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Gary R. Peterson
Vice President
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December 20, 2001

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

Subject: Duke Energy Corporation
Catawba Nuclear Station, Unit 2
Docket Number 50-414
Request for Relief Number 01-003
Limited Weld Examinations in End-of-Cycle 11
Refueling Outage

Please find attached, pursuant to 10 CFR 50.4 and 10 CFR 50.55a(g)(5)(iii), Request for Relief Number 01-003. This request pertains to limited weld examinations during the Unit 2 End-of-Cycle 11 Refueling Outage. Duke is requesting that NRC review and approve this Request for Relief at your earliest available opportunity.

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

If you have any questions concerning this subject, please call L.J. Rudy at (803) 831-3084.

Very truly yours,

Gary R. Peterson

LJR/s

Attachment

A047

Document Control Desk

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December 20, 2001

xc (with attachment):

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U.S. Nuclear Regulatory Commission, Region II
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61 Forsyth St., SW, Suite 23T85
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DUKE ENERGY CORPORATION

STATION: CATAWBA NUCLEAR STATION UNIT 2

10-YEAR INTERVAL REQUEST FOR RELIEF NO. 01-003

Duke Energy Corporation has determined that conformance with certain ASME Section XI Code requirements is impractical. Therefore, pursuant to 10CFR50.55a(g)(5)(iii), Duke Energy requests relief from applicable portions of the code.

Reference Attachment 1 for welds addressed by this relief request. There are six (6) welds in this request: one B-D, one B-J, three C-B, and one C-F-1.

ASME Section XI Code of Record: 1989 Edition with no addenda

Interval: Second Ten-Year Interval; Second Inspection Period

Applicable Code Case: N-460

I. System/Component(s) for Which Relief is Requested:

ASME Section XI Code Class 1 Examination Category B-D
Full Penetration Welds of Nozzles In Vessels

| <u>ID Number</u> | <u>Item Number</u> | <u>Configuration</u> |
|------------------|--------------------|--|
| 2PZR-W1 | B03.110.001 | Pressurizer Nozzle-to-Vessel Welds |

II. Code Requirement:

ASME Section XI 1989 Edition with no addenda,
Examination Category B-D, Item No. B03.110, Figure IWB-
2500-7 (b), Examination Volume A-B-C-D-E-F-G-H.

III. Code Requirement from which Relief is Requested:

Relief is being sought from the requirement to examine 100% of the volume A-B-C-D-E-F-G-H shown in Figure IWB-2500-7(b).

IV. Basis for Relief:

During the ultrasonic examination of the Pressurizer Surge Nozzle to Head Weld, 2PZR-W1 shown in Attachment 2, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 42.80%. Limitations are caused by the weld geometry that restricts access to only one side of the weld, and the proximity of heater tubes that restrict the scanning surface. The percentage of coverage reported represents the aggregate coverage obtained from one scan perpendicular to the weld axis and two scans, 180° apart parallel to the weld.

V. Alternate Examinations or Testing:

No additional examinations are planned during the current interval for 2PZR-W1. Radiography is not practical because of the geometry of the component, which prevents placement of the film and exposure source. Duke Energy Corporation will continue to use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld.

VI. Justification for the Granting of Relief:

Although the examination volume A-B-C-D-E-F-G-H in Figure IWB-2500-7(b) for ID Number 2PZR-W1 could not be covered, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. For results of the examination, reference Attachment 2.

Pressurizer Surge Nozzle to Head Weld, 2PZR-W1 is located inside containment and is part of the reactor coolant system pressure boundary. General Design Criterion 30, "Quality of Reactor Coolant Pressure

Boundary," of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," mandates that means be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage. If a leak were to develop at this weld location, the instrumentation available to the operators for detection and monitoring of leakage would provide prompt and qualitative information necessary to permit them to take immediate corrective action. If a leak should develop, the only corrective action would be to shutdown and depressurize the reactor coolant system, since the component is non-isolable.

Plant Technical Specifications dictate that a reactor coolant system water inventory balance be performed on a regular basis. A normal operating practice is to perform this computer based mass balance on a daily frequency and/or whenever the operators suspect any abnormal changes to other leakage detection systems. A plant technical specification requires that if the leak rate cannot be reduced below 1 gpm unidentified that the plant be put in hot standby within 6 hours and in cold shutdown within the following 30 hours. Leakage as a result of a failed weld discussed in this section would show up as unidentified leakage and subject to the 1 gpm limit.

Other leakage detection systems available to the operator and dictated per plant technical specifications are:

- Containment Atmosphere Gaseous and Particulate Radioactivity Monitoring System (EMF monitors 38 & 39) which would detect airborne radiological activity;
- 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;
- Containment Ventilation Unit Condensate Drain Tank Level Monitoring Subsystem which collects and measures as unidentified leakage the moisture removed from the containment atmosphere.

Additionally, other indicators are also available to the operator that a leak exists or may be developing:

- Containment Atmosphere Iodine Monitor (EMF 40)

- Charging / Letdown system mismatches;
- Containment humidity indications;
- Pre-Cycle walkdowns performed each outage while system is at operating temperature and pressure prior to criticality;
- Post-Cycle walkdowns performed at operating temperature and pressure performed during unit shutdown.

VII. Implementation Schedule:

This examination will continue to be scheduled in accordance with the requirements of ASME Section XI for future inspection intervals.

I. System/Component(s) for Which Relief is Requested:

ASME Section XI Code Class 1 Examination Category B-J
Pressure Retaining Welds in Piping; Branch Pipe
Connection Welds

| <u>ID Number</u> | <u>Item Number</u> | <u>Configuration</u> |
|------------------|--------------------|----------------------|
| 2NC13-WN9 | B09.031.003 | Nozzle to Pipe |

II. Code Requirement:

ASME Section XI 1989 Edition with no addenda,
Examination Category B-J, Item No. B09.031, Figure IWB-
2500-8(c).

ASME Section XI, Appendix III, Paragraph III-4420, 1989
Edition with no addenda as modified by Code Case N-460.
"The examination shall be performed using a
sufficiently long examination beam path to provide
coverage of the required examination volume in two-beam
path directions. The examination shall be performed
from two sides of the weld, where practicable, or from
one side of the weld, as a minimum."

III. Code Requirement from which Relief is Requested:

Relief is being sought from the requirement to examine
the weld in two beam path directions.

IV. Basis for Relief:

During the ultrasonic examination of this branch pipe
connection weld, 2NC13-WN9 shown in Attachment 3,
greater than 90% of the required examination volume as
allowed by Code Case N-460 could not be achieved. The
examination coverage was limited to 22.87% of the
required examination volume. This is an austenitic
stainless steel branch connection weld where access is
limited to the main run pipe side of the weld. The main
run of pipe is cast stainless steel. The percentage of
coverage reported represents the aggregate coverage
obtained from one scan parallel to the pipe axis and
two scans, 180° apart in the circumferential direction

on each weld. The weld design prevented any scan from the branch connection side. In order to achieve more coverage the weld would have to be re-designed to allow scanning from both sides.

Duke Energy Corporation does not claim credit for coverage of the far side of austenitic 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. Duke Energy Corporation uses refracted longitudinal waves to examine cast austenitic welds.

V. Alternate Examinations or Testing:

No additional examinations are planned during the current interval for 2NC13-WN9. Radiography is not practical because of the geometry of the component, which prevents placement of the film and exposure. Duke Energy Corporation will continue to use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld.

VI. Justification for the Granting of Relief:

Although the examination requirements as defined in ASME Section XI 1989 Edition with No Addenda, Appendix III, Paragraph III-4420, for ID Number 2NC13-WN9, could not be covered, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. For results of the examination, reference Attachment 3.

2NC13-WN9 is located inside containment and is part of the reactor coolant system pressure boundary. General Design Criterion 30, "Quality of Reactor Coolant Pressure Boundary," of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," mandates that means be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage. If a leak were to develop at this weld location, the instrumentation available to the operators for detection and monitoring of leakage would provide prompt and qualitative information necessary to permit them to take immediate corrective action. If a leak should develop, the only

corrective action would be to shutdown and depressurize the reactor coolant system, since the component is non-isolable.

Plant Technical Specifications dictate that a reactor coolant system water inventory balance be performed on a regular basis. A normal operating practice is to perform this computer based mass balance on a daily frequency and/or whenever the operators suspect any abnormal changes to other leakage detection systems. A plant technical specification requires that if the leak rate cannot be reduced below 1 gpm unidentified that the plant be put in hot standby within 6 hours and in cold shutdown within the following 30 hours. Leakage as a result of a failed weld discussed in this section would show up as unidentified leakage and subject to the 1 gpm limit.

Other leakage detection systems available to the operator and dictated per plant technical specifications are:

- Containment Atmosphere Gaseous and Particulate Radioactivity Monitoring System (EMF monitors 38 & 39) which would detect airborne radiological activity;
- 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;
- Containment Ventilation Unit Condensate Drain Tank Level Monitoring Subsystem which collects and measures as unidentified leakage the moisture removed from the containment atmosphere.

Additionally, other indicators are also available to the operator that a leak exists or may be developing:

- Containment Atmosphere Iodine Monitor (EMF 40)
- Charging / Letdown system mismatches;
- Containment humidity indications;
- Pre-Cycle walkdowns performed each outage while system is at operating temperature and pressure prior to criticality;
- Post-Cycle walkdowns performed at operating temperature and pressure performed during unit shutdown.

VII. Implementation Schedule:

This examination will continue to be scheduled in accordance with the requirements of ASME Section XI for future inspection intervals.

I. System/Component(s) for Which Relief is Requested:

ASME Section XI Code Class 2 Examination Category
C-B Pressure Retaining Nozzle Welds in Vessels; Nozzle
to Shell (or Head) Weld

| <u>ID Number</u> | <u>Item Number</u> | <u>Configuration</u> |
|------------------|--------------------|-------------------------|
| 2SGB-06A-18 | C02.021.001 | Nozzle to Shell Weld |

II. Code Requirement:

ASME Section XI 1989 Edition with no addenda,
Examination Category C-B, Item No. C02.021, Figure IWC-
2500-4 (a). ASME Section V, Article 4, Paragraph T-
424.1 states: "The volume shall be examined by moving
the search unit over the examination surface so as to
scan the entire examination volume."

III. Code Requirement from which Relief is Requested:

Relief is being sought from the requirement to scan the
entire examination volume C-D-E-F shown in Figure IWC-
2500-4(a).

IV. Basis for Relief:

During the ultrasonic examination of Steam Generator 2B
Auxiliary Feedwater Nozzle-to-Shell Weld 2SGB-06A-18,
Item Number C02.021.001, greater than 90% coverage of
the required examination volume could not be obtained.
The examination coverage was limited to 75.00% of the
required examination volume. This is a ferritic nozzle
to shell weld where access is limited to the vessel
shell side only. The weld would have to be re-designed
to allow scanning from both sides in order to achieve
greater than 90% coverage. The percentage of coverage
reported represents the aggregate coverage obtained
from one scan perpendicular to the weld axis and two
scans, 180° apart parallel to the weld as shown in
Attachment 4.

V. Alternate Examinations or Testing:

No additional examinations are planned during the current interval for ID Number 2SGB-06A-18. Radiography is not an acceptable alternative because of access restrictions for source and film placement. Duke Energy Corporation will continue to use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld.

VI. Justification for the Granting of Relief:

Although the entire examination volume C-D-E-F in Figure IWC-2500-4(a) for ID Number 2SGB-06A-18 could not be covered, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. For results of the examination, reference Attachment 4.

Steam Generator 2B Auxiliary Feedwater Nozzle-to-Shell Weld 2SGB-06A-18 is located inside containment and is part of the secondary system pressure boundary. If a leak were to develop at this weld location, the instrumentation available to the operators for detection and monitoring of leakage would provide prompt and qualitative information necessary to permit them to take immediate corrective action. If a leak should develop, the probable corrective action would be shutdown and depressurize the steam generators, since the weld is non-isolable.

Other leakage detection systems available to the operator and dictated per plant technical specifications are:

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

Additionally, other indicators are also available to the operator that a leak exists or may be developing:

- Containment humidity indications;

- Pre-Cycle walkdowns performed each outage while system is at operating temperature and pressure prior to criticality;
- Post-Cycle walkdowns performed at operating temperature and pressure performed during unit shutdown.

VII. Implementation Schedule:

This examination will continue to be scheduled in accordance with the requirements of ASME Section XI for future inspection intervals.

I. System/Component(s) for Which Relief is Requested:

ASME Section XI Code Class 2 Examination Category
C-B Pressure Retaining Nozzle Welds in Vessels; Nozzle
to Shell (or Head) Weld

| <u>ID Number</u> | <u>Item Number</u> | <u>Configuration</u> |
|------------------|--------------------|---------------------------|
| 2BNSHX-3-N1 | C02.021.004 | Nozzle to Channel Weld |
| 2BNSHX-3-N2 | C02.021.005 | Nozzle to Channel Weld |

II. Code Requirement:

ASME Section XI 1989 Edition with no addenda, Category
C-B, Item No. C02.021, Figure IWC-2500-4(a).
ASME Section XI, Appendix III, Paragraph III-4420, 1989
Edition with no addenda as modified by Code Case N-460.
"The examination shall be performed using a
sufficiently long examination beam path to provide
coverage of the required examination volume in two-beam
path directions. The examination shall be performed
from two sides of the weld, where practicable, or from
one side of the weld, as a minimum."

III. Code Requirement from which Relief is Requested:

Relief is being sought from the requirement to perform
the examination from two beam path directions.

IV. Basis for Relief:

During the ultrasonic examination of the Containment
Spray Heat Exchanger Inlet and Outlet Nozzle to Channel
Welds 2BNSHX-3-N1 and 2BNSHX-3-N2 shown in Attachments
5 and 6, respectively, greater than 90% coverage of the
required examination volume could not be obtained. The
examination coverage for both welds was limited to
49.03%. Austenitic weld metal characteristics and
single sided access caused by the component geometry

prevents two-beam path direction coverage of the examination volume. Obtaining coverage greater than 90% of the weld volume as defined in Code Case N-460 is not possible. In order to achieve two beam path direction coverage, the welds would have to be re-designed to allow scanning from both sides.

The most effective ultrasonic technique for the examination of dissimilar metal welds uses refracted longitudinal waves. The longitudinal wave is preferred as the austenitic weld metal creates highly attenuative barriers to shear wave ultrasound. The longitudinal wave is less affected by these difficulties. However, the longitudinal wave is affected by mode conversion when it strikes the inside surface of the safe end or pipe at any angle other than a right angle to the surface.

The calculations below show that a 45° refracted longitudinal wave striking the inside surface of a pipe will produce a 22.9° refracted shear wave in addition to the normally expected 45° reflected longitudinal wave.

$$\begin{aligned}\sin^{-1} &= (\sin 45^{\circ} \times V_s) \div V_L \\ &= (0.707 \times 0.123) \div 0.223\end{aligned}$$

Where: \sin^{-1} is the shear wave angle

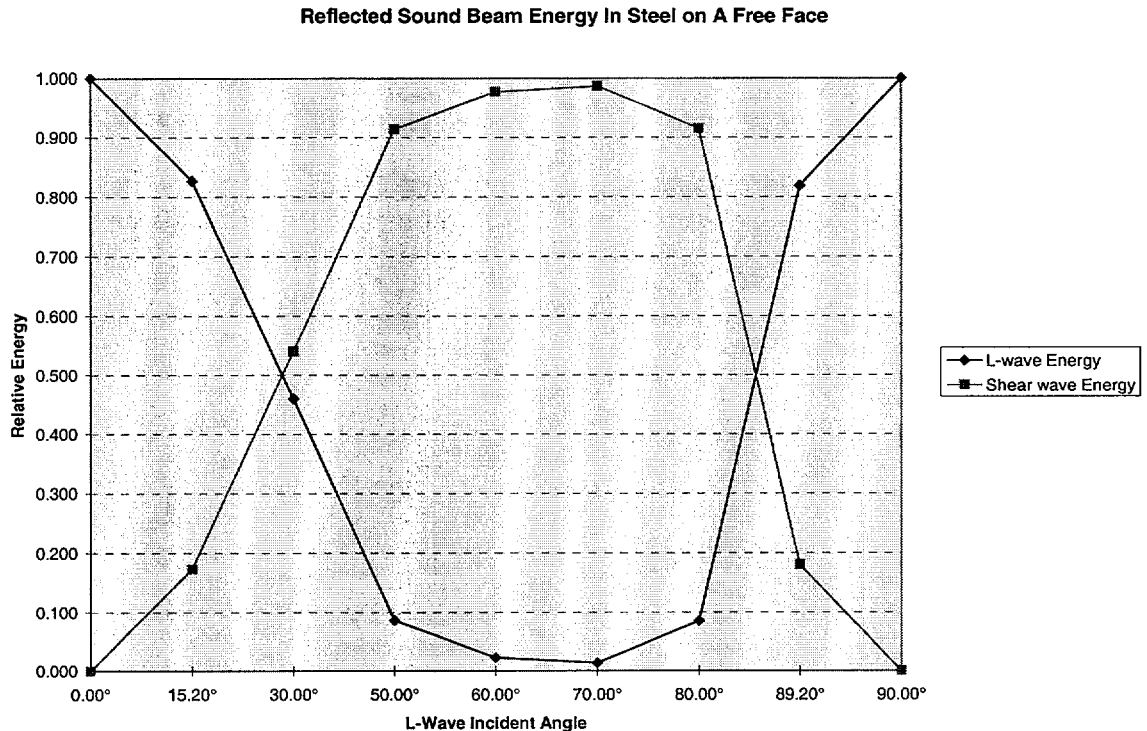
V_s is the shear wave velocity of the stainless steel safe end/pipe material in inches / μ sec.

V_L is the longitudinal wave velocity of the stainless steel safe/pipe end material in inches/ μ sec.

As shown in the graph below, the mode conversion process creates two sound beams of differing intensities reflecting off the inside surface¹. At incident angles greater than 30 degrees, the shear wave will predominate. However, the shear wave is attenuated and scattered by the austenitic weld metal and the layer of buttering. The examination sensitivity is degraded to such an extent that any examination using the second sound path leg is meaningless. Therefore, the two-beam path direction coverage requirement is impractical.

In order to obtain the required two-beam path direction coverage, welds would have to be re-designed to allow scanning from both sides.

¹Firestone, F.A.: Tricks with the Supersonic Reflectoscope, J. Soc. Nondestructive Testing, vol. 7, no. 2, Fall 1948.



V. Alternate Examinations or Testing:

No additional examinations are planned during the current interval for weld Numbers 2BNSHX-3-N1 and 2BNSHX-3-N2. Radiography is not an acceptable alternative because of access restrictions for source and film placement. Duke Energy Corporation will continue to use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of these welds.

VI. Justification for the Granting of Relief:

Although the examination volume as defined in ASME Section XI 1989 Edition with no addenda, Figure IWC-2500-4 (a) could not be covered in two beam path

directions, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. These welds were examined using procedures and calibration blocks in accordance with ASME Section XI, Appendix III.

Containment Spray (NS) is used to control pressure inside the containment vessel during a safety injection with high containment pressure. This system is not used for normal operation of the plant.

The area that contains the welds (Containment Spray Heat Exchanger Inlet and Outlet Nozzle to Channel) is surveyed twice a day by Operations during their routine rounds. One of the items that must be checked off is for general condition of the room containing the heat exchanger. It is reasonable to expect the operator making these rounds to detect any external leaks from these welds.

This same area is also surveyed once a week by a periodic test that is used to specifically look for radioactive leaks outside containment. This area must be surveyed and signed off. If a leak were encountered, it would be written up in a work request and a Problem Investigation Process form filled out. The Fluid Leak Management Process then examines the leak. The leak is either repaired or set up for periodic monitoring. A leak in the NS system would also have to be entered into the Emergency Core Cooling System Leakage Program managed by Technical Specification 5.5.3.

VII. Implementation Schedule:

These examinations will continue to be scheduled in accordance with the requirements of ASME Section XI for future inspection intervals.

I. System/Component(s) for Which Relief is Requested:

ASME Section XI Examination Category C-F-1 Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping; Circumferential Weld

| <u>ID Number</u> | <u>Item Number</u> | <u>Configuration</u> |
|------------------|--------------------|----------------------|
| 2NV20-5 | C05.021.232 | Pipe to Valve |

II. Code Requirement:

ASME Section XI 1989 Edition with no addenda, Examination Category C-F-1, Item No. C05.021, Figure IWC-2500-7 (a), Examination Volume C-D-E-F.

III. Code Requirement from which Relief is Requested:

Relief is being sought from the requirement to examine 100% of Volume C-D-E-F shown in Figure IWC-2500-7 (a).

IV. Basis for Relief:

During the ultrasonic examination of this pipe to valve weld, 2NV20-5 shown in Attachment 7, greater than 90% of the required examination volume as allowed by Code Case N-460 could not be achieved. The examination coverage was limited to 61.09% of the required examination volume. This is an austenitic stainless steel pipe to valve weld where access is limited to the pipe side of the weld only. The percentage of coverage reported represents the aggregate coverage obtained from one scan parallel to the pipe axis and two scans, 180° apart in the circumferential direction on each weld. The weld design prevented any axial scan from the valve side. In order to achieve more coverage the weld would have to be re-designed to allow scanning from both sides.

Duke Energy Corporation does not claim credit for coverage of the far side of austenitic 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. Duke Energy Corporation uses a combination of shear waves and longitudinal waves to examine single sided austenitic 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 detected through the weld metal, PDI does not provide a qualification for single sided examinations of austenitic welds.

V. Alternate Examinations or Testing:

No additional examinations are planned during the current interval for ID Number 2NV20-5. Because of the valve configuration, radiography would not provide any additional coverage. Duke Energy Corporation will use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld.

VI. Justification for the Granting of Relief:

Although the examination volume as defined in ASME Section XI 1989 Edition with no addenda, Figure IWC-2500-7 (a) could not be covered, the amount of coverage obtained for these examinations provides an acceptable level of quality and integrity. These welds were examined using procedures, personnel and equipment qualified through the Performance Demonstration Initiative (PDI).

This weld is located on the Seal Return Line from the Reactor Coolant Pumps. This same line also provides mini-flow protection for the high head safety injection pumps. The seal return line containing this weld is normally in service during power operations. The Seal Return Line containing the weld is located in the Auxiliary Building. During power operations and unit refueling outages, the Seal Return Line is accessible for visual inspections.

If a leak were to occur at the weld in question (at Valve 2NV-204), there are several periodic tests and

evaluations that are performed by established procedures that should identify the leakage for prompt OPS/ENG evaluation:

- During power operation, any leakage from the Seal Return Line would be identified as a mass loss in the reactor coolant system water inventory balance. As described above, a normal operating practice is to perform this computer based mass balance on a daily frequency and/or whenever the operators suspect any abnormal changes to other leakage detection systems. A plant technical specification requires that if the leak rate cannot be reduced below 1 gpm unidentified that the plant be put in hot standby within 6 hours and in cold shutdown within the following 30 hours. Leakage as a result of a failed weld discussed in this section would show up as unidentified leakage and subject to the 1-gpm limit.
- If a leak were to occur at the subject weld, the water would spill on the floor in the Auxiliary Building and flow to a floor drain and then to the Floor Drain Tank. Our Chemistry department periodically monitors the tank level and evaluates unidentified leakage for correction.

This same area is also surveyed once a week by a periodic test that is used to specifically look for radioactive leaks outside containment. This area must be surveyed and signed off. If a leak were encountered, it would be written up in a work request and a Problem Investigation Process form filled out. The Fluid Leak Management Process then examines the leak. The leak is either repaired or set up for periodic monitoring.

VII. Implementation Schedule:

This examination will continue to be scheduled in accordance with the requirements of ASME Section XI for future inspection intervals.

Finally, for all of the welds covered by this request for relief, in the event that a through wall leak were discovered, the affected component would be subjected to an operability determination as required by existing plant processes. Should the affected component be determined to be inoperable, the applicable Technical Specification remedial actions would be followed.

The following individuals contributed to the development of this RFR:

Jim McArdle (NDE Level III) provided Sections II-V and part of Section VI

David Goforth (Systems Engineer) provided part of Section VI

Andy Hogge (Sponsor) compiled the remaining sections

Sponsored By:

A. J. Hogge, Jr. Date 12/19/2001

Approved By:

R. Kevin Rhyme Date 12/19/01

| | |
|--------------|---------------------------------|
| Attachment 1 | Description Table |
| Attachment 2 | UT Examination Data B03.110.001 |
| Attachment 3 | UT Examination Data B09.031.003 |
| Attachment 4 | UT Examination Data C02.021.001 |
| Attachment 5 | UT Examination Data C02.021.004 |
| Attachment 6 | UT Examination Data C02.021.005 |
| Attachment 7 | UT Examination Data C05.021.232 |

ASME Class 1 & 2 Inservice Inspection Request For Relief 01-003
 For Catawba Unit 2 Based on ASME Section XI - 1989 Code

| Item No. | Exam Category/ Figure No. | System Or Component | Area To Be Examined | Reason For Request | Licensee Proposed Alternate Examination |
|-------------|---|------------------------|---|---|--|
| B03.110.001 | B-D IWB-2500-7 (b) | Pressurizer | Pressurizer Surge Nozzle to Lower Head | Limited scan due to the weld geometry that restricts access to only one side of the weld, and the proximity of heater tubes that restricts the scanning surface. Actual coverage obtained = 42.80% (See Attachment 2) | None |
| B09.031.003 | B-J IWB-2500-8(c) Appendix III, Paragraph III-4420 | NC System | Reactor Coolant System Nozzle to Pipe | Limited scan due to access limited to the main run pipe side of the weld. Actual coverage obtained = 22.87% (See Attachment 3) | None |

ASME Class 1 & 2 Inservice Inspection Request For Relief 01-003
 For Catawba Unit 2 Based on ASME Section XI - 1989 Code

| Item No. | Exam Category /Figure No. | System Or Component | Area To Be Examined | Reason For Request | Licensee Proposed Alternate Examination |
|-------------|---|----------------------------------|--|---|---|
| C02.021.001 | C-B IWC-2500-4 (a) | Steam Generator | Steam Generator 2B Auxilliary Feedwater Nozzle to Shell | Limited scan due to access limited to the vessel shell side only. Actual coverage obtained = 75% (See Attachment 4) | None |
| C02.021.004 | C-B IWC-2500-4(a) Appendix III, Paragraph III-4420 | Containment Spray Heat Exchanger | Containment Spray Heat Exchanger Outlet Nozzle to Channel | Limited scan due to single-sided access caused by the component geometry. Actual coverage obtained = 49.03% (See Attachment 5) | None |
| C02.021.005 | C-B IWC-2500-4(a) Appendix III, Paragraph III-4420 | Containment Spray Heat Exchanger | Containment Spray Heat Exchanger Inlet Nozzle to Channel | Limited scan due to single-sided access caused by the component geometry. Actual coverage obtained = 49.03% (See Attachment 6) | None |

ASME Class 1 & 2 Inservice Inspection Request For Relief 01-003
For Catawba Unit 2 Based on ASME Section XI - 1989 Code

| Item No. | Exam Category /Figure No. | System Or Component | Area To Be Examined | Reason For Request | Licensee Proposed Alternate Examination |
|-----------------|----------------------------------|----------------------------|---|--|--|
| C05.021.232 | C-F-1 IWC-2500-7 (a) | NV System | Chemical and Volume Control Valve 2NV-204 to Pipe | Limited scan due to access limited to the pipe side of the weld only. Actual coverage obtained = 61.09% (See Attachment 7) | None |

| | | | | | | | | |
|--|------------------------------|----------------------------|---|--|---|-------------------|-----------------------------------|--|
| DUKE POWER COMPANY | | | | | | Exam Start: 1433 | Form NDE-UT-2A | |
| ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS | | | | | | Exam Finish: 1504 | Revision 4 | |
| Station: CNS | Unit: 2 | Component/Weld ID: 2PZR-W1 | | | | Date: 10/9/2001 | | |
| Weld Length (in.): 77" | Surface Condition: AS GROUND | | Lo: 9.2.3 | | Surface Temperature: <u>71</u> ° <u>F</u> | | | |
| Examiner: David Zimmerman <i>David Zimmerman</i> | Level: III | | Scans: | | | | Pyrometer S/N: <u>MCNDE 27010</u> | |
| Examiner: Larry Mauldin <i>Larry Mauldin</i> | Level: III | | 45 <input type="checkbox"/> _____ dB | 70 <input checked="" type="checkbox"/> <u>59</u> dB | Cal Due: <u>2/14/2002</u> | | | |
| Procedure: NDE-620 | Rev: 8 | FC: 00-07 | 45T <input type="checkbox"/> _____ dB | 70T <input checked="" type="checkbox"/> <u>59</u> dB | Configuration: <u>ZR Surge Nozzle to Lower Head</u> | | | |
| Calibration Sheet No: 0102054, 0102055, 0102056 | | | 60 <input checked="" type="checkbox"/> <u>74/71.5</u> dB | S2 _____ Flow _____ S1 _____ | | | | |
| | | | 60T <input checked="" type="checkbox"/> <u>74/71.5</u> dB | <u>NOZZLE</u> to <u>HEAD</u> | | | | |
| | | | Other: _____ dB | Scan Surface: <u>OD</u> | | | | |
| | | | | Applies to NDE-680 only | | | | |
| | | | | Skew Angle: <u>N/A</u> | | | | |

| 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 | 60/70 | | | | | | | | | | | | | | | |

| | | | |
|---|-----------------|-----------------------|--|
| Remarks: | | | |
| Limitations: (see NDE-UT-4) <input checked="" type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/> | | | Sheet <u>1</u> of <u>12</u> |
| Reviewed By: <i>Sandy Moss</i> | Level: <u>B</u> | Date: <u>10-11-01</u> | Authorized Inspector: <i>Robert M. Lewis</i> Date: <u>10/17/01</u> |
| | | | Item No: B03.110.001 |

REQUEST FOR RELIEF #01-003 ATTACHMENT 2

AH 11/19/01

**DUKE POWER COMPANY
ISI LIMITATION REPORT**

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2PZR-W1

Item No: B03.110.001

Remarks:

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ * _____ to L _____ * _____ INCHES FROM WO 3.0" to BEYOND
 ANGLE: 0 45 60 Other 70° FROM N/A DEG to N/A DEG

* There are 20 (.75" Dia. @) Heater Tubes. 70°L loss-2.3" @ = 46 in. / 60°L loss-3.2" @ = 64 in.

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L N/A to L N/A INCHES FROM WO 3.0" to BEYOND
 ANGLE: 0 45 60 Other 70° FROM 0 DEG to 360 DEG

DUE TO 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

Prepared By: David K. [Signature] Level: III Date: 10/09/01 Sketch(s) attached yes no Sheet 2 of 12

Reviewed By: Gary [Signature] Date: 10-11-01 Authorized Inspector: Robert [Signature] Date: 10/17/01

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

See Drwg. For Calculations
 Zone I = 4.9 sq. in.
 Zone II & III = 11.1 sq. in.

Volume Calculation

Zone I = 4.9 sq.in. X 78 in. = 382.2 cu.in.
 Zone II & III = 11.1 sq.in. X 78 in. = 865.8 cu.in.
 Loss = 70° -- 46 in., 60° -- 64 in. for heater tubes

Coverage Calculations

| Scan # | Angle | Beam Direction | Area Examined (sq.in.) | Length Examined (in.) | Volume Examined (cu.in.) | Volume Required (cu.in.) | Percent Coverage |
|--------|-------|----------------|------------------------|-----------------------|--------------------------|--------------------------|------------------|
| 1 | 70 | 2 | 4.1 | 32 | 131.2 | 156.8 | |
| 1 | 70 | 2 | 2.3 | 46 | 105.8 | 225.4 | |
| 2 | 70 | 1 | 1.8 | 78 | 140.4 | 382.2 | |
| 3 | 70 | CW | 3.5 | 78 | 273 | 382.2 | |
| 4 | 70 | CCW | 3.5 | 78 | 273 | 382.2 | |
| 5 | 60 | 2 | 11 | 14 | 154 | 155.4 | |
| 5 | 60 | 2 | 1.8 | 64 | 115.2 | 710.4 | |
| 6 | 60 | 1 | .3 | 78 | 23.4 | 865.8 | |
| 7 | 60 | CW | 5.9 | 78 | 460.2 | 865.8 | |
| 8 | 60 | CCW | 5.9 | 78 | 460.2 | 865.8 | |

Item No: B03.110.001

Prepared By: Larry Mauldin *Larry Mauldin* Level: III Date: 10/9/2001

Reviewed By: *Larry Moss* Level: II Date: 10-11-01

301/12

| | |
|---|------------|
| 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 | Volume Calculation |
|--|---|
| See Drwg. For Calculations Zone I = 4.9 sq. in. Zone II & III = 11.1 sq. in. | Zone I = 4.9 sq.in.X 78 in. = 382.2 cu.in. Zone II & III = 11.1 sq.in. X 78 in. = 865.8 cu.in. Loss = 70° -- 46 in., 60° -- 64 in. for heater tubes |

Coverage Calculations

| Scan # | Angle | Beam Direction | Area Examined (sq.in.) | Length Examined (in.) | Volume Examined (cu.in.) | Volume Required (cu.in.) | Percent Coverage |
|--------|-------|----------------|------------------------|-----------------------|--------------------------|--------------------------|------------------|
| | | | | | 2136.4 | 4992 | 42.80 |

| | |
|----------|-------------|
| Item No: | B03.110.001 |
|----------|-------------|

| | | | |
|----------------------------|----------------------|------------|-----------------|
| Prepared By: Larry Mauldin | <i>Larry Mauldin</i> | Level: III | Date: 10/9/2001 |
|----------------------------|----------------------|------------|-----------------|

| | | | |
|------------------------------|--|------------------|-----------------------|
| Reviewed By: <i>Gay Moss</i> | | Level: <i>II</i> | Date: <i>10-11-01</i> |
|------------------------------|--|------------------|-----------------------|

40112

PRESSURIZER URGE NOZZLE TO LOWER HEAD

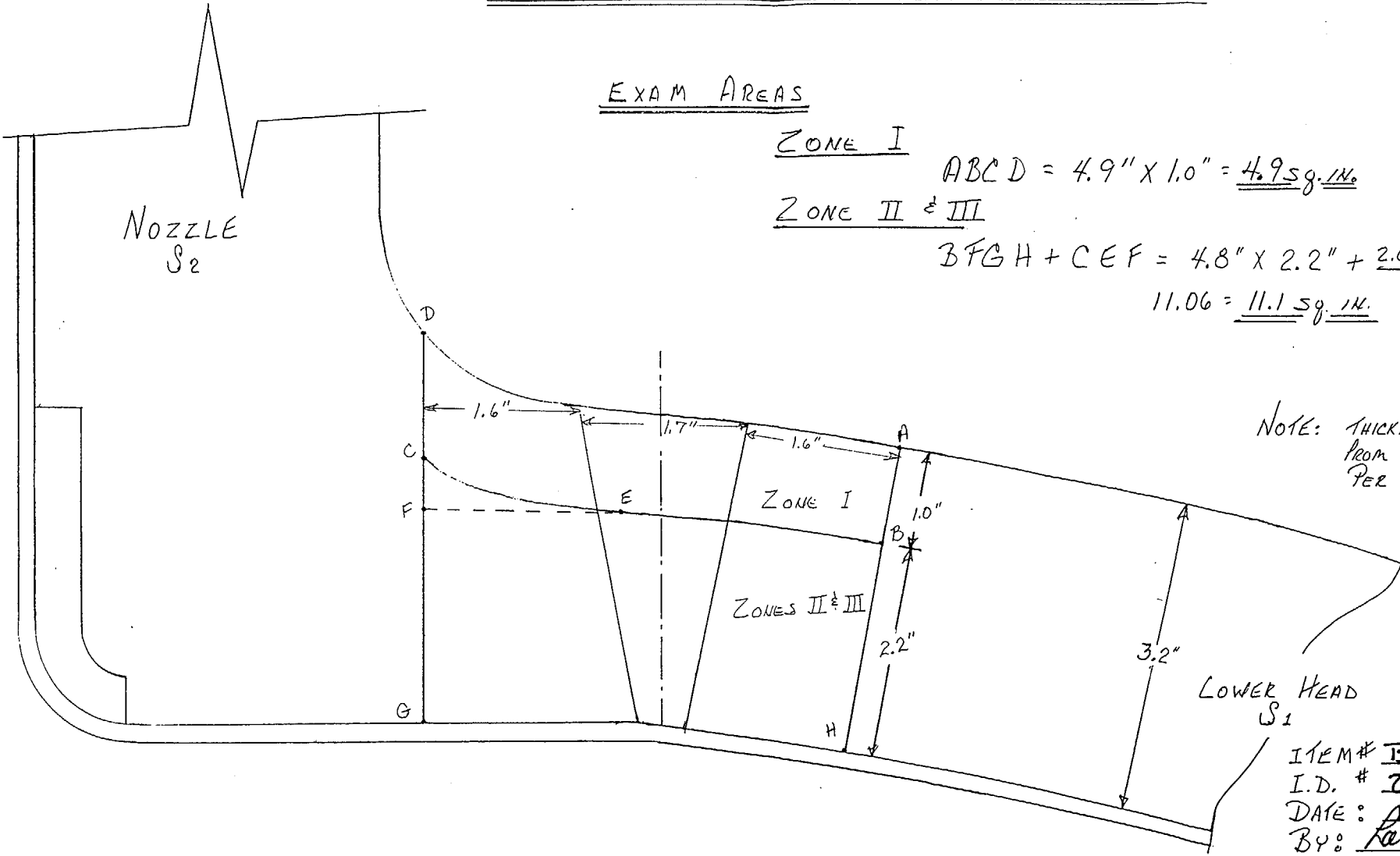
EXAM AREAS

ZONE I

$ABCD = 4.9" \times 1.0" = \underline{4.9 \text{ sq. in.}}$

ZONE II & III

$BFGH + CEF = 4.8" \times 2.2" + \frac{2.0" \times .5"}{2} =$
 $11.06 = \underline{11.1 \text{ sq. in.}}$



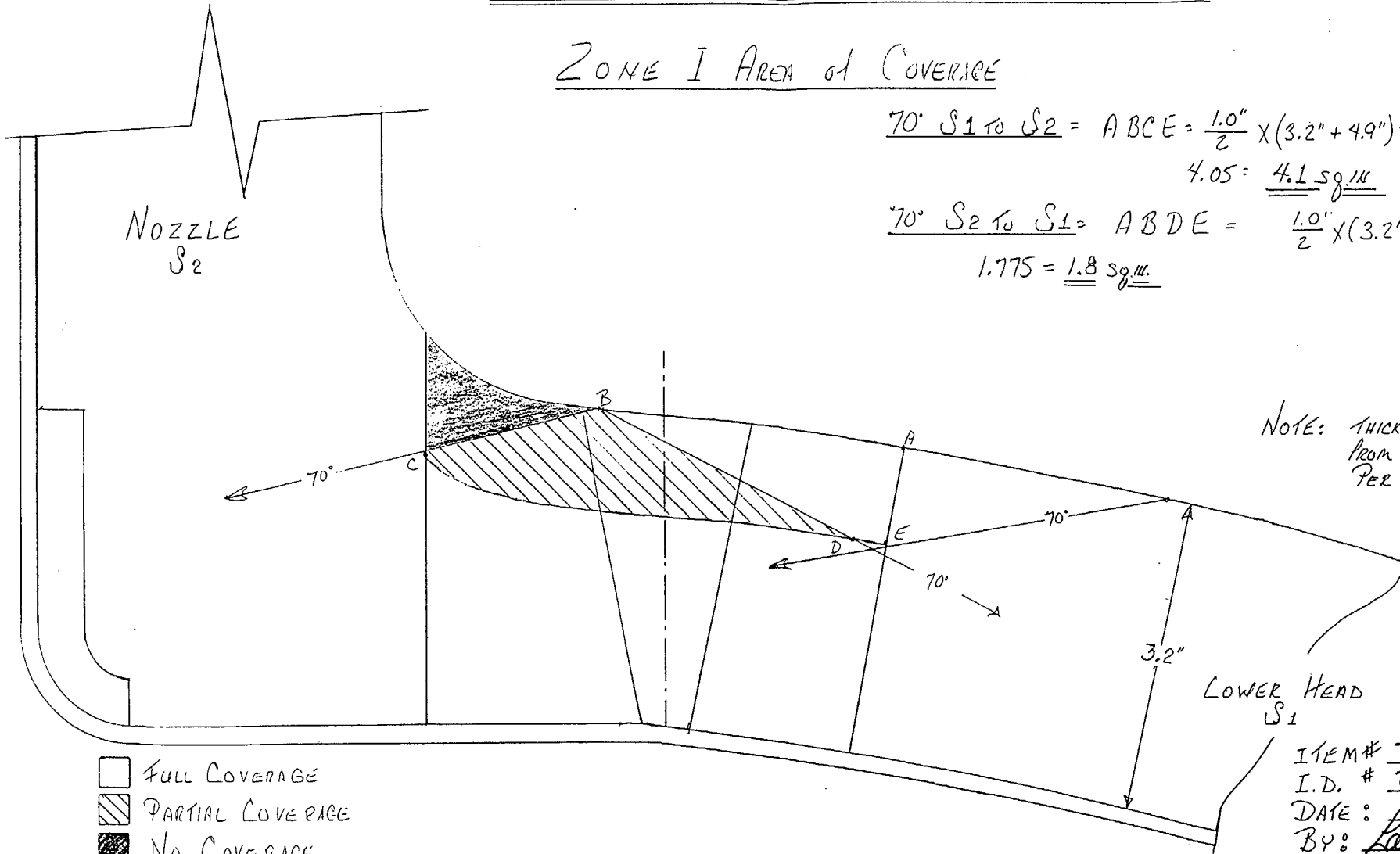
NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

LOWER HEAD
S1

ITEM# B03-110.001
 I.D. # 2PRR-W1
 DATE: 10/09/01
 BY: Kang Thauler

PRESSURIZER SURGE NOZZLE TO LOWER HEAD

ZONE I AREA of COVERAGE



$$70^\circ \text{ S1 TO S2} = ABCE = \frac{1.0''}{2} \times (3.2'' + 4.9'') =$$

$$4.05 = \underline{\underline{4.1 \text{ sq. in.}}}$$

$$70^\circ \text{ S2 TO S1} = ABDE = \frac{1.0''}{2} \times (3.2'' + .35'') =$$

$$1.775 = \underline{\underline{1.8 \text{ sq. in.}}}$$

NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

ITEM# B03.110.001

I.D. # 2PER-W1

DATE: 10/09/01

BY: Larry Thacker

PRESSURIZER SURGE NOZZLE TO LOWER HEAD

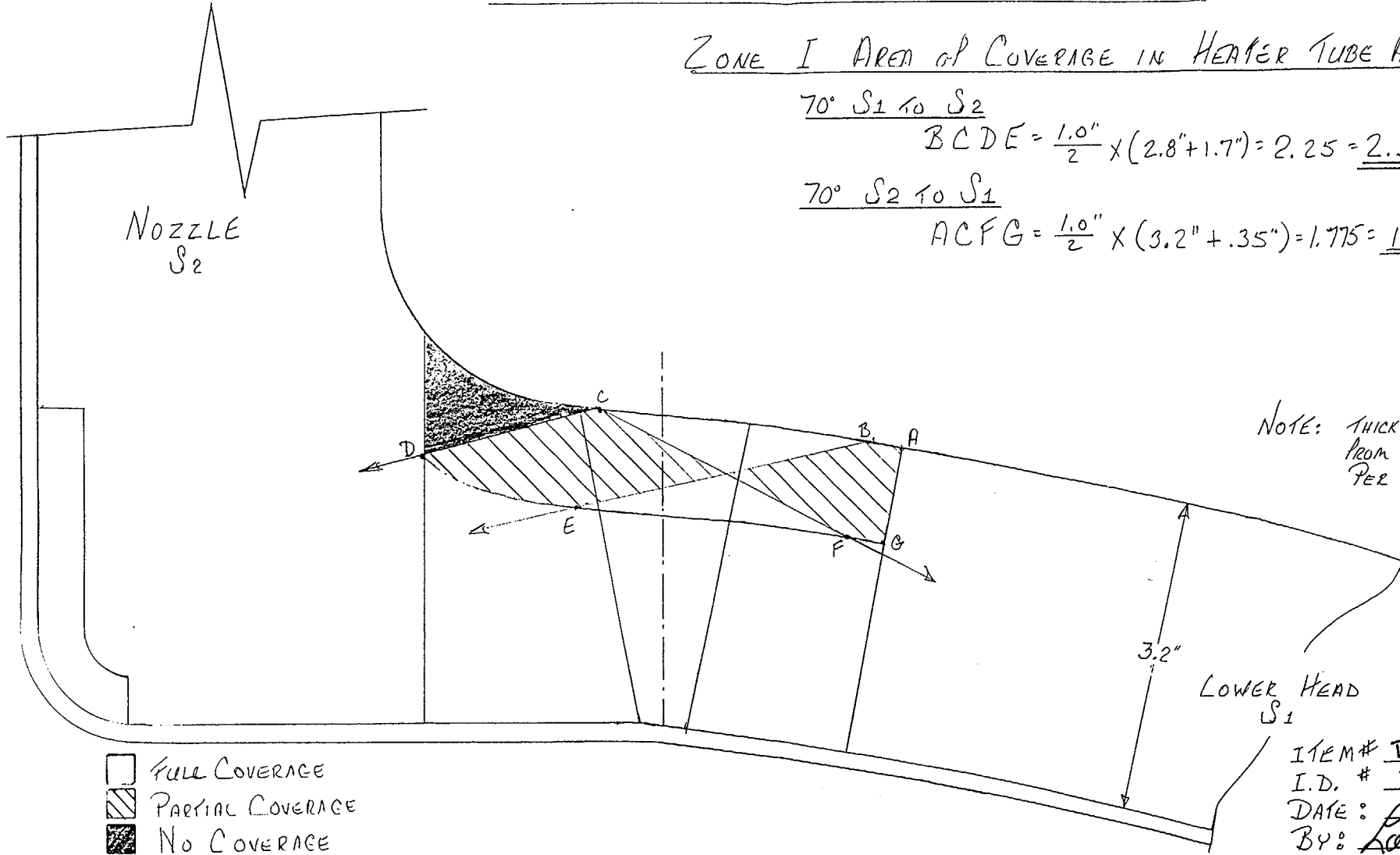
ZONE I AREA OF COVERAGE IN HEATER TUBE AREA

70° S₁ TO S₂

$$BCDE = \frac{1.0''}{2} \times (2.8'' + 1.7'') = 2.25 = \underline{\underline{2.3 \text{ sq. in.}}}$$

70° S₂ TO S₁

$$ACFG = \frac{1.0''}{2} \times (3.2'' + .35'') = 1.775 = \underline{\underline{1.8 \text{ sq. in.}}}$$



NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

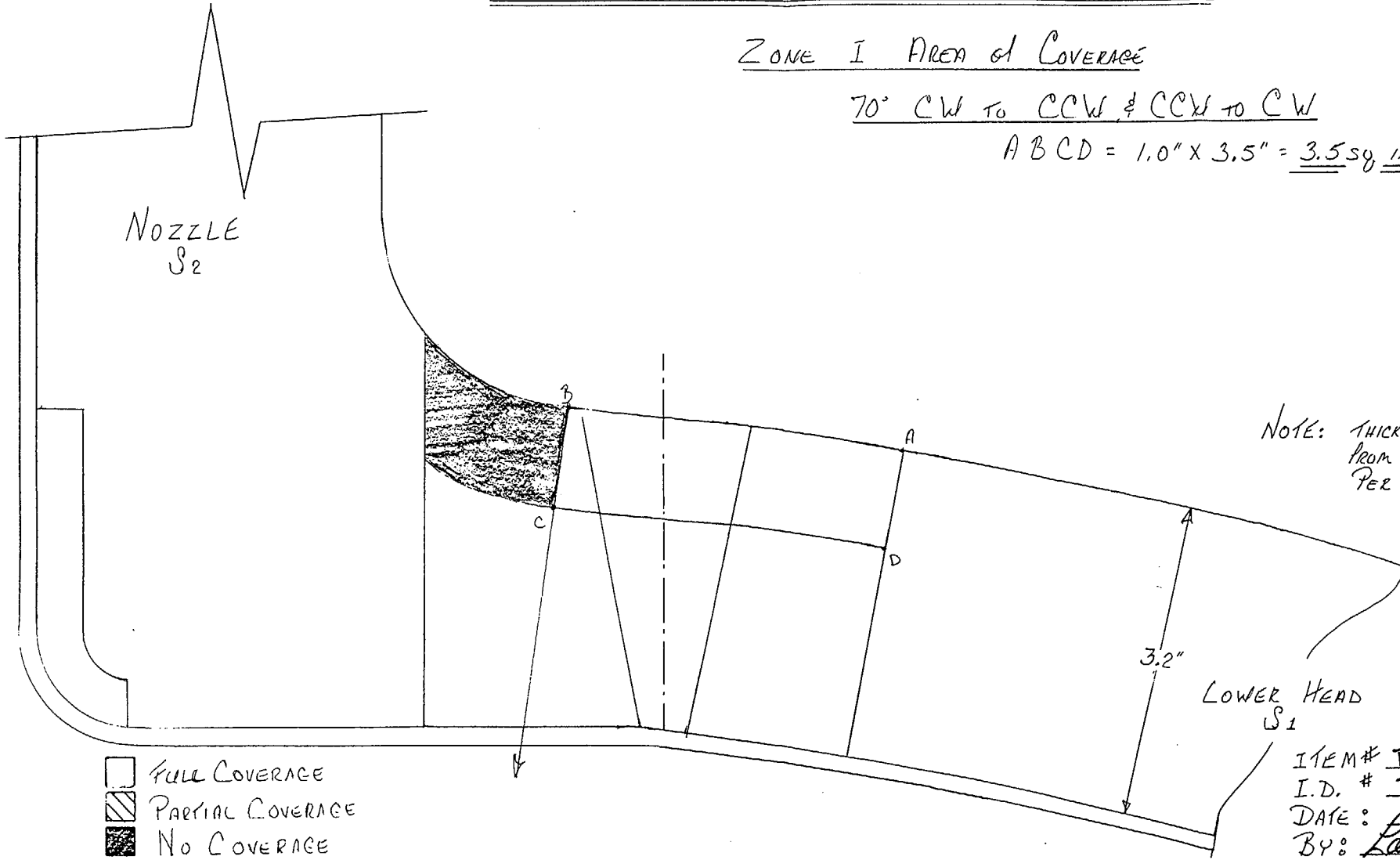
ITEM# B03.110.001
 I.D. # 2PER-W1
 DATE: 10/09/01
 BY: Larry Thullen

PRESSURIZER SURGE NOZZLE TO LOWER HEAD

ZONE I AREA OF COVERAGE

70° CW TO CCW & CCW TO CW

$ABCD = 1.0" \times 3.5" = \underline{\underline{3.5 \text{ sq. in.}}}$



NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

ITEM# B03.110.001
I.D. # 2PER-W1
DATE: 10/09/01
BY: Larry Thawler

PRESSURIZER SURGE NOZZLE TO LOWER HEAD

ZONE S II & III COVERAGE

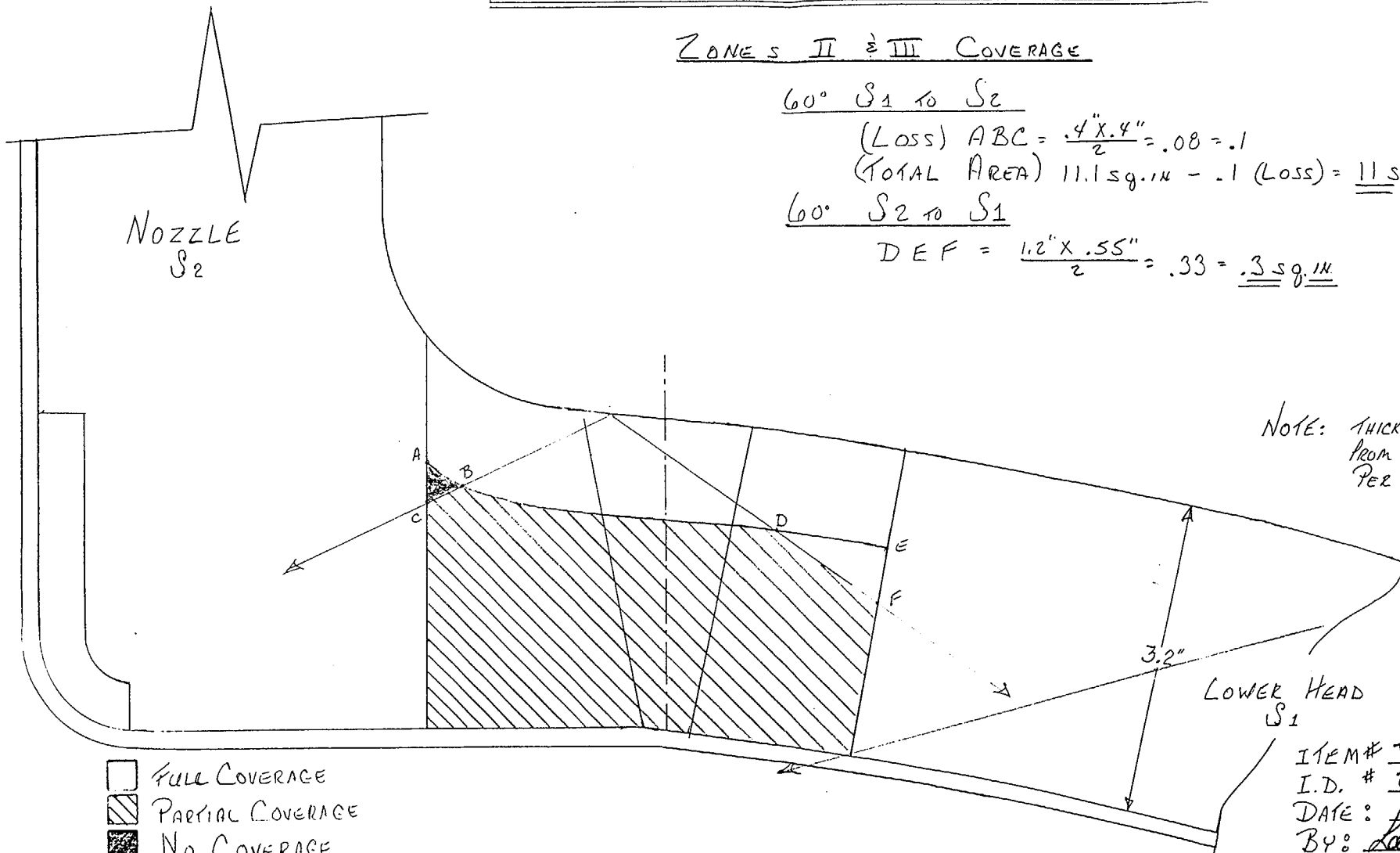
60° S₁ TO S₂

$$(LOSS) ABC = \frac{.4 \times .4}{2} = .08 = .1$$

$$(TOTAL AREA) 11.1 \text{ sq. in.} - .1 (LOSS) = \underline{\underline{11 \text{ sq. in.}}}$$

60° S₂ TO S₁

$$DEF = \frac{1.2 \times .55}{2} = .33 = \underline{\underline{.3 \text{ sq. in.}}}$$



NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

ITEM# B03.110.001

I.D. # 2PER-W1

DATE: 10/09/01

BY: Larry Thacker

PG. 9 of 12

PRESSURIZER SURGE NOZZLE TO LOWER HEAD

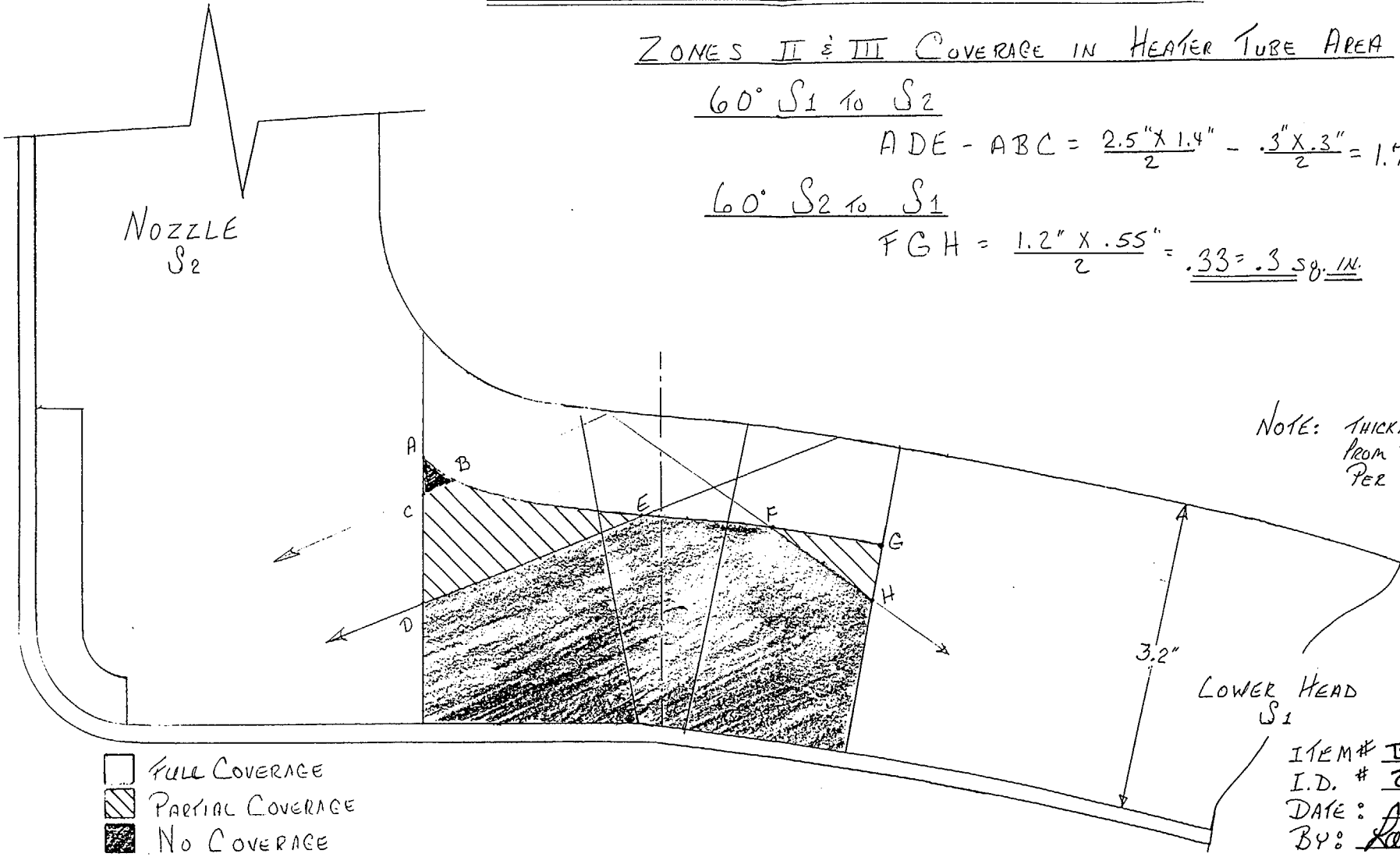
ZONES II & III COVERAGE IN HEATER TUBE AREA

60° S₁ TO S₂

$$ADE - ABC = \frac{2.5" \times 1.4"}{2} - \frac{.3" \times .3"}{2} = 1.775 = \underline{\underline{1.8 \text{ sq. in.}}}$$

60° S₂ TO S₁

$$FGH = \frac{1.2" \times .55"}{2} = .33 = \underline{\underline{.3 \text{ sq. in.}}}$$



NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

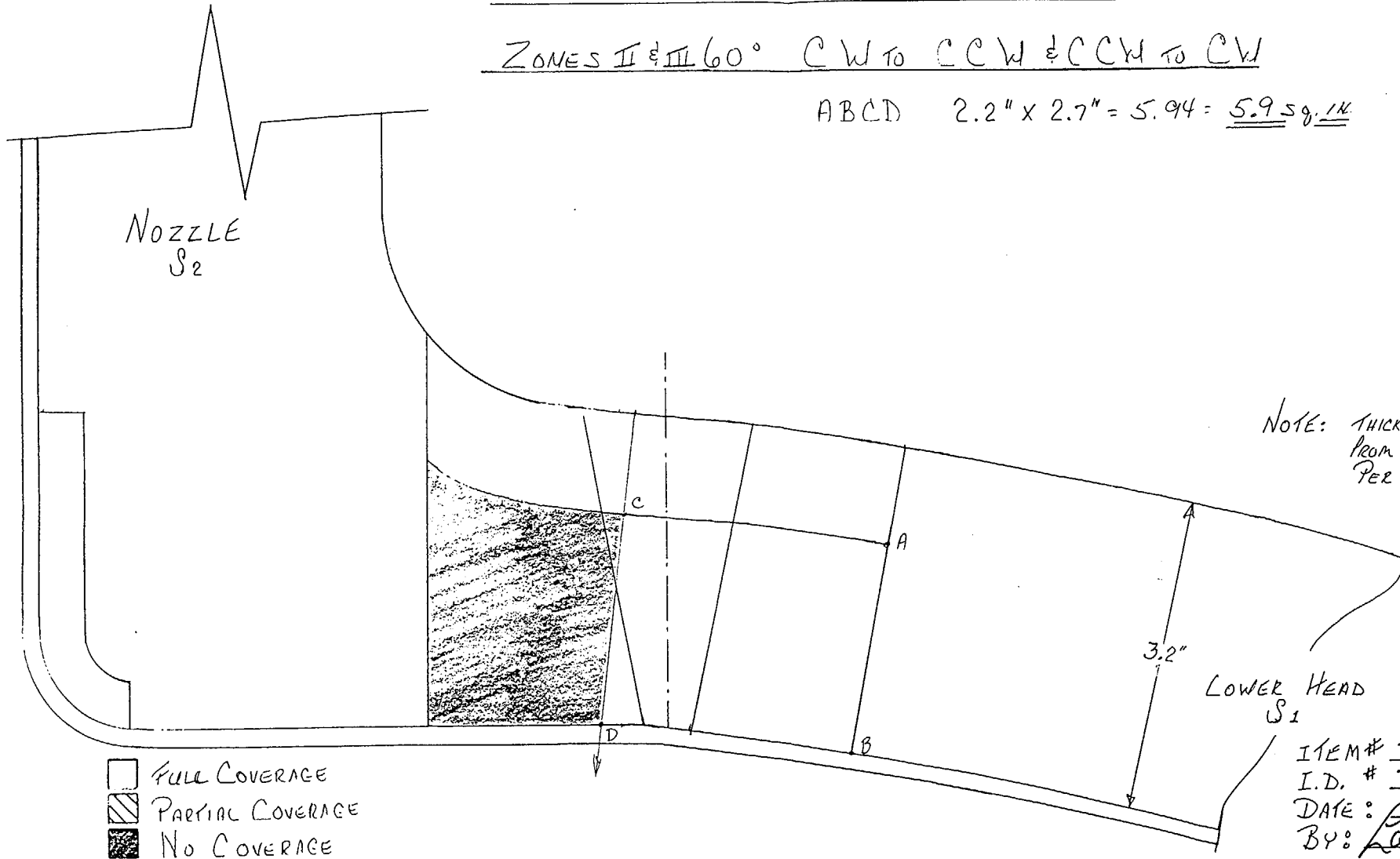
- FULL COVERAGE
- PARTIAL COVERAGE
- NO COVERAGE

ITEM# B03.110.001
 I.D. # 2PER-W1
 DATE: 10/09/01
 BY: Larry Mauldin

PRESSURIZER SURGE NOZZLE TO LOWER HEAD

ZONES II & III 60° CW TO CCW & CCW TO CW

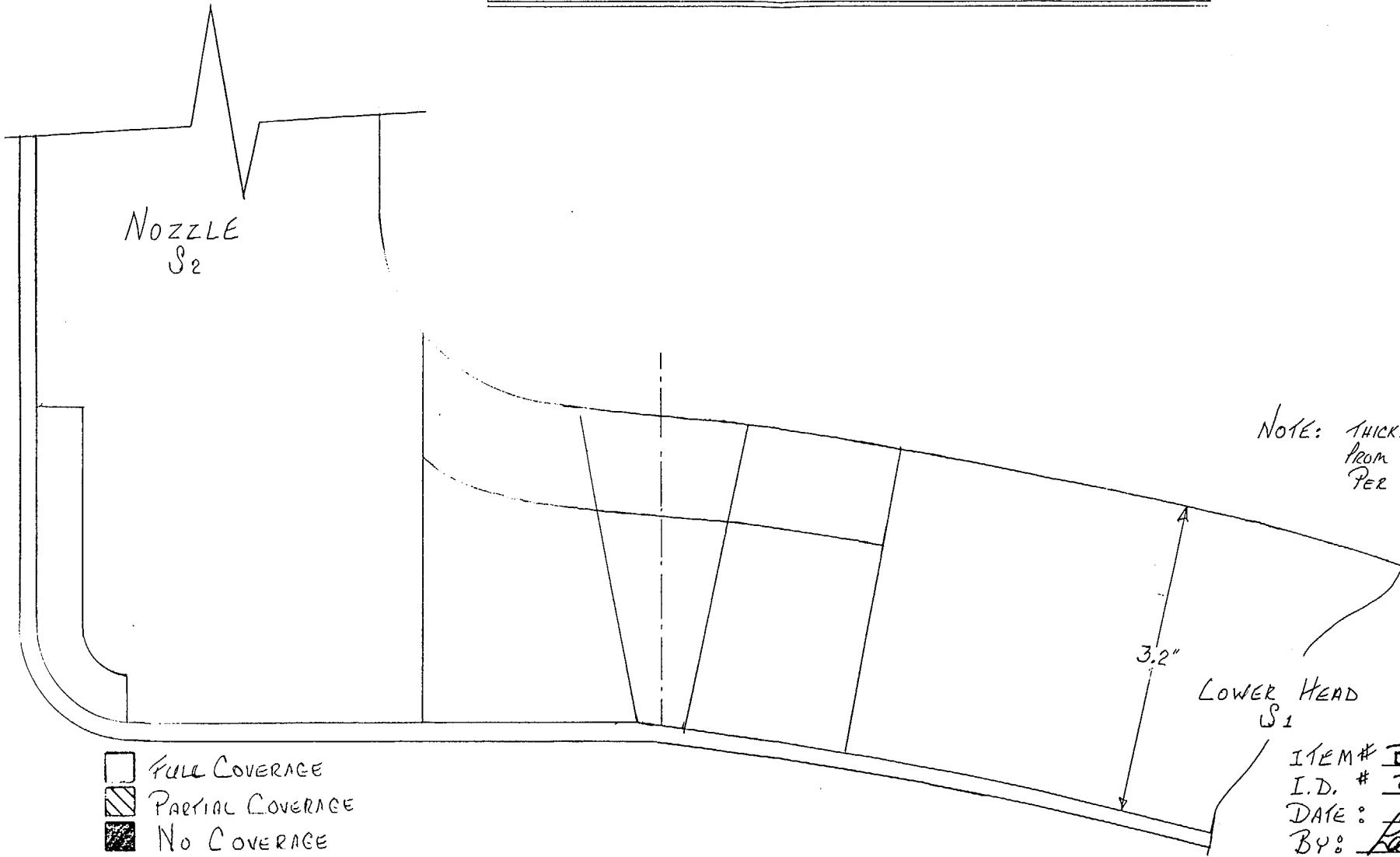
ABCD $2.2" \times 2.7" = 5.94 = \underline{\underline{5.95g, 1K}}$



NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

ITEM# B03.110.001
I.D. # ZPER-W1
DATE: 10/09/01
BY: Ken Moulder

PRESSURIZER SURGE NOZZLE TO LOWER HEAD



NOTE: THICKNESSES TAKEN FROM PSI DATA, PER B&W.

ITEM# B03.110.001
I.D. # ZPER-W1
DATE: 10/05/01
BY: Kerry Thibault

| | | | | | | | |
|--|------------------------------|--|---------------------------------------|---|--|-------------------|----------------|
| DUKE POWER COMPANY | | | | | | Exam Start: 1040 | Form NDE-UT-2A |
| ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS | | | | | | Exam Finish: 1059 | Revision 4 |
| Station: CNS | Unit: 2 | Component/Weld ID: 2NC13-WN9 | | | | Date: 9/19/2001 | |
| Weld Length (in.): 38" | Surface Condition: AS GROUND | | Lo: 9.2.3 | Surface Temperature: <u>70</u> ° <u>F</u> | | | |
| Examiner: David Zimmerman <i>David Zimmerman</i> | Level: III | Scans: | | Pyrometer S/N: <u>MCNDE 27010</u> | | | |
| Examiner: Gary J. Moss <i>Gary J. Moss</i> | Level: II | 45 <input checked="" type="checkbox"/> <u>63</u> dB | 70 <input type="checkbox"/> _____ dB | Cal Due: <u>2/14/2002</u> | | | |
| Procedure: NDE-610 | Rev: 4 | 45T <input checked="" type="checkbox"/> <u>63</u> dB | 70T <input type="checkbox"/> _____ dB | Configuration: <u>Branch to Pipe</u> | | | |
| FC: * | | 60 <input type="checkbox"/> _____ dB | | <u>S1</u> Flow <u>S2</u> | | | |
| Calibration Sheet No: 0102008, 0102009 | | 60T <input type="checkbox"/> _____ dB | | <u>Pipe</u> to <u>Branch</u> | | | |
| | | Other: _____ dB | | Scan Surface: <u>OD</u> | | | |
| | | | | Applies to NDE-680 only | | | |
| | | | | Skew Angle: <u>N/A</u> | | | |

| 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° | AXIAL | | | | | | | | | | | | | |
| NRI | 45° | CIRC | | | | | | | | | | | | | |

| | | | | | |
|---|-------------------|----------------------|---|-----------------------|----------------------------|
| Remarks: * FC 97-01, 98-20 | | | | | |
| Limitations: (see NDE-UT-4) <input checked="" type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/> | | | | | Sheet <u>1</u> of <u>6</u> |
| Reviewed By: <i>Perry Mauldin</i> | Level: <u>III</u> | Date: <u>9/21/01</u> | Authorized Inspector: <i>Robert M. Gill</i> | Date: <u>10/17/01</u> | Item No: B09.031.003 |

REQUEST FOR RELIEF #01-003 ATTACHMENT 3

**DUKE POWER COMPANY
ISI LIMITATION REPORT**

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2NC13-WN9

Item No: B09.031.003

Remarks:

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO 2.0" 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. B...*

Level: III

Date: 9/20/01

Sketch(s) attached yes

^{DK2} no 4120/01 Sheet 2 of 6

Reviewed By: *Randy Mauldin*

Date: 9/21/01

Authorized Inspector: *Robert M. Smith*

Date: 10/17/01

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

Volume Calculation

PROFILE #1
 2.1" X .77" = 1.62 SQ. IN.
 PROFILE #2
 2.2" X .77" = 1.69 SQ. IN

63" DIA. / 2 = 31.5" @ PROFILE
 PROFILE 1
 1.62 SQ. IN. X 31.5" = 51.03 CU. IN.
 PROFILE 2
 1.69 SQ. IN. X 31.5" = 53.24 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 |
|------------|-------|----------------|------------------------|-----------------------|--------------------------|--------------------------|------------------|
| PROFILE #1 | | | | | | | |
| 1 | 45° | 2 | 1.62 | 19 | 30.78 | 30.78 | |
| 1 | 45° | 2 | 0 | 12.5 | 0 | 20.25 | |
| 2 | 45° | 1 | 0 | 31.5 | 0 | 51.03 | |
| 3 | 45° | CW | .33 | 19 | 6.27 | 30.78 | |
| 3 | 45° | CW | 0 | 12.5 | 0 | 20.25 | |
| 4 | 45° | CCW | .33 | 19 | 6.27 | 30.78 | |
| 4 | 45° | CCW | .33 | 12.5 | 0 | 20.25 | |

Item No: B09.031.003

Prepared By: *Dave [Signature]* Level: *III* Date: *9/20/01*

Reviewed By: *Larry Mauldin* Level: *III* Date: *9.21.01*

3 of 6

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

Volume Calculation

PROFILE #1
 2.1" X .77" = 1.62 SQ. IN.
 PROFILE #2
 2.2" X .77" = 1.69 SQ. IN

63" DIA. / 2 = 31.5" @ PROFILE
 PROFILE 1
 1.62 SQ. IN. X 31.5" = 51.03 CU. IN.
 PROFILE 2
 1.69 SQ. IN. X 31.5" = 53.24 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 |
|------------|-------|----------------|------------------------|-----------------------|--------------------------|--------------------------|------------------|
| PROFILE #2 | | | | | | | |
| 1 | 45° | 2 | 1.64 | 19 | 31.16 | 32.11 | |
| 1 | 45° | 2 | 0 | 12.5 | 0 | 21.13 | |
| 2 | 45° | 1 | 0 | 31.5 | 0 | 53.24 | |
| 3 | 45° | CW | .10 | 19 | 1.9 | 32.11 | |
| 3 | 45° | CW | 0 | 12.5 | 0 | 21.13 | |
| 4 | 45° | CCW | .10 | 19 | 1.9 | 32.24 | |
| 4 | 45° | CCW | 0 | 12.5 | 0 | 21.13 | |
| | | | | | 95.38 | 417.08 | 22.87 |

Item No: B09.031.003

Prepared By: *Daniel K. Zy* Level: *IV* Date: *9/20/01*

Reviewed By: *Randy Mauldin* Level: *III* Date: *9-21-01*

487 6

12 ¹/₈ NOZZLE

DRAWING #1

INSPECTION AREA:

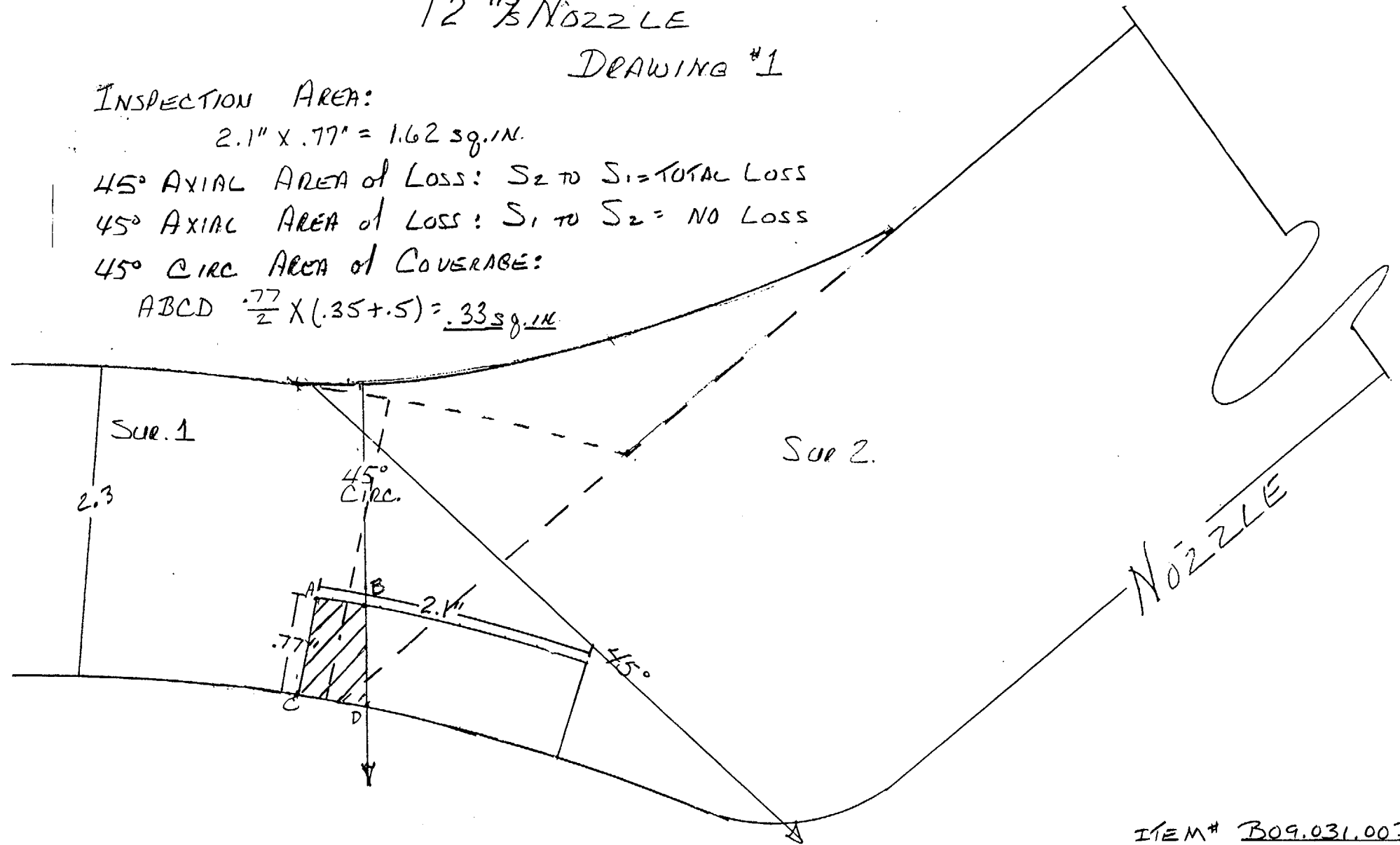
$$2.1" \times .77" = 1.62 \text{ sq. in.}$$



45° AXIAL AREA OF LOSS: S₂ TO S₁ = TOTAL LOSS

45° AXIAL AREA OF LOSS: S₁ TO S₂ = NO LOSS

45° CIRC AREA OF COVERAGE:

$$ABCD \cdot \frac{.77}{2} \times (.35 + .5) = .33 \text{ sq. in.}$$



-  - AXIAL LOSS
 -  - CIRC. LOSS
- SCALE 1-1

ITEM# B09.031.003
I.D.# 2NC13-WING
BY: Daniel R. III
DATE: 9/20/01
5 of 6

12" $\frac{7}{8}$ NOZZLE DRAWING #2

INSPECTION AREA:

$$2.2" \times .77" = 1.69 \text{ sq. in.}$$

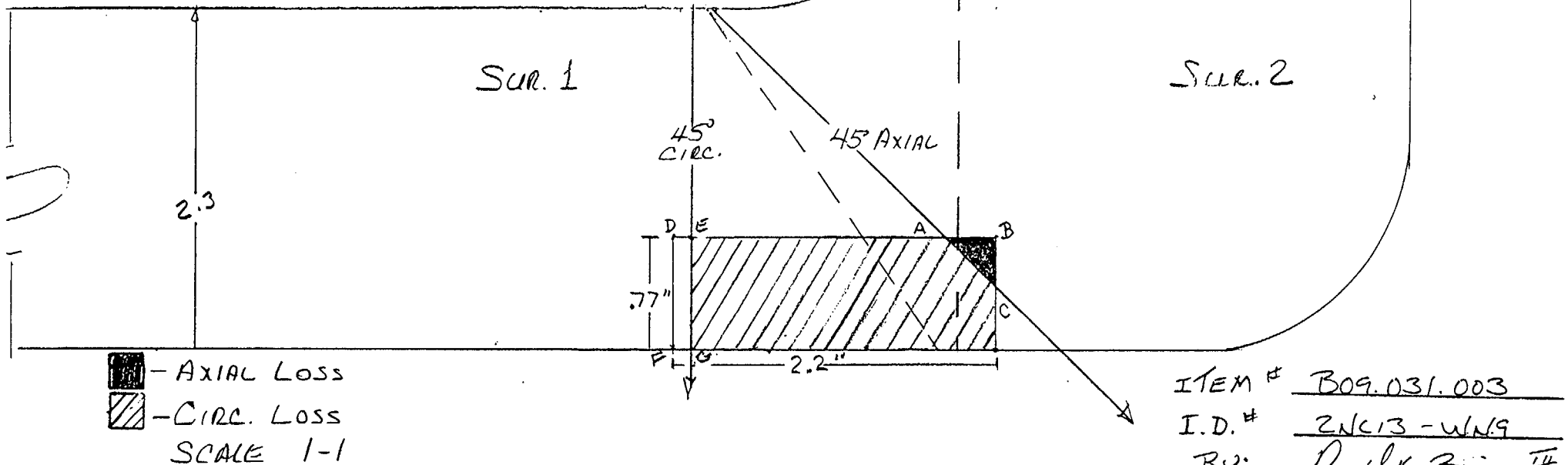
45° AXIAL AREA OF LOSS: S_2 TO S_1 = TOTAL LOSS

45° AXIAL AREA OF COVERAGE - S_1 TO S_2

$$ABC \quad \frac{.3 \times .3}{2} = .045 = .05 \quad 1.69 - .05 = \underline{1.64 \text{ sq. in.}}$$

45° CIRC. AREA OF COVERAGE:

$$DEFG \quad .13" \times .77" = \underline{.10 \text{ sq. in.}}$$



ITEM # B09.031.003

I.D. # 2NC13-WN.9

BY: David K. [Signature]

DATE: 9/20/01

1 of 6

| | | | | | | | | |
|--|------------------------------|--|---------------------------------------|---|---|------------------------------|----------------|--|
| DUKE POWER COMPANY | | | | | | Exam Start: 1210 | Form NDE-UT-2A | |
| ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS | | | | | | Exam Finish: 1236 | Revision 4 | |
| Station: CNS | Unit: 2 | Component/Weld ID: 2SGB-06A-18 | | | | Date: 9/28/2001 | | |
| Weld Length (in.): 18.8" | Surface Condition: AS GROUND | | Lo: 9.2.3 | | Surface Temperature: <u>69</u> ° <u>F</u> | | | |
| Examiner: Gary J. Moss <i>Gary J. Moss</i> Level: II | FC: 00-07 | | Scans: | | Pyrometer S/N: <u>MCNDE 27010</u> | | | |
| Examiner: David Zimmerman <i>David K. Z</i> Level: III | | | 45 <input type="checkbox"/> _____ dB | 70 <input checked="" type="checkbox"/> <u>59.0</u> dB | Cal Due: <u>2/14/2002</u> | | | |
| Procedure: NDE-620 Rev: <u>8</u> | | | 45T <input type="checkbox"/> _____ dB | 70T <input checked="" type="checkbox"/> <u>59.0</u> dB | Configuration: <u>Nozzle to Shell</u> | | | |
| Calibration Sheet No: 0102033, 0102034, 0102035 | | 60 <input checked="" type="checkbox"/> <u>72.5/71.5</u> dB | | 60T <input checked="" type="checkbox"/> <u>72.5/71.5</u> dB | | S2 _____ Flow _____ S1 _____ | | |
| | | Other: _____ dB | | NOZZLE to SHELL | | 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 | |
|-------|-------------------------------------|-----------------------------------|--------|-------|-------|------------|------------|------------|------------|------------|------------|-----------|-----------------------------------|-----------------------------------|-------|--|
| | | 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 | 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: | | | | | |
| Limitations: (see NDE-UT-4) <input checked="" 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>Larry Mauldin</i> | Level: <u>III</u> | Date: <u>10-02-01</u> | Authorized Inspector: <i>Robert M. Sullivan</i> | Date: <u>10/17/01</u> | Item No: C02.021.001 |

REQUEST FOR RELIEF # 01003 ATTACHMENT 4

**DUKE POWER COMPANY
ISI LIMITATION REPORT**

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2SGB-06A-18

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 2.6" to BEYOND
 ANGLE: 0 45 60 Other _____ FROM 0 DEG to 360 DEG

DUE TO 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 *David K. Zimmerman* Level: III Date: 9/28/1901

Sketch(s) attached yes no

Sheet 2 of 4

Reviewed By: *Larry Maeder* Date: 10-02-01

Authorized Inspector: *Robert m...ed*

Date: 10/17/01

3 of 4

| | |
|---|------------|
| DUKE POWER COMPANY Limited Examination Coverage Worksheet | NDE-91-1 |
| | Revision 0 |

| | | | | |
|--|--|---------------------------------------|----------------------------------|---------------------------------------|
| Examination Volume/Area Defined | | | | |
| <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 |
| 1.375 IN. X 1.75 IN.= 2.4 SQ.IN. | 2.4 SQ.IN. X 70 IN.= 168 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 | 60°L | 2 | 2.4 | 70 | 168 | 168 | |
| 2 | 60°L | 1 | 0 | 70 | 0 | 168 | |
| 3 | 60°L | CW | 2.4 | 70 | 168 | 168 | |
| 4 | 60°L | CCW | 2.4 | 70 | 168 | 168 | 100.00 |
| | | | | | 504 | 672 | 75.00 |

| | |
|----------|-------------|
| Item No: | C02.021.001 |
|----------|-------------|

| | | |
|--|-------------------|-----------------|
| Prepared By: David K. Zimmerman <i>David K Zimmerman</i> | Level: III | Date: 9/28/1901 |
| Reviewed By: <i>Larry Mauldin</i> | Level: <u>III</u> | Date: 10-02-01 |

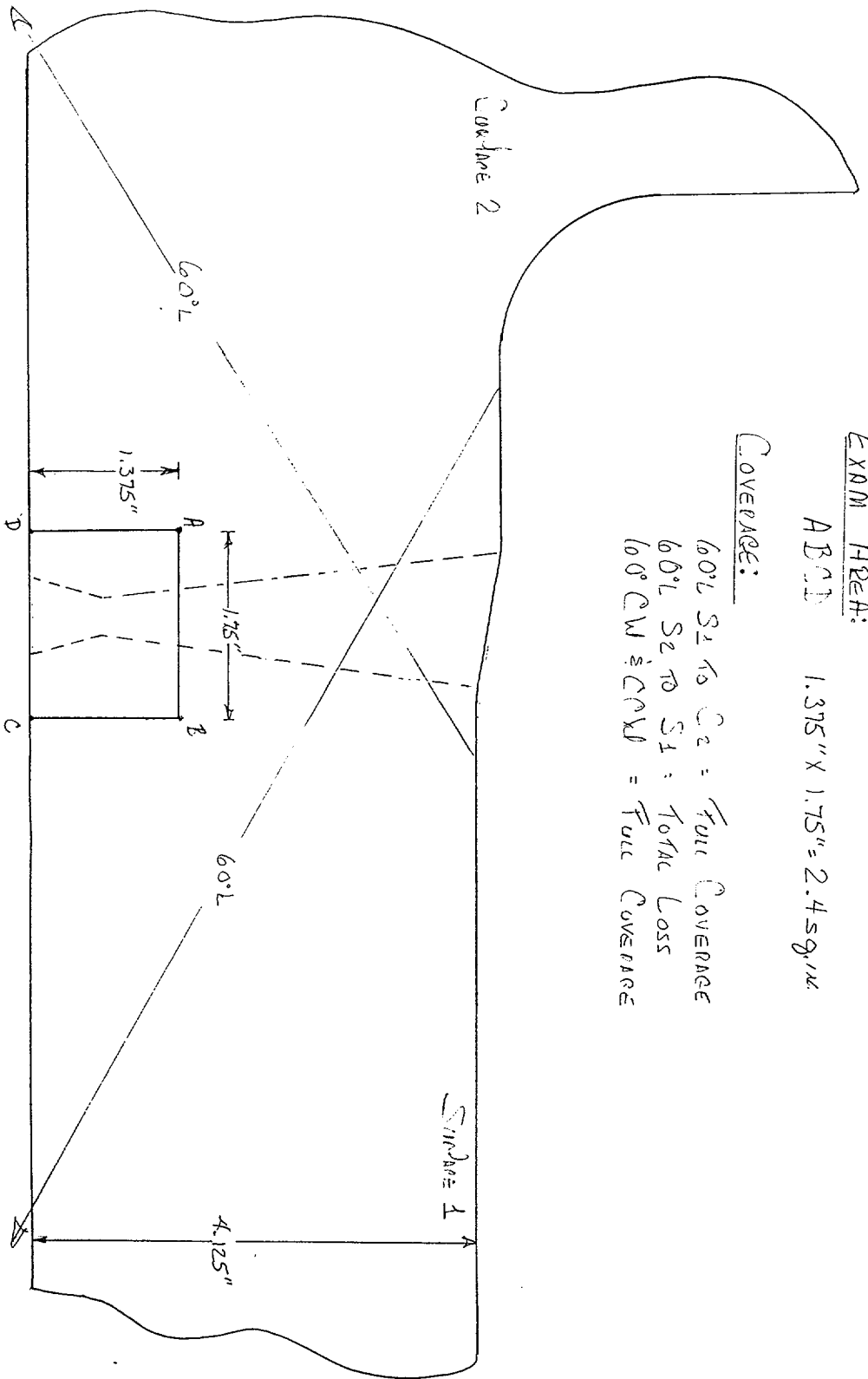
AUXILIARY FEEDWATER NOZZLE

EXOM AREA:

ABCD 1.375" x 1.75" = 2.4 sq. in.

COVERAGE:

60° L S1 to C2 = Full Coverage
 60° L S2 to S1 = Total Loss
 60° CW & CWD = Full Coverage



I.D. # 25478-06A-18
 ITEM # COZ.021.001
 BY: Daniel B. III
 DATE: 9/26/01
 Pa. U. 014

DUKE POWER COMPANY

ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS

| | | | | |
|--|------------|---|---------------------------------------|---|
| Station: CNS | Unit: 2 | Component/Weld ID: 2BNSHX-3-N1 | Exam Start: 1008 | Form NDE-UT-2A |
| | | | Exam Finish: 1028 | Revision 4 |
| Weld Length (in.): 40.03 | | Surface Condition: AS GROUND | Lo: 9.2.3 | Surface Temperature: <u>87</u> ° <u>F</u> |
| Examiner: Jay A. Eaton | Level: III | Scans: 45 <input type="checkbox"/> _____ dB 70 <input checked="" type="checkbox"/> <u>64</u> dB 45T <input checked="" type="checkbox"/> <u>34</u> dB 70T <input type="checkbox"/> _____ dB 60 <input checked="" type="checkbox"/> <u>62</u> dB 60T <input type="checkbox"/> _____ dB Other: _____ dB | Pyrometer S/N: <u>MCNDE 27008</u> | |
| Examiner: Gayle E. Houser | Level: III | | Cal Due: <u>2/14/2002</u> | |
| Procedure: NDE-630 | Rev: 2 | | Configuration: <u>Nozzle to Shell</u> | |
| FC: 99-02 | | S2 _____ Flow _____ S1 _____ | | |
| Calibration Sheet No: 0102001, 0102002, 0102003 | | NOZZLE to SHELL | | |
| | | 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 |
|-------|-------------------------------------|-----------------------------------|--------|-------|-------|------------|------------|------------|------------|------------|------------|-----------|-----------------------------------|-------|-------|
| | | 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 | | | | |
| 1 | 60°L | 200 | 1.5" | .5"* | 10.0" | 360° | INT. | IND. | | | | 2 | 1 | AXIAL | NO |

* FROM TOE OF WELD

| | | | | |
|---|-------------------|----------------------|--|----------------------------|
| Remarks: 60° & 70° L WERE SCANNED @ LESS THAN SCANNING DB(REF. + 14 DB) DUE TO SIGNAL TO NOISE RATIO | | | | |
| Limitations: (see NDE-UT-4) <input checked="" type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/> | | | | Sheet <u>1</u> of <u>9</u> |
| Reviewed By: <u>Larry Mauldin</u> | Level: <u>III</u> | Date: <u>9-18-01</u> | Authorized Inspector: <u>Robert M...</u> | Date: <u>10/17/01</u> |
| | | | | Item No: C02.021.004 |

REQUEST FOR RELIEF # 01-003 ATTACHMENT 5

**DUKE POWER COMPANY
ISI LIMITATION REPORT**

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2BNSHX-3-N1

Item No: C02.021.004

Remarks:

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL - 0.9" to BEYOND
 ANGLE: 0 45 60 Other 70° FROM 0 DEG to 360 DEG

WELD TAPER

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL + 0.9" to BEYOND
 ANGLE: 0 45 60 Other 70° FROM 0 DEG to 360 DEG

WELD TAPER

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL to C + 0.6"
 ANGLE: 0 45 60 Other _____ FROM 0 DEG to 360 DEG

WELD TAPER SURF. 1

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL - 0.1 to BEYOND
 ANGLE: 0 45 60 Other _____ FROM 0 DEG to 360

WELD TAPER SURF. 2

Prepared By: 

Level: III


Date: 9/11/01

Sketch(s) attached yes no

Sheet 2 of 9

Reviewed By: 

Date: 9.18.01

Authorized Inspector: 

Date: 10/17/01

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

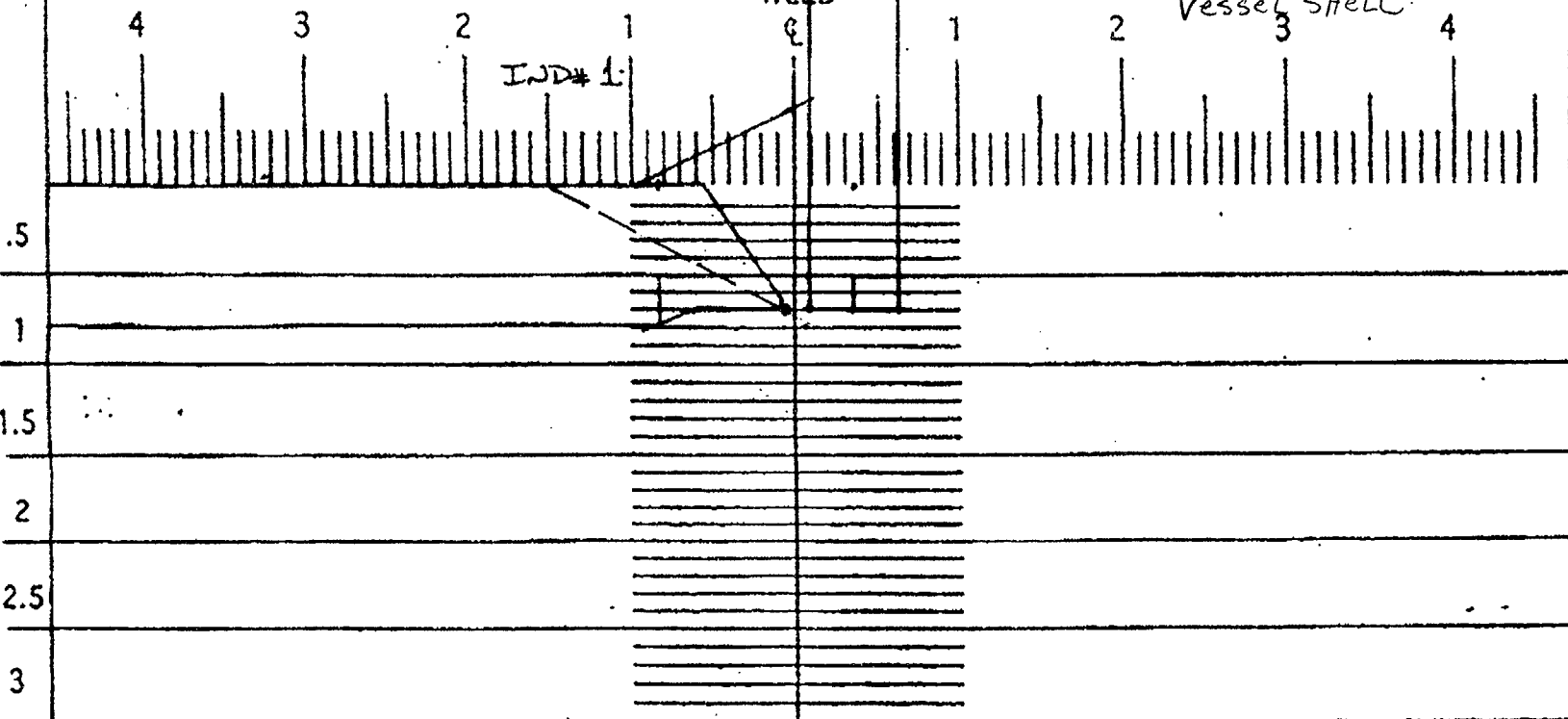
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

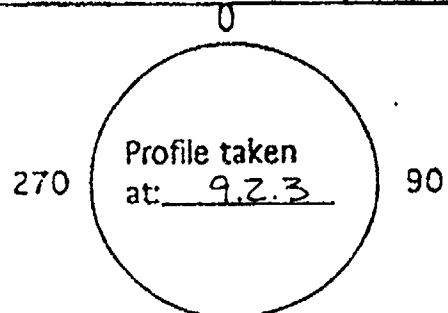
EXAMINATION SURFACE 2

Vessel Shell



Component ID/Weld No. ZBNSHX-3-N1

Remarks:



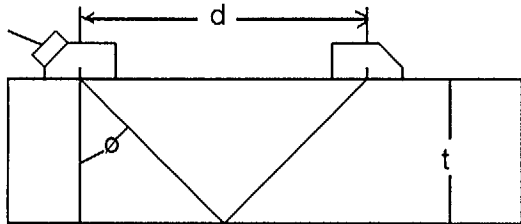
Examiner: *[Signature]* Level: III Date: 9/11/01
 Reviewed By: *[Signature]* Level: III Date: 9-18-01
 Authorized Inspector: *[Signature]* Date: 10/17/01

Item No: C02.021.004

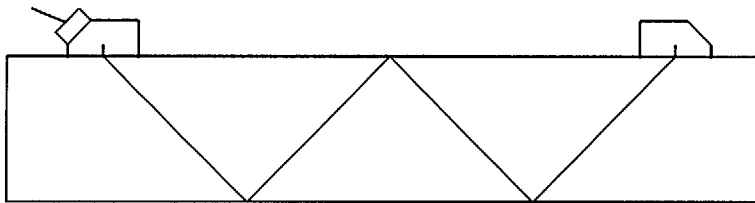
**DUKE POWER COMPANY
ULTRASONIC BEAM ANGLE MEASUREMENT RECORD**

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: _____ 12 IN. _____

Pipe Schedule: _____ N/A _____

Nominal 45 deg: d= 1.4 ; t= 0.75 ; measured angle= 43.03 deg

Nominal 60 deg: d= 0 ; t= 0 ; measured angle= 0.00 deg

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

Item No.
C02.021.004

| | | | | | | | |
|-----------------------------|------------------------|--------------|-------------------|--------------------------|-----------------------|--------------|-------------------|
| Examiner Gayle E. Houser | <i>Gayle E. Houser</i> | Level III | Date 9/11/2001 | Examiner Jay A. Eaton | <i>Jay A. Eaton</i> | Level III | Date 9/11/2001 |
| Reviewed By | <i>Larry Mauldin</i> | Level III | Date 9-18-01 | Authorized Inspector | <i>Robert McEl...</i> | | Date 10/17/01 |

DUKE POWER COMPANY
ULTRASONIC INDICATION RESOLUTION SHEET

Form NDE-UT-8

Revision 1

Acceptance Standard:

IND. #1 - 60°L IS A GEOMETRIC REFLECTOR DUE TO WELD ROOT CONFIGURATION.

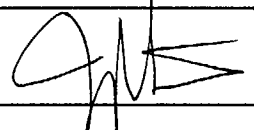
Item No: C02.021.004

Acceptable Indications: IND. #1

Rejectable Indications: N/A

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

Examiner:
Jay A. Eaton

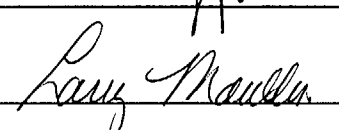


Level:
III

Date:
9/11/2001

Sheet 5 of 9

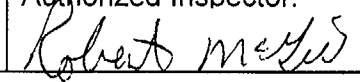
Reviewer:



Level:
III

Date:
9-18-01

Authorized Inspector:



Date:
10/17/01

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

$(0.25 \text{ in} \times 1.1 \text{ in}) + (0.15 \text{ in} \times 0.05 \text{ in} / 2) = 0.283 \text{ sq. in.}$

Volume Calculation

$0.283 \text{ sq. in.} \times 40 \text{ in.} = 11.32 \text{ cubic in.}$

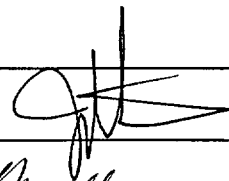
Coverage Calculations

| Scan # | Angle | Beam Direction | Area Examined (sq.in.) | Length Examined (in.) | Volume Examined (cu.in.) | Volume Required (cu.in.) | Percent Coverage |
|--------|-------|----------------|------------------------|-----------------------|--------------------------|--------------------------|------------------|
| 1 | 60&70 | S1 | .253 | 40 | 10.12 | 11.32 | |
| 2 | 60&70 | S2 | 0 | 40 | 0 | 11.32 | |
| 3 | 45 | CW | .151 | 40 | 6.04 | 11.32 | |
| 4 | 45 | CCW | .151 | 40 | 6.04 | 11.32 | |
| | | Total | Aggregate | Coverage | 22.2 | 45.28 | 49.03 |

649

Item No: C02.021.004

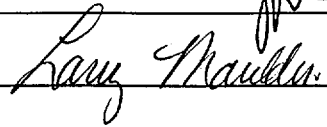
Prepared By: JAY EATON



Level: III

Date: 9/11/2001

Reviewed By:



Level: III

Date: 9-18-01

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

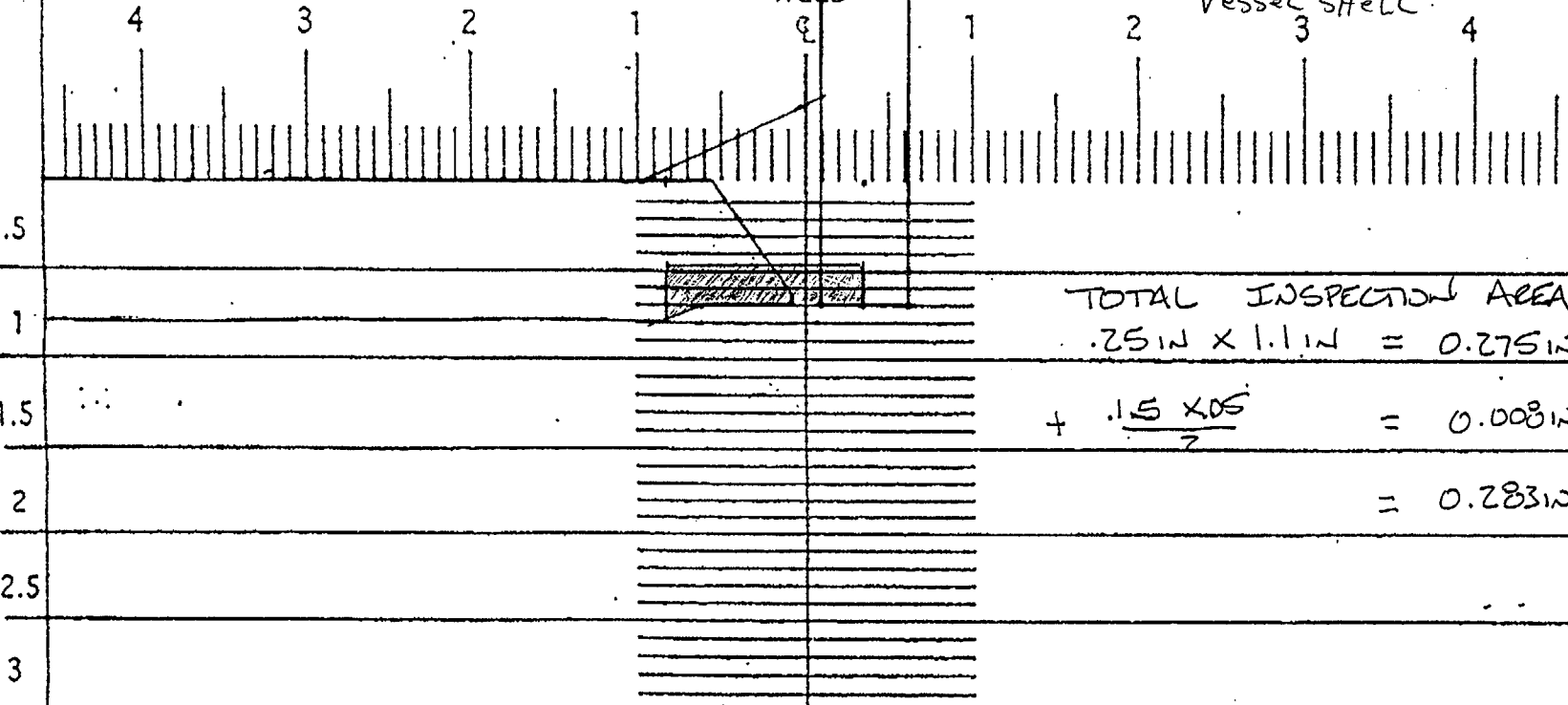
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1 NOZZLE

WELD

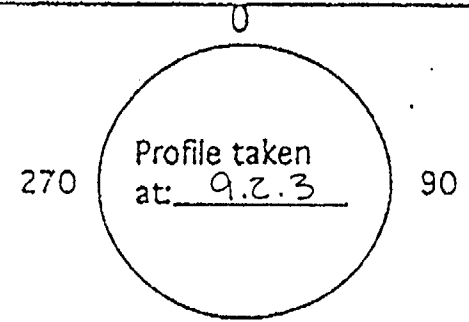
EXAMINATION SURFACE 2
Vessel SHELL



TOTAL INSPECTION AREA
 $.25 \text{ IN} \times 1.1 \text{ IN} = 0.275 \text{ IN}^2$
 $+ \frac{.15 \times .05}{2} = 0.00375 \text{ IN}^2$
 $= 0.27875 \text{ IN}^2$

Component ID/Weld No. ZBNSHX-3-N1

Remarks:

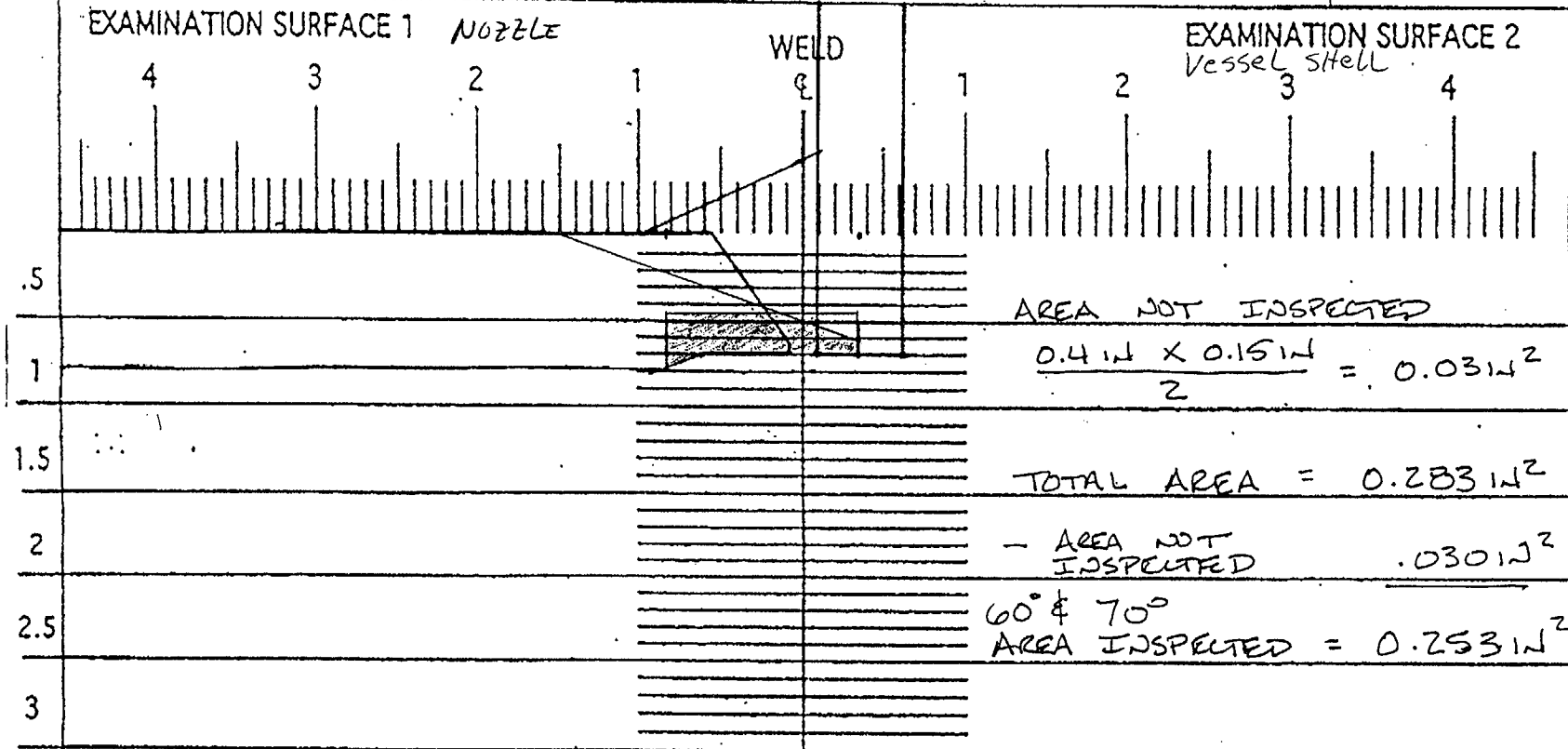


Item No: C02.021.004
 Examiner: [Signature] Level: III Date: 9/11/01
 Reviewed By: [Signature] Level: III Date: 9/18/01
 Authorized Inspector: [Signature] Date: 10/17/01

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

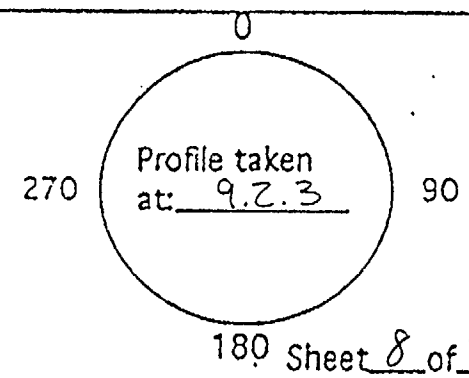
NDE-UT-5

Revision 1



Component ID/Weld No. ZBN5HX-3-N1

Remarks:



Item No: C02.D21.004

Examiner: [Signature] Level: III Date: 9/11/01

Reviewed By: [Signature] Level: III Date: 9/10/01

Authorized Inspector: [Signature] Date: 10/17/01

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

NDE-UT-5

Revision 1

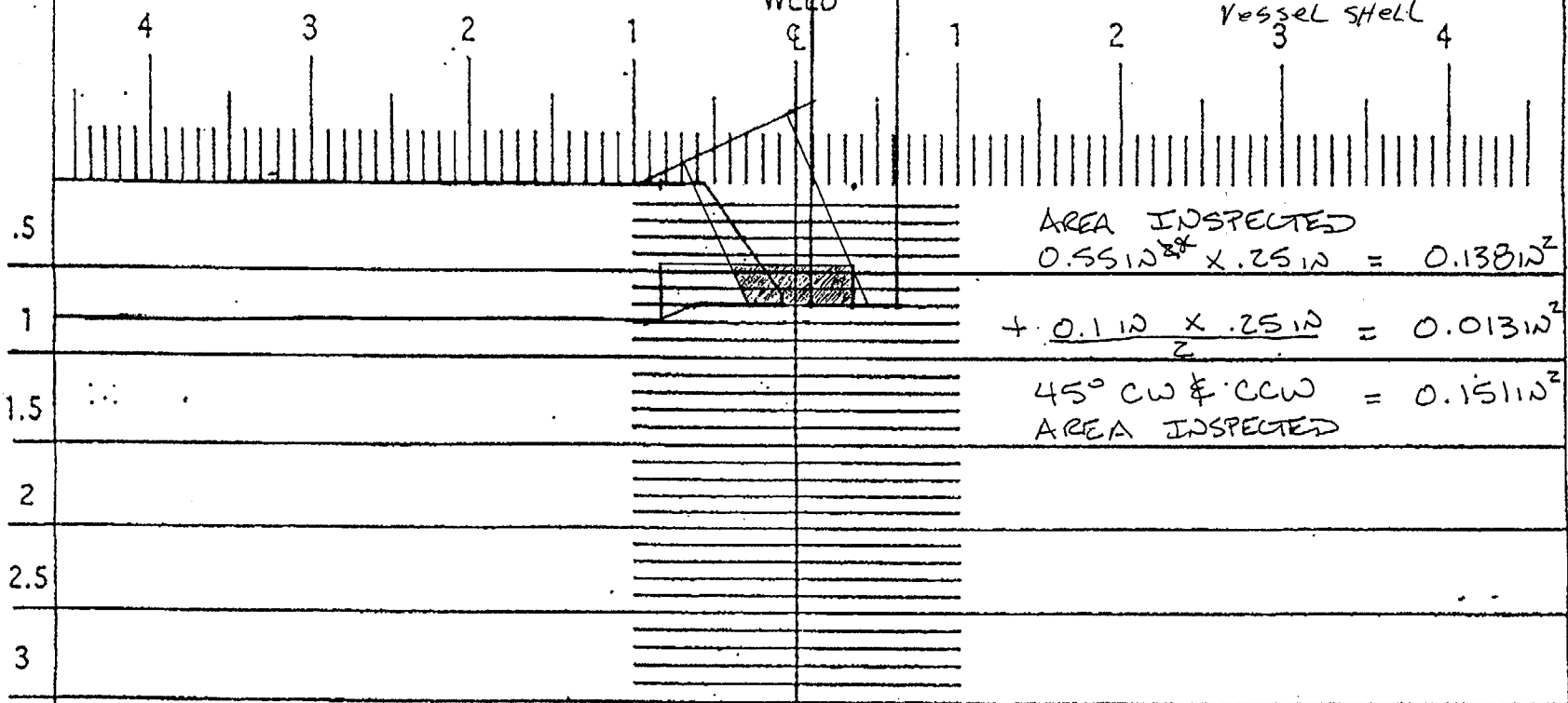
EXAMINATION SURFACE 1

NOZZLE

WELD

EXAMINATION SURFACE 2

VESSEL SHELL



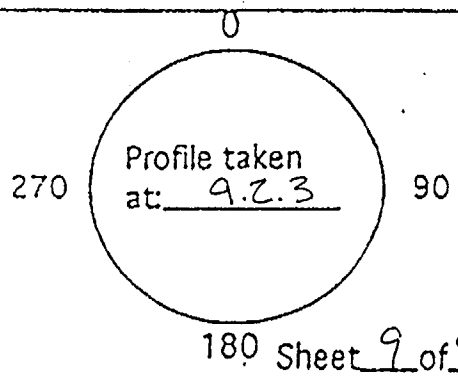
AREA INSPECTED
 $0.55 \text{ IN} \times .25 \text{ IN} = 0.138 \text{ IN}^2$

$+ \frac{0.1 \text{ IN} \times .25 \text{ IN}}{2} = 0.013 \text{ IN}^2$

$45^\circ \text{ CW \& CCW} = 0.151 \text{ IN}^2$
AREA INSPECTED

Component ID/Weld No. ZBNSHX-3-N1

Remarks:



Item No: C02.021.004
Examiner: [Signature] Level: III Date: 9/11/01
Reviewed By: [Signature] Level: IV Date: 9/18/01
Authorized Inspector: [Signature] Date: 10/17/01

| | | | | | | | |
|--|------------------------------|--------------------------------|--|-------------------------|---|-------------------|----------------|
| DUKE POWER COMPANY | | | | | | Exam Start: 1008 | Form NDE-UT-2A |
| ULTRASONIC EXAMINATION DATA SHEET FOR PLANAR REFLECTORS | | | | | | Exam Finish: 1028 | Revision 4 |
| Station: CNS | Unit: 2 | Component/Weld ID: 2BNSHX-3-N2 | | | | Date: 9/11/2001 | |
| Weld Length (in.): 40.03 | Surface Condition: AS GROUND | | Lo: 9.2.3 | | Surface Temperature: <u>87</u> ° <u>F</u> | | |
| Examiner: Jay A. Eaton <i>[Signature]</i> | Level: III | | Scans: | | Pyrometer S/N: <u>MCNDE 27008</u> | | |
| Examiner: Gayle E. Houser <i>[Signature]</i> | Level: III | | 45 <input type="checkbox"/> _____ dB 70 <input checked="" type="checkbox"/> <u>64</u> dB | | Cal Due: <u>2/14/2002</u> | | |
| Procedure: NDE-630 Rev: 2 | FC: 99-02 | | 45T <input checked="" type="checkbox"/> <u>34</u> dB 70T <input type="checkbox"/> _____ dB | | Configuration: <u>Nozzle to Shell</u> | | |
| Calibration Sheet No: 0102001, 0102002, 0102003 | | | 60 <input checked="" type="checkbox"/> <u>62</u> dB | | <u>S2</u> Flow <u>S1</u> | | |
| | | | 60T <input type="checkbox"/> _____ dB | | <u>NOZZLE</u> to <u>SHELL</u> | | |
| | | Other: _____ dB | | Scan Surface: <u>OD</u> | | | |
| | | | | Applies to NDE-680 only | | | |
| | | | | Skew Angle: <u>N/A</u> | | | |

| 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 | 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 | | | | | |
| 1 | 60°L | 251 | 1.7" | .5"* | 26" | 360° | INT. | IND. | | | | 2 | 1 | AXIAL | NO | |

* FROM TOE OF WELD

| | | | |
|---|------------------|----------------------|--|
| Remarks: 60° & 70° L WERE SCANNED @ LESS THAN SCANNING DB(REF. + 14DB) DUE TO SIGNAL TO NOISE RATIO | | | |
| Limitations: (see NDE-UT-4) <input checked="" type="checkbox"/> 90% or greater coverage obtained: yes <input type="checkbox"/> no <input checked="" type="checkbox"/> | | | Sheet <u>1</u> of <u>9</u> |
| Reviewed By: <i>Randy Mauldin</i> | Level: <u>IV</u> | Date: <u>9-18-01</u> | Authorized Inspector: <i>Robert McNeil</i> Date: <u>10/17/01</u> |
| | | | Item No: C02.021.005 |

REQUEST FOR RELIEF #01-003 ATTACHMENT 6

**DUKE POWER COMPANY
ISI LIMITATION REPORT**

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2BNSHX-3-N2

Item No: C02.021.005

Remarks:

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL - 0.9" to BEYOND
 ANGLE: 0 45 60 Other 70° FROM 0 DEG to 360 DEG

WELD TAPER

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL + 0.9" to BEYOND
 ANGLE: 0 45 60 Other 70° FROM 0 DEG to 360 DEG


WELD TAPER

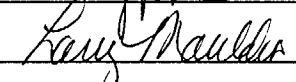
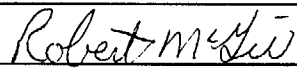
NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL to C + 0.6"
 ANGLE: 0 45 60 Other _____ FROM 0 DEG to 360 DEG

WELD TAPER SURF. 1

NO SCAN SURFACE BEAM DIRECTION
 LIMITED SCAN 1 2 1 2 cw ccw
 FROM L _____ to L _____ INCHES FROM WO CL - 0.1 to BEYOND
 ANGLE: 0 45 60 Other _____ FROM 0 DEG to 360

WELD TAPER SURF. 2

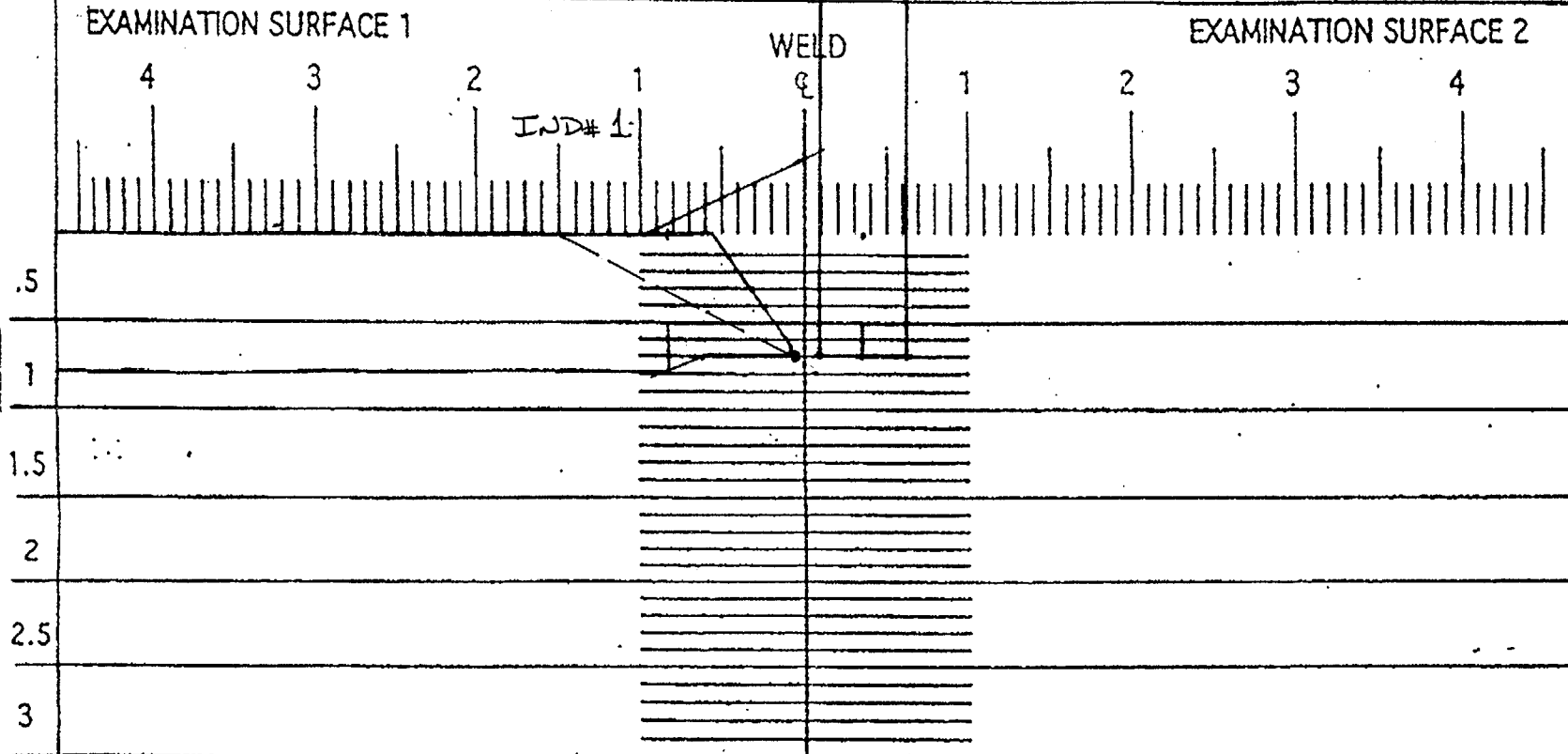
Prepared By:  Level: III Date: 9/11/01 Sketch(s) attached yes no Sheet 2 of 9

Reviewed By:  Date: 9-18-01 Authorized Inspector:  Date: 10/17/02

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

NDE-UT-5

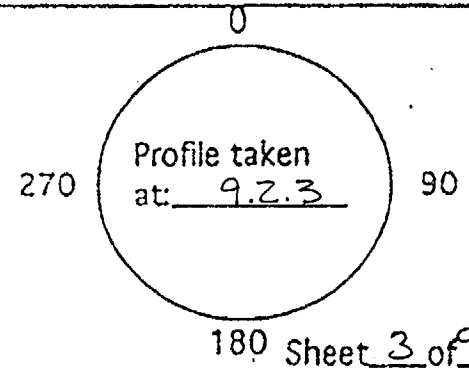
Revision 1



Component ID/Weld No. ZBNSHX-3-NZ

: Remarks:

Item No: COZ.021.005
 Examiner: [Signature] Level: III Date: 9/11/01
 Reviewed By: [Signature] Level: III Date: 9/18/01
 Authorized Inspector: [Signature] Date: 10/17/01



DUKE POWER COMPANY
ULTRASONIC INDICATION RESOLUTION SHEET

Form NDE-UT-8

Revision 1

Acceptance Standard:

IND. #1 - 60°L IS A GEOMETRIC REFLECTOR DUE TO WELD ROOT CONFIGURATION.

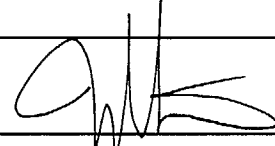
Item No: C02.021.005

Acceptable Indications: IND. #1

Rejectable Indications: N/A

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

Examiner:
Jay A. Eaton

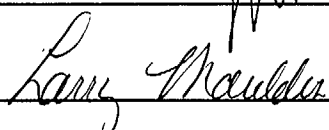


Level:
III

Date:
9/11/2001

Sheet 4 of 9

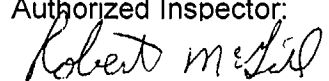
Reviewer:



Level:
III

Date:
9-18-01

Authorized Inspector:



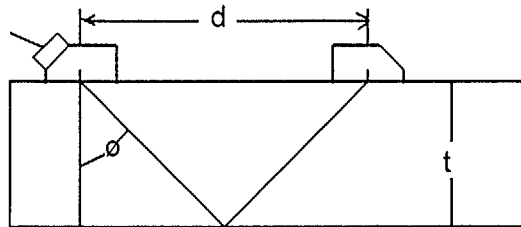
Date:

10/17/01

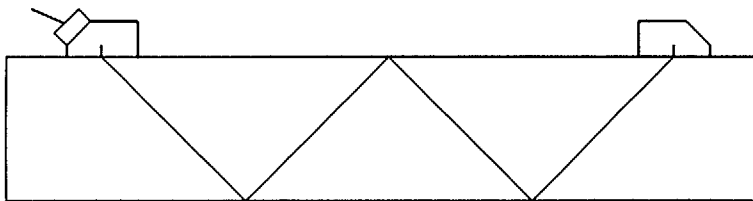
**DUKE POWER COMPANY
ULTRASONIC BEAM ANGLE MEASUREMENT RECORD**

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: _____ 12 IN. _____

Pipe Schedule: _____ N/A _____

Nominal 45 deg: d= 1.4 ; t= 0.75 ; measured angle= 43.03 deg

Nominal 60 deg: d= 0 ; t= 0 ; measured angle= 0.00 deg

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

Item No.
C02.021.005

| | | | | | | | |
|-----------------------------|------------------------|--------------|-------------------|--------------------------|----------------------|--------------|-------------------|
| Examiner Gayle E. Houser | <i>Gayle E. Houser</i> | Level III | Date 9/11/2001 | Examiner Jay A. Eaton | <i>Jay A. Eaton</i> | Level III | Date 9/11/2001 |
| Reviewed By | <i>Ray Mauldin</i> | Level III | Date 9-18-01 | Authorized Inspector | <i>Robert M. ...</i> | | Date 10/17/07 |

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

$(0.25 \text{ in} \times 1.1 \text{ in}) + (0.15 \text{ in} \times 0.05 \text{ in} / 2) = 0.283 \text{ sq. in.}$

Volume Calculation

$0.283 \text{ sq. in.} \times 40 \text{ in.} = 11.32 \text{ cubic in.}$

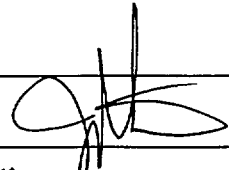
Coverage Calculations

| Scan # | Angle | Beam Direction | Area Examined (sq.in.) | Length Examined (in.) | Volume Examined (cu.in.) | Volume Required (cu.in.) | Percent Coverage |
|--------|-------|----------------|------------------------|-----------------------|--------------------------|--------------------------|------------------|
| 1 | 60&70 | S1 | .253 | 40 | 10.12 | 11.32 | |
| 2 | 60&70 | S2 | 0 | 40 | 0 | 11.32 | |
| 3 | 45 | CW | .151 | 40 | 6.04 | 11.32 | |
| 4 | 45 | CCW | .151 | 40 | 6.04 | 11.32 | |
| | | TOTAL | AGGREGATE | COVERAGE | 22.2 | 45.28 | 49.03 |

609

Item No: C02.021.005

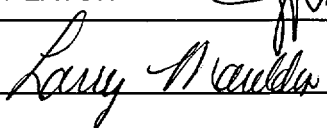
Prepared By: JAY EATON



Level: III

Date: 9/11/2001

Reviewed By:



Level: IV

Date: 9.18.01

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

NDE-UT-5

Revision 1

EXAMINATION SURFACE 1 *Nozzle*

4 3 2 1

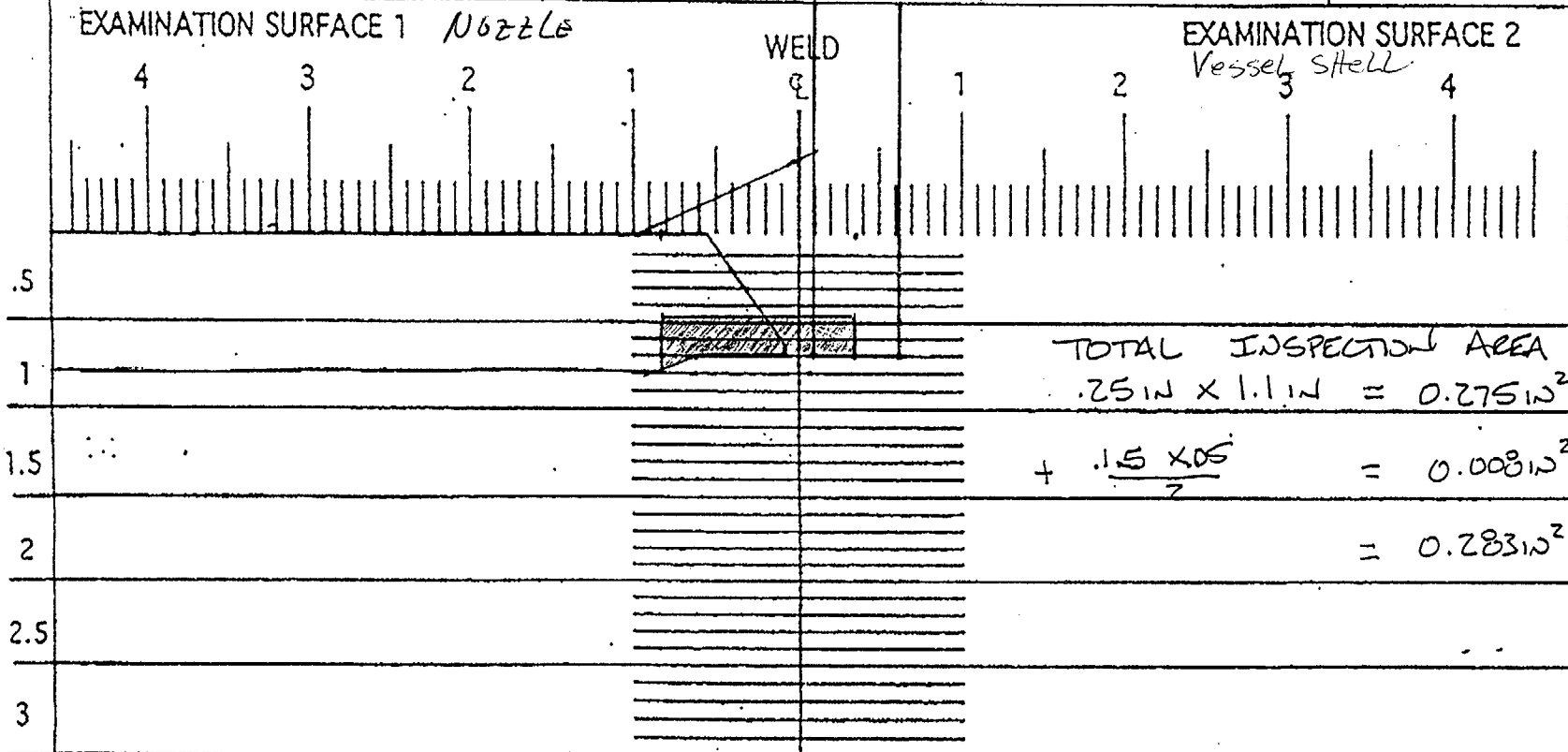
WELD

ε

EXAMINATION SURFACE 2

Vessel shell

1 2 3 4



Component ID/Weld No. *ZBNSHX-3-NZ*

Remarks:

270

Profile taken
at: 9.2.3

90

Item No: *COZ.021.005*

Examiner:

Level: *III*

Date: *9/11/01*

Reviewed By:

Level: *III*

Date: *9.18.01*

Authorized Inspector:

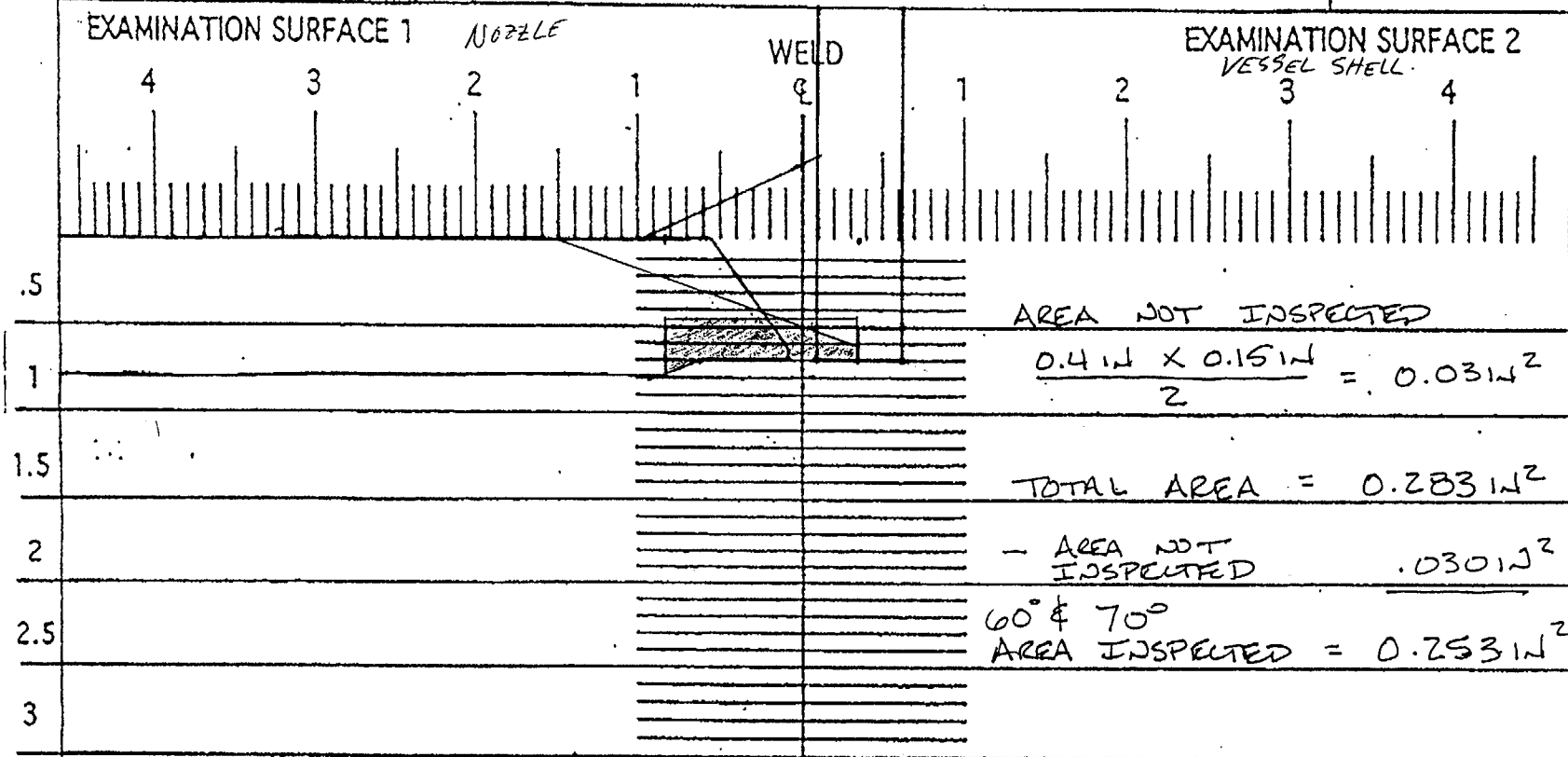
Date: *10/17/01*

180 Sheet 7 of 9

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

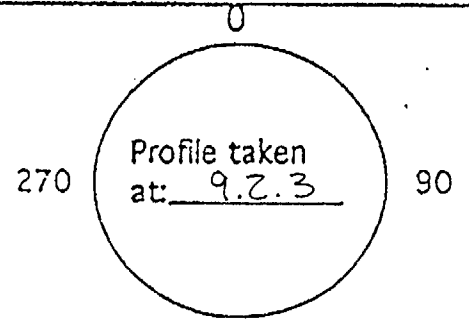
NDE-UT-5

Revision 1



Component ID/Weld No. ZBNSHX-3-NZ

Remarks:



Item No: COZ.021.005

| | | |
|--|-------------------|-----------------------|
| Examiner: <u>[Signature]</u> | Level: <u>III</u> | Date: <u>9/11/01</u> |
| Reviewed By: <u>Law Maulda</u> | Level: <u>III</u> | Date: <u>9-18-01</u> |
| Authorized Inspector: <u>Robert Mester</u> | | Date: <u>10/17/07</u> |

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

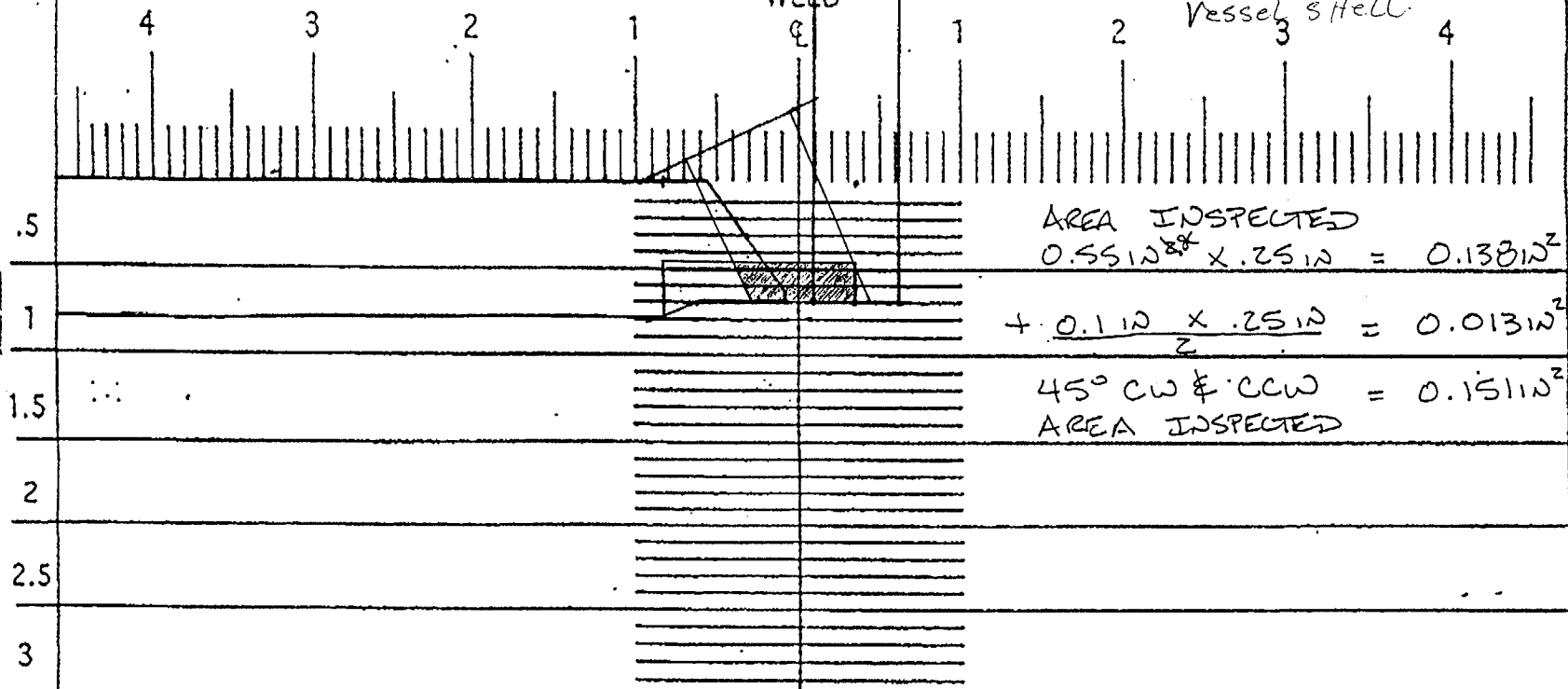
NDE-UT-5

Revision 1

EXAMINATION SURFACE 1

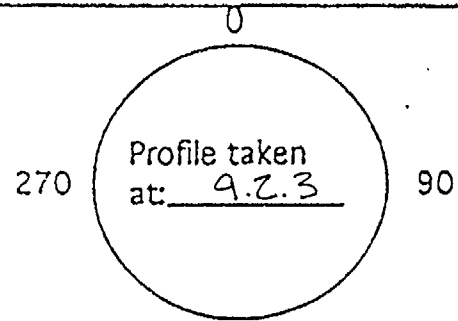
EXAMINATION SURFACE 2

Vessel Shell



Component ID/Weld No. ZBNSHX - 3 - NZ

Remarks:



Examiner:

Item No: COZ.021.005

Level: III Date: 9/11/01

Reviewed By:

Lawrence Mauldin

Level: III Date: 9-18-01

Authorized Inspector:

Robert McNeil

Date: 10/17/07

180 Sheet 9 of 9

| DUKE POWER COMPANY | | | | | | | | | | | | | Exam Start: | 0952 | NDE-UT-3A | |
|--|----|----------------------------|---|----------------------------------|----------------------------|--------------------------|---------------------------|--------------------------------|--------------------------|---------------------------|--------------------------|---------------------------|--------------|-------|------------|--|
| ULTRASONIC EXAMINATION DATA SHEET FOR LAMINAR REFLECTORS | | | | | | | | | | | | | Exam Finish: | 0955 | Revision 2 | |
| Station: CNS | | | Unit: 2 | | Component/Weld ID: 2NV20-5 | | | | | | Date: 9/12/2001 | | | | | |
| Nominal Material Thickness (in.): 0.237 | | | | Weld Length (in.): 14.25" | | | | Surface Temperature: 81° Deg F | | | | | | | | |
| Measured Material Thickness (in): .245 | | | | Lo: 9.1.1.1 | | | | Pyrometer S/N: MCNDE 27010 | | | | | | | | |
| Surface Condition: AS GROUND | | | | Calibration Sheet No: 0102005 | | | | Cal Due: 2/14/2002 | | | | | | | | |
| Examiner: Marion T. Weaver <i>Marion T. Weaver</i> Level: II | | | Configuration: <u> </u> Pipe to VLV 2NV-204 <u> </u> S2 Flow <u> </u> S1 <u> </u> VALVE to <u> </u> PIPE | | | | | | | | | | | | | |
| Examiner: Gary J. Moss <i>GJMoss</i> Level: II | | | | | | | | | | | | | | | | |
| Procedure: NDE-640 Rev: 1 FC: * | | | | | | | | | | | | | | | | |
| 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 | | |
| | 0° | NRI | | | | | | | | | | | | | | |

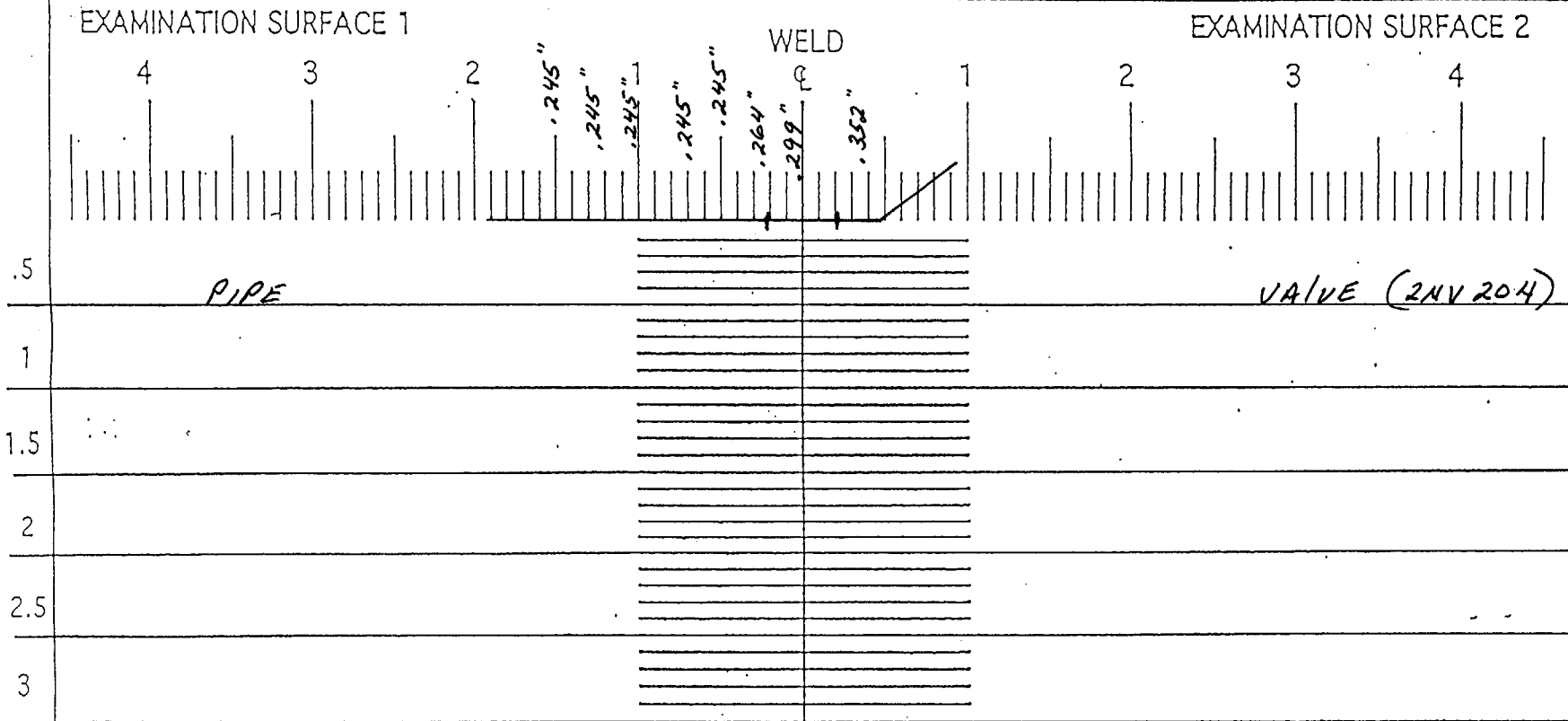
| | | | | | | | | | | | | | | |
|-----------------------------------|--|--|-------------------|--|----------------------|--|--|--|--|--|--|----------------------|------------------------------------|--|
| Remarks: * 95-18 & 95-19 | | | | | | | | | | | | | | |
| | | | | | | | | | | Limitations: see NDE-UT-4 <input checked="" type="checkbox"/> None: <input type="checkbox"/> | | | Sheet <u> 1 </u> of <u> 6 </u> | |
| Reviewed By: <i>Larry Mauldin</i> | | | Level: <i>III</i> | | Date: <i>9-17-01</i> | | Authorized Inspector: <i>Robert McNeil</i> | | | Date: <i>10/17/01</i> | | Item No: C05.021.232 | | |

REQUEST FOR RELIEF # 01-003 ATTACHMENT 7

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

NDE-UT-5

Revision 1



Component ID/Weld No. 2NV 20-5

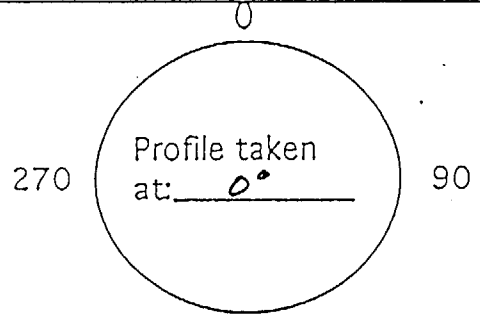
Remarks:

Item No: CO5.021.232

Examiner: Glenn T. Weaver Level: II Date: 9-12-01

Reviewed By: Randy Paulsen Level: III Date: 9-17-01

Authorized Inspector: Robert M. Hill Date: 10/17/01



Catawba Unit #2
EOC11
NO ANGLE BEAM
DATA

CALIBRATION SHEET # 0102006

#

#

COMPONENT I.D.# 2NV205

ITEM # COS.021.232

306

**DUKE POWER COMPANY
ISI LIMITATION REPORT**

FORM NDE-UT-4

Revision 1

Component/Weld ID: 2NV20-5

Item No: C05.021.232

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 CL to BEYOND
 ANGLE: 0 45 60 Other FROM 0 DEG to 360 DEG

DUE TO 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: Marion T. Weaver *Marion T. Weaver* Level: II Date: 9/12/2001 Sketch(s) attached yes no Sheet 4 of 6

Reviewed By: *Randy Mauldin* Date: 9-17-01 Authorized Inspector: *Robert m y l u* Date: 10/17/01

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

Volume Calculation

0.1 IN. X 0.9 IN = 0.09 SQ. IN.

0.09 SQ. IN. X 14.2 IN. = 1.28 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 | CW | .09 | 14.2 | 1.28 | 1.28 | |
| 2 | 45 | CCW | .09 | 14.2 | 1.28 | 1.28 | |
| 3 | 60 | 1 | 0 | 14.2 | 0 | 1.28 | |
| 4 | 60 | 2 | .04 | 14.2 | 0.568 | 1.28 | |
| Shear | Wave | Aggregate | Coverage | | 3.128 | 5.12 | 61.09 |
| RL | Wave | Supplemental | Coverage | | | | |
| 4 | 60RL | 2 | .05 | 14.2 | 0.71 | 1.28 | 55.47 |

SUPPLEMENTAL COVERAGE 55.47 X 25% (1 SCAN) = 13.87% OF TOTAL WELD

596

Item No: C05.021.232

Prepared By: *Marion V. Weaver*

Level: *II*

Date: *9-12-01*

Reviewed By: *Larry Mauldin*

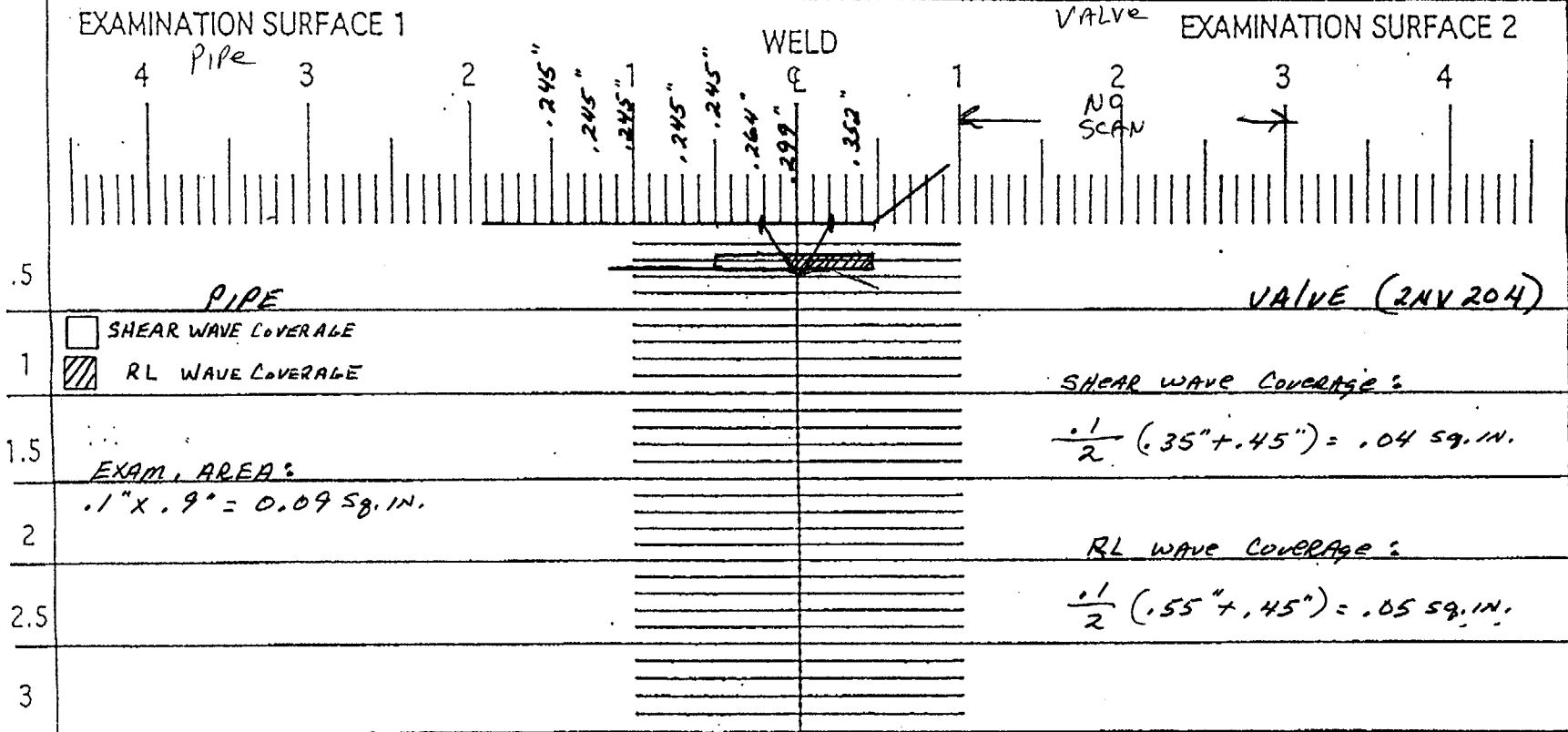
Level: *III*

Date: *9-17-01*

DUKE POWER COMPANY
UT PROFILE/PLOT SHEET

NDE-UT-5

Revision 1



Component ID/Weld No. 2NV 20-5

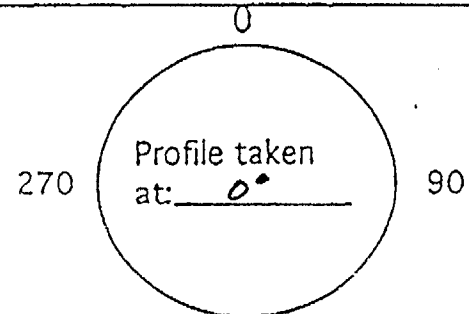
Remarks:

Item No: C05.021.232

Examiner: Marilyn T. Weaver Level: II Date: 9-12-01

Reviewed By: Larry Mauldin Level: III Date: 9-17-01

Authorized Inspector: Robert M. Hill Date: 10/17/01



180 Sheet 6 of 6