

ONS-2015-087

July 15, 2015

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

Duke Energy Carolinas, LLC (Duke Energy) Oconee Nuclear Station, Unit 3 Docket Number 50-287, Renewed License Numbers DPR-50 Scott L. Batson Vice President Oconee Nuclear Station

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10 CFR 50.55a

Subject: Fourth Ten-Year Inservice Inspection Plan, Relief Request No. 15-ON-003, Limited Volume Inspections from 3EOC27 Outage

Pursuant to 10 CFR 50.55a(g)(5)(iii), Duke Energy hereby requests NRC approval of the following relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1998 Edition with 2000 Addenda.

The attached Relief Request applies to limited volumetric examinations performed on welds associated with various systems and components during Unit 3, EOC27 outage. The relief request details are provided as an enclosure to this letter.

This submittal document contains no regulatory commitments.

If there are any questions or further information is needed you may contact David Haile at (864) 873-4742.

Sincerely,

Scott L. Batson Vice President Oconee Nuclear Station

<u>Enclosure</u>

Relief Request Serial #15-ON-003: Limited volume examinations per 10 CFR 50.55a(g)(5)(iii) for Unit 3, Fourth Inservice Inspection Interval

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#### cc (with enclosure):

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### Enclosure to ONS-2015-087

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Duke Energy Carolinas, LLC Oconee Nuclear Station, Unit 3

Relief Request Serial #15-ON-003:

Limited volume examinations per 10 CFR 50.55a(g)(5)(iii) for Unit 3,

Fourth Inservice Inspection Interval

#### **1.0** Scope of Relief Request

Relief is requested pursuant to 10 CFR 50.55a(g)(5)(iii) for welds listed in Table 1. These welds were required to be examined in accordance with Inservice Inspection Plans for the following Units.

Oconee Nuclear Station - Unit 3 Fourth 10-Year Inservice Inspection Interval Interval Start Date: Unit 3 January 2, 2005 Interval End Date: July 15, 2014

			Table 1		
<u>Relief</u> Request	<u>Oconee</u>	Examination Performed	<u>Weld ID</u> Number	Item/Summary Number	Examination Data
<u>Section</u> <u>Number</u>	<u>Unit</u> Number	(Refueling Outage)			
2.0	3	3EOC27	3-RPV-WR18	O3.B1.11.0003	See Attachment A Pages 1-3
3.0	3	3EOC27	3-RPV-WR34	O3.B1.11.0004	See Attachment A Pages 4-8
4.0	3	3EOC27	3-RPV-WR35	O3.B1.21.0001	See Attachment A Pages 9-12
5.0	3	3EOC27	3-LDCA-IN-1	O3.B2.51.0001	See Attachment A Pages 13-17
6.0	3	3EOC27	3-LDCA-OUT- WJ35V	O3.B2.51.0002	See Attachment A Pages 18-22
7.0	3	3EOC27	3-LDCB-IN- WJ33V	O3.B3.150.0003	See Attachment A Pages 23-29
8.0	3	3EOC27	3-LDCB-OUT- WJ36V	O3.B3.150.0004	See Attachment A Pages 30-36

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#### 2.0 Weld # 3-RPV-WR18

#### 2.1. ASME Code Component(s) Affected

Unit 3 Reactor Vessel Upper Nozzle Belt to Upper Shell Weld, Reactor Coolant System, Weld # 3-RPV-WR18, Summary Number O3.B1.11.0003, and ASME Code Class 1.

#### 2.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

#### 2.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-A, Item Number B1.11 Fig. IWB-2500-1, 100% Volume Coverage of Examination Volume A-B-C-D.

#### 2.4. Impracticality of Compliance

Component configuration:

- Surface 1: Upper Nozzle Belt Carbon steel
- Surface 2: Upper Shell Weld Carbon steel
- Diameter: 167.63 in.
- Thickness: 12.00 in.

This component was scanned with automated methods from the Reactor Vessel interior. Scanning requirements are described in ASME Section V, Article 4, T-441.1.2(a), T-441.1.3, T-441.1.4, T-441.1.5 and T-441.1.6. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

- Inner 15% Thickness coverage using 45° & 70° longitudinal waves for axial scans (S1, S2), and circumferential scans (CW, CCW) obtained 83.2% coverage.
- Outer 85% Thickness coverage using 45° longitudinal waves and 45° shear waves for axial scans (S1, S2), and circumferential scans (CW, CCW) obtained 77.8% coverage.
- The aggregate coverage was calculated to be 79.00%. See attached examination coverage sheet for calculations.

The impracticality was caused by the Reactor Vessel Outlet Nozzle Boss configuration that does not allow meaningful interrogation. The current configuration does not allow scanning of all of the required volume for this weld. The weld configuration would have to be redesigned and replaced, which is impractical.

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

Forty six Indications were recorded during this examination and determined to be acceptable per IWB-3510-1.

2.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

2.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

#### 2.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B1.11.0003 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring, it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

#### 2.8. References

Also in Duke Energy Relief Request 94-01 was approved by the NRC during the second inspection interval. The previous approved SE is documented in Docket No. 50-287, TAC No.M89366 dated June 12, 1995.

#### 3.0 Weld # 3-RPV-WR34

3.1. ASME Code Component(s) Affected

Unit 3 Reactor Vessel Lower Shell to Transition Piece Weld, Reactor Coolant System, Weld # 3-RPV-WR34, Summary Number O3.B1.11.0004, and ASME Code Class 1.

3.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

3.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-A, Item Number B1.11 Fig. IWB-2500-1, 100% Volume Coverage of Examination Volume A-B-C-D.

#### 3.4. Impracticality of Compliance

Component configuration:

- Surface 1: Lower Shell Carbon steel
- Surface 2: Transition Piece Carbon steel
- Diameter: 170.25 in.
- Thickness: 5.5 in.

This component was scanned with automated methods from the Reactor Vessel interior. Scanning requirements are described in ASME Section V, Article 4, T-441.1.2(a), T-441.1.3, T-441.1.4, T-441.1.5 and T-441.1.6. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

- Inner 15% Thickness coverage using 45° & 70° longitudinal waves for axial scans (S1, S2), and circumferential scans (CW, CCW) obtained 35% coverage.
- Outer 85% Thickness coverage using 45° longitudinal waves and 45° shear waves for axial scans (S1, S2), and circumferential scans (CW, CCW) obtained 44% coverage.
- The aggregate coverage was calculated to be 42.7%. See attached examination coverage sheet for calculations.

The impracticality was caused by the Reactor Vessel interior configuration (Guide Lugs and Flow Stabilizers) that does not allow meaningful interrogation. The current configuration does not allow scanning of all of the required volume for this weld. The weld configuration would have to be redesigned and replaced, which is impractical.

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

Four indications were recorded during this examination and determined to be acceptable per IWB-3510-1.

3.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

3.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

#### 3.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B1.11.0004 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring,

it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

3.8. References

Duke Energy Relief Request 05-ON-002 was approved by the NRC during the last inspection interval. The previous approved SE is documented in Accession Number ML062270661, TAC No.MC7996 dated August 30, 2006. Also in Duke Energy Relief Request 94-01 was approved by the NRC during the second inspection interval. The previous approved SE is documented in Docket No. 50-287, TAC No.M89366 dated June 12, 1995.

#### 4.0 Weld # 3-RPV-WR35

4.1. ASME Code Component(s) Affected

Unit 3 Reactor Vessel Transition Piece to Lower Head Weld, Reactor Coolant System, Weld # 3-RPV-WR35 Summary Number O3.B1.21.0001, and ASME Code Class 1.

4.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

4.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-A, Item Number B1.21. Fig. IWB-2500-3, 100% Volume Coverage of Examination Volume A-B-C-D.

4.4. Impracticality of Compliance

Component configuration:

- Surface 1: Transition Piece Carbon steel
- Surface 2: Lower Head Carbon steel
- Diameter: 143.00 in.
- Thickness: 5.375 in.

This component was scanned with automated methods from the Reactor Vessel interior. Scanning requirements are described in ASME Section V, Article 4, T-441.1.2(a), T-441.1.3, T-441.1.4, T-441.1.5 and T-441.1.6. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

 Inner 15% Thickness coverage using 45° & 70° longitudinal waves for axial scans (S1, S2), and circumferential scans (CW, CCW) obtained 32.7% coverage

- Outer 85% Thickness coverage using 45° longitudinal waves and 45° shear waves for axial scans (S1, S2), and circumferential scans (CW, CCW) obtained 37.1% coverage.
- The aggregate coverage was calculated to be 36.4%. See attached examination coverage sheet for calculations.

The impracticality was caused by the Reactor Vessel interior configuration (Incore Nozzles and Flow Stabilizers) that does not allow meaningful interrogation. The current configuration does not allow scanning of all of the required volume for this weld. The weld configuration would have to be redesigned and replaced, which is impractical.

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

Sixteen indications were recorded during this examination and determined to be acceptable per IWB-3510-1.

4.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

4.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

4.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B1.21.0001 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

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Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring, it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

#### 4.8. References

Duke Energy Relief Request 05-ON-002 was approved by the NRC during the last inspection interval. The previous approved SE is documented in Accession Number ML062270661, TAC No.MC7996 dated August 30, 2006.

#### 5.0 Weld # 3-LDCA-IN-1

5.1. ASME Code Component(s) Affected

Unit 3 Letdown Cooler 3A, Chemical Connector to Channel Body Weld, High Pressure Injection System, Weld # 3-LDCA-IN-1, Summary Number O3.B2.51.0001, and ASME Code Class 1.

5.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

5.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-B, Item Number B2.51 Fig. IWB-2500-1 (b), 100% Volume Coverage of Examination Volume A-B-C-D.

5.4. Impracticality of Compliance

Component configuration:

- Surface 1: Chemical Connector Stainless steel
- Surface 2: Channel Body Stainless steel
- Diameter: 8.625 in.
- Thickness: 0.875 in.

This component was scanned manually with conventional methods. Scanning requirements are described in ASME Section V, Article 4, T-441.1.2(a), T-441.1.3, T-441.1.4, T-441.1.5 and T-441.1.6. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

- Axial scan coverage (S1,S2) using 45° Shear and Longitudinal and 60° & 70° Longitudinal waves obtained 97.2% coverage.
- Circumferential scan coverage (CW, CCW) using a 45° shear wave obtained 78.1% coverage.

• The aggregate coverage was calculated to be (97.2% + 78.1%)/2 = 87.7%.

The impracticality was caused by the weld taper configuration and nozzle on the chemical connector that does not allow meaningful interrogation. In order to scan all of the required volume for this weld. The shell to sampling nozzle weld would have to be redesigned and replaced, which is impractical.

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

No indications were recorded during this examination.

5.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

5.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

#### 5.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B2.51.0001 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring,

it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

5.8. References

None.

- 6.0 Weld # 3-LDCA-OUT-WJ35V
  - 6.1. ASME Code Component(s) Affected

Unit 3 Letdown Cooler 3A, Chemical Connector to Channel Body Weld, High Pressure Injection System, Weld # 3-LDCA-OUT-WJ35V, Summary Number O3.B2.51.0002, and ASME Code Class 1.

6.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

6.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-B, Item Number B2.51 Fig. IWB-2500-1 (b), 100% Volume Coverage of Examination Volume A-B-C-D.

6.4. Impracticality of Compliance

Component configuration:

- Surface 1: Chemical Connector Stainless steel
- Surface 2: Channel Body Stainless steel
- Diameter: 8.625 in.
- Thickness: 0.875 in.

This component was scanned manually with conventional methods. Scanning requirements are described in ASME Section V, Article 4, T-441.1.2(a), T-441.1.3, T-441.1.4, T-441.1.5 and T-441.1.6. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

- Axial scan coverage (S1,S2) using 45° Shear and Longitudinal and 60° & 70° Longitudinal waves obtained 97.2% coverage.
- Circumferential scan coverage (CW, CCW) using a 45° shear wave obtained 78.1% coverage.
- The aggregate coverage was calculated to be (97.2% + 78.1%)/2 = 87.7%.

The impracticality was caused by the weld taper configuration and nozzle on the chemical connector that does not allow meaningful interrogation. In order to scan

all of the required volume for this weld. The shell to sampling nozzle weld would have to be redesigned and replaced, which is impractical.

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

No indications were recorded during this examination.

6.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

6.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

#### 6.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B2.51.0002 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring, it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

#### 6.8. References

None.

#### 7.0 Weld # 3-LDCB-IN-WJ33V

7.1. ASME Code Component(s) Affected

Unit 3 Letdown Cooler 3B, Nozzle to Channel Body Weld, High Pressure Injection System, Weld # 3-LDCB-IN-WJ33V, Summary Number O3.B3.150.0003, and ASME Code Class 1.

7.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

7.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-D, Item Number B3.150, Fig. IWB-2500-7 (a),100% Volume Coverage of Examination Volume A-B-C-D-E-F-G-H-I.

7.4. Impracticality of Compliance

Component configuration:

- Surface 1: Channel Body Stainless steel
- Surface 2: Inlet Nozzle Stainless steel
- Diameter: 8.625 in.
- Thickness: 0.875 in.

This component was scanned manually with conventional methods. Scanning requirements are described in ASME Section XI, Appendix III, III-4420 and III-4430. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

- Axial scan coverage: 45° shear waves and 60° and 70° longitudinal waves in the S1 and S2 direction obtained an aggregate coverage of 52.6%.
- Circumferential scan coverage: 45° shear and longitudinal waves obtained an aggregate coverage of 68.6%.
- The total aggregate coverage was calculated to be (52.6% + 68.6%)/2 = 60.6%.

The impracticality was caused by the weld taper configuration of the inlet nozzle to the channel body that does not allow interrogation from Surface 2 nozzle side. In order to scan all of the required volume for this weld. The channel body to inlet nozzle weld would have to be redesigned and replaced to allow scanning from both sides of the weld, which is impractical

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

No indications were recorded during this examination.

7.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

7.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

7.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B3.150.0003 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring, it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

#### 7.8. References

Duke Energy Relief Request 11-ON-002 was approved by the NRC during the last inspection interval. The previous approved SE is documented in Accession Number ML13025A291, TAC No.ME8433 and ME8434 dated February 4, 2013.

#### 8.0 Weld # 3-LDCB-OUT-WJ36V

8.1. ASME Code Component(s) Affected

Unit 3 Letdown Cooler 3B, Nozzle to Channel Body Weld, High Pressure Injection System, Weld # 3-LDCB-OUT-WJ36V, Summary Number O3.B3.150.0004, and ASME Code Class 1.

#### 8.2. Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1998 Edition through the 2000 Addenda.

8.3. Applicable Code Requirement

IWB-2500, Table IWB-2500-1, Examination Category B-D, Item Number B3.150, Fig. IWB-2500-7 (a), 100% Volume Coverage of Examination Volume A-B-C-D-E-F-G-H-I.

#### 8.4. Impracticality of Compliance

Component configuration:

- Surface 1: Channel Body Stainless steel
- Surface 2: Outlet Nozzle Stainless steel
- Diameter: 8.625 in.
- Thickness: 0.875 in.

This component was scanned manually with conventional methods. Scanning requirements are described in ASME Section XI, Appendix III, III-4420 and III-4430. These requirements describe and are specific to scanning components in two axial and two circumferential directions. This component was scanned to the extent possible to meet these requirements. The aggregate coverage that was obtained is described and calculated from the following:

- Axial scan coverage: 45° shear waves and 60° and 70° longitudinal waves in the S1 and S2 direction obtained an aggregate coverage of 52.6%.
- Circumferential scan coverage: 45° shear and longitudinal waves obtained an aggregate coverage of 68.6%.
- The total aggregate coverage was calculated to be (52.6% + 68.6%)/2 = 60.6%.

The impracticality was caused by the weld taper configuration of the inlet nozzle to the channel body that does not allow interrogation from Surface 2 nozzle side. In order to scan all of the required volume for this weld. The channel body to inlet

nozzle weld would have to be redesigned and replaced to allow scanning from both sides of the weld, which is impractical

The Oconee Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage. The achieved coverage did not meet the acceptance criteria of this Code Case.

This relief request is specific to examination volume coverage limitations only. All other Code requirements were satisfied.

No indications were recorded during this examination.

8.5. Proposed Alternative and Basis for Use

No substitution alternative for this weld is available which would provide better results. Radiography (RT) is not a desired option because RT is limited in the ability to detect service induced flaws. Use of other manual or automated UT techniques, whether conventional or phased array, were considered, but would not increase coverage due to the limitation created by the component configuration. The use of any other UT technique available would incur the same physical scanning limitations. The UT technique applied is considered best effort.

8.6. Duration of Proposed Alternative

This request is for the fourth inservice inspection interval. The interval ended on July 15, 2014.

#### 8.7. Justification for Granting Relief

Ultrasonic examination of the weld for the item number O3.B3.150.0004 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, 1998 Edition with the 2000 Addenda.

The system leakage test performed each refueling outage in accordance with Table IWB-2500-1, Examination Category B-P requires a VT-2 visual examination to detect evidence of leakage. This test and VT-2 examination provides additional assurance of pressure boundary integrity.

In addition to the above Code required examinations (volumetric and pressure test), Reactor Building Normal Sump monitoring and Reactor Building process radiation monitoring contribute to ensuring pressure boundary integrity by providing means to detect reactor coolant leakage and take prompt corrective actions. Operating experience for this weld did not find any previous failures.

Duke Energy has examined the weld to the maximum extent possible utilizing approved examination techniques and equipment. Based on the acceptable results for the coverage completed by the volumetric examination, the pressure testing (VT-2) examinations required by Section XI, and the leakage monitoring, it is Duke's position that the combination of examinations provides a reasonable assurance of quality and safety.

#### 8.8. References

Duke Energy Relief Request 11-ON-002 was approved by the NRC during the last inspection interval. The previous approved SE is documented in Accession Number ML13025A291, TAC No.ME8433 and ME8434 dated February 4, 2013.

# Attachment A

# to Relief Request 15-ON-003

UT Detail Data sheets from 3EOC-27 Limited Exam Coverage AREVA

Document No.: 51-9222850-000

#### Duke Energy / Oconee Unit 3 EOC27 10 Year ISI Final Report

	v		UPPE	Co	E BELT	O UPPEI 03.B1.11.0003 3-RPV-WR18 er: 8068903D	R WEL	LWELD	•
						age Obtain		1296	
inner 1	5%T:	83.2%			Outer 85%T:	77.8%		Aggregate:	78.6%
Mold	Length	252.17	Tin	E	xamination V	olume Defini	tion		
vveiu			axial plane)		Volume Calc	ulation			
nner 15%T			27.63 s		Inner 15%T				2 cu. in
Duter 85%T Limita	tions	F	157.30 s	g. in. Limits scan b	Outer 85%T			39665.5	Compensation(s)
Outlet noz		Slight redu		and circ scan o	•		ztes due to	nozle boss	
INNER 1		Beam	Area Examined	Length Examined	Volume Examined	verage Calcul Volume Required	Percent		
Entry #	(deg.)	Direction	(sq. m) 27.63	(in.) 222.84	(cu in.) 6157 17	(cu in) 6157 17	Examined 100.0%	Limited	Comment
1 2	70L/45L 70L/45L	Up/Down Up/Down	and the second se	29.32	186.34	810.15 <sup>®</sup> 6967.32	23.0%	Yes	Outlet Nozzle Boss limits scan
Circumferen		Direction Co							
Circumferen Entry # 3 4	tial Beam D Exam Angle (deg.) 70L/45L 70L/45L	Direction Co Beam Direction CW/CCW CW/CCW	Area Examined (sq. in.) 198.00	Circ Extent Examined (%) 68.6% 36.6% Total Circ. B	Axial Extent Examined (%) 100.0% team Direction	-	Percent Examined 68.6% 86.6% 75.3%	Limited Yes Yes	Comment Coverage between Inlet/Outfet Nozzles
3	Exam Angla (deg.) 70L/45L	Beam Direction CW/CCW	Area Examined (sq. in.) 198.00	Examined (%) 68.6% 86.6%	Examined (%) 100.0% 100.0% eam Direction	n Coverage:	Examined 68.6% 86.6% 75.3%	Yes	Coverage between Inlet/Outlet Nozzles
<u>Entry</u> # 3 4	Exam Angla (deg.) 70L/45L 70L/45L	Beam Direction CW/CCW	Area Examined (sq. in.) 198.00	Examined (%) 68.6% 86.6%	Examined (%) 100.0% 100.0%	n Coverage:	Examined 68.6% 86.6%	Yes	Coverage between Inlet/Outlet Nozzles
Entry # 3 4 OUTER 8	Exam Angla (deg.) 70L/45L 70L/45L 85%T	Beam Direction CW/CCW CW/CCW	Area Examined (sq. in.) 198.00	Examined (%) 68.6% 86.6%	Examined (%) 100.0% 100.0% eam Direction	n Coverage:	Examined 68.6% 86.6% 75.3%	Yes	Coverage between Inlet/Outlet Nozzles
Entry # 3 4 OUTER 8	Exam Angla (deg.) 70L/45L 70L/45L 85%T Direction C Exam.	Beam Direction CW/CCW CW/CCW	Ārea Examined (sq. in.) 198.00 148.20 Area	Examined (%) 68.6% 86.6% Totał Circ, B	Examined (%) 100.0% 100.0% ieam Direction Inner 15% co Volume	verage:	Examined 68.6% 86.6% 75.3% 83.2%	Yes	Coverage between Inlet/Outlet Nozzles
Entry # 3 4 OUTER S Axial Beam	Exam Angle (deg.) 70L/45L 70L/45L 70L/45L <b>85%T</b> Direction C Exam. Angle	Beam Direction CW/CCW CW/CCW	Ārea Examined (sq. in.) 198.00 148.20 Area Examined	Examined (%) 68.6% 86.6% Totał Circ. B	Examined (%) 100.0% ieam Direction Inner 15% co	verage: Volume Required	Examined 68.6% 86.6% 75.3%	Yes	Coverage between Inlet/Outlet Nozzles
Entry # 3 4 OUTER : Axial Beam Entry # 1	Exam Angla (deg.) 70L/45L 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S	Beam Direction CW/CCW CW/CCW	Area Examined (sq. in.) 198.00 148.20 Area Examined (sq. in.) 157.30	Examined (%) 68.6% 86.6% Totał Circ. B Length Examined (in) 222.84	Examined (%) 100.0% 100.0% eam Direction inner 15% co Volume Examined (cu in.) 35052.73	verage: Volume Required (cu in) 35052.73	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0%	Yes Yes <i>Limited</i> No	Coverage between Inlet/Outfet Nozzles Coverage between Inlet Nozzles Comment None
Entry # 3 4 OUTER 6 Axial Beam	Exam Angla (deg.) 70L/45L 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.)	Beam Direction CW/CCW CW/CCW	Area Examined (sq. in.) 198.00 148.20 148.20 148.20 Area Examined (sq. in.) 157.30 36.18	Examined (%) 68.6% 86.6% Totał Circ. B Length Examined (in.) 222.84 29.32	Examined (%) 100.0% 100.0% ieam Direction inner 15% co Volume Examined (cu. in.) 35052.73 1060.77	verage: Volume Required (cu in.) 35052 73* 4612 04*	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0% 23.0%	Yes Yes	Coverage between Inlet/Outfet Nozzles Coverage between Inlet Nozzles
Entry # 3 4 OUTER 1 Axial Beam Entry # 1 2	Exam Angle (deg.) 70L/45L 70L/45L 70L/45L <b>85%T</b> Direction C Exam. Angle (deg.) 45L/45S 45L/45S	Beam Direction CW/CCW CW/CCW Coverages Beam Direction Up/Dh Up/Dh Up/Dh	Area Examined (sq. in.) 198.00 148.20 148.20 148.20 Area Examined (sq. in.) 157.30 36.18 I Coverage	Examined (%) 68.6% 86.6% Totał Circ. B Length Examined (in) 222.84	Examined (%) 100.0% 100.0% eam Direction Inner 15% co Volume Examined (cu in) 35052 73 1060.77	verage: Volume Required (cu in) 35052.73	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0%	Yes Yes <i>Limited</i> No	Coverage between Inlet/Outfet Nozzles Coverage between Inlet Nozzles Comment None
Entry # 3 4 OUTER 1 Axial Beam Entry # 1 2	Exam Angle (deg.) 70L/45L 70L/45L 70L/45L <b>85%T</b> Direction C Exam. Angle (deg.) 45L/45S 45L/45S	Beam Direction CW/CCW CW/CCW Coverages Beam Direction Up/Dh Up/Dh Up/Dh	Area Examined (sq. in.) 198.00 148.20 148.20 148.20 Area Examined (sq. in.) 157.30 36.18 I Coverage	Examined (%) 68.6% 86.6% Totał Circ. B Length Examined (in.) 222.84 29.32	Examined (%) 100.0% 100.0% ieam Direction inner 15% co Volume Examined (cu. in.) 35052.73 1060.77	verage: ** Volume Required (cu in.) 35052 73* 4612 04*	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0% 23.0%	Yes Yes <i>Limited</i> No	Coverage between Inlet/Outfet Nozzles Coverage between Inlet Nozzles Comment None
Entry # 3 4 OUTER 1 Axial Beam Entry # 1 2	Exam Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S	Beam Direction CW/CCW CW/CCW Coverages Beam Direction Up/Dn Up/Dn Total Axia	Area Examined (sq. in.) 198.00 148.20	Examined (%) 68.6% 36.6% Total Circ. B Length Examined (in.) 222.84 29.32 252.16 Circ Extent	Examined (%) 100.0% 100.0% feam Direction Inner 15% co Volume Examined (cu. in.) 35052.73 1060.77 36113.50 Axial Extent	verage: ** Volume Required (cu in.) 35052 73* 4612 04*	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0% 23.0% 91.0%	Yes Yes <i>Limited</i> No	Coverage between Inlet/Outfet Nozzles Coverage between Inlet Nozzles Comment None
Entry # 3 4 OUTER 1 Axial Beam Entry # 1 2 Circumferent	Exam Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S mulal Beam I Exam. Angle	Beam Direction CW/CCW CW/CCW Coverages Beam Direction Up/Dh Up/Dh Up/Dh Up/Dh Up/Dh Up/Dh Up/Dh Up/Dh	Area Examined (sq. in.) 198.00 148.20	Examined (%) 68.6% 86.6% Total Circ. B Length Examined (in.) 222.84 29.32 252.16 Circ Extent Examined	Examined (%) 100.0% 100.0% eam Direction Inner 15% co Volume Examined (cu.in.) 35052.73 1060.77 36113.50 Axial Extern Examined	verage: * Volume Required (cu in.) 35052.73* 4612.04* 39664.77	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0% 23.0% 91.0% Percent	Yes Yes Limited No Yes	Coverage between inlet/Outfet Nozzles Coverage between inlet Nozzles Comment None Outlet Nozzle Boss limits scan
Entry # 3 4 OUTER 1 Axial Beam Entry # 1 2	Exam Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S	Beam Direction CW/CCW CW/CCW Coverages Beam Direction Up/Dn Up/Dn Total Axia Direction Co Beam Direction CW/CCW	Area Examined (sq. in.) 198.00 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 157.30 36.18 I Coverages Area Examined (sq. in.) 1054.80	Examined (%) 68.6% 86.6% Totał Circ. B Length Examined (in) 222.84 29.32 252.16 Circ Extent Examined (%) 60.2%	Examined (%) 100.0% 100.0% leam Direction Inner 15% co Volume Examined (cu in) 35052.73 1060.77 36113.50 Axial Extent Examined (%)	verage: * Volume Required (cu in.) 35052.73* 4612.04* 39664.77	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0% 23.0% 91.0% Percent Examined 60.2%	Yes Yes Limited No Yes Limited Yes	Coverage between Inlet/Outfet Nozzles Coverage between Inlet Nozzles Comment None Outlet Nozzle Boss limits scan Comment Coverage between Inlet/Outlet Nozzles
Entry # 3 4 OUTER : Axial Beam Entry # 1 2 Circumferent Entry #	Exam Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam Angle (deg.) 45L/45S 45L/45S 45L/45S	Beam Direction CW/CCW CW/CCW Coverages Beam Direction Up/Dn Up/Dn Total Axla Direction Co Beam Direction	Area Examined (sq. in.) 198.00 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 148.20 157.30 36.18 I Coverages Area Examined (sq. in.) 1054.80	Examined (%) 68.6% 36.6% Total Circ. B Length Examined (in.) 222.84 29.32 252.16 Circ Extent Examined (%) 60.2% 71.7%	Examined (%) 100.0% 100.0% ieam Direction Inner 15% co Volume Examined (cu. in.) 35052.73 1060.77 36113.50 Axial Extent Examined (%) 100.0% 100.0%	verage: * Volume Required (cu in.) 35052.73* 4612.04* 39664.77	Examined 68.6% 86.6% 75.3% 83.2% Percent Examined 100.0% 23.0% 91.0% Percent Examined	Yes Yes <i>Limited</i> No Yes	Coverage between inlet/Outflet Nozzles Coverage between inlet Nozzles Comment None Outlet Nozzle Boss limits scan

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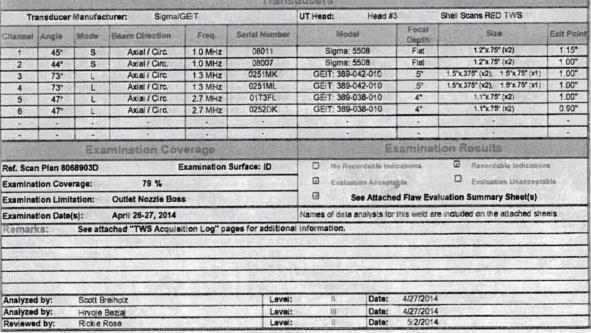
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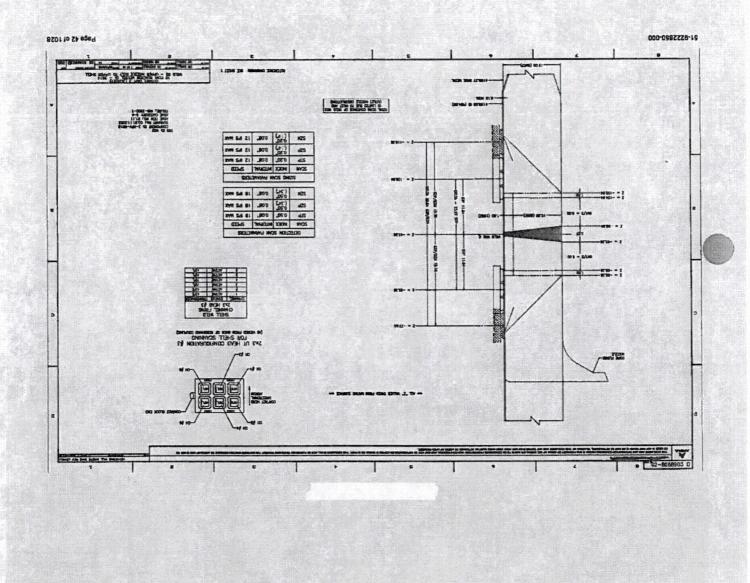


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#### Duke Energy / Oconee Unit 3 EOC27 10 Year ISI Final Report

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	Exam,	Beam	Area Examined	Length Examined	Volume Examined	Volume Required	Percent		
Entry #	Angle (deg.)	Direction	(sa. in.)	(in)	(cu in)		Examined	Umited	Comment
1	70L/45L	Up/Dn	10.54	64.30	677.72	677.72	100.0%	No	Coverage between lugs and stabilizers
						and the second	and the second second	A State of the second second	Coverage above stabilizers
2	70L/45L	Up/Dn	6.95	193,40	1344.13	2038.44	65.9%	Yes	Coverage above stabilizers
2 3	70L/45L 70L/45L	Up/Dn Up/Dn Total Axial	0.00	193.40 280.71 <b>538.41</b>	1344,13 0.00 2021.85	2038 44 2958 64 5674.80	65.9% 0.0% 35.6%	Yes Yes	Obstructed
3	70U/45L tial Beam D Exam	Up/Dn Total Axial Direction Co	0 00 <sup>*</sup> Coverage verages Area	280.71 538.41 Circ Extent	0.00 2021.85 Axial Extent	2958.64	0.0% 35.6%		
	70U/45L tial Beam D	Up/Dn Total Axial	0 00 <sup>*</sup> Coverage verages	280.71 538.41	0.00 2021.85	2958.64 <sup>*</sup> 5674.80	0.0%		
3 Circumferen	70L/45L tial Beam D Exam Angle	Up/Dn Total Axial Direction Co Beam Direction CW/CCW	0 00 Coverage verages Area Examined (sq in) 88 44	280.71 538.41 Circ Extent Examined	0.00 2021.85 Axial Extent <i>Examined</i> (%) 43.0%	2958.64 <sup>*</sup> 5674.80	0.0% 35.6% Percent Examined 8.6%	Yes	Obstructed Comment Coverage between lugs and stabilizers
3 Circumferen Entry #	70L/45L tial Beam D Exam. Angle (deg.)	Up/Dn Total Axial Direction Co Beam Direction	0 00 Coverage verages Area Examined (sq in) 88 44	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5%	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0%	2958,64 5674,80	0.0% 35.6% Percent Examined 8.6% 25.4%	Yes	Obstructed
3 Circumferen Entry # 4	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L	Up/Dn Total Axial Direction Co Beam Direction CW/CCW	0 00 Coverage verages Area Examined (sq in) 88 44	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5%	0.00 2021.85 Axial Extent <i>Examined</i> (%) 43.0%	2958,64 5674,80	0.0% 35.6% Percent Examined 8.6% 25.4%	Yes Limited Yes	Obstructed Comment Coverage between lugs and stabilizers
3 Circumferen Entry # 4	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L	Up/Dn Total Axial Direction Co Beam Direction CW/CCW	0 00 Coverage verages Area Examined (sq in) 88 44	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5%	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0%	2958.64 5674.80	0.0% 35.6% Percent Examined 8.6% 25.4%	Yes Limited Yes	Obstructed Comment Coverage between lugs and stabilizers
3 Circumferen Entry # 4 5	70L/45L <i>tial Beam D</i> <i>Exam.</i> <i>Angle</i> ( <i>deg.</i> ) 70L/45L 70L/45L	Up/Dn Total Axial Direction Co Beam Direction CW/CCW	0 00 Coverage verages Area Examined (sq in) 88 44	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5%	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction	2958.64 5674.80	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0%	Yes Limited Yes	Obstructed Comment Coverage between lugs and stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER 1	70L/45L <i>tial Beam D</i> <i>Exam.</i> <i>Angle</i> ( <i>deg.</i> ) 70L/45L 70L/45L 8 <b>5%T</b>	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW	0.00" Coverage Area Examined (sq.in.) 88.44" 345.72"	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con	2958.64 5674.80 n Coverage: //erage:	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0%	Yes Limited Yes	Obstructed Comment Coverage between lugs and stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER 1	70L/45L tiai Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam.	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW	0.00* Coverage Area Examined (sq. in.) * 88.44* 345.72*	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 13% con Volume	2958.64 5674.80 n Coverage: verage: Volume	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0%	Yes Limited Yes	Obstructed Comment Coverage between lugs and stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER Axial Beam	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined	2958.64" 5674.80 n Coverage:" verage: Volume Required	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% Percent	Yes Limited Yes Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER 1 Axial Beam Entry #	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L B5%T Direction C Exam. Angle (deg.)	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined (sq. in)	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.)	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu. in.)	2958.64" 5674.80 n Coverage: verage: Volume Required (cu. in.)	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% Percent Examined	Yes <u>Limited</u> Yes Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen Entry # 4 5 OUTER Axial Beam Entry # 1	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L B5%T Direction C Exam. Angle (deg.) 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW overages Beam Direction Up/Dn	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined (sq. in) 44 45	280.71 538.41 Circ Extent Examined (%) Total Circ. B Length Examined (in.) 64.30	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu.in.) 2858.78	2958.64" 5674.80 n Coverage: verage: Volume Required	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% Percent	Yes Limited Yes Yes	Obstructed <u>Comment</u> Coverage between lugs and stabilizers Coverage above stabilizers <u>Comment</u> Coverage between lugs and stabilizers
3 Circumferen Entry # 4 5 OUTER 1 Axial Beam Entry #	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L B5%T Direction C Exam. Angle (deg.)	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined (sq. in)	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.)	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu. in.)	2958.64" 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% Percent Examined 100.0% 63.6%	Yes <u>Limited</u> Yes Yes <u>Umited</u> No	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen Entry # 4 5 OUTER 1 Axial Beam Entry # 1 2	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW CW/CCW	0 00" Coverage Area Examined (sq. in.) * 88 44 * 345.72 Area Examined (sq. in.) 44 45 28 28 0.00"	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Inner 15% con Volume Examined (cu.in.) 2258.78 5469.35	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.56	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% Percent Examined 100.0% 63.6%	Yes <u>Limited</u> Yes Yes <u>Umited</u> No Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen Entry # 4 5 OUTER 1 Axial Beam Entry # 1 2 3	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn	0 00" Coverage Area Examined (sq in) 88 44 345.72" Area Examined (sq.in) 44 45 28 28 0.00" Coverage	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu. in) 2858.78 5469.35 0.00	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.56 12480.20	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% 35.0% Percent Examined 100.0% 0.0%	Yes <u>Limited</u> Yes Yes <u>Umited</u> No Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen Entry # 4 5 OUTER 1 Axial Beam Entry # 1 2	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn	0 00" Coverage Area Examined (sq. in) 88 44" 345.72" Area Examined (sq. in.) 44 45 28 28 0.00" Coverage	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71 538.41	0.00 2021.85 Axial Extent <i>Examined</i> (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu.in.) 2858.78 5469.35 0.00 8328.13	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.56 12480.20	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% 35.0% Percent Examined 100.0% 0.0%	Yes <u>Limited</u> Yes Yes <u>Umited</u> No Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER 1 Axial Beam <u>Entry #</u> 1 2 3	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S 45L/45S 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn	0 00" Coverage Area Examined (sq in) 88 44 345.72" Area Examined (sq.in) 44 45 28 28 0.00" Coverage	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu. in) 2858.78 5469.35 0.00	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.56 12480.20	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% 35.0% Percent Examined 100.0% 0.0%	Yes <u>Limited</u> Yes Yes <u>Umited</u> No Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER 1 Axial Beam <u>Entry #</u> 1 2 3	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn Total Axial	0 00" Coverage Area Examined (sq in) 88 44 345.72" Area Examined (sq in) 44 45 28 28 0.00" Coverage Verages Area	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71 538.41 Circ Extent	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Examined (cu.in) 2058.78 5469.35 0.00 8328.13 Axial Extent	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.56 12480.20	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% 25.4% 34.0% 35.0% Percent Examined 100.0% 63.6% 0.0% 34.8%	Yes <u>Limited</u> Yes Yes <u>Umited</u> No Yes	Obstructed Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage above stabilizers
3 Circumferen <u>Entry #</u> 4 5 OUTER 1 Axial Beam <u>Entry #</u> 1 2 3 Circumferen <u>Entry #</u> 4	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S tial Beam D Exam. Angle	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Correction Co Beam Direction CW/CCW	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined (sq.in.) 44 45 28 28 0.00" Coverage verages Area Examined (sq.in.) 44 45 28 28 0.00"	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71 538.41 Circ Extent Examined (%) 31.3%	0.00 2021.85 Axial Extent <i>Examined</i> (%) 43.0% 57.0% earn Direction Inner 15% con Volume Examined (cu.in.) 2858.78 5469.35 0.00 8328.13 Axial Extent <i>Examined</i> (%) 43.0%	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.56 12480.20	0.0% 35.6% Percent Examined 8.6% 25.4% 34.0% 35.0% 35.0% 9.00% 63.6% 0.0% 34.8% Percent Examined 13.5%	Yes <u>Limited</u> Yes Yes <u>Limited</u> Yes	Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage above stabilizers Coverage above stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers
3 Circumferen 4 5 OUTER Axial Beam Entry # 1 2 3 Circumferen Entry #	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 70L/45L B5%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S 45L/45S tial Beam D Exam. Angle (deg.)	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined (sq.in.) 44 45 28 28 0.00" Coverage verages Area Examined (sq.in.) 44 45 28 28 0.00"	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71 538.41 Circ Extent Examined (%) 31.3% 69.5%	0.00 2021.85 Axial Extent Examined (%) 43.0% 57.0% eam Direction Inner 15% con Volume Examined (cu in) 2858.78 5469.35 0.00 8328.13 Axial Extent Examined (%) 43.0% 57.0%	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.55 12480.20 23937.54	0.0% 35.6% Percent Examined 8.6% 34.0% 34.0% 35.0% 35.0% 9.6% 0.0% 34.8% Percent Examined 13.5% 39.6%	Yes Limited Yes Yes Umited No Yes Yes	Obstructed  Comment  Coverage between lugs and stabilizers Coverage above stabilizers  Coverage between lugs and stabilizers Coverage above stabilizers Obstructed  Comment  Comment
3 Circumferen <u>Entry #</u> 4 5 OUTER 1 Axial Beam <u>Entry #</u> 1 2 3 Circumferen <u>Entry #</u> 4	70L/45L tial Beam D Exam. Angle (deg.) 70L/45L 70L/45L 85%T Direction C Exam. Angle (deg.) 45L/45S 45L/45S tial Beam D Exam. Angle (deg.) 45L/45S	Up/Dn Total Axial Direction Co Beam Direction CW/CCW CW/CCW Overages Beam Direction Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Up/Dn Correction Co Beam Direction CW/CCW	0 00" Coverage Area Examined (sq in) 88 44" 345.72" Area Examined (sq.in.) 44 45 28 28 0.00" Coverage verages Area Examined (sq.in.) 44 45 28 28 0.00"	280.71 538.41 Circ Extent Examined (%) 20.1% 44.5% Total Circ. B Length Examined (in.) 64.30 193.40 280.71 538.41 Circ Extent Examined (%) 31.3% 69.5%	0.00 2021.85 Axial Extent <i>Examined</i> (%) 43.0% 57.0% earn Direction Inner 15% con Volume Examined (cu.in.) 2858.78 5469.35 0.00 8328.13 Axial Extent <i>Examined</i> (%) 43.0%	2958.64 5674.80 n Coverage: verage: Volume Required (cu. in.) 2858.78 8598.55 12480.20 23937.54	0.0% 35.6% Percent Examined 8.6% 34.0% 34.0% 35.0% 35.0% 9.6% 0.0% 34.8% Percent Examined 13.5% 39.6%	Yes <u>Limited</u> Yes Yes <u>Limited</u> Yes	Comment Coverage between lugs and stabilizers Coverage above stabilizers Coverage above stabilizers Coverage above stabilizers Coverage above stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers Coverage between lugs and stabilizers

attach A pg 4 of 36

Document No.: 51-9222850-000



Duke Energy / Oconee Unit 3 EOC27 10 Year ISI Final Report

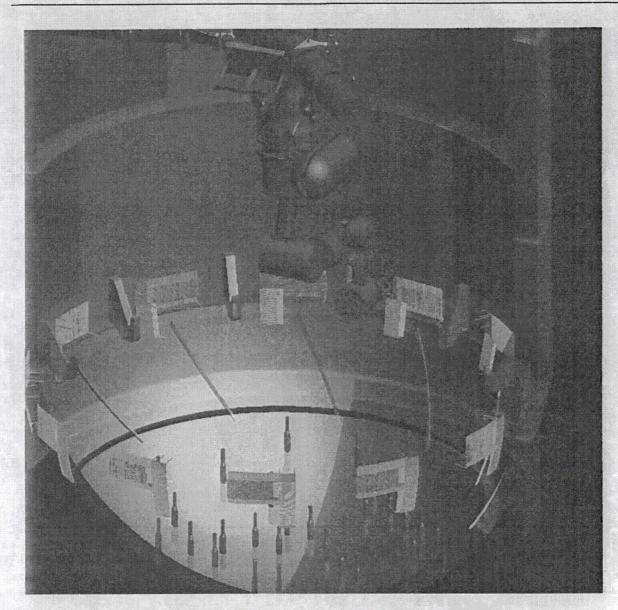
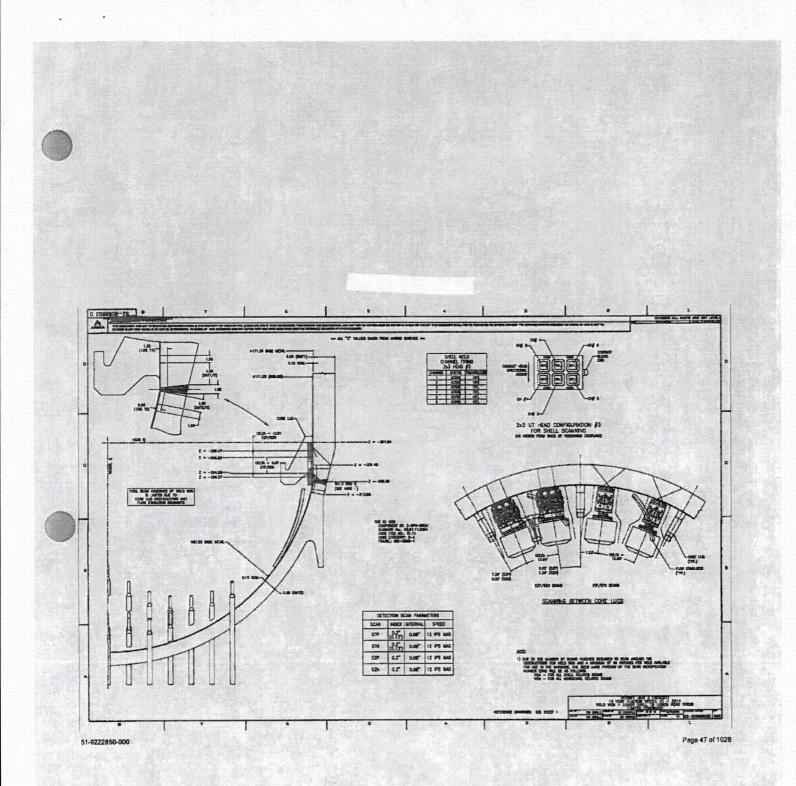


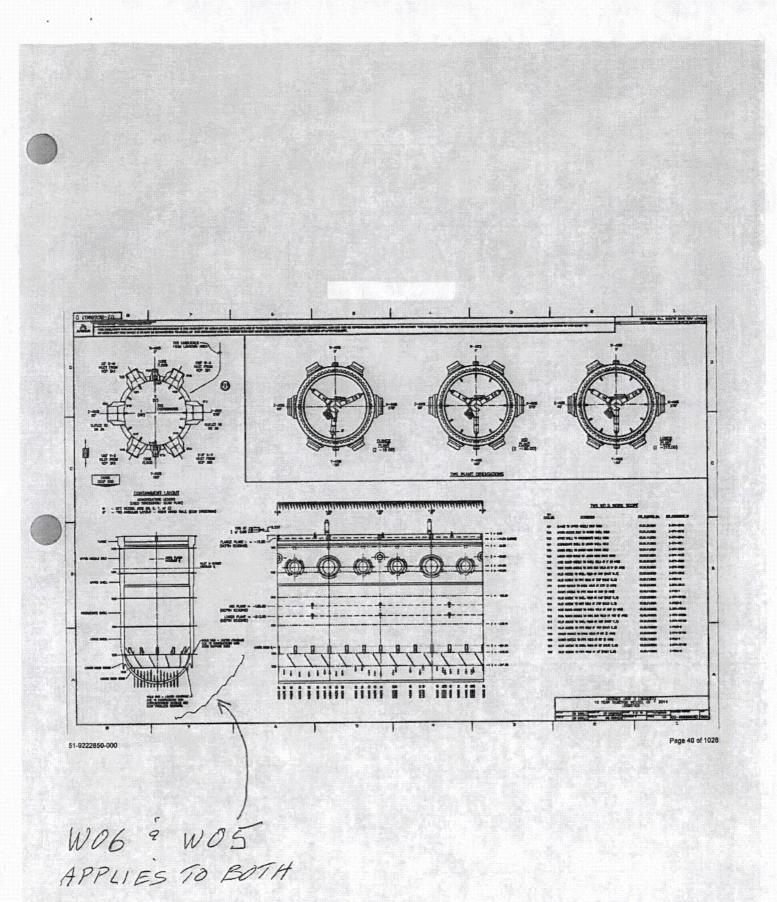
Figure 1-2: TWS Weld W05 - Lower shell to Lower Head Weld

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

attach A 895436



W05 attach A B 6 J 36



A Pg 7 1 36

Utility:	Duke E	nergy		Plant:	Oconee	Unit:	3	a da da se condete a da da	Outage:	3EOC2	7
WS We	ld Numbe		W05	Componen	tiD: 3-RPV	-WR34		Summary	No.:	O3.B1.11.0004	ŀ
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Tr	ansducer		1-1-1-1		Canada and the state of the sta	ducors	Head #			ans RED TWS Size	Exit Po
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Tr Channel 1 2	Angle 45° 44°	Manufac Mode S S	turer: Sigma/l Beam Direction Axial / Circ Axial / Circ	GEIT Freq. 1.0 MHz 1.0 MHz	Trans Serial Number 08011 08007	ducors UT Head: Mode Sigma: 5: Sigma: 5:	Head # 1 508 508	3 Focal Depth Flat Flat	Shell Sc	ans RED TWS Size 1.2"x.75" (x2) 1.2"x.75" (x2)	Exit Pol 1 15* 1 00*
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Tr :hannel 1 2 3 4 5	Angle 45° 44° 73° 73° 47°	Manufac Mode S S L L L	turer: Sigma/ Beam Direction Axial / Circ Axial / Circ Axial / Circ Axial / Circ Axial / Circ Axial / Circ	GEIT Freq. 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz	Serial Number 08011 08007 0251MK 0251ML 01T3FL	UT Head: Mode Sigma: 5: Sigma: 5: GEIT: 389-0 GEIT: 389-0 GEIT: 389-0	Head # 508 508 42-010 42-010 38-010	3 Focal Depth Flat Flat 5" 5" 4"	Shell Sc	zans RED TWS Size 1.2"x.75" (x2) 1.2"x.75" (x2) 75" (x2), 1.5"x.75" (x1) 75" (x2), 1.5"x.75" (x1) 1.1"x.75" (x2)	Exit Pol 1 15" 1 00" 1.00" 1.00" 1 00"
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Document No.: 51-9222850-000

#### Duke Energy / Oconee Unit 3 EOC27 10 Year ISI Final Report OCONEE - UNIT 3 EXAMINATION COVERAGE FOR WELD: W06 LOWER HEAD TORUS TO LOWER HEAD DOME WELD Summary Number: 03.B1.21.0001 Component ID: 3-RPV-WR35 Scan Plan Drawing Number: 8068903D Sheets 13 & 14 WELD VOLUME COVERAGE OBTAINED: 36% Zone Coverage Obtained Outer 85%T: 37.1% Aggregate: 36.4% Inner 15%T: 32.7% **Examination Volume Definition** 2.70 449 248 in Weld Length: Area Measurement (axial plane) **Volume Calculation** inner 15%T 2592 16 cu in 577 so in Inner 15%T 33.04 sq. in 14843, 15 cu. in. Outer 85%T Outer 85%T Compensation(s) Limits scan by: Limitations None Incore Instrumentation Nozzles Incore Nozzies restrict UT head movement None Flow Stabilizers restrict UT head movement Flow Stabilizers Examination Coverage Calculations INNER 16%T Axial Beam Direction Coverages Length Volume Volume Fram Area Examined Required Percent Examined Examined Angle Beam Limited Comment (cu in) (cu in) Examined (deg.) Direction (sq. in nn 1 Entry # 926 70 Coverage between nozzles and stabilizers 160.61 926 70 100.0% No 5 77 701/451 Up/Dn 198.73" 56.8% Coverage above nozzles 45 and 52 3.28 34 44 112.97 Yes 2 701 /451 Un/Dn 18.5% Coverage above nozzle 46 11 23 12 02 64 80 Yes 1 07 701 /451 Un/On 3 0.00 1401.93 0.0% Yes Obstructed 0.00' 242 97 70L/45L 1In/On A 1051.69 2592.16 40.6% Total Axial Coverage 449.25 Circumferential Beam Direction Coverages Circ Extent Axial Extent Exam Area Beam Examined Examined Examined Percent Angle Comment (%) Examined Limited (deg.) Direction (sq. in.) 1%) Entry # 20.3% 90 72 100 0% Coverage between nozzles and stabilizers CW/CCW 20 3% Yes 701/451 CW/CCW \* Coverage above nozzles 45 and 52 20.16 4.5% 80.0% 3.6% Yes 70U45L 6 70L/45L CW/CCW \* Coverage above nozzle 46 10 08" 2.3% 42 0% 0.9% Yes Total Circ. Beam Direction Coverage:" 24.9% Inner 15% coverage: 32.7% OUTER 85%T Axial Beam Direction Coverages Length Volume Volume Exam. Ama Percent Examined Required Angle Beam Examined Examined Comment Direction (sq in.) (in ) (cu in ) (cu in) Examined Limited Entry # (deg.) Coverage between nozzles and stabilizers 160 61 5306 42 100 0% 45L/45S Up/Dn 33.04 5306 42 NO Coverage above nozzles 45 and 52 1137 97 87 7% 997.45 Yes 2 45L/45S Up/Dn 28.96 34 44 Coverage above nozzle 46 201.15 17.91\* 371 08 54 2% Yes 3 450459 Up/Dn 11 23 8027 67 450/455 Up/Dn 0.00" 242.97 0 00 0.0% Yes Obstructed 4 Total Axial Coverage 449.25 6505.03 14843 15 43 8% Circumferential Beam Direction Coverages Circ Extent Axial Extent Exam Area Examined Examined Examined Percent Beam Angle CWICCW Examined Limited Commant (deg.) (%) (%) Entry # Coverage between nozzles and stabilizers 450455 638.28 24.8% 100.0% 24 8% Yes 5 45L/45S CW/CCW Coverage above nozzles 45 and 52 141.84 5.5% 81 0% \$ 5% Yes 6 451/458 CW/CCW \* 70.92 2.8% 39.0% 1 1% Yes Coverage above nozzle 46 Total Circ. Beam Direction Coverage: 30.3%

Outer 85% coverage:

37.1%

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**Controlled Document** 

PROPRIETARY



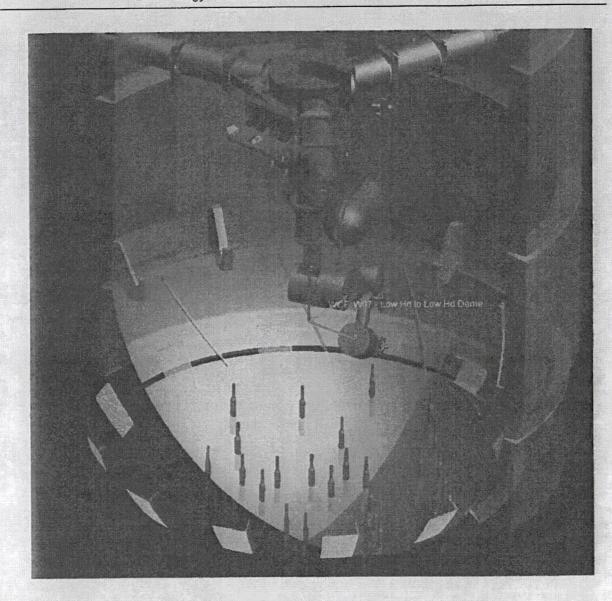
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Scan Sp Tr Channel 1 2 3 4 5 6 6 -	eed: ransducer Angle 45° 44° 73° 73° 73° 47° 47°	4 IPS ( Manufac Mode S S L L L L L	MAP/ MAN) turer: Beam Dire Axial / Axial / Axial / Axial / Axial /	Sync. In Sigma/C ction Circ. Circ. Circ. Circ. Circ. Circ. Circ. Circ.	Terval: SEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 	0.08" Index Va Frans Serial Number 08011 08007 0251MK 0251ML 01T3FL 0252DK	Nue: 0 2%0.5 duce rs UT Head: Model Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03	Head #: 108 12-010 12-010 138-010 18-010	3 Focal Depth Flat Flat 5" 5" 4" 4"	1 1. 1.5*x.375* 1.5*x.375* 1. 1. 1.	s RED TWS Size 2*x75' (x2) 2*x.75'' (x2) (x2), 1.5*x.75'' (x1) (x2), 1.5*x.75'' (x1) 1*x.75'' (x2) 1*x.75'' (x2)	Exit Poir 1.15" 1.00" 1.00" 1.00" 0.90"
Tr Channel 1 2 3 4 5 6	eed: ansducer Angle 45° 44° 73° 73° 47° - -	4 IPS ( Manufac Mode S S L L L L L C C X a	MAP/ MAN) turer: Beam Dire Axial / Axial / Axial / Axial / Axial /	Sync. In Sigma/C ction Circ. Circ. Circ. Circ. Circ. Circ. Circ.	Attribution of the second seco	0.08" Index Va Frans Serial Number 08011 08007 0251MK 0251ML 01T3FL 0252DK	Iue: 0 2%0.5 ducers UT Head: Model Sigma: 55 Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03	Head #: 108 12-010 12-010 138-010 18-010	3 Focal Oepth Flat Flat 5° 5° 4° 4° 4° 4° 4°	Shell Soan 1 1. 1.5'x.375' 1.5'x.375' 1. 1. 5'x.375' 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	s RED TWS Size 2*x75' (x2) 2*x.75'' (x2) (x2), 1.5*x.75'' (x1) (x2), 1.5*x.75'' (x1) 1*x.75'' (x2) 1*x.75'' (x2)	Exit Poir 1.15" 1.00" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - -	eed: ansducer Angle 45° 44° 73° 47° 47° - - - - - - - - - - -	4 IPS ( Manufac Mode S S L L L L S S 88903D	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. In Sigma/C ction Circ. C	Attribution of the second seco	0.08* Index Va Serial Number 08011 08007 0251MK 0251ML 01T3FL 0252DK	Ilue: 0 2%0.5 duce rs UT Head: Model Sigma 55 Sigma 55 Sigma 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04	Head # 008 02010 12-0 12-	3 Focal Depth Flat Flat 5° 5° 4" 4" 4"	1. 1. 1.5%375 1.5%375 1. 5%37	s RED TWS Size 2*x.75' (x2) 2*x.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Poir 1.15" 1.00" 1.00" 1.00" 1.00" - -
Tr Channel 1 2 3 4 5 6 - - - - - - - - - - - - - - - - - -	eed: ansducer Angle 45° 44° 73° 47° 47° 47° - - - - - - - - - - - - -	4 IPS ( Manufac Mode S S L L L L L L S 8903D mage:	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ctian Circ. C	Atterval: GEIT Freg 1.0 MHz 1.0 MHz 1.0 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz       	0.08" Index Va Serial Number 08011 08007 0251MK 0251ML 01T3FL 0252DK	Ilue: 0 2"/0.5" Cluce rs UT Head: Model Sigma: 55 Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT:	Head # 08 08 12-010 12-010 18-010 18-010 10 10 10 10 10 10 10 10 10 10 10 10	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" - - - - - - - - - - - - - - -	Shell Scan 1 1.5x375 1.5x375 1.5x375 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5'x.75' (x1) (x2), 1.5'x.75' (x1) 1*.75' (x2) 1*.75' (x2) 	Exit Poir 1.15" 1.00" 1.00" 1.00" 1.00" -
Tr Channel 1 2 3 4 5 6 - - - Ref. Sca Examina Examina	eed: ransducer Angle 45° 44° 73° 47° 47° - - - - - - - - - - - - -	4 IPS ( Manufac Mode S S L L L L L L L S 88903D rage: tation:	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Attribution of the second seco	0.08" Index Va Serial Number 08011 08007 0251MK 0251ML 01T3FL 0252DK	Ilue: 0 2"/0.5" Clubers UT Head: Model Sigma: 55 Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GEIT: 389-05 GEIT: 3	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - - - - Ref. Sca Examina Examina	eed: ransducer Angle 45° 44° 73° 47° 47° - - an Plan 800 atton Cove atton Limit atton Date	4 IPS ( Manufac Mode S S L L L L L S S S S S S S S S S S S S	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Serial Number 08051 08007 0251MK 0251ML 0173FL 0252DK	Nue: 0 2"/0.5" CUDE IS UT Head: UT Head: Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GE	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5'x.75' (x1) (x2), 1.5'x.75' (x1) 1*.75' (x2) 1*.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - - - Ref. Sca Examina Examina	eed: ransducer Angle 45° 44° 73° 47° 47° - - an Plan 800 atton Cove atton Limit atton Date	4 IPS ( Manufac Mode S S L L L L L S S S S S S S S S S S S S	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Serial Number 08011 08007 0251MK 0251ML 01T3FL 0252DK	Nue: 0 2"/0.5" CUDE IS UT Head: UT Head: Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GE	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - - - Ref. Sca Examina Examina	eed: ransducer Angle 45° 44° 73° 47° 47° - - an Plan 800 atton Cove atton Limit atton Date	4 IPS ( Manufac Mode S S L L L L L S S S S S S S S S S S S S	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Serial Number 08051 08007 0251MK 0251ML 0173FL 0252DK	Nue: 0 2"/0.5" CUDE IS UT Head: UT Head: Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GE	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - - - Ref. Sca Examina Examina	eed: ransducer Angle 45° 44° 73° 47° 47° - - an Plan 800 atton Cove atton Limit atton Date	4 IPS ( Manufac Mode S S L L L L L S S S S S S S S S S S S S	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Serial Number 08051 08007 0251MK 0251ML 0173FL 0252DK	Nue: 0 2"/0.5" CUDE IS UT Head: UT Head: Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GE	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - - - Ref. Sca Examina Examina	eed: ransducer Angle 45° 44° 73° 47° 47° - - an Plan 800 atton Cove atton Limit atton Date	4 IPS ( Manufac Mode S S L L L L L S S S S S S S S S S S S S	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Serial Number 08051 08007 0251MK 0251ML 0173FL 0252DK	Nue: 0 2"/0.5" CUDE IS UT Head: UT Head: Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GE	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Tr Channel 1 2 3 4 5 6 - - - - - - - - - - - - - - - - - -	eed: ransducer Angle 45° 44° 73° 47° 47° - - - an Plan 800 atton Limit atton Date KS:	4 IPS ( Manufac Mode S S L L L L L L S S 8903D stage: tation: (s): See attr	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Trans Serial Number 08011 08007 0251MK 0251MK 0251ML 01T3FL 0252DK - - Surface: ID	Ilue: 0 2"/0.5" duce rs UT Head: Vir Head: Sigma: 55 Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GEI	Head #	3 Focal Depth Flat Fiat 5" 5" 4" 4" 4" - xaminations able bd Flaw Eval this weld are	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -
Channel 1 2 3 4 5 6 - - - - - - - - - - - - - - - - - -	eed: ransducer Angle 45° 44° 73° 47° 47° 47° 47° 47° 47° 47° 47	4 IPS ( Manufac Mode S S L L L L L S S S S S S S S S S S S S	MAP/ MAN) turer: Beam Dire Axial / Axial /	Sync. Ir Sigma/C ction Circ. C	Anterval: GEIT Freq 1.0 MHz 1.0 MHz 1.3 MHz 1.3 MHz 2.7 MHz 2.7 MHz 2.7 MHz constant	0.08" Index Va Serial Number 08051 08007 0251MK 0251ML 0173FL 0252DK	Nue: 0 2"/0.5" CUDE IS UT Head: UT Head: Sigma: 55 GEIT: 389-04 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-03 GEIT: 389-04 GEIT: 389-04 GE	Head #: 008 12-010 12-0	3 Focal Depth Flat Flat 5" 5" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4" 4"	Shell Scan 1 1.5'x.375' 1.5	s RED TWS Size 2%.75' (x2) 2%.75' (x2) (x2), 1.5*x.75' (x1) (x2), 1.5*x.75' (x1) 1*x.75' (x2) 1*x.75' (x2) 	Exit Point 1.15" 1.00" 1.00" 1.00" 0.90" -

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Document No.: 51-9222850-000

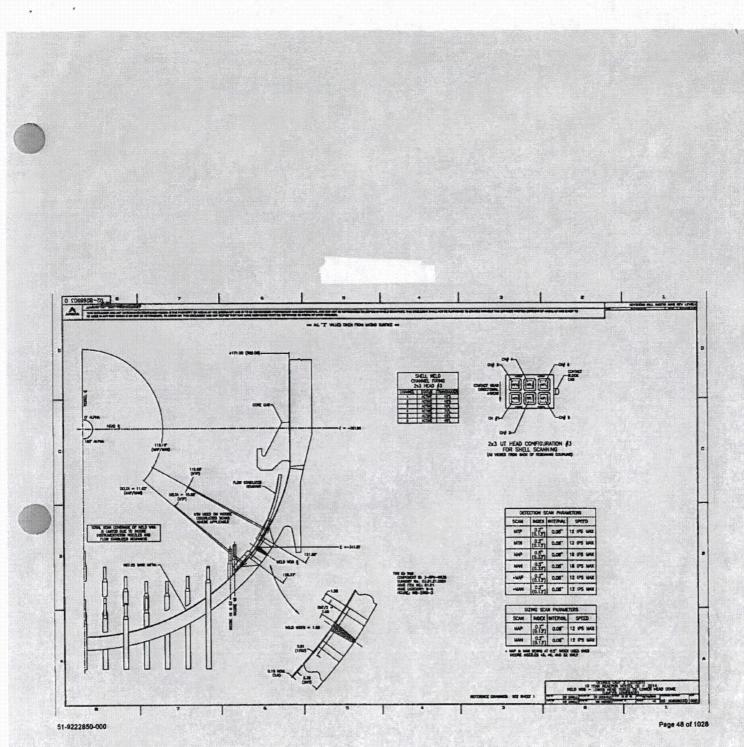
Duke Energy / Oconee Unit 3 EOC27 10 Year ISI Final Report



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

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

51-9222850-000



". WO6" eillach A Pg 12 of 36

## Let Down Cooler - Chemical Connector to Channel Body

#### % Coverage Calculations

Weld No.: 3-LDCA-IN-1

Ø = 8.625"

"t" = 0.875"

Weld Length = 27.1"

Total Inspection Area = 2.28 sq. in.

% Length Limited due to nozzle = 6" / 27.1" x 100 = 22.1%

#### Aggregate Coverage Calculation

#### Axial Scans

22.1% of length x 96.5% of the volume of length / 100 = 21.3%

77.9% of length x 97.4% of the volume of length / 100 = 75.9%

Aggregate coverage Axial scans = 21.1 + 75.9 = 97.2%

#### Circ. Scans

100% of length x 78.1% of the volume of length / 100 = 78.1%

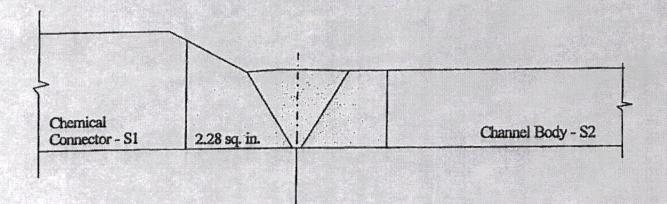
Total = (97.2 + 78.1) / 2 = 87.7% Aggregate Coverage

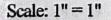
Inspector / Date: Jame f. Mc Gulle # 5-5-14 Page 10 of 14 18 allach A Da 13 of 26

# Letdown Cooler Chemical Con. Lettor to Channel Body Total Exam Area

Weld No. : 3-LDCA-IN-1

Item No. : 03.B2.51.0001





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Pg 11 of 14

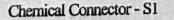
Letdown Cooler Chemical Connector to Channel Body Area Examined - Axial Scans

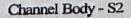
Weld No. : 3-LDCA-IN-1

9515136

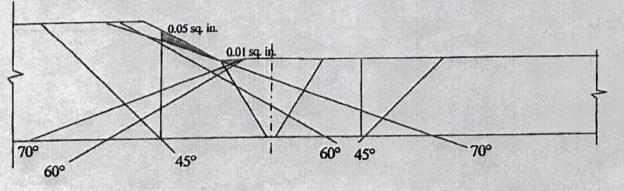
= Area Not Examined = 0.05 + 0.01 = 0.06 sq. in.

= Area Examined = 2.28 - 0.06 / 2.28 x 100 = 97.4%





Item No. : 03.B2.51.0001



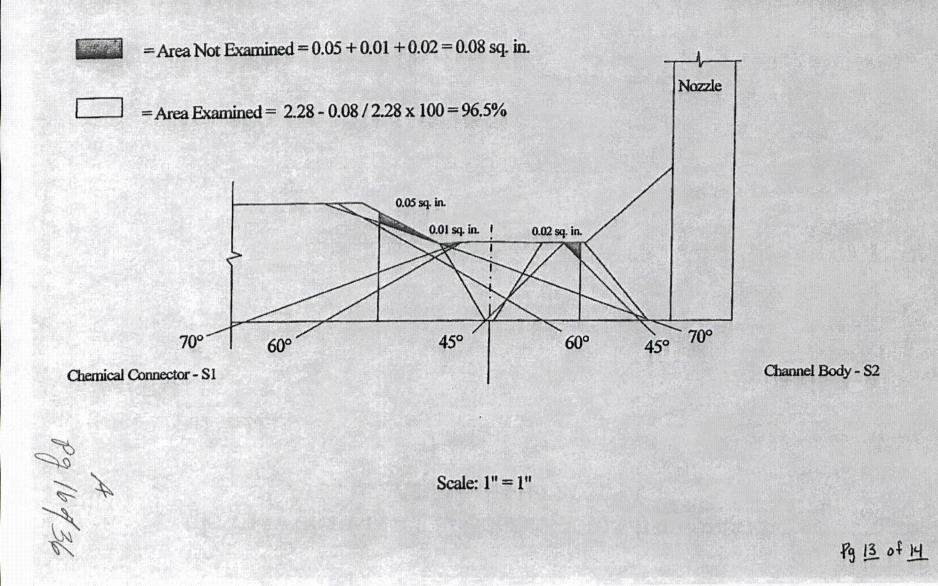
Scale: 1" = 1"

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Letdown Cooler Chemical Con. ector to Channel Body Area Examined @ Nozzle - Axial Scans

Weld No. : 3-LDCA-IN-1

Item No. : 03.B2.51.0001



Letdown Cooler Chemical Connector to Channel Body Area Examined - Circ. Scan

Weld No. : 3-LDCA-IN-1

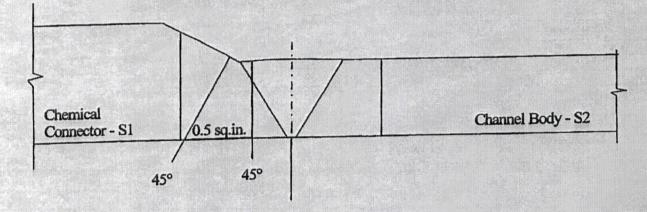
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Item No. : 03.B2.51.0001



= Area Not Examined = 0.5 sq. in.

= Area Examined = 2.28 - 0.5 / 2.28 x 100 = 78.1%



Scale: 1" = 1"

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## Let Down Cooler - Chemical Connector to Channel Body

## % Coverage Calculations

#### Weld No.: 3-LDCA-OUT-WJ35V

Ø		2000		0.00	-	
1	-	States 1	- 80	62	5.	<b>L</b> .83
×		21/2-1	0.01	U Æ	<b>1 1 1</b>	
200 <b>- 100</b> - 100		20256		and inter-		

#### "t" = 0.875"

Weld Length = 27.1"

Total Inspection Area = 2.28 sq. in.

% Length Limited due to nozzle = 6" / 27.1" x 100 = 22.1%

### Aggregate Coverage Calculation

#### Axial Scans

22.1% of length x 96.5% of the volume of length / 100 = 21.3%

77.9% of length x 97.4% of the volume of length / 100 = 75.9%

Aggregate coverage Axial scans = 21.1 + 75.9 = 97.2%

#### Circ. Scans

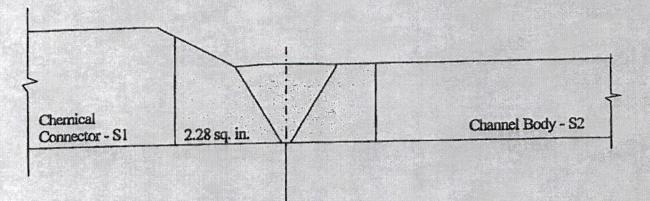
100% of length x 78.1% of the volume of length / 100 = 78.1%

Total = (97.2 + 78.1) / 2 = 87.7% Aggregate Coverage

Inspector / Date: James f. Mc Gedle 10 5-5-14 Page 10 of 14 Mc 14 5/1/14 5/1/14

Letdown Cooler Chemical Con. Sector to Channel Body Total Exam Area

Weld No. : 3-LDCA-OUT-WJ35V



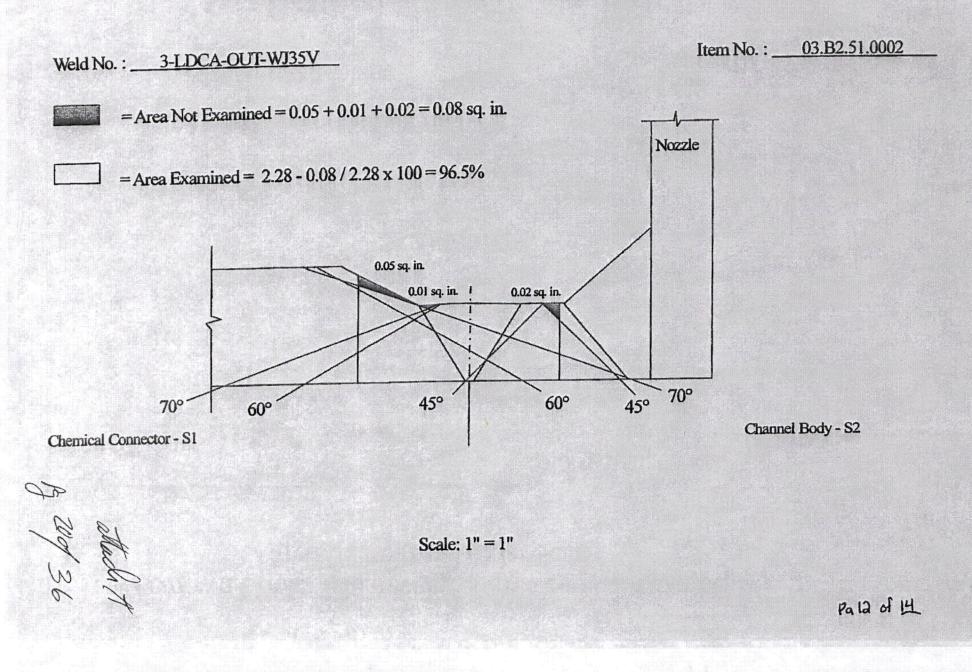
Scale: 1" = 1"



Item No. :

03.B2.51.0002

Letdown Cooler Chemical ConLector to Channel Body Area Examined @ Nozzle - Axial Scans



Letdown Cooler Chemical Connector to Channel Body Area Examined - Axial Scans

Weld No. : 3-LDCA-OUT-WJ35V

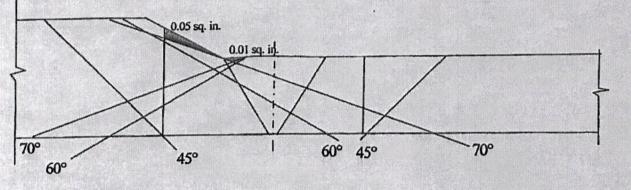
Item No. : 03.B2.51.0002

= Area Not Examined = 0.05 + 0.01 = 0.06 sq. in.

= Area Examined = 2.28 - 0.06 / 2.28 x 100 = 97.4%

Chemical Connector - S1

Channel Body - S2



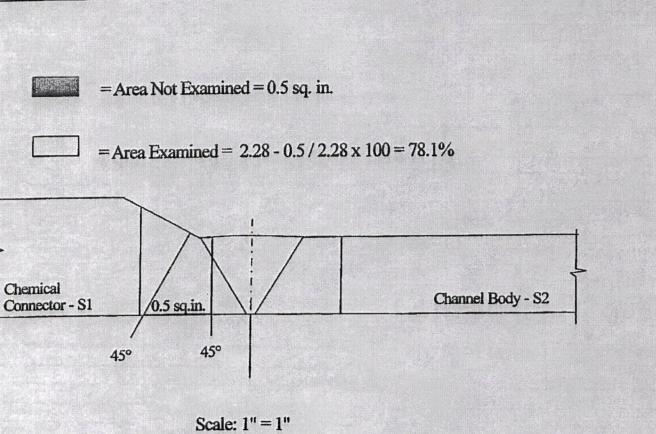
Scale: 1" = 1"

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Letdown Cooler Chemical Connector to Channel Body Area Examined - Circ. Scan

## Weld No. : 3-LDCA-OUT-WJ35V

35 / 32 Br



Item No. : 03.B2.51.0002

## Let Down Cooler - Nozzle to Channel Body

## % Coverage Calculations

#### Weld No. : 3-LDCB-IN-WJ33V

Dia.= 3.5"

"t" = 0.875"

Weld Length = 27.1"

#### Axial Scans

Along Axis of Pipe = 100% of the Length x 45.2% of the Volume = 45.2%Along Radius of Pipe = 100% of the Length x 60.0% of the Volume = 60.0%

Average = 45.2% + 60.0% / 2 = 52.6%

#### Circ. Scans

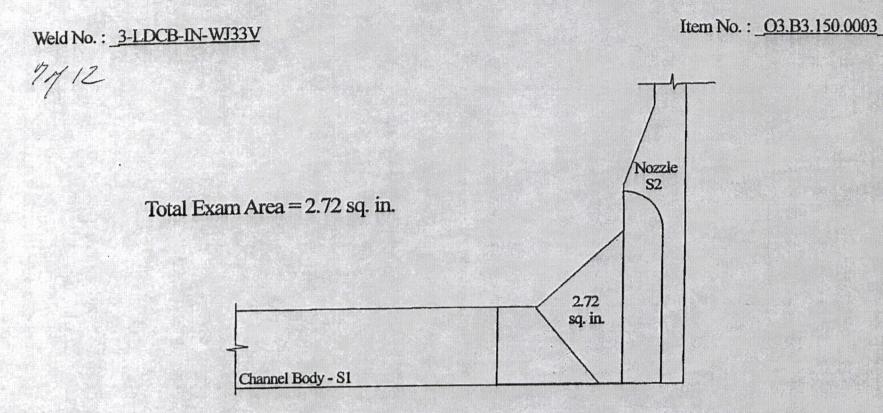
Along Axis of Pipe = 100% of the Length x 55.5% of the Volume = 55.5%Along Radius of Pipe = 100% of the Length x 81.7% of the Volume = 81.7%

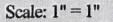
Average = 55.5% + 81.7% / 2 = 68.6%

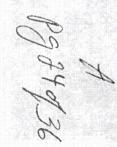
Total = ( 52.6 = 68.6 ) / 2 = 60.6% Aggregate Coverage

Inspector / Date: Jamesf. Mc Gulle to 5-5-14 Page & of 12 uttach A 1923/36

Letdown Cooler Nozzle to Channel Body







Letdown Cooler Nozzle to Channel Body Area Examined - Axial Scans

Item No. : 03.B3.150.0003

Weld No. : 3-LDCB-IN-WJ33V

84/2

Area not Examined = 1.78 sq. in.



Area Examined =  $2.72 - 1.78 / 2.72 \times 100 = 34.6\%$ Nozzle S2 Nozzle S3 Nozzle S4.6%

of 15%

# Letdown Cooler Nozzle to Channel Body Area Examined - Circ. Scans

Weld No. : \_3-LDCB-IN-WJ33V

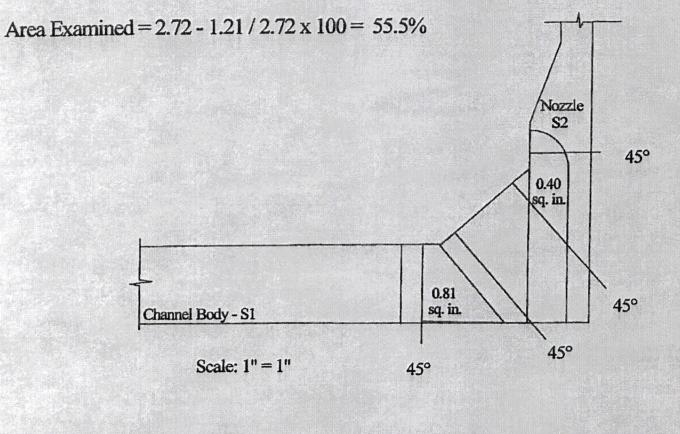
Item No. : 03.B3.150.0003

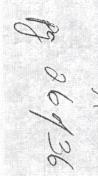


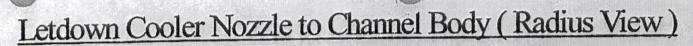
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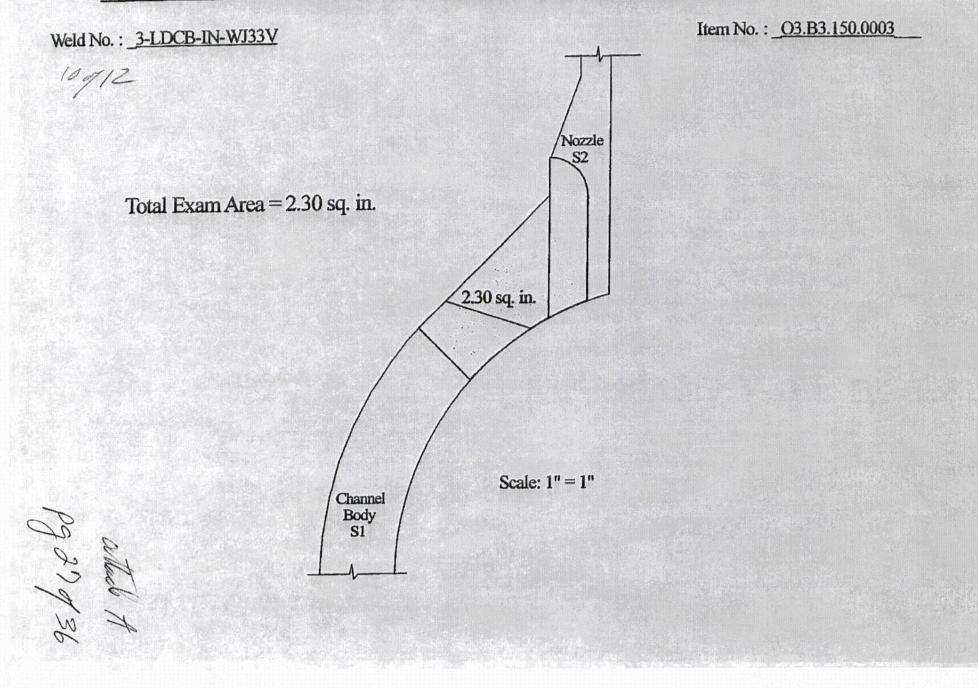
Area not Examined = 0.81 + 0.40 = 1.21 sq. in.











Letdown Cooler Nozzle to Charnel Body (Radius View) Area Examined - Axial Scans

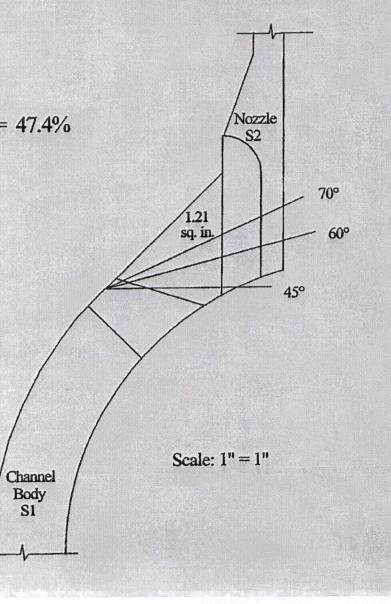
Weld No. : 3-LDCB-IN-WJ33V

Item No. : \_03.B3.150.0003

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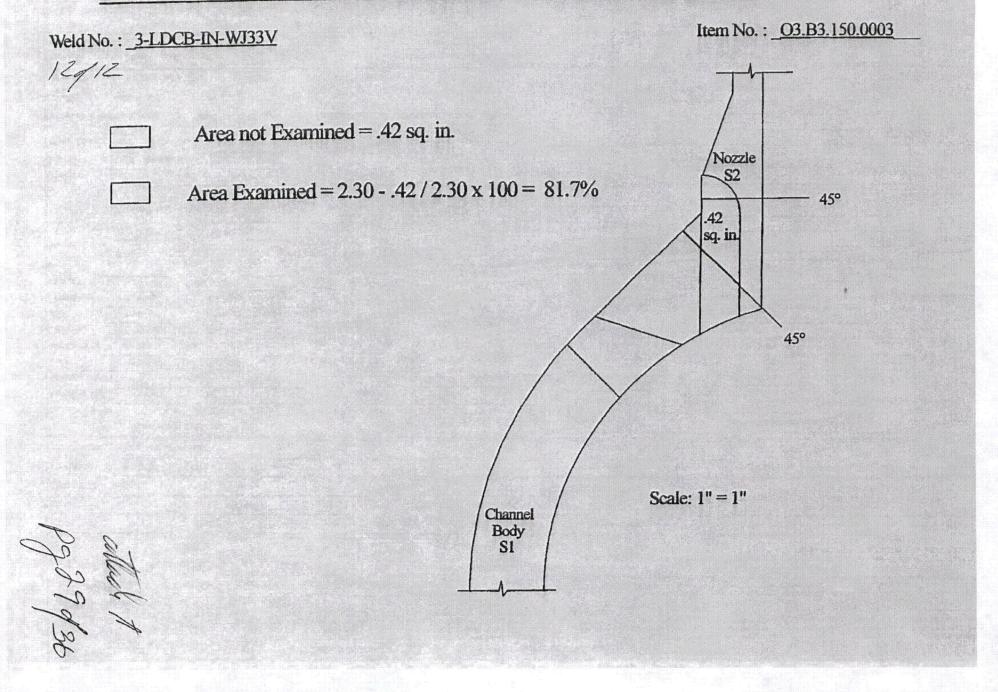
Area not Examined = 1.21 sq. in.

Area Examined = 2.30 - 1.21 / 2.30 x 100 = 47.4%



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Letdown Cooler Nozzle to Channel Body (Radius View)



## Let Down Cooler - Nozzle to Channel Body

### % Coverage Calculations

#### Weld No.: 3-LDCB-OUT-WJ36V

Dia.= 3.5"

"t" = 0.875"

27.1" Weld Length =

#### Axial Scans

Along Axis of Pipe = 100% of the Length x 45.2% of the Volume = 45.2% Along Radius of Pipe = 100% of the Length x 60.0% of the Volume = 60.0%

Average = 45.2% + 60.0% / 2 = 52.6%

#### Circ. Scans

Along Axis of Pipe = 100% of the Length x 55.5% of the Volume = 55.5%

Along Radius of Pipe = 100% of the Length x 81.7% of the Volume = 81.7%

Average = 55.5% + 81.7% / 2 = 68.6%

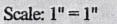
Total = ( 52.6 = 68.6 ) / 2 = 60.6% Aggregate Coverage

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Letdown Cooler Nozzle to Channel Body



Weld No. : <u>3-LDCB-OUT-WI36V</u> M/CTotal Exam Area = 2.72 sq. in. 2.72sq. in. 2.72sq. in.



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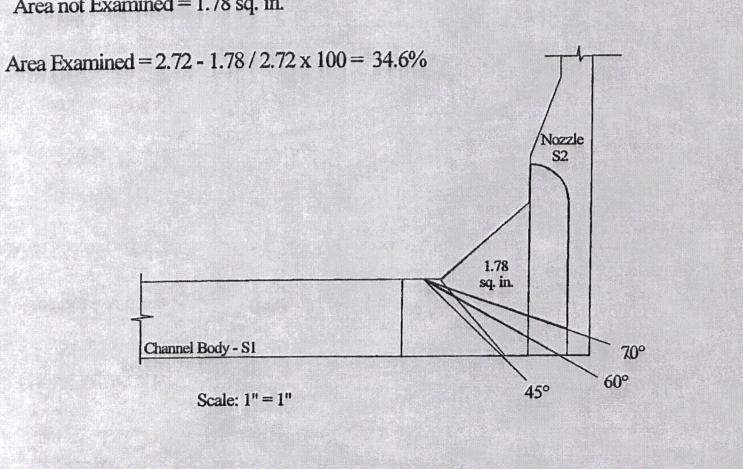
Letdown Cooler Nozzle to Channel Body Area Examined - Axial Scans

Item No. : 03.B3.150.0004

Weld No. : 3-LDCB-OUT-WJ36V

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Area not Examined = 1.78 sq. in.





Letdown Cooler Nozzle to Channel Body Area Examined - Circ. Scans

## Weld No. : 3-LDCB-OUT-WJ36V

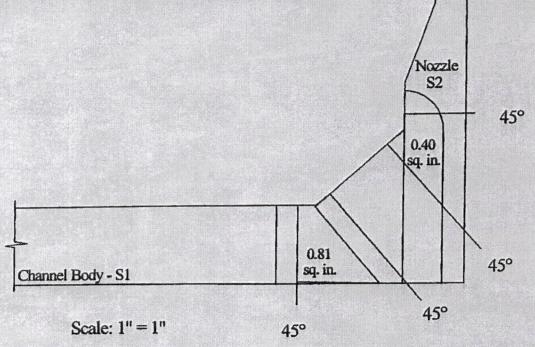
Item No. : 03.B3.150.0004

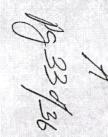
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Area not Examined = 0.81 + 0.40 = 1.21 sq. in.

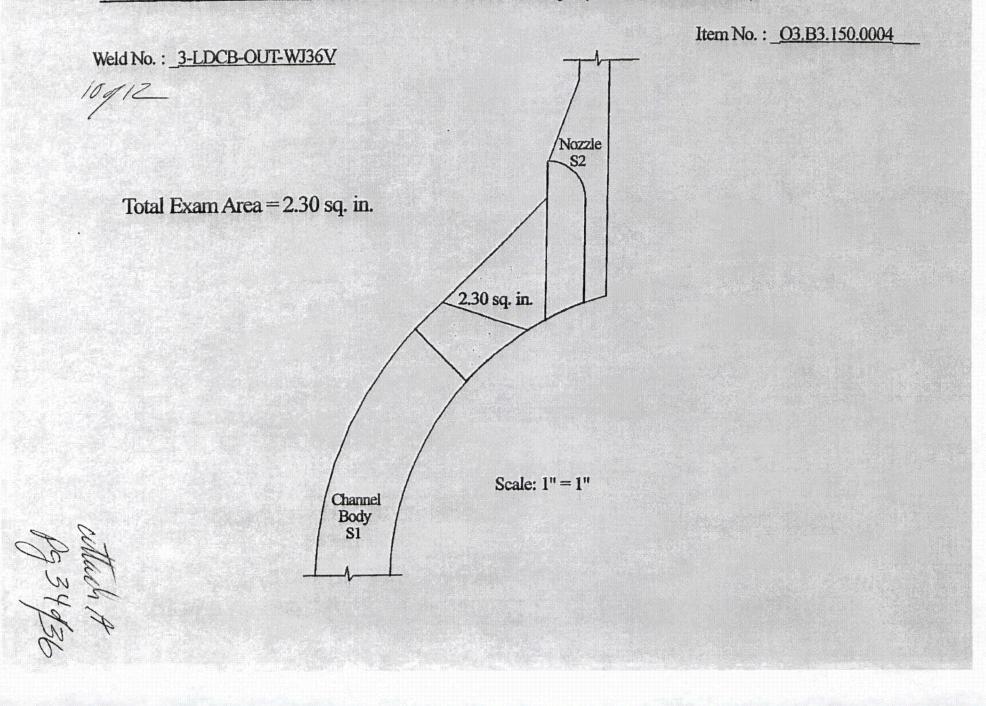


Area Examined = 2.72 - 1.21 / 2.72 x 100 = 55.5%





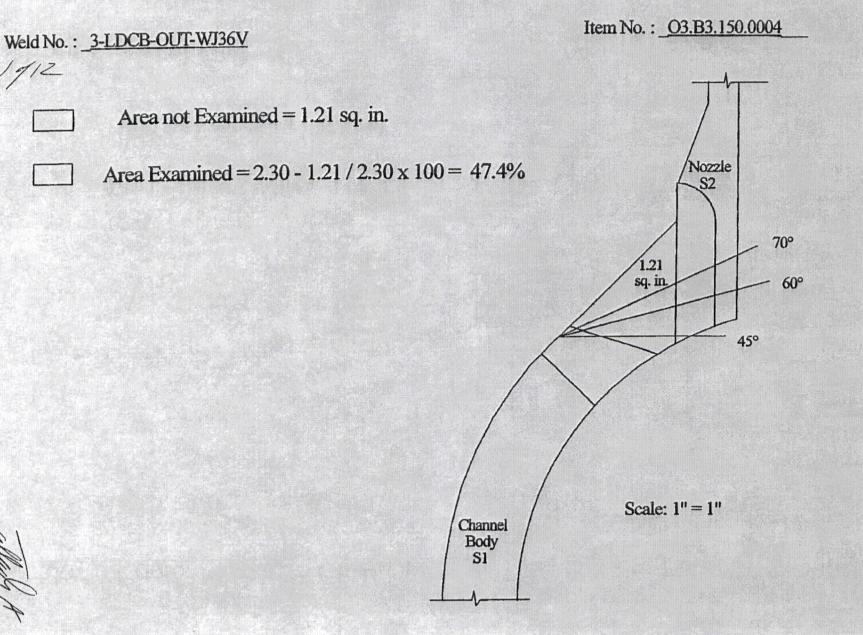
Letdown Cooler Nozzle to Channel Body (Radius View)



Letdown Cooler Nozzle to Chamlel Body (Radius View) Area Examined - Axial Scans

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Letdown Cooler Nozzle to Channel Body (Radius View)

