Progress Energy

Crystal River Nuclear Plant
Docket No. 50-302
Operating License No. DPR-72

Ref: 10 CFR 50.55a

October 26, 2009
3F1009-05

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Crystal River Unit 3 – Response to Request for Additional Information on the Third 10-Year Inservice Inspection Interval Requests for Relief 09-001-II, 09-002-II and 09-003-II (TAC NO. ME0905, ME0906 and ME0907)

References:
1. CR-3 to NRC letter, dated March 20, 2009, "Crystal River Unit 3 – Third Ten-Year Inservice Inspection (ISI) Interval Relief Requests #09-001-II, #09-002-II and #09-003-II"
2. CR-3 to NRC letter, dated May 28, 2009, "Crystal River Unit 3 – Third Ten-Year Inservice inspection (ISI) Interval Relief Request #09-003-II, Revision 1"
3. NRC to CR-3 Electronic Mail, dated August 23, 2009, "Request for Additional Information on the Third 10-Year Inservice Inspection Interval Requests for Relief 09-001-II, 09-002-II and, and 09-003-II for Florida Power Corporation Crystal River Nuclear Power Plant, Unit 3"

Dear Sir:

Pursuant to 10 CFR 50.55a(g)(5)(iii), Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., submitted Relief Requests 09-001-II, 09-002-II and 09-003-II (References 1 and 2). These relief requests seek approval for limited volumetric examinations performed on ASME Code Class 1 piping and nozzles, ASME Code Class 2 piping and nozzles, and on the ASME Code Class 1 Reactor Pressure Vessel Shell, respectively, during the Crystal River Unit 3 (CR-3) Third Ten-Year Inservice Inspection (ISI) Interval. The Nuclear Regulatory Commission (NRC), by electronic mail dated August 23, 2009, provided a request for additional information (RAI) concerning the Relief Requests (Reference 3). The Enclosure to this letter provides the response to the RAI. No new regulatory commitments are made in this submittal.

If you have any questions regarding this submittal, please contact Mr. Dan Westcott, Superintendent, Licensing and Regulatory Programs at (352) 563-4796.

Sincerely,

Stephen J. Cahill

Stephen J. Cahill
Manager, Engineering
Crystal River Nuclear Plant

SJC/dwh

Enclosure: Response to Request for Additional Information

xc: NRR Project Manager
Regional Administrator, NRC Region II
Senior Resident Inspector

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A047
NRR

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50 - 302 / LICENSE NUMBER DPR - 72

ENCLOSURE

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The NRC staff has reviewed the information submitted by the licensee, and based on this review, determined the following information is required to complete the evaluation.

2. REQUEST FOR ADDITIONAL INFORMATION

2.1 Request for Relief 09-001-II, Part A, Examination Category B-D, Items B3.110, B3.120, B3.130, and B3.140, Full Penetration Welded Nozzles in Vessels

2.1.1 In Attachment A of Enclosure 1, the licensee has included multiple sketches and tables with volume coverage percentages for different angle beam orientations on steam generator and pressurizer nozzle-to-vessel welds and inner radius sections. However, in many of the sketches, it is unclear which portions, and how much of the ASME Code-Required Volumes have been completed. Please clearly describe or provide drawings showing volume coverage for each of the ultrasonic angles applied. Include dimensions, scanning directions and ultrasonic techniques (longitudinal or shear wave) used. In addition, list the base and weld materials. As applicable, describe NDE equipment (ultrasonic scanning apparatus), details of the listed obstructions (size, shape, proximity to the weld, etc.) to demonstrate accessibility limitations, and discuss whether alternative methods or advanced technologies could be employed to maximize ASME Code coverage.

RESPONSE

B3.110 Pressurizer Nozzle-to-Head Welds: B2.2.1A, B2.2.2A, B2.2.3A and B2.2.4A and B3.120 Pressurizer Nozzle Inner Radius: B2.2.1B, B2.2.2B, B2.2.3B and B2.2.4B

The pressurizer upper head material is SA-516 Grade 70 carbon steel and the relief nozzle material is SA-508 Class 1 carbon steel. Welds B2.2.1A, B2.2.2A, and B2.2.3A (Relief Nozzles) have a diameter of 6.875 inches and a wall thickness of 4.750 inches. Weld B2.2.4A (Spray Nozzle) has a diameter of 7.750 inches and a wall thickness of 4.750 inches.

During the manual ultrasonic examination of these nozzle-to-head welds and nozzle inner radii, less than 90% coverage of the required examination volume was obtained. The percentage of coverage reported for each weld represents the aggregate coverage from all scans performed on the weld and adjacent base material (pressurizer head). The examination coverage was based on the aggregate from each scan as follows:

- *Manual scans of the base material from the head side (Scan directions as labeled 1, 3 and 4 on Figures 1 and 2): 45°, 60°, and a supplemental 35° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions and 0° longitudinal wave.*

- *Manual scans of the weld volume from the head side (Scan directions as labeled 1, 3 and 4 on Figures 1 and 2): 45° and 60° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions and 0° longitudinal wave.*

- *Manual scans of the weld volume from the nozzle side (Scan direction as labeled 2 on Figures 1 and 2): 35° and 70° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions.*

The actual material, coverage amount, and component configurations are as follows:

B2.2.1A	CLAD CARBON STEEL	50%	Nozzle-to-Head Welds
B2.2.2A	CLAD CARBON STEEL	50%	Nozzle-to-Head Welds
B2.2.3A	CLAD CARBON STEEL	50%	Nozzle-to-Head Welds
B2.2.4A	CLAD CARBON STEEL	56%	Nozzle-to-Head Welds
B2.2.1B	CLAD CARBON STEEL	42%	Nozzle Inner Radius
B2.2.2B	CLAD CARBON STEEL	42%	Nozzle Inner Radius
B2.2.3B	CLAD CARBON STEEL	42%	Nozzle Inner Radius
B2.2.4B	CLAD CARBON STEEL	48%	Nozzle Inner Radius

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The Crystal River Unit 3 (CR-3) Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D-E-F-G-H-J (Figure 3). Therefore, the available coverage will not meet the acceptance criteria of this Code Case. The area not examined for the pressurizer nozzle-to-head welds are shown in Figure 4.

There were no recordable indications found during the inspection of the nozzle-to-head welds or nozzle inner radii.

The pressurizer nozzle-to-vessel head welds and the pressurizer nozzle inner radii are accessible only from the head side, based on the nozzle curvature. The scanning surface of the nozzle is perpendicular to the head surface, which prohibits the ultrasonic wave entering the Code required examination volume at an angle that will integrate the weld volume for in-service flaws. In order to scan all of the required volume for this weld, the relief nozzles would have to be redesigned to allow scanning from both sides of the weld, which is impractical.

Radiography, as an alternative, is not feasible because access is not available for film placement. IWB-2500, Table IWB-2500-1, Examination Category *B-P System Leakage Tests and VT-2 visual examinations performed each refueling outage provide adequate assurance of pressure boundary integrity. No alternative examinations or advanced* *technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.*

Welds B2.2.2A and B2.2.2B have an obstruction in the examination area from a welded lifting lug (Figures 5 and 6). The exam was limited for 13 inches radially for a limitation of 25% of the Code Required Volume. Combined with the total examination limitations, due to geometry and physical restriction, the total examination of Code Required Volume was approximately 50% and 42%, respectively.

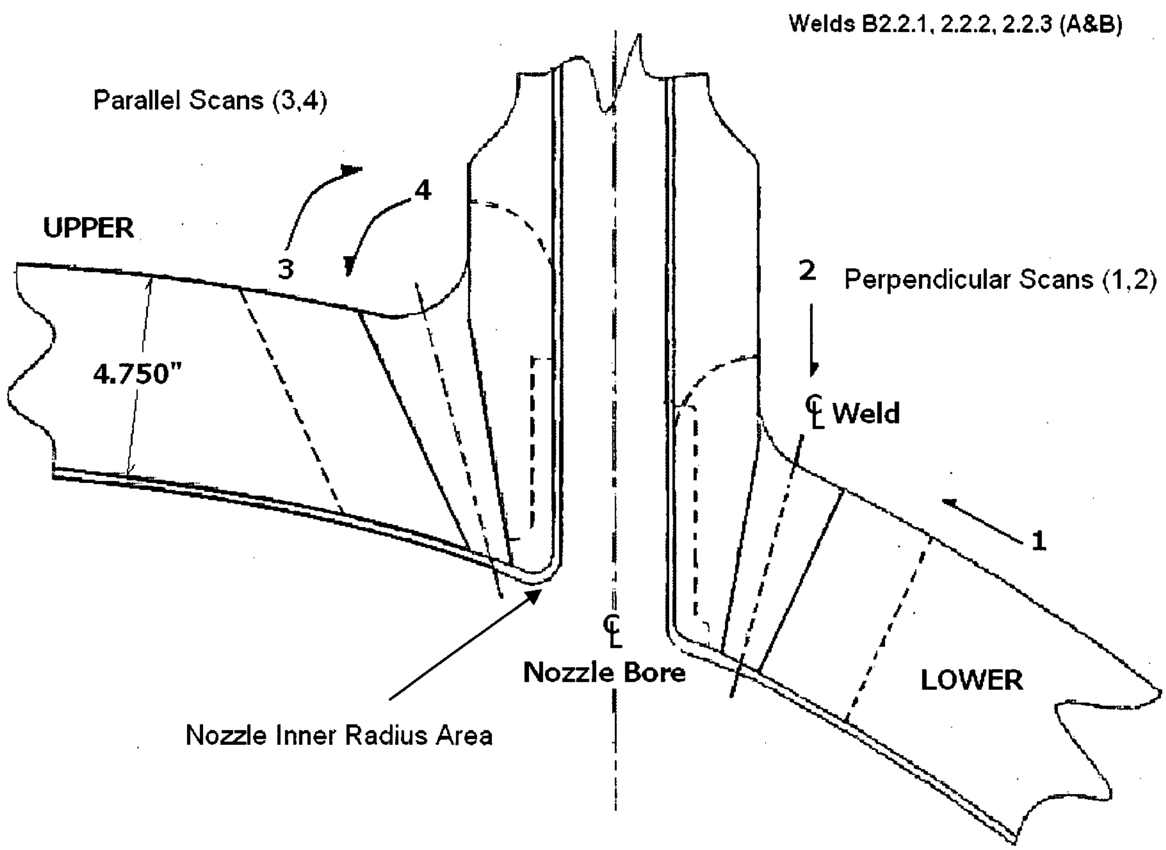


Figure 1

Relief Nozzles

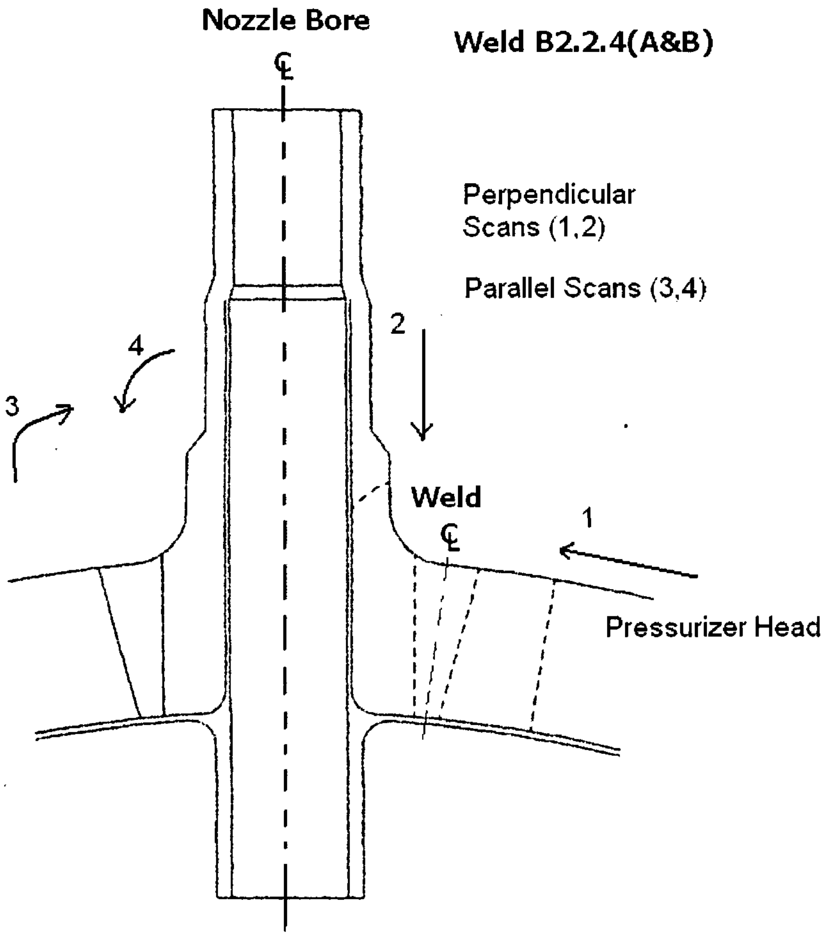


Figure 2

Spray Nozzle

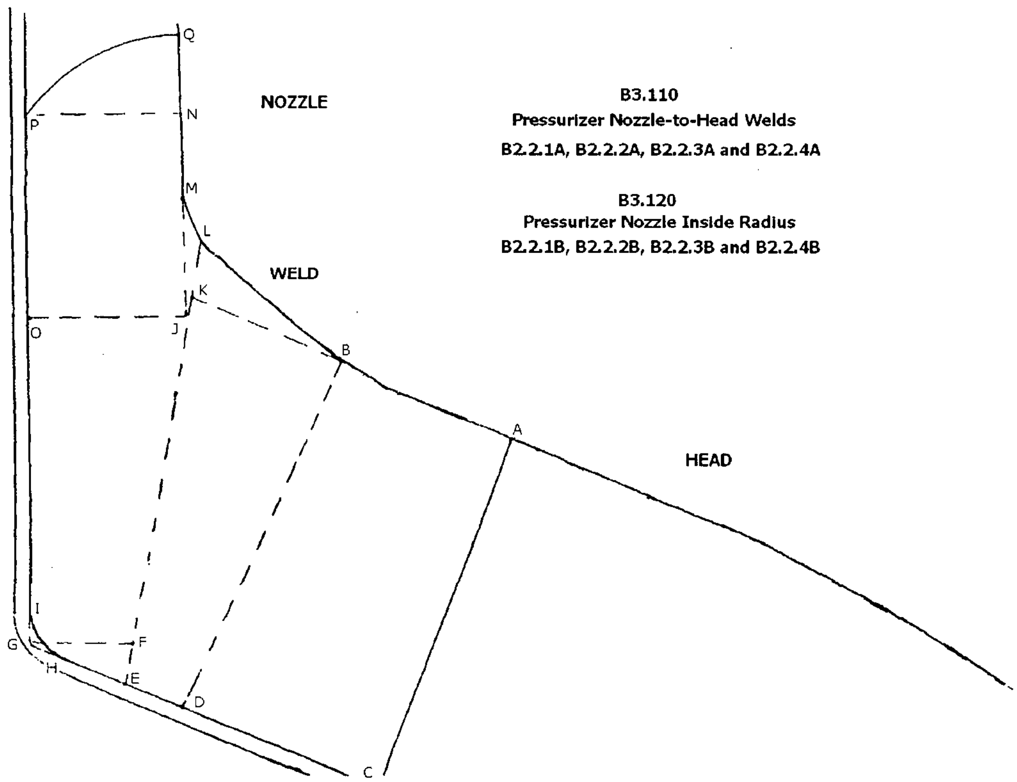


Figure 3

Weld Examination Volume

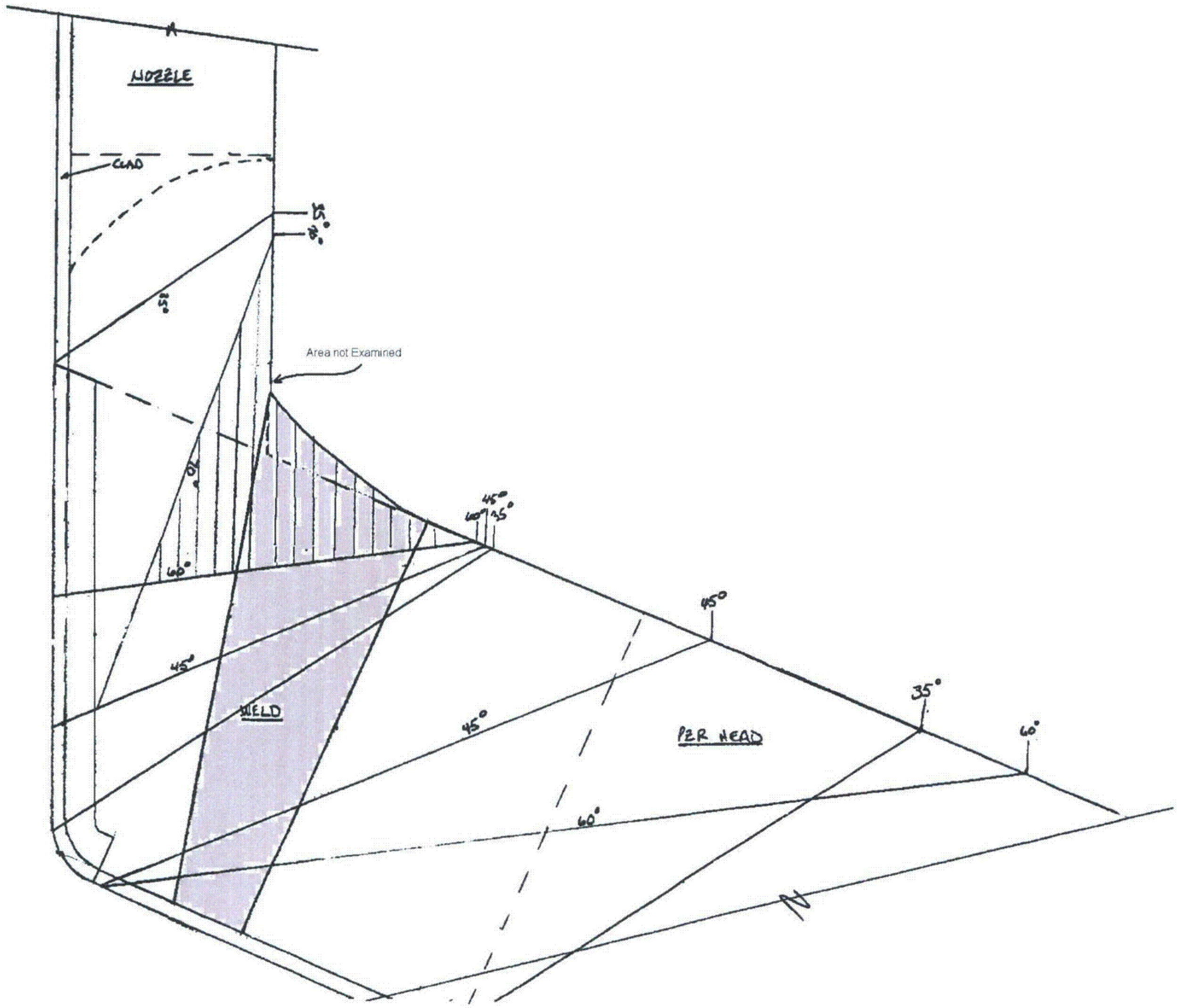


Figure 4

B3.110, PRESSURIZER NOZZLE-TO-HEAD WELDS

B2.2.1A, B2.2.2A, B2.2.3A, B2.2.4A
Area not examined is the Cross Hatched area.

Welds B2.2.2A & B2.2.2B

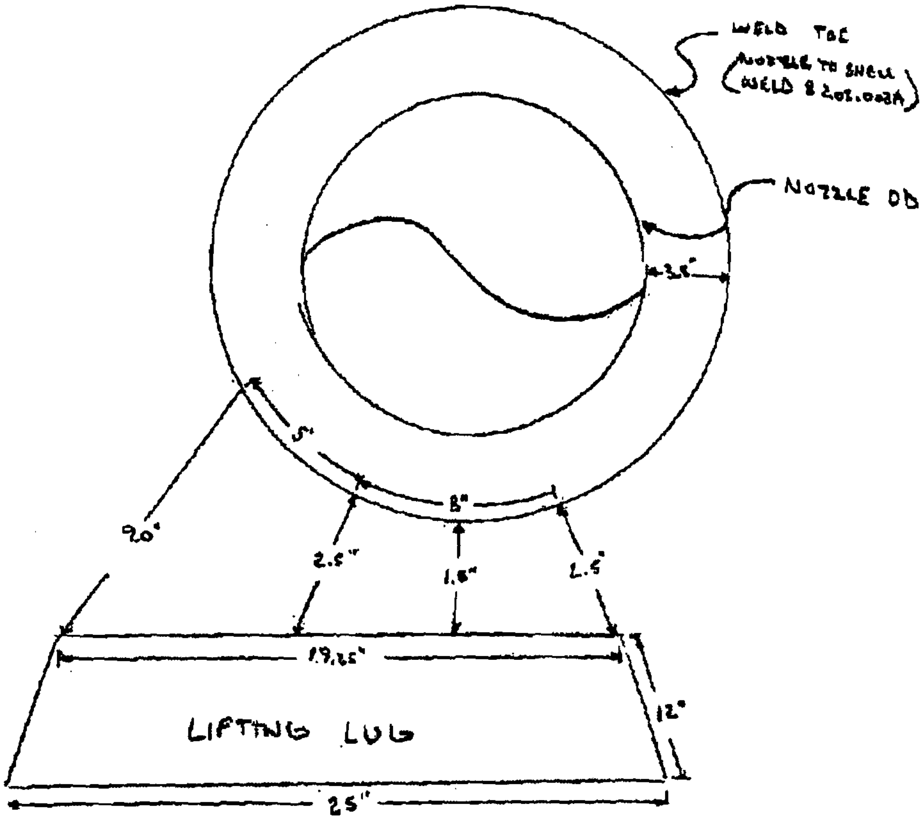


Figure 5

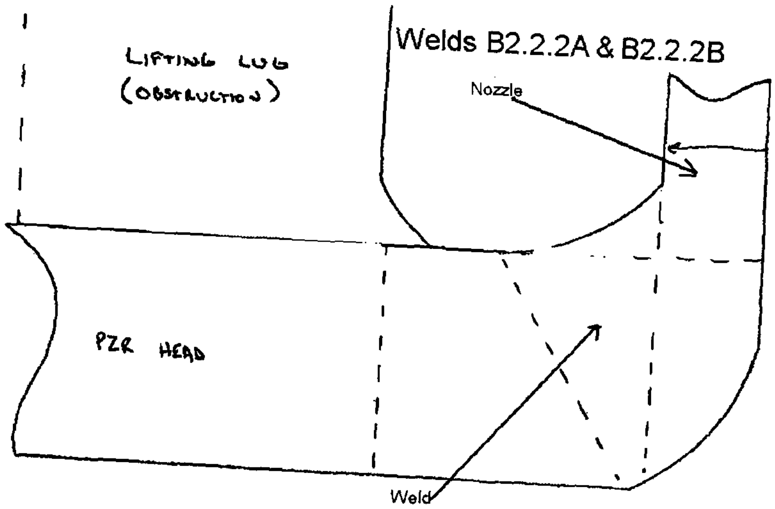


Figure 6

B3.130 Steam Generator Nozzle-to-Head Welds: B3.2.1 and B3.2.4

These welds are the steam generator inlet nozzle-to-head welds (upper head) for each Once-Through Steam Generator (OTSG) RCSG-1A and RCSG-1B. There is one inlet nozzle per OTSG. The steam generator upper head material is SA-508 64 Class 1 carbon steel and the inlet nozzle material is SA-533 Grade B carbon steel. Welds B3.2.1 and B3.2.4 have a diameter of 179.54 inches and a wall thickness of 9.00 inches.

During the ultrasonic examination of these welds, less than 90% coverage of the required examination volume was obtained. The percentage of coverage reported for each weld represents the aggregate coverage from all scans performed on the weld and adjacent base material (steam generator upper head). The examination coverage was based on the aggregate from each scan as follows:

- *Manual scans of the weld volume from the steam generator head side: 35°, 45°, and 60° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions and 0° longitudinal wave.*

The actual material, coverage amount, and component configurations are as follows:

B3.2.1	CLAD CARBON STEEL	46%	Steam Generator Nozzle To Head Weld
B3.2.4	CLAD CARBON STEEL	46%	Steam Generator Nozzle To Head Weld

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The CR-3 Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D-E-F-G-H-I. Therefore, the available coverage will not meet the acceptance criteria of this Code Case. The area not examined for the steam generator inlet nozzle-to-head welds are shown in Figure 7.

There were no recordable indications found during the inspection of these welds.

The steam generator nozzle-to-vessel head welds are accessible only from the head side, based on the designed nozzle configuration. The proximity of the nozzle radius prevented examination coverage from the nozzle side. In order to scan all of the required volume for these welds, the inlet nozzle would have to be redesigned to allow scanning from both sides of the weld, which is impractical.

Radiography, as an alternative, is not feasible because access is not readily available for film placement and the background radiation from the steam generator upper tube sheet would severely impact the quality of the radiograph. IWB-2500, Table IWB-2500-1, Examination Category B-P System Leakage Tests and VT-2 visual examinations performed each refueling outage provide adequate assurance of pressure boundary integrity. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current *inspection interval.*

B3.130 Steam Generator Nozzle-to-Head Welds: B3.2.2, B3.2.3, B3.2.5 and B3.2.6

These welds are the steam generator outlet nozzle-to-head welds (lower head) for each OTSG, RCSG-1A and RCSG-1B. There are two welds per OTSG. The steam generator lower head material is SA-508 64, Class 1 carbon steel and the outlet nozzle material is SA-533 Grade B carbon steel.

During the ultrasonic examination of this weld, less than 90% coverage of the required examination volume was obtained. The percentage of coverage reported for each weld represents the aggregate coverage from all scans performed on the weld and adjacent base material (steam generator lower head). The examination coverage was based on the aggregate from each scan as follows:

- *Manual scans of the weld volume from the steam generator head side: 45° and 60° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions and 0° longitudinal wave.*

The actual material, coverage amount, and component configurations are as follows:

B3.2.2	CLAD CARBON STEEL	63%	Steam Generator Nozzle-to-Head Weld
B3.2.3	CLAD CARBON STEEL	50%	Steam Generator Nozzle-to-Head Weld
B3.2.5	CLAD CARBON STEEL	63%	Steam Generator Nozzle-to-Head Weld
B3.2.6	CLAD CARBON STEEL	49%	Steam Generator Nozzle-to-Head Weld

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The CR-3 Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume A-B-C-D-E-F-G-H-I (Figure 9). Therefore, the available coverage will not meet the acceptance criteria of this Code Case.

There were no recordable indications found during the inspection of these welds.

These welds are obstructed by the OTSG support skirt (Figures 9 and 10), which is welded to the OTSG 360°. In order to scan all of the required volume for this weld, the outlet nozzle would have to be redesigned to allow scanning from both sides of the weld, which is impractical.

Radiography as an alternative is not feasible because access is not readily available for film placement and the background radiation from the steam generator upper tube sheet would severely impact the quality of the radiograph. IWB-2500, Table IWB-2500-1, Examination Category B-P System Leakage Tests and VT-2 visual examinations performed each refueling outage provide adequate assurance of pressure boundary integrity. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

B3.140 Steam Generator Nozzle Inside Radius Welds: B3.2.1.1, B3.2.2.1, B3.2.3.1, B3.2.4.1, B3.2.5.1 and B3.2.6.1

The limitations discussed in the nozzle-to-shell welds are also applicable to the nozzle inner radius examinations. During the ultrasonic examination of this weld, less than 90% coverage of the required examination volume was obtained. The percentage of coverage reported for each weld represents the aggregate coverage from all scans performed on the weld and adjacent base material (OTSG head). The examination coverage was based on the aggregate from each scan as follows:

- *Manual scans of the base material from the head side: 45° and 60° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions and 0° longitudinal wave.*

- *Manual scans of the weld volume from the head side: 45° and 60° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions and 0° longitudinal wave.*

The actual material, coverage amount, and component configurations are as follows:

B3.2.1.1	CLAD CARBON STEEL	61%	Nozzle Inner Radius
B3.2.2.1	CLAD CARBON STEEL	48%	Nozzle Inner Radius
B3.2.3.1	CLAD CARBON STEEL	43%	Nozzle Inner Radius
B3.2.4.1	CLAD CARBON STEEL	61%	Nozzle Inner Radius
B3.2.5.1	CLAD CARBON STEEL	48%	Nozzle Inner Radius
B3.2.6.1	CLAD CARBON STEEL	43%	Nozzle Inner Radius

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The CR-3 Inservice Inspection Plan allows the use of Code Case N-460, which requires greater than 90% volumetric coverage of examination volume M-N-O-P (Figures 7, 8 and 9). Therefore, the available coverage will not meet the acceptance criteria of this Code Case.

There were no recordable indications found during the inspection of these nozzle inner radii.

The steam generator nozzle inside radii are accessible only from the head side, based on the designed nozzle configuration. The proximity of the nozzle outer radius prevented examination coverage from the nozzle side. In order to scan all of the required volume for this weld, the OTSG nozzles would have to be redesigned to allow scanning from both sides of the weld, which is impractical.

Radiography, as an alternative, is not feasible because access is not available for film placement. IWB-2500, Table IWB-2500-1, Examination Category B-P System Leakage Tests and VT-2 visual examinations performed each refueling outage provide adequate assurance of pressure boundary integrity. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

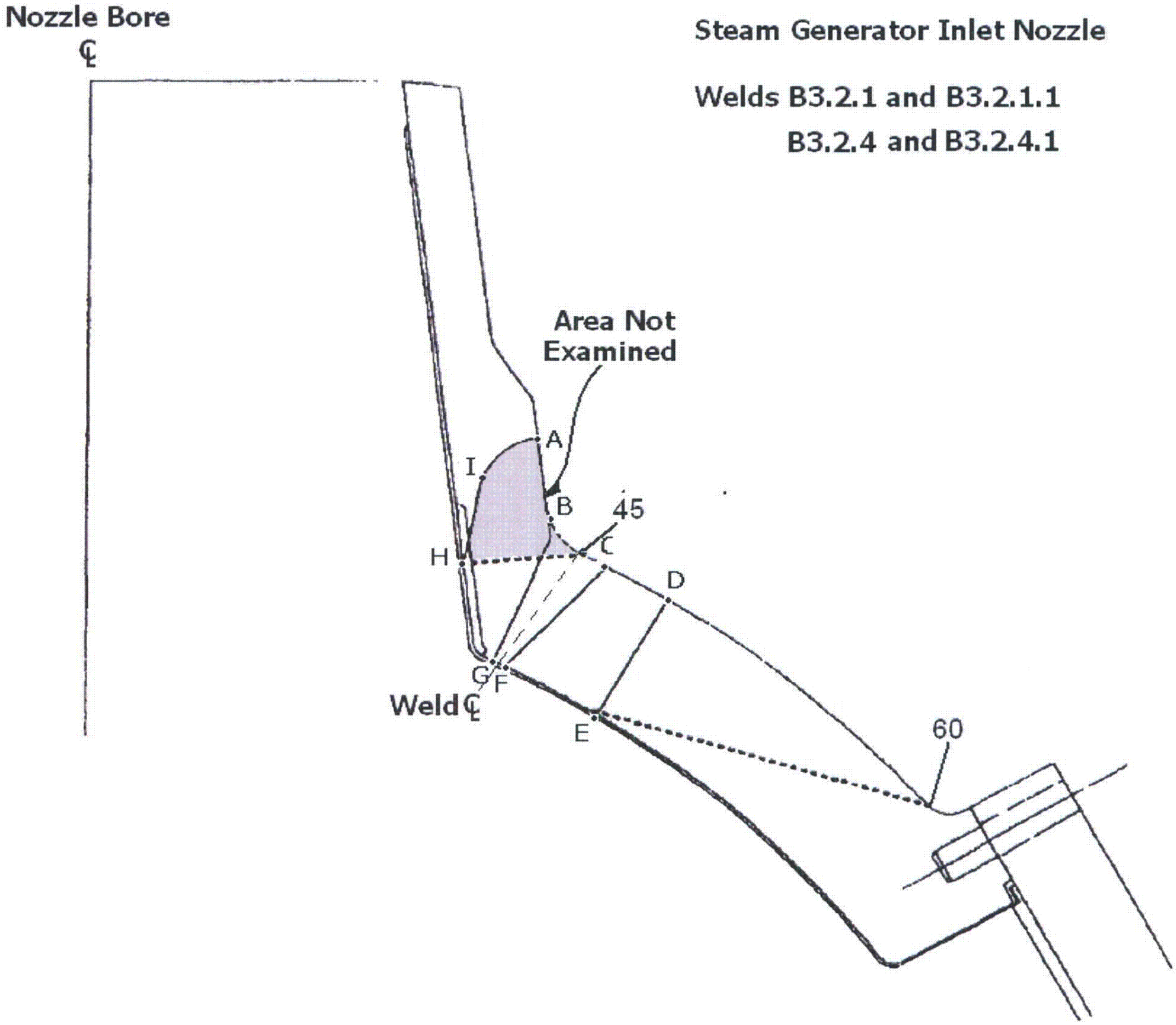

Nozzle Bore
℄
Steam Generator Inlet Nozzle
Welds B3.2.1 and B3.2.1.1
B3.2.4 and B3.2.4.1
Area Not
Examined
A
I
B
45
H
C
D
G
F
Weld ℄
E
60

Figure 7

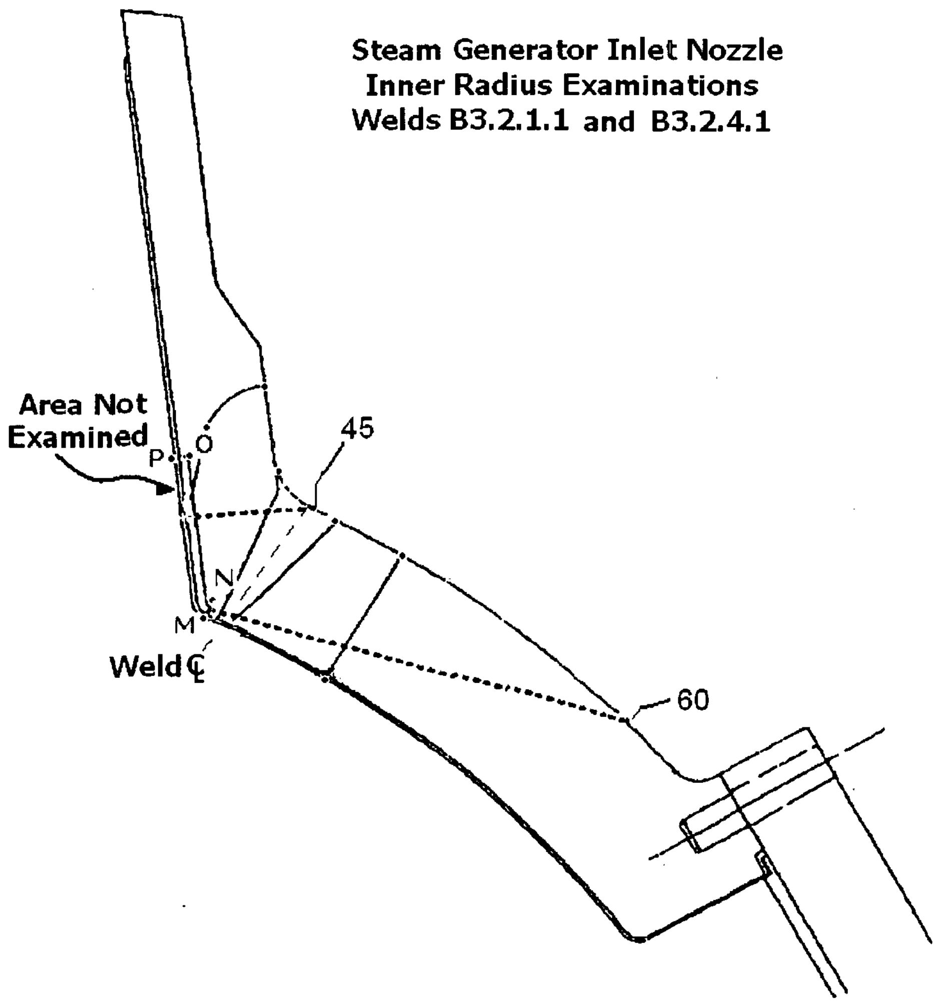


Figure 8

The area not examined is at the upper section of the box outlined by M-N-O-P.

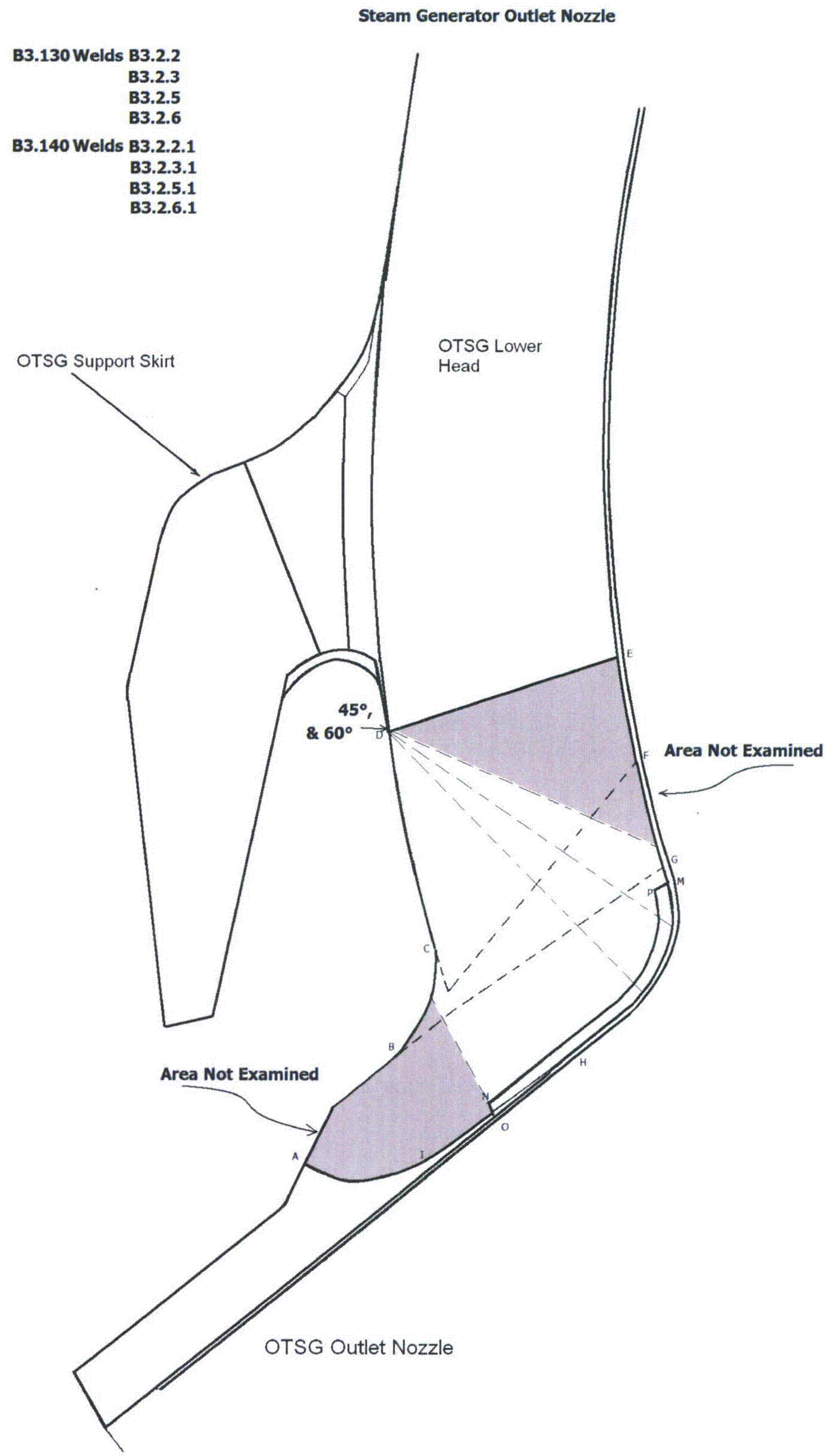

Steam Generator Outlet Nozzle
B3.130 Welds B3.2.2
B3.2.3
B3.2.5
B3.2.6
B3.140 Welds B3.2.2.1
B3.2.3.1
B3.2.5.1
B3.2.6.1
OTSG Support Skirt
OTSG Lower Head
45°, & 60°
D
E
F
Area Not Examined
G
M
P
C
B
Area Not Examined
N
H
O
A
I
OTSG Outlet Nozzle

Figure 9

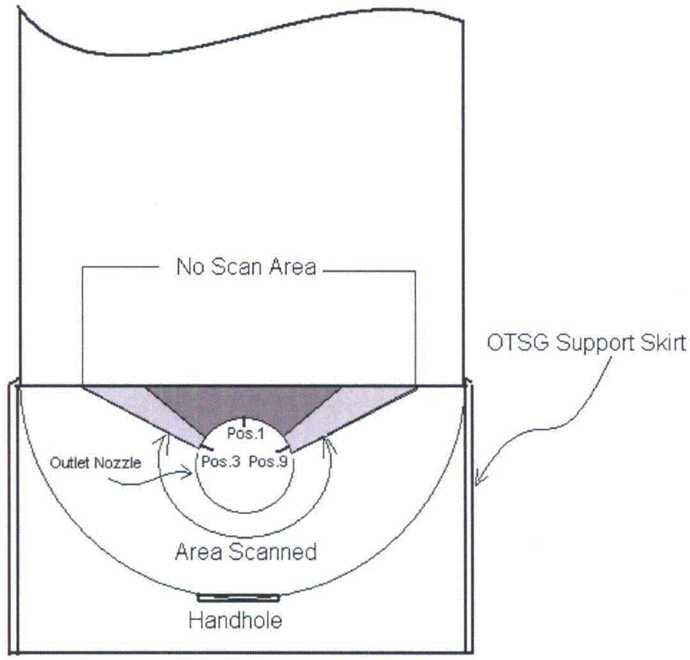


Figure 10

The above figure details a side view of the nozzle, Steam Generator and Support Skirt configuration. The Support Skirt wraps around the Steam Generator entirely with an opening for the Outlet Nozzle. The limitation is only on the upper portion of the nozzle as shown in gray.

Welds B3.2.2, B3.2.3, B3.2.5, B3.2.6
Welds B3.2.2.1, B3.2.3.1, B3.2.5.1, B3.2.6.1

2.2 <u>Request for Relief 09-001-II, Part B, Examination Category B-J, Items B9.21, Pressure Retaining Circumferential Welds in Piping Less than 4 NPS, and Part D, Examination Category R-A, Item R1.20, Risk Informed Piping Examinations</u>

The licensee has not provided sufficient information to support the bases for impracticality for each of the Examination Category B-J and R-A piping welds in RR 09-

001-II. Only general statements regarding geometries and access restrictions are provided, such as the following:

> The ultrasonic examination of the above pipe welds was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform the ultrasonic examination from both sides of the weld since one side of the weld was not suitable for scanning based on the scanning surface angle of the component.

2.2.1 Provide further information to support the basis for each limited Examination Category B-J and R-A weld, and therefore, demonstrate impracticality. This information should include detailed descriptions with sufficient explanation for the clarification. It may refer to the enclosed lay-out or cross-sectional drawings/sketches to enable the staff to fully understand the causes of ultrasonic scan limitations and their impact on examination volume coverage.

2.2.2 Describe the ultrasonic techniques (shear wave and angles, and refracted L-wave and angles) applied to maximize coverage when examining from a single side of these welds.

2.2.3 In addition to the bases for impracticality, state whether any outside diameter surface feature, such as weld crown, diametrical weld shrinkage, or surface roughness conditions caused limited volumetric coverage during the subject piping weld examinations. Discuss the efforts that were used to correct these conditions.

2.2.4 Confirm that ASME Code-Required surface examinations were completed for the subject welds, as applicable.

RESPONSE

R1.20 Circumferential Pipe Welds, B4.5.108.17 (RI-ISI):

The ultrasonic examination of the above pipe weld was limited in coverage due to component configuration, elbow-to-valve (Figure 11). It is not possible to perform the ultrasonic examination from both sides of the weld since the valve prohibits scanning from the down-stream side of the weld based on the scanning surface angle of the component. Additionally, the intrados of the elbow restricts scanning from approximately 1.5 inches through 4.5 inches circumferentially; therefore, the welds only received a single sided examination resulting in less than 90% coverage of the required examination volume, with an actual 50% coverage for the subject weld. The examination coverage was based on the aggregate from manual scans of the pipe side: 45° and 70° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions.

A single sided examination for a stainless steel weld can only be credited for 50% of the Code Required Volume. [10 CFR 50.55a(b)(2)(xv)(A)(2): Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds. Where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the *opposite side of the weld. Dissimilar metal weld qualifications must be demonstrated from the austenitic side of the weld and may be used to perform examinations from either side of the weld.]*

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The Non-Destructive Examination (NDE) techniques and procedures used incorporate examination techniques qualified under Appendix VIII of the ASME Section XI Code by the Performance Demonstration Initiative (PDI) for examination of the pipe welds. The entire volume of these welds was interrogated ultrasonically; however, the qualified technique is only qualified to detect flaws on the examination side of the weld. No indications were identified for these examinations.

Therefore, since the welds only received a single-sided examination, the resulting code coverage credit in less than 90% coverage of the required examination volume. The limitations were not due to excessive weld crown, diametrical weld shrinkage, or surface roughness conditions. A surface examination was not required for this weld as described in Code Case N-578, Risked Informed ISI.

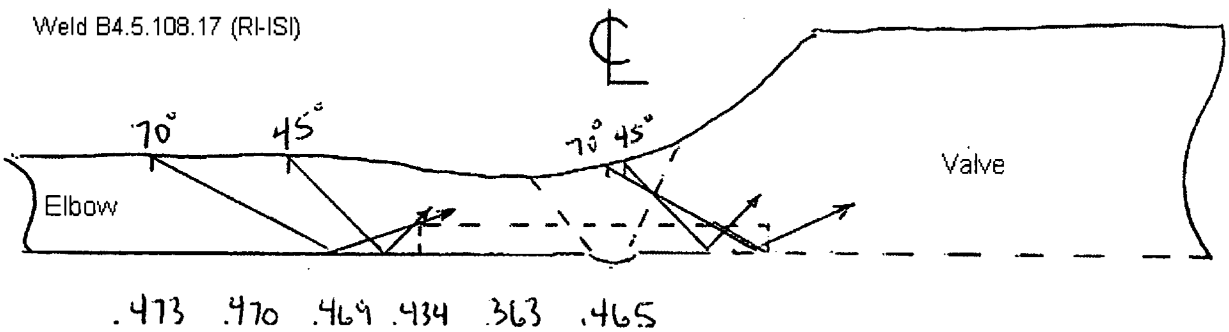


Figure 11

Retraction for B9.21 Circumferential Pipe Welds

As part of the initial Request for Relief, CR-3 submitted the welds in Category B-J, B9.21 for relief from the ASME Section XI requirements. The Code relief request was only for the volumetric examinations, which were performed to satisfy a CR-3 augmented program, and not ASME Section XI Code requirements.

ASME Section XI, 1989 Edition, Category B-J, Item B9.21, only requires a surface examination for those components. Additionally, 10 CFR 50.55a(g)(4)(iii) states that, "Licensees may, but are not required to, perform the surface examinations of High Pressure Safety Injection Systems specified in Table IWB–2500–1, Examination Category B-J, Item Numbers B9.20, B9.21, and B9.22."

The CR-3 Third Interval ISI Program, Section 6.2.2 for Augmented Programs, included the discussion for B-J, B9.21 welds.

6.2.2 Volumetric Examination of Class 1 Piping, ASME Examination Category B-J, < 4 inches NPS ≥ 2 inches NPS in HPI system

The 1989 edition of ASME Code, Section XI for Category B-J, requires only surface examination on Class 1 piping welds less than 4 inches NPS. Class 2 HPI piping ≥ 2 inches NPS and ≤ 4 inches NPS receive both a surface and volumetric examination. FPC recognizes the importance of conducting volumetric examinations on austenitic stainless steel piping in PWR High Pressure Injection Systems.

Therefore, volumetric examination, in addition to the Code Required surface examination, will be performed on all Class 1 HPI system welds selected for examination under Category B-J.

The request for relief from the ASME Code requirements (B9.21, Less than 4 inches NPS Circumferential Pipe Welds) is retracted for the following welds: B4.5.62, B4.5.71.3, B4.5.71.4, B4.5.79.4, B4.5.79.5, B4.5.84.2, B4.5.84.4, B4.5.151, and B4.5.165.

The Code Required surface examination was performed for the above welds. No recordable indications were noted.

2.3 <u>Request for Relief 09-001-II, Part C, Examination Category B-M-1, Item B12.40, Valve Body Welds NPS 4 or Larger</u>

2.3.1 The licensee has not provided sufficient information to enable the staff to determine whether the subject valve body weld is inaccessible for volumetric examination. The licensee stated that the ultrasonic examination of the DHV-3 valve body weld would require disassembly of the valve to access the weld, however the drawings submitted in Attachment A of Enclosure 1 do not adequately display this weld, nor fully show access limitations. In addition, the provided drawings are unclear and difficult to read. Please submit clear diagrams/sketches of the valve and location of the subject weld, showing access restrictions that make disassembly of the valve necessary for volumetric examination.

<u>RESPONSE</u>

The B-M-1 weld for valve DHV-3 is a limited single sided examination that is also inaccessible for volumetric examination without valve disassembly. Figure 12 shows the canopy-to-valve body configuration and weld without the yoke in place. The valve actuator support i.e., yoke, encompass the entire DHV-3 canopy-to-valve body weld (Figures 12 and 14). The valve actuator is seal welded to a mechanical clamp which is attached to the valve body (Figures 13 and 14). The examination of the B-M-1 after the yoke is removed would still result in a request for relief from the Code requirements since the examination of the weld is a single sided examination and the Code Required Volume coverage would be less than 90%.

DHV-3 is the first valve downstream of the reactor on the decay heat removal line and is in a high radiation area even when the reactor is de-fueled. This is the only B-M-1 category weld at CR-3. Removal of the yoke would involve extensive man-hours to *remove the yoke and its welded clamp, inspect the canopy weld, reinstall the yoke and re-weld the yoke to the clamp. The estimated time spent on the valve for removal, inspection, re-installation and post-maintenance testing is 100 man-hours, which would result in a total radiation exposure of 10R.*

The B-M-1 weld only received a single sided examination during the pre-service examination resulting in 75% calculated coverage, which is less than 90% coverage of the required examination volume. The examination coverage was based on the aggregate from manual scans on the canopy side: 45^0 and 70^0 shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions. The ultrasonic examination of the valve body weld for DHV-3 was limited in coverage due to component configuration, canopy-to-valve. It is not possible to perform the ultrasonic examination from both sides of the weld since the cast stainless valve material and the scanning surface angle are not conducive to scanning from the valve body side of the component.

A single sided examination for a stainless steel weld can only be credited for 50% of the Code Required Volume. [10 CFR 50.55a(b)(2)(xv)(A)(2): Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds. Where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld.]

Manual scans were performed during the pre-service examinations using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The Non-Destructive Examination (NDE) techniques and procedures used incorporate examination techniques qualified under Appendix VIII of the ASME Section XI Code by the Performance Demonstration Initiative (PDI) for examination of the pipe welds. The entire volume of this weld was interrogated ultrasonically; however, the qualified technique is only qualified to detect flaws on the examination side of the weld. No indications were identified for these examinations. The limitations were not due to excessive weld crown, diametrical weld shrinkage or surface roughness conditions.

Cut-away view of the canopy on top of DHV-3

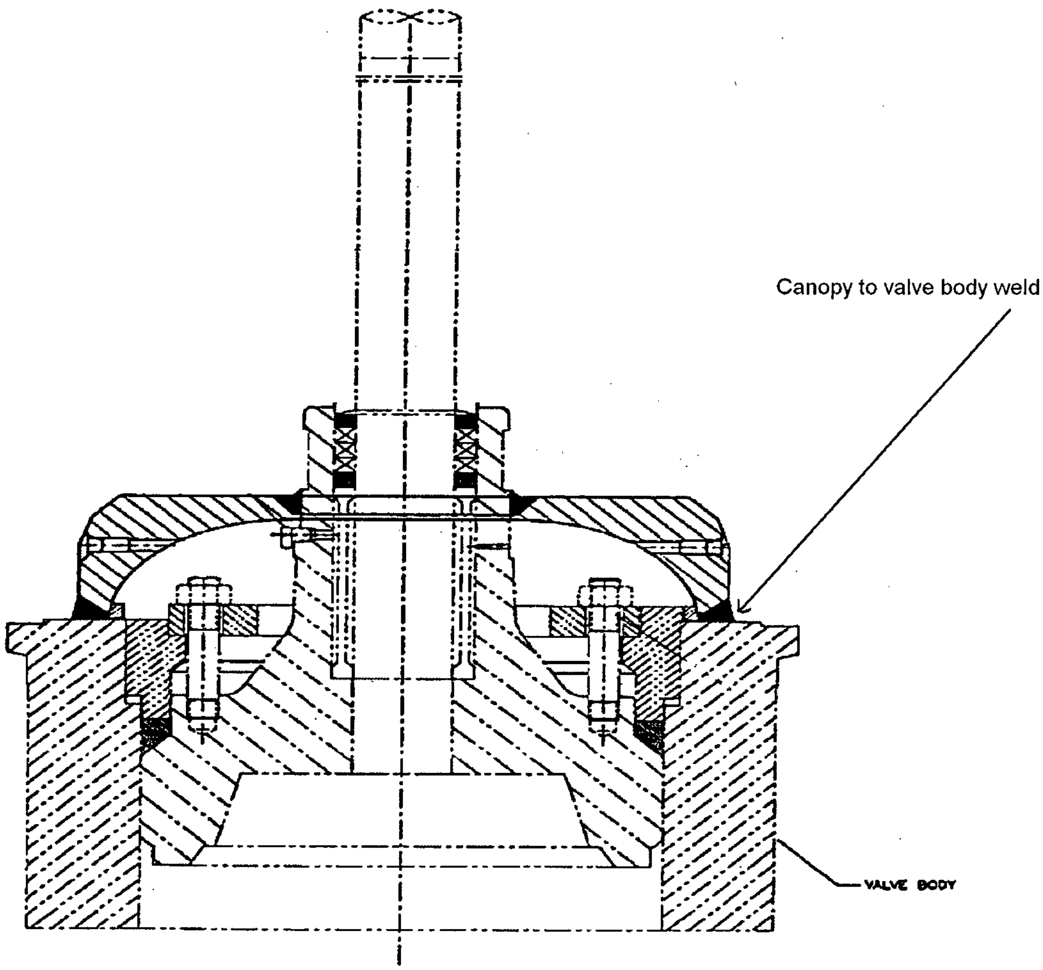


Figure 12

This figure shows the canopy to valve body configuration without the yoke in place.

Cut-away view of the canopy on top of DHV-3 with the yoke installed

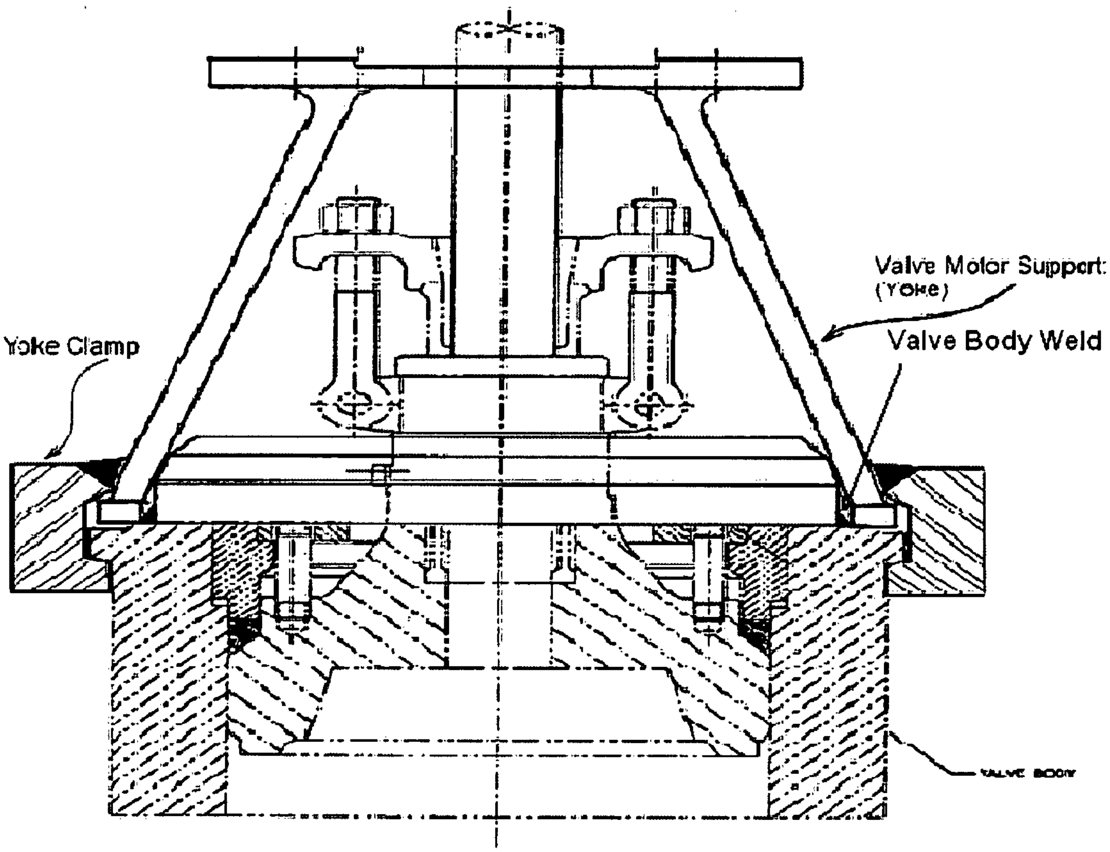


Figure 13

Cut-away view of the yoke clamp assembly

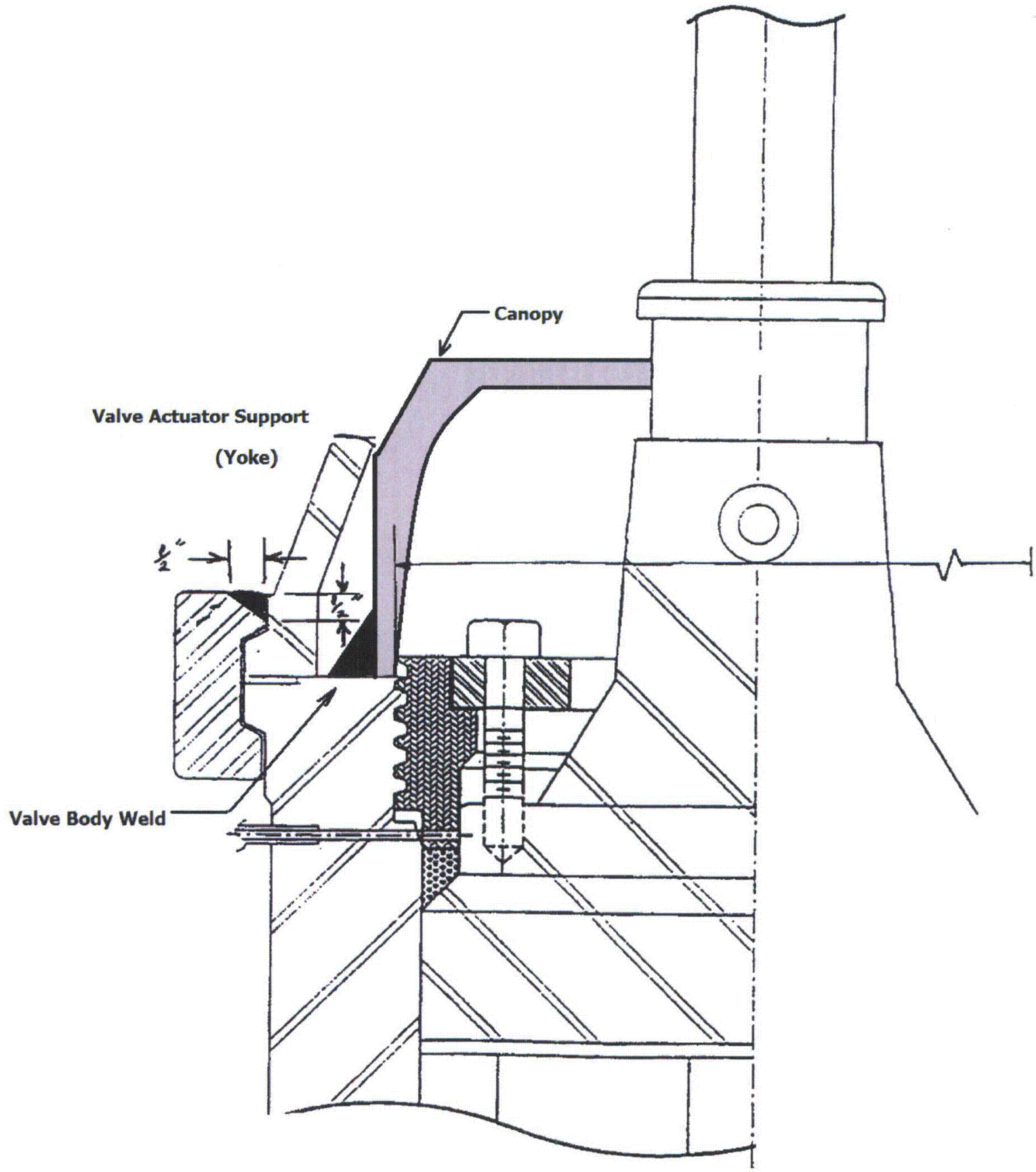
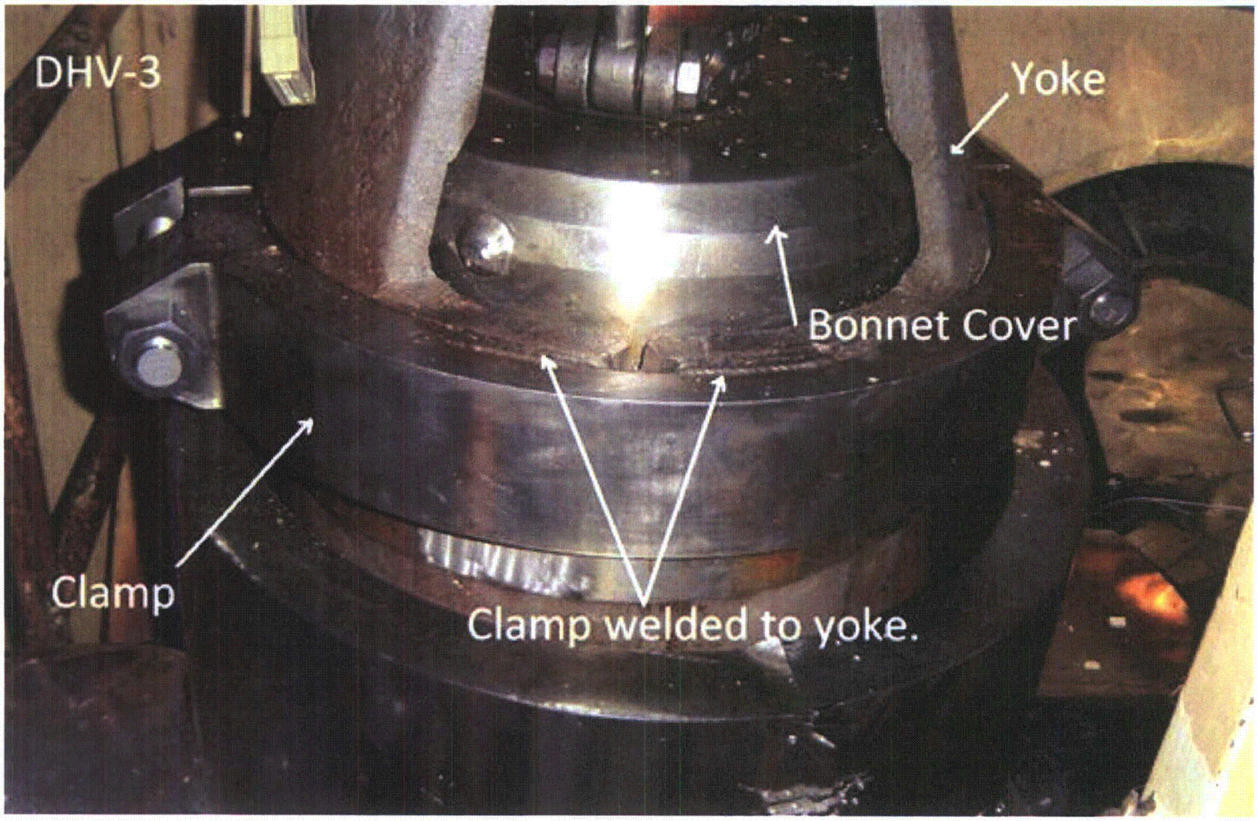


Figure 14

This detail shows the where the clamp is welded to the yoke of DHV-3



Photograph of DHV-3 configuration

2.4 Request for Relief 09-002-II, Parts A and B, Examination Category C-A and C-B, Items C1.10 and C2.21, Pressure Retaining Welds in Pressure Vessels and Nozzle-to-Shell Welds

2.4.1 The coverage sketches included in the licensee's submittal do not contain dimensions and are not adequate to demonstrate impracticality for the subject volumetric examinations. Please clearly describe ASME Code Required Volumes and areas of completed coverage (including dimensions) that for clarification refers to the cross-sectional sketches. Summarize scanning directions and techniques used. In addition, list the base and weld materials, if not already provided. As applicable, describe NDE equipment (ultrasonic scanning apparatus), details of the listed obstructions (size, shape, proximity to the weld, etc.) to demonstrate accessibility limitations, and discuss whether alternative methods or advanced technologies could be employed to maximize ASME Code coverage.

2.4.2 The description associated with Examination Categories C-A and C-B list the component type (shell-to-flange weld, nozzle-to-shell weld), however, it is not clear what the actual components are, or what systems are involved. Please state the component(s) for the subject welds and to what system these components are assigned.

2.4.3 Also, identify whether 100 percent of the ASME Code Required surface examinations were completed, as applicable, and if any indications were detected.

RESPONSE

C1.10 Shell to Flange Weld, Summary Number C1.1.5;

The Decay Heat Cooler DHHE-1A is part of the Decay Heat Removal System. The examination was performed from the shell side of the heat exchanger. The base and weld material is stainless steel, SA-240, TP 304 with a nominal thickness of 1.25 inches. The flange is also SA-240, TP-304 stainless steel. The examination limitation is solely based on the configuration of the weld joint, shell-to-flange (Figure 15 for general location of C1.1.5) with a total coverage amount of 42.5% (Figure 16 for coverage plot). The examination can only be conducted from the shell side with perpendicular and parallel scans.

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The NDE techniques and procedures used incorporate examination techniques qualified in accordance with the ASME Section XI Code for examination of vessel welds less than 2 inches. The qualified technique is only qualified to detect flaws on the examination side of the weld.

Ultrasonic examination of the subject weld was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform a 100 percent ultrasonic examination from both sides of the weld since one side of the weld was not suitable for scanning based on the scanning surface angle of the component (flange). A single-sided examination for a stainless steel weld can only be credited for

50% of the Code Required Volume, as detailed in 10 CFR 50.55a(b)(2)(xv)(A)(2), (Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds. Where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld.). No indications were identified for this examination and a surface examination is not required for this category/item number.

Therefore, since the welds only received a single-sided examination, the resulting code coverage credit in less than 90% coverage of the required examination volume. The limitations were not due to excessive weld crown, diametrical weld shrinkage, or surface roughness conditions.

Radiography as an alternative is not feasible because access is not available for film placement. IWC-2500, Table IWC-2500-1, Examination Category C-H System Leakage Tests and VT-2 visual examinations performed each inspection period provide adequate assurance of pressure boundary integrity. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

The surface examination was completed and no recordable indications were noted.

<u>C2.21 Nozzle to Shell Weld, Summary Number C1.2.3; DHHE-1A Inlet</u>

The NDE techniques and procedures used incorporate examination techniques qualified in accordance with the ASME Section XI Code for examination of vessel welds less than 2 inches. The entire volume of this weld (Figure 15 for weld location) was interrogated ultrasonically; however, the qualified technique is only qualified to detect flaws on the examination side of the weld. No indications were identified for these examinations.

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The NDE techniques and procedures used incorporate examination techniques qualified in accordance with the ASME Section XI Code for examination of vessel welds less than 2 inches. The qualified technique is only qualified to detect flaws on the examination side of the weld.

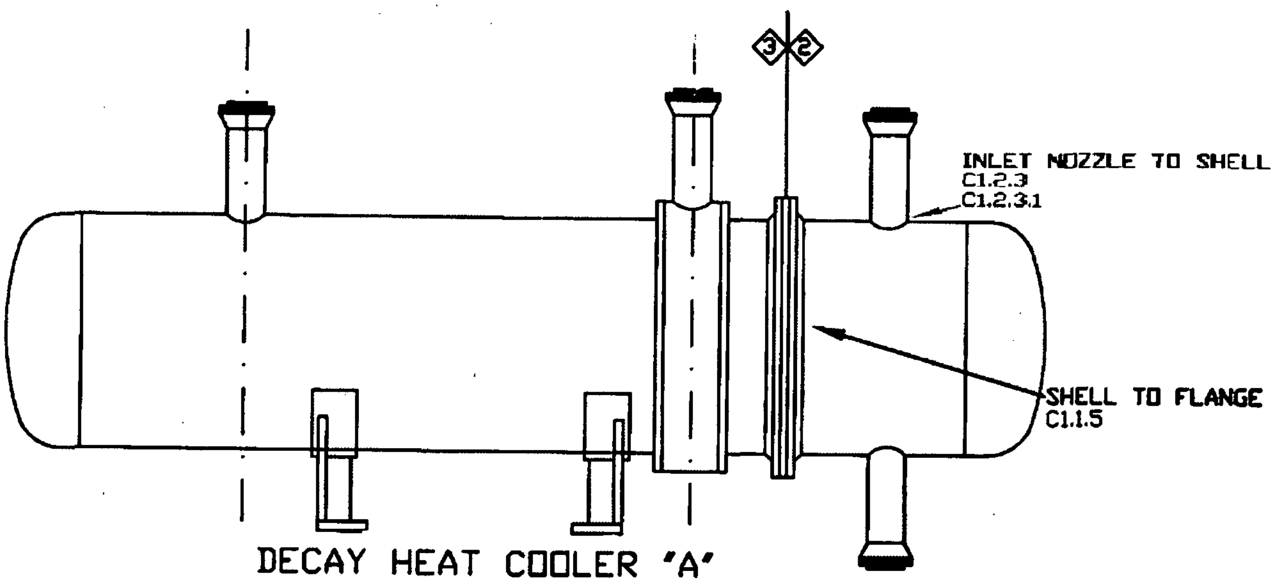
A single-sided examination for a stainless steel weld can only be credited for 50% of the Code Required Volume, as detailed in 10 CFR 50.55a(b)(2)(xv)(A)(2) (Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds. Where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld.).

Radiography as an alternative is not feasible because access is not available for film placement. IWC-2500, Table IWC-2500-1, Examination Category C-H System Leakage Tests and VT-2 visual examinations performed each inspection period provide adequate assurance of pressure boundary integrity. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

Ultrasonic examination of the subject weld was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform a 100 percent ultrasonic examination from both sides of the weld since scanning was performed on the shell side only (Figure 17). The scanning surface of the pipe is perpendicular to the shell surface which prohibits the ultrasonic wave entering the Code required examination volume at an angle that will integrate the weld volume for in-service flaws. Therefore, since the welds only received a single-sided examination, the resulting code coverage credit is less than 90% coverage of the required examination volume. The limitations were not due to excessive weld crown, diametrical weld shrinkage, or surface roughness conditions.

The surface examination was completed and no recordable indications were noted.

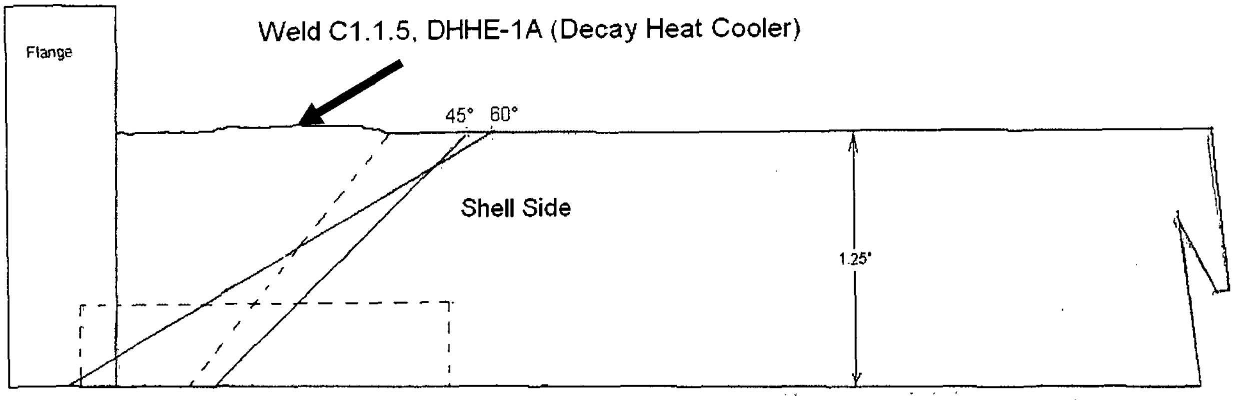
General Location of Weld C1.1.5 and C1.2.3

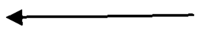


(DHHE-1A)

Figure 15

Cross-Sectional View of Weld C1.1.5





Direction of Scan

Figure 16

Cross-Sectional View of Weld C1.2.3

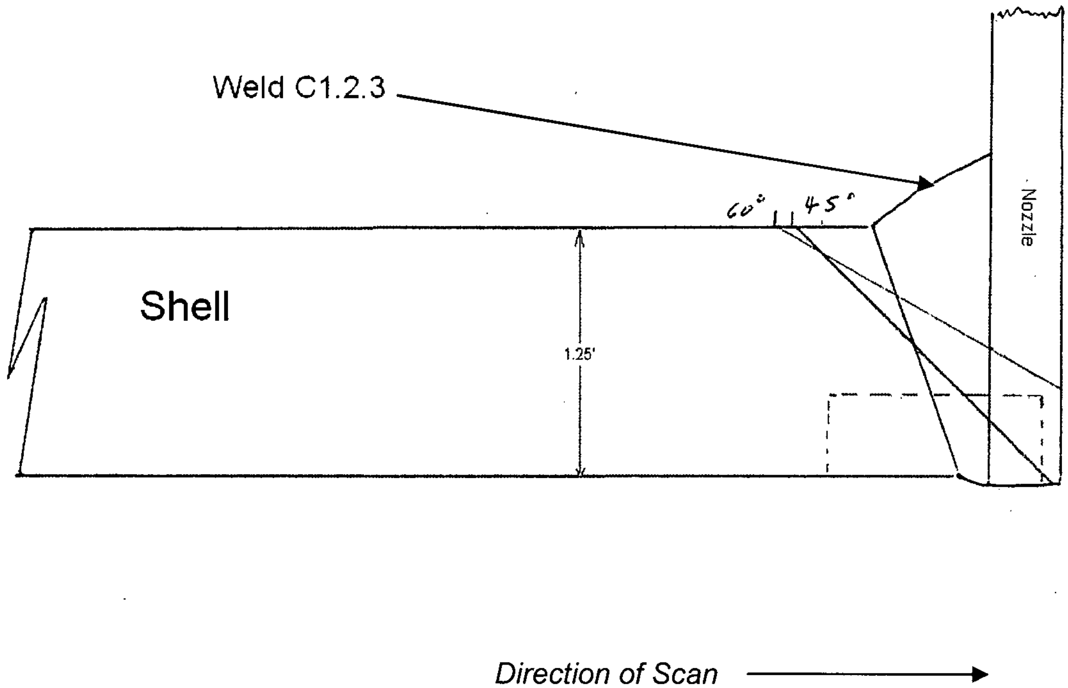


Figure 17

2.5 <u>Request for Relief 09-002-II, Part C, Examination Category C-F-1, Items C5.11, C5.21, and Augmented 7.1, Pressure Retaining Circumferential Welds in Austenitic Stainless Steel of High Alloy Piping, and Part D, Examination Category C-F-2, Items C5.51, Pressure Retaining Circumferential Welds in Carbon or Low Alloy Steel</u>

The licensee has not provided sufficient information to support the bases for impracticality for each of the Examination Category C-F-1 and C-F-2 piping welds in RR 09-002-II. Only general statements regarding geometries and access restrictions are provided, such as the following:

> The ultrasonic examination of the above pipe welds was limited in coverage due to component configuration and/or immovable physical barriers. It is not possible to perform the ultrasonic examination from both sides of the weld since one side of the weld was not suitable for scanning based on the scanning surface angle of the component.

2.5.1 Provide further information to support the basis for each limited Examination Category C-F-1 and C-F-2 weld, and therefore, demonstrate impracticality. This information should include detailed descriptions (with sufficient explanation which may refer to the lay-out or cross-sectional drawings/sketches) to enable the staff to fully understand the causes of ultrasonic scan limitations and their impact on examination volume coverage.

2.5.2 Describe the ultrasonic techniques (shear wave and angles, and refracted L-wave and angles) applied to maximize coverage when examining from a single side of these welds.

2.5.3 In addition to the bases for impracticality, state whether any outside diameter surface feature, such as weld crown, diametrical weld shrinkage, or surface roughness conditions caused limited volumetric coverage during the subject piping weld examinations. Discuss the efforts that were used to correct these conditions.

2.5.4 Confirm that ASME Code Required surface examinations were completed for the subject welds, as applicable.

<u>RESPONSE</u>

<u>Category C-F-1, Item C5.11 and C5.21 Pressure Retaining Circumferential Welds in Austenitic Stainless Steel of High Alloy Piping and Examination Category C-F-2, Item C5.51, Pressure Retaining Circumferential Welds in Carbon or Low Alloy Steel</u>

For the remainder of the C-F-1, Items C5.11 and C5.21, and Examination Category C-F-2, Item C5.51, the ultrasonic examinations were limited in coverage due to component configuration, (valve-to-elbow, valve-to-pipe, flange-to-pipe, flange-to-reducer, or tee-to-pipe). It is not possible to perform the ultrasonic examination from both sides of the weld since the configuration, scanning surface angle, or material properties, prohibit scanning from the appurtenance side of the weld.

Tee and valve material is cast stainless steel which is not suitable for scanning and the inspection techniques are not qualified in accordance with Appendix VIII. The examination coverage was based on the aggregate from manual scans of the pipe or *elbow side: 45° and 70° shear wave scans perpendicular and parallel to the weld in one axial direction and two circumferential directions. For welds with a nominal thickness less than 0.500 inches, a 70° refracted longitudinal wave transducer was used to detect flaws parallel to the weld. Therefore, the welds only received a single-sided examination resulting in code coverage credit less than 90% coverage of the required examination volume. The actual coverage was 50% for single sided components (Figures 18, 19 and 20).*

Regarding Examination Category C-F-2, Item C5.51, the ultrasonic examinations were limited in coverage due to component configuration, (Sweep-o-let to Flange). The welds were examined from both sides using the minimum and maximum scanning angles. The configuration limits access of the transducer for scanning. The examination coverage was based on the aggregate from manual scans of both sides: 45° and 70° shear wave scans perpendicular and parallel to the weld in two axial directions and two circumferential directions.

Manual scans were performed using qualified pulse-echo ultrasonic instruments and hand-held transducers, as specified in the Progress Energy ultrasonic examination procedures.

The NDE techniques and procedures used incorporate examination techniques qualified under Appendix VIII of the ASME Section XI Code by the PDI for examination of the pipe welds. The Code Required Volume of these welds was interrogated ultrasonically to the extent possible. No indications were identified for these examinations.

The limitations were not due to excessive weld crown, diametrical weld shrinkage, or surface roughness conditions.

CR-3 invoked Code Case N-663, Alternative Requirements for Classes 1 and 2 Surface Examinations, for the Third Ten-Year Inspection Interval. The surface examinations are not required for Item Number C5.11 and C5.21, as described in Code Case N-663.

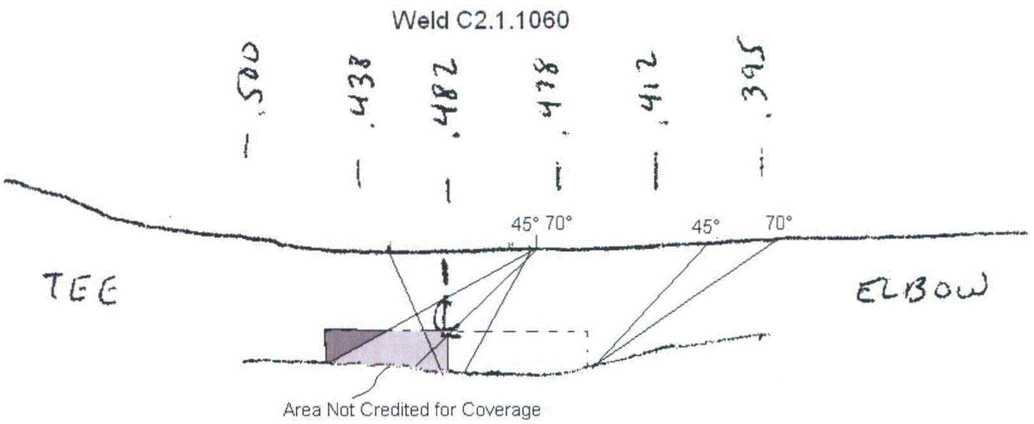


Figure 18

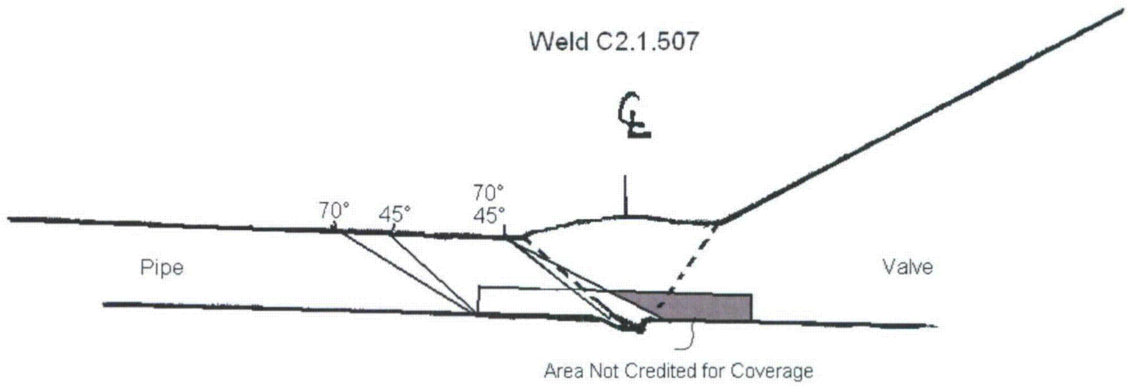


Figure 19

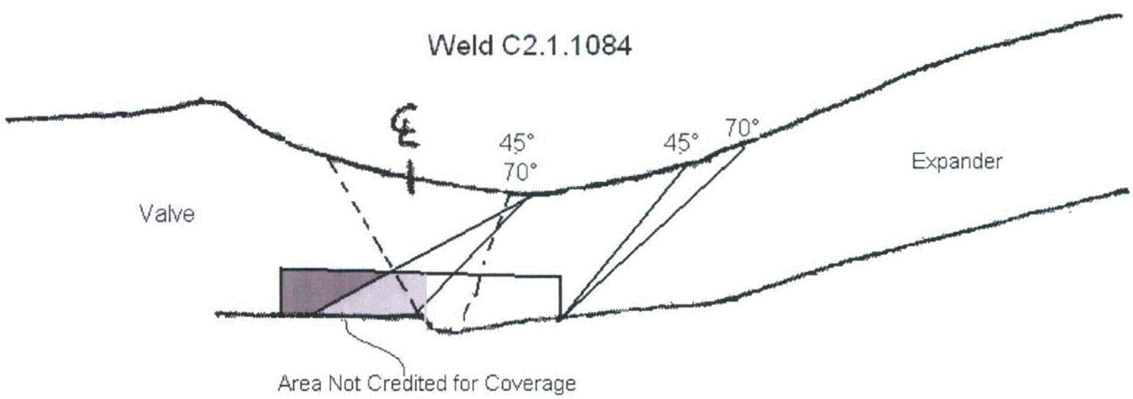


Figure 20

The majority of the C-F-1 welds do not have a specific Code Required Volume (CRV) sketch. The CRV sketch were not a Code requirement and therefore were not mandatory. The following sketches are typical for the reported configurations (Figures 21 and 22).

Typical Coverage Plot for Pipe-to-Valve, Flange-to-Pipe, and Tee-to-Pipe

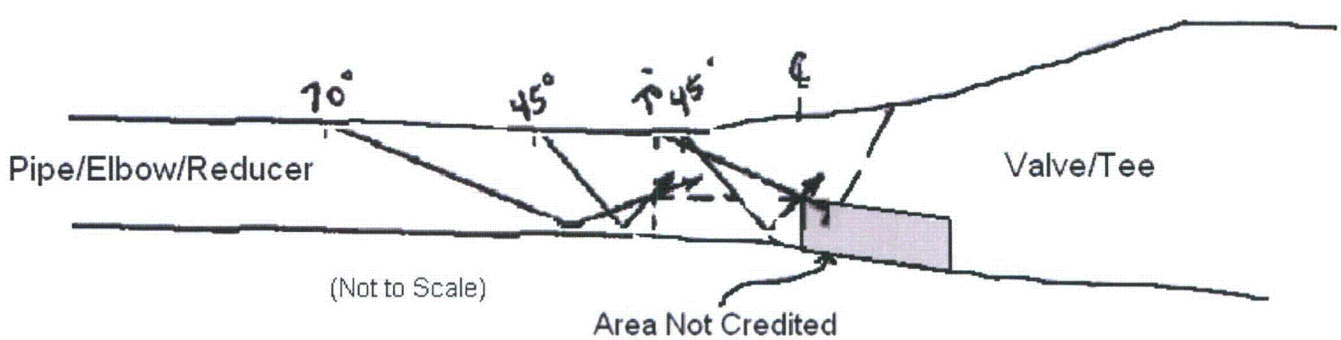


Figure 21

Typical Profile for C-F-2, C5.51 Welds C2.1.118, C2.1.221, and C2.1.290
(Sweep-o-let-to-Flange)

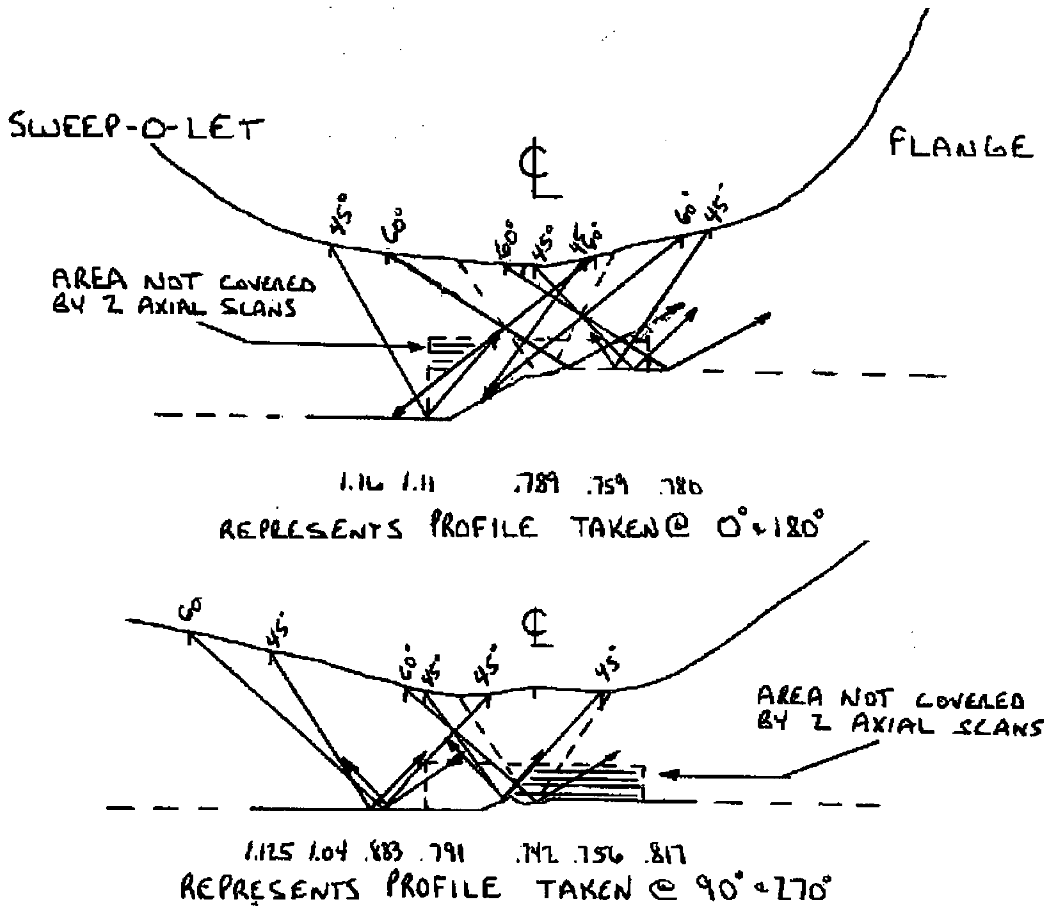


Figure 22

<u>*Relief Request Retraction: AUG7.1 and C-F-1 Pressure Retaining Circumferential Welds in Austenitic Stainless Steel of High Alloy Piping (Pre-service Examinations)*</u>

As part of the initial Request for Relief, CR-3 submitted the welds in Category C-F-1, Item C5.21, and Augmented 7.1 for relief from the ASME Section XI requirements.

For Category AUG 7.1, the Code relief request was only for the volumetric examinations, which were performed to satisfy a CR-3 augmented program and not ASME Section XI Code requirements. The request relief from the ASME Code requirements (AUG7.1) is retracted for the following welds: C2.1.190, C2.1.192A, C2.1.605, C2.1.625, and X121.020.

A portion of the welds listed for the C-F-1, Item C5.21 were part of the High Pressure Injection System plant modification installed during the Third Ten-Year Interval. The welds were inspected prior to being placed in-service; however, they are not components selected for subsequent in-service examination and are not credited for meeting the C-F-1 percentage examining 7.5% of the component population for the *interval. Therefore, request for relief from the ASME Code requirements (Item C5.21) is retracted for the following welds: C2.1.2136, C2.1.2137, C2.1.2162, C2.1.2164, C2.1.2169, C2.1.2173, C2.1.2174, C2.1.2175, C2.1.2176, C2.1.2199, C2.1.2200, C2.1.2202, C2.1.2238, and C2.1.2240.*

The Code required examinations for the above welds were performed for pre-service; no recordable indications were noted.

Relief Request Retraction: Category C-F-1, Item C5.21, Pressure Retaining Circumferential Welds in Austenitic Stainless Steel of High Alloy Piping

Code coverage for weld C2.1.1070 was reported in error as having Code Coverage less than 90%. A review of the documentation indicated that the Code Coverage was 96.63%. The configuration is a pipe to pipe with a 1.0" diameter vent line limiting a portion of the scanning area. The Code coverage sketch was incorrectly calculated which resulted reporting the coverage as 86.5%.

Relief Request Retraction: Category C-F-2, Item C5.51, Pressure Retaining Circumferential Welds in Ferritic Steel Piping

Code coverage for welds C2.1.121 and C2.1.8 were reported in error as having Code Coverage less than 90%. A review of the documentation indicated that the Code Coverage was 98.6% and 100%, respectively. The configuration is a pipe to valve and per 10 CFR 50.55a(b)(2)(xv)(A)(2), full coverage credit may be claimed from a single side for ferritic welds where examination from both sides is not possible.

2.6 Request for Relief 09-003-II, Part A, Examination Category B-A, Items B1.11 and B1.12, Reactor Pressure Vessel (RPV) Circumferential and Longitudinal Shell Welds

2.6.1 In Attachment A and B of Enclosure 3, the licensee has included multiple sketches and tables with volumetric coverage percentages at different angle beam orientations and arrangements. However, the sketches included are of poor quality and generally unclear, and do not adequately demonstrate impracticality and volumetric coverage(s) achieved. Please clearly explain the limiting conditions and completed percentages of the ASME Code volumes examined. Include in your response the ultrasonic angles applied and include dimensions and scanning directions. Please submit and refer to the cross-sectional drawings, if needed for providing the above clarification. Also, discuss whether alternative methods or advanced technologies could be employed to maximize ASME Code coverage.

2.6.2 Please report whether any indications were detected for the third ten-year ISI examination for the RPV nozzle belt intermediate shell Weld (B1.2.3).

RESPONSE

Reactor Pressure Vessel Weld Lay-Out

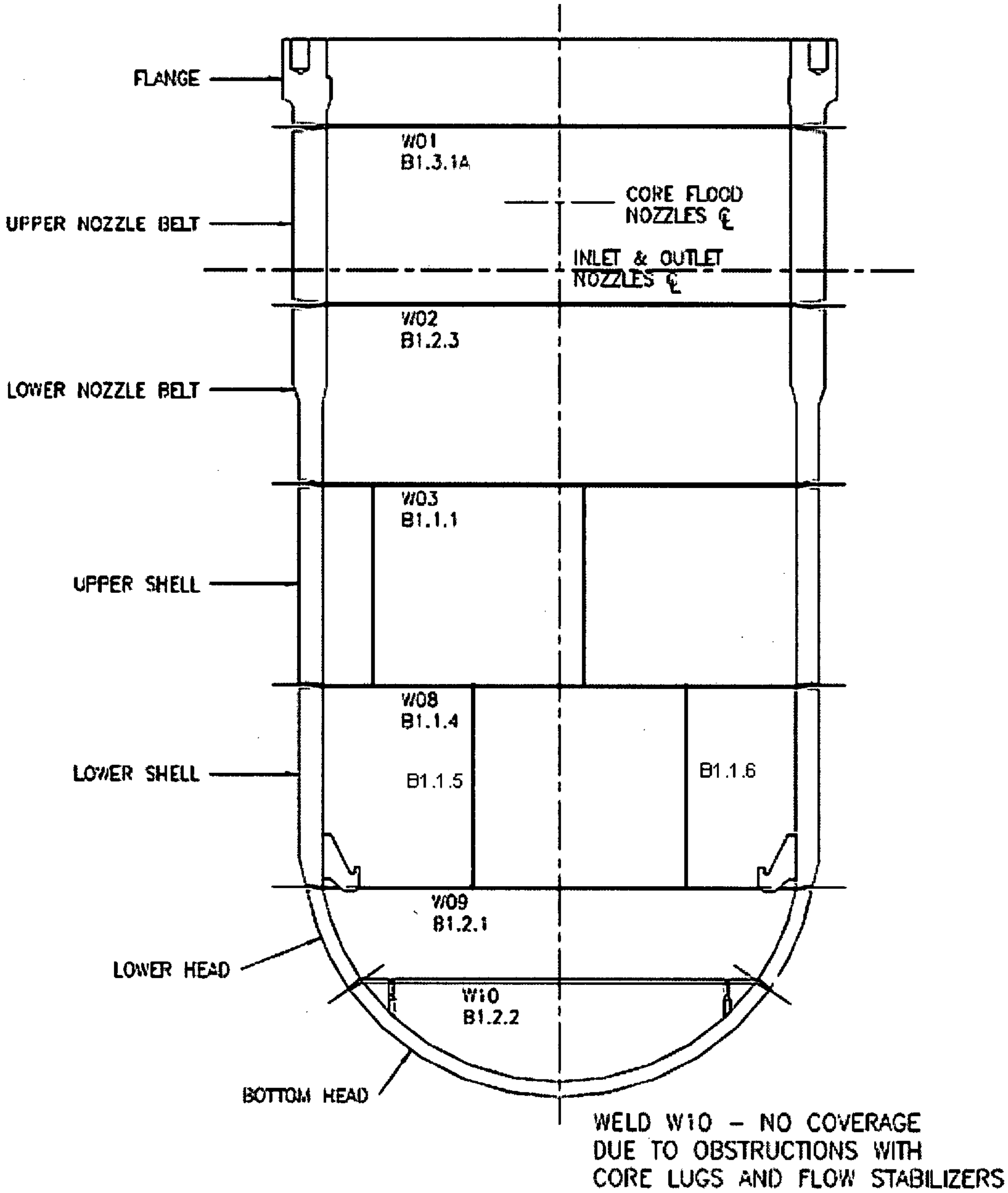


Figure 23

Component B1.2.1, Reactor Pressure Vessel Lower Shell-to-Transition Piece Weld

Weld B1.2.1 (Figures 23 and 24 for weld location) was scanned using 45° and 70° longitudinal waves for the inner 15% and 45° longitudinal and shear waves for the outer 85% of the weld volume in two parallel and two perpendicular directions to the weld. The total coverage of the Code Required Volume was 46% and was calculated using an aggregate of all scans.

The weld is limited by flow stabilizers and core positioning lugs (Figures 24 through 28 for positioning of the core lugs and stabilizers in relation to the weld). The scan limitation is a physical limitation which would also impact alternative methods or advanced technologies. Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

Complete redesign would be needed to provide enough clearance so the welds could be examined. Such a re-design is impractical for an installed reactor vessel.

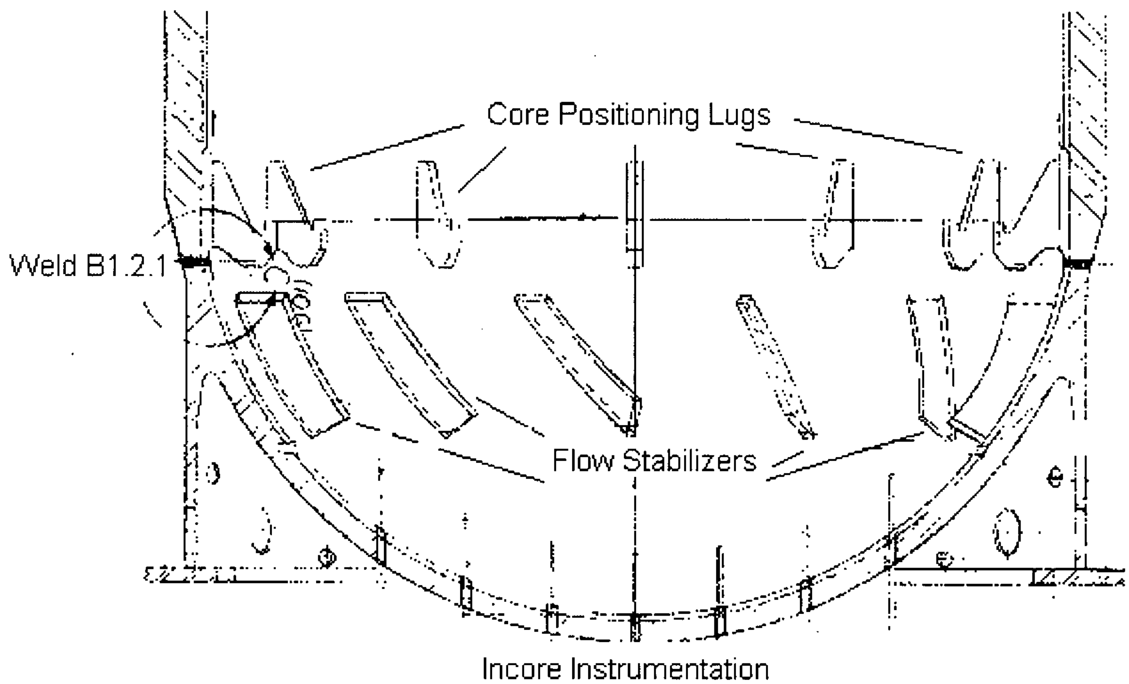


Figure 24

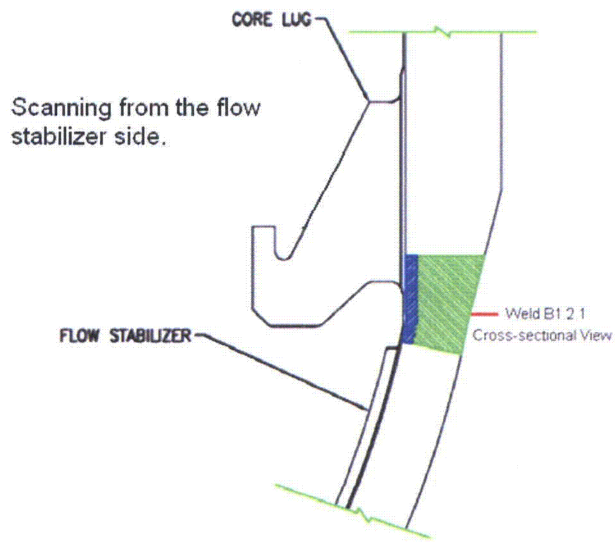


Figure 25

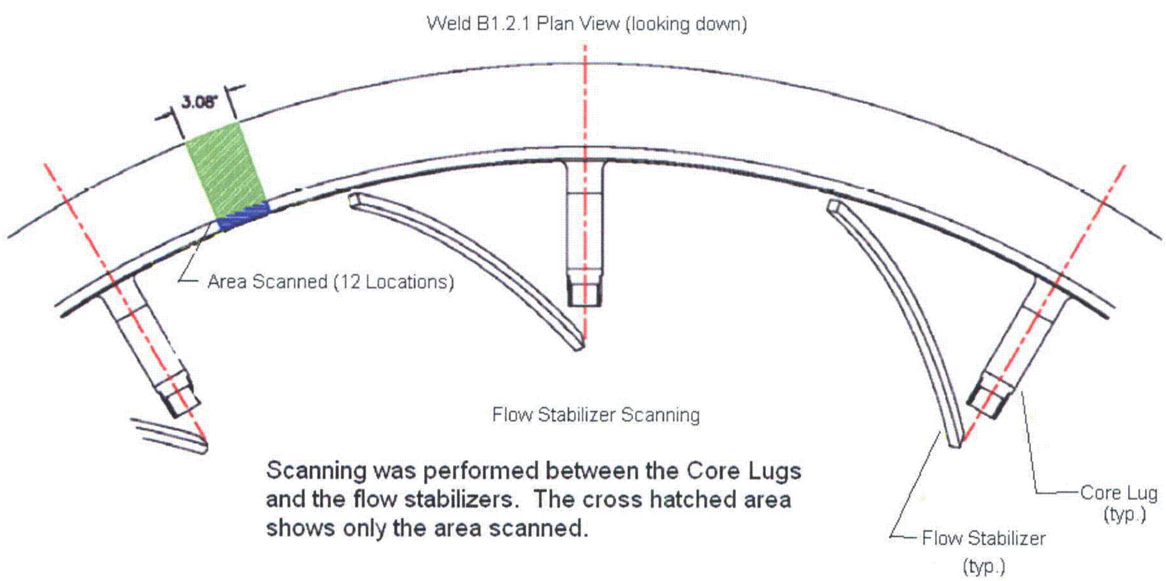


Figure 26

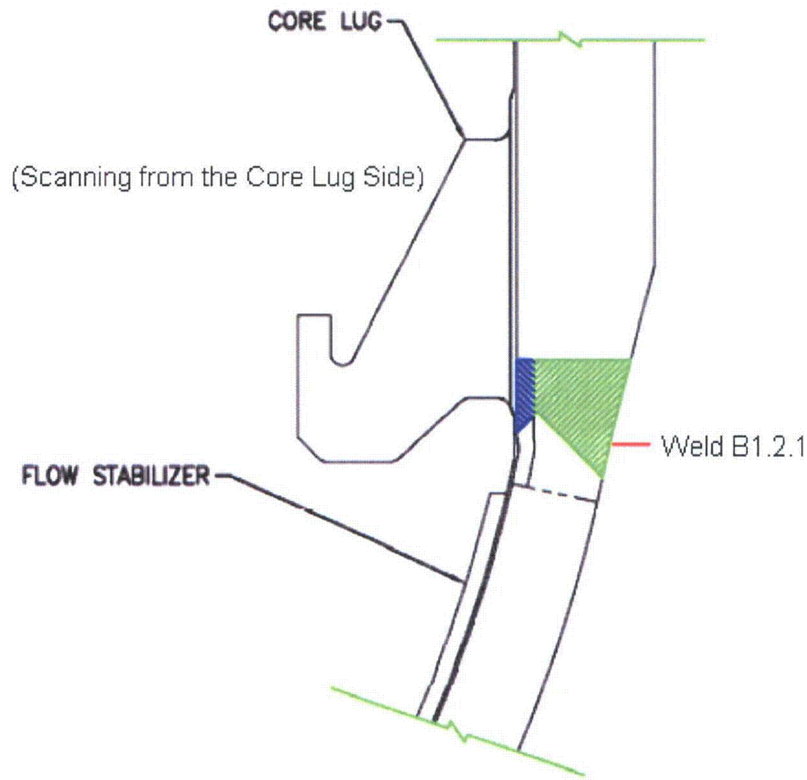


Figure 27

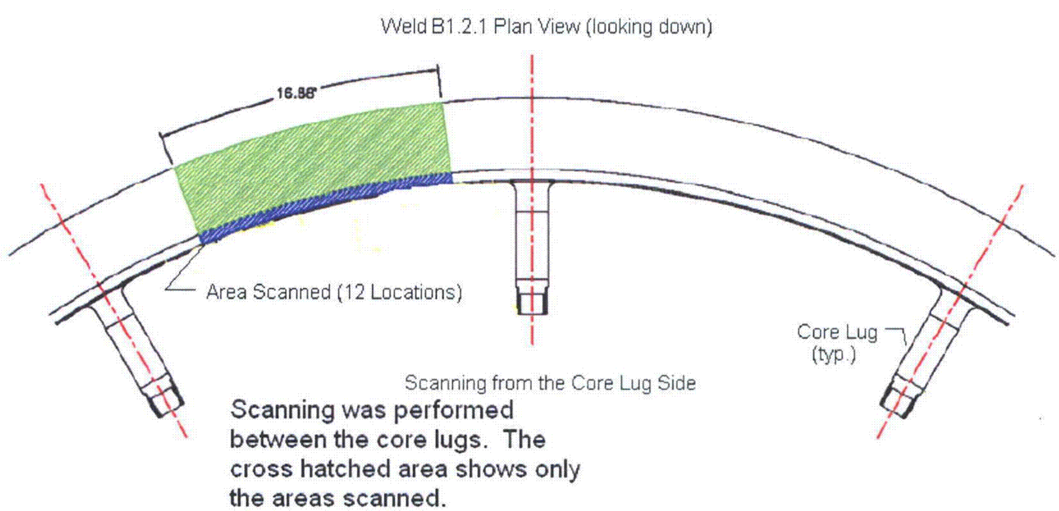


Figure 28

Component B1.2.2, Reactor Vessel Transition Piece to Bottom Head Weld

Weld B1.2.2 (Figures 23 and 29 for weld location) is the reactor vessel transition-piece-to-lower-head-weld. The weld is limited by flow stabilizers and incore instrumentation nozzles (Figure 29). Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

Consideration was given to examining the weld from the vessel outside diameter. Access to the weld from the vessel exterior presents Safety and ALARA hazards. Access to the weld to perform the inspection from the outside using a Manual Contact Ultrasonic method would require concrete removal in the cavity and to suspend an inspection team between the exterior of the vessel and inside the shield wall by harnesses.

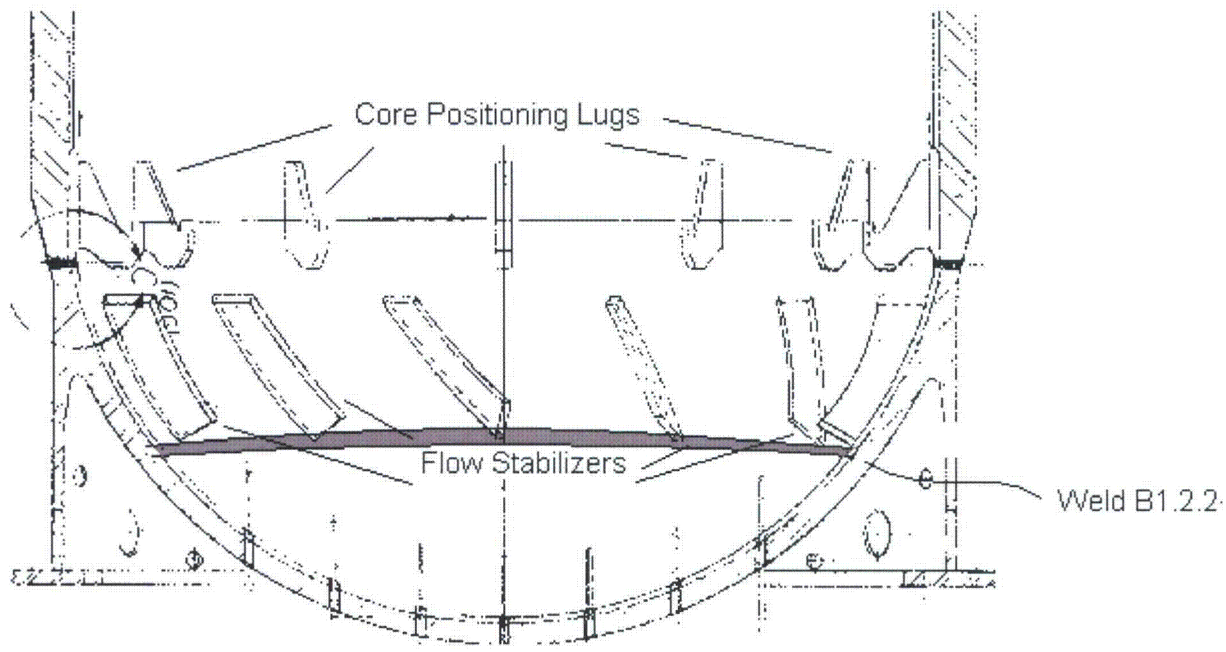


Figure 29

Component B1.2.3, Reactor Pressure Vessel Nozzle Belt Intermediate Weld

Weld B1.2.3 (Figure 23 for weld location) was scanned using 45° and 70° longitudinal waves for the inner 15% and 45° longitudinal and shear waves for the outer 85% of the weld volume (Figure 30) in two parallel and two perpendicular directions. The total coverage was calculated using an aggregate of all scans. Refer to Figures 30, 31 and 32 for cross-sectional view and plan views of axial and circumferential scan coverages. During the Third Ten-Year Interval examination, a total of 90 percent of the weld was examined. The remaining ten percent was not accessible due to scanning interferences *with the inlet nozzle openings and the outlet nozzle boss extensions (Figures 31, 32, 35, 36, and 37 for representation of nozzle boss limitations). The scan limitation is a physical limitation which would also impact alternative methods or advanced technologies. Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.*

There were no recordable indications noted for weld B1.2.3. The circumferential scan was limited by the nozzle configuration for the circumferential scan only.

Complete redesign and replacement of the nozzles would be needed to provide enough clearance so the welds could be examined. Such a re-design or replacement is impractical for an installed reactor vessel.

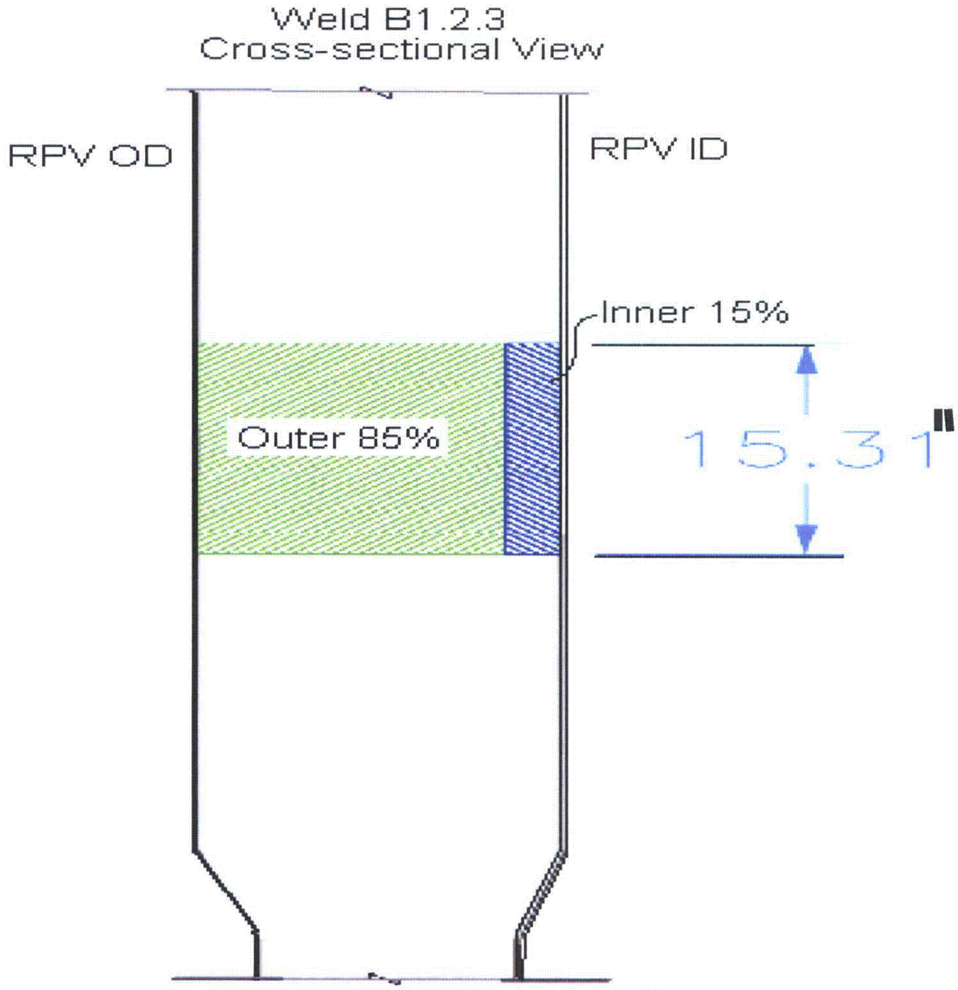


Figure 30

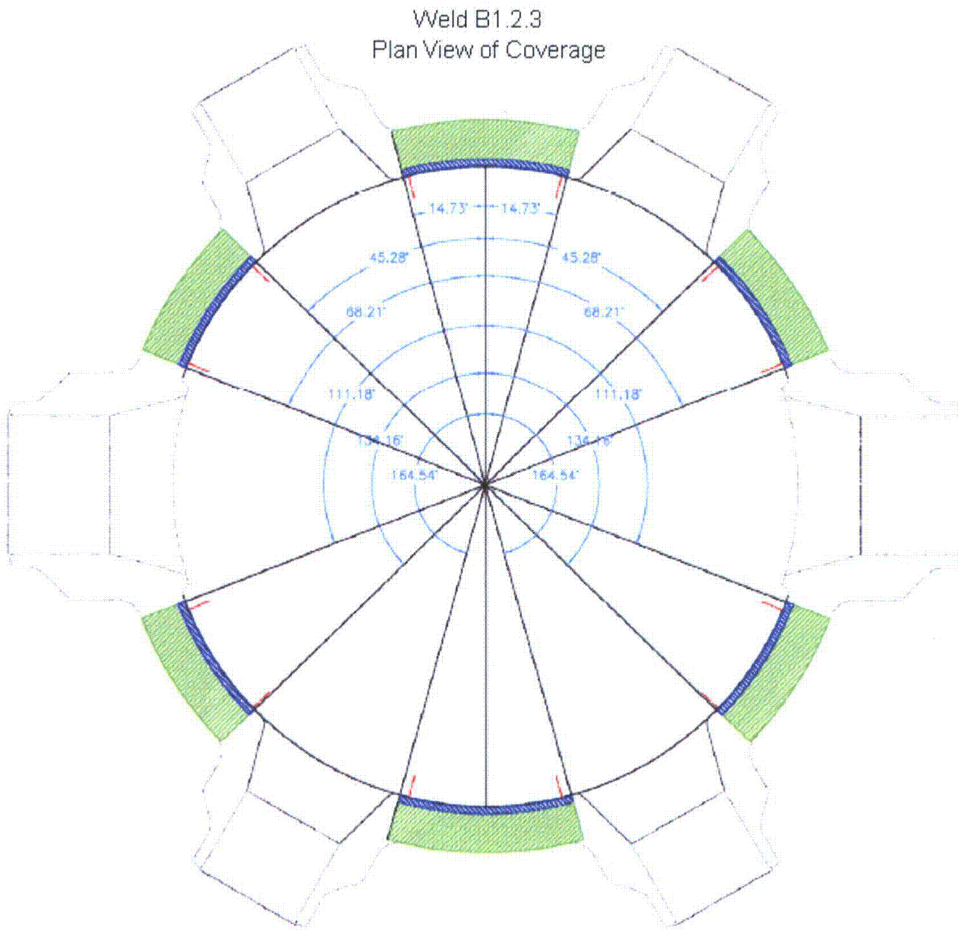


Figure 31

Axial scan coverage is detailed above

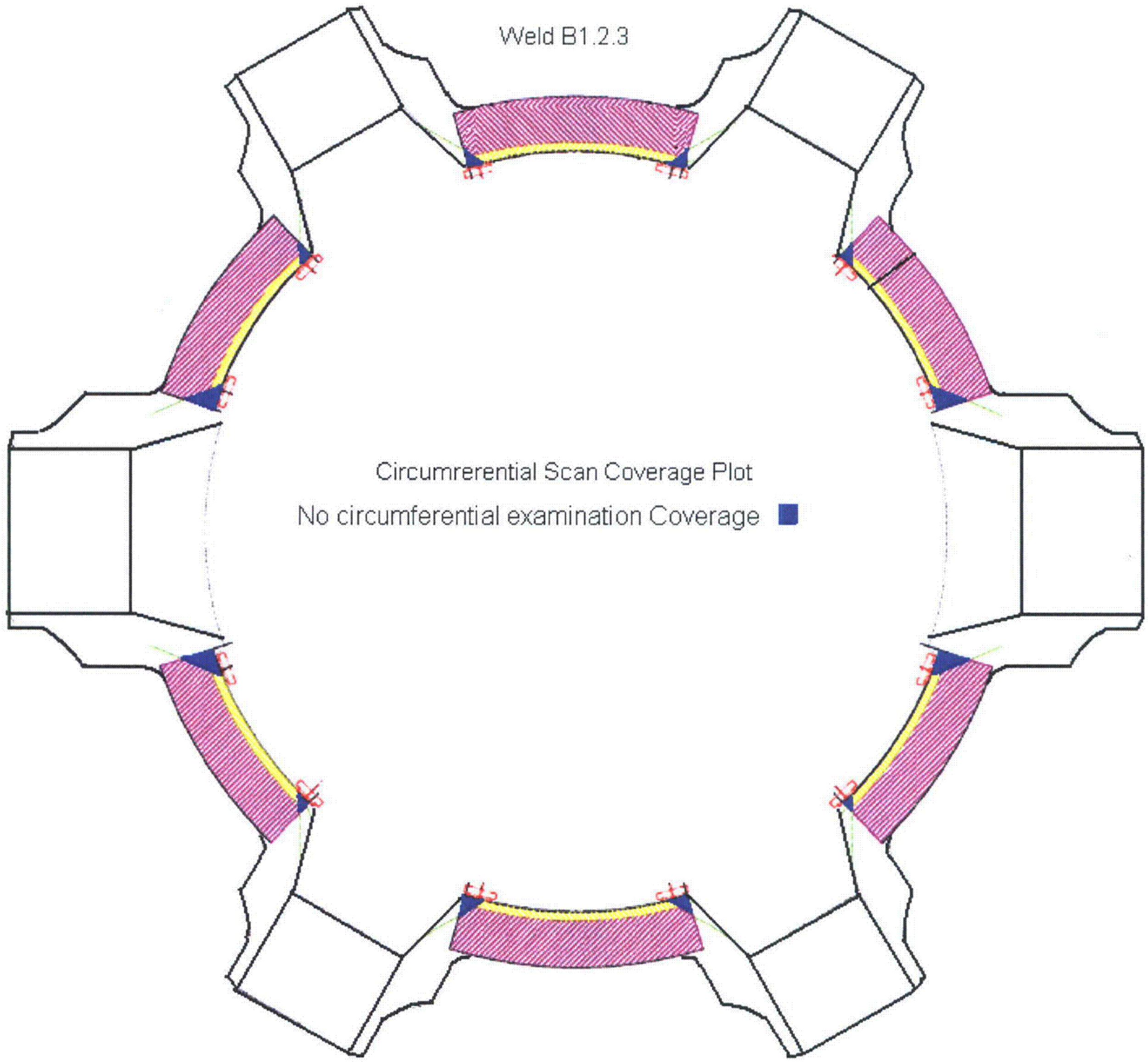


Figure 32

View looking down.

Solid areas are the limited scan areas. The limitations are due to nozzle outlets and nozzle bosses. For additional nozzle boss configuration details refer to Figures 35, 36 and 37.

Components B1.1.5 and B1.1.6, RPV Long Seam

The RPV Long Seam Welds, Welds B1.1.5 and B1.1.6, on the lower shell section are limited by the geometry of the Core Positioning Lugs (Figures 33 and 34). Welds B1.1.5 and B1.1.6 were scanned using 45° and 70° longitudinal waves for the inner 15% and 45° longitudinal and shear waves for the outer 85% of the weld volume in two parallel and two perpendicular directions. The total coverage of the Code Required Volume was 88.1% and was calculated using an aggregate of all scans. The scan limitation is a physical limitation which would also impact alternative methods or advanced technologies. Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval. The core positioning lugs are approximately 24 inches long.

Complete redesign and replacement of the core positioning lugs would be needed to provide enough clearance so the welds could be examined. Such a re-design or replacement is impractical for an installed reactor vessel.

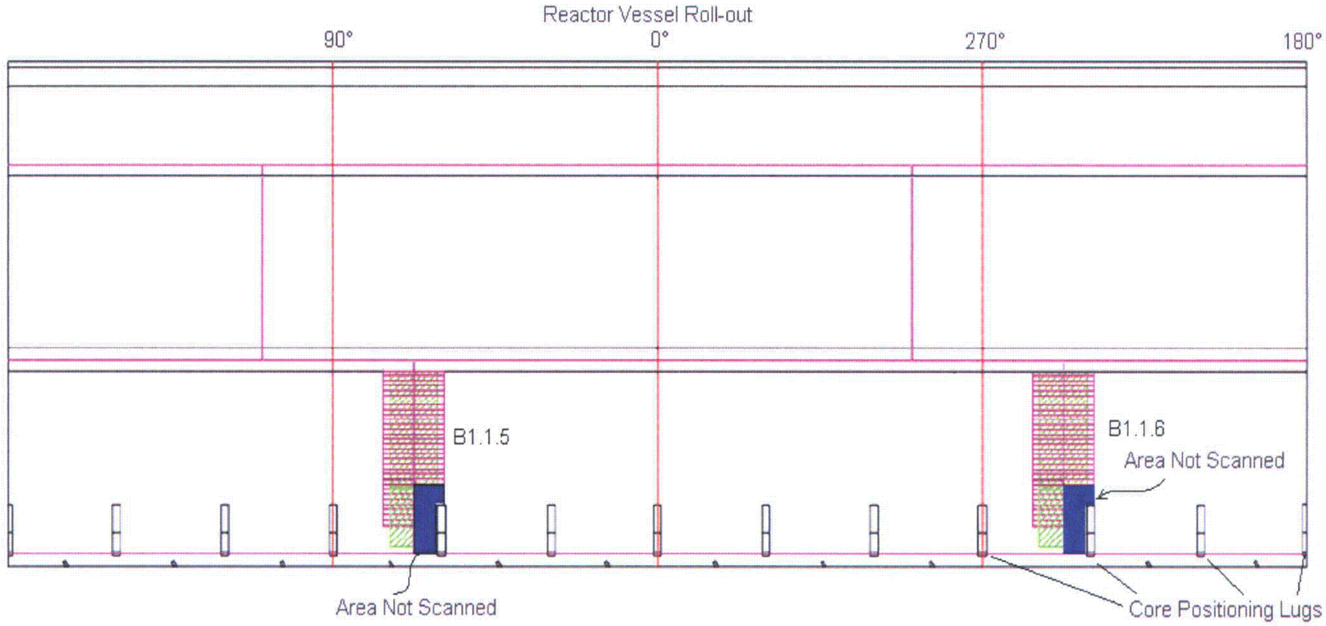


Figure 33

The scan limitaitons are detailed by the solid areas shown above. The cross hatched areas represent the total scan area for the subject welds.

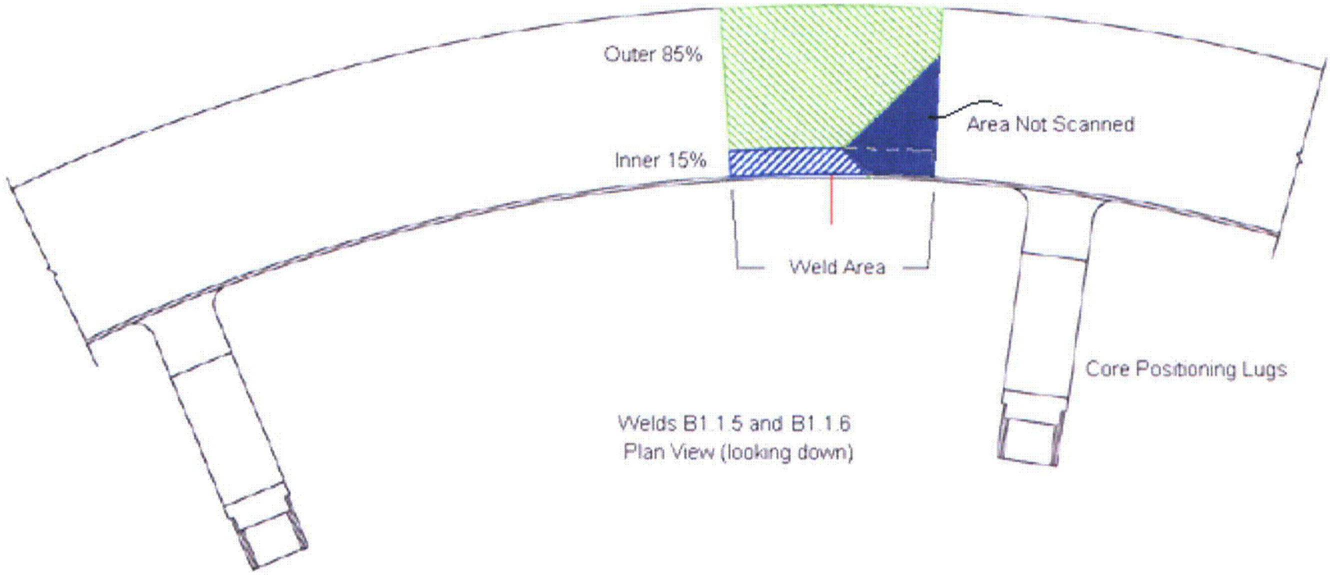


Figure 34

Solid color represents the limited scan area

2.7 <u>Request for Relief 09-003-II, Part B, Examination Category B-D, Item B3.90, RPV Nozzle-to-Vessel Welds</u>

2.7.1 In Attachment B of Enclosure 3, the licensee has included several sketches and tables with volumetric coverage percentages at different angle beam orientations. However, the sketches included are of poor quality and generally unclear, and do not adequately demonstrate impracticality and volumetric coverage(s) achieved. Please clearly describe volume coverage for each of the ultrasonic angles applied, and include dimensions, materials for the base metal and weld, and scanning directions. Please submit and refer to the cross-sectional drawings, if needed for providing the above clarification. Also, discuss whether alternative methods or advanced technologies could be employed to maximize ASME Code coverage.

<u>RESPONSE</u>

<u>Components B1.4.7A and B1.4.8A, Reactor Pressure Vessel Outlet Nozzle to Shell Welds</u>

The Reactor Pressure Vessel Outlet Nozzle to Shell Welds, B1.4.7A and B1.4.8A, are limited by the geometry of the nozzles for the inner 15% examination from the inside diameter of the Reactor Pressure Vessel, only. The nozzle base metal and welds are carbon steel. The nozzles also have a stainless steel cladding on the inside diameter. The outer 85% of the Code required volume was examined 100% from the bore of the nozzle. Welds B1.4.7A and B1.4.8A were scanned using 45° and 70° longitudinal waves for the inner 15% and 15° longitudinal and 45°shear waves for the outer 85% of the weld volume. The welds were examined in two radial and two circumferential directions. The total coverage of the Code Required Volume was 69.8% and was calculated using an aggregate of all scans.

The boss extension limits the circumferential scan coverage (Figures 35, 36 and 37, bottom). However, 100% of the required weld volume and adjacent base material has received two axial angle beam scans from the nozzle bore. The scan limitation is a physical limitation which would also impact alternative methods or advanced technologies. Radiography as an alternative is not feasible because access is not available for film placement. No alternative examinations or advanced technologies were considered capable of maximizing ASME code coverage further for the weld during the current inspection interval.

Complete redesign of the nozzles would be needed to provide enough clearance so the welds could be examined. Such a re-design is impractical for an installed reactor vessel.

Design Detail of the Outlet Nozzles

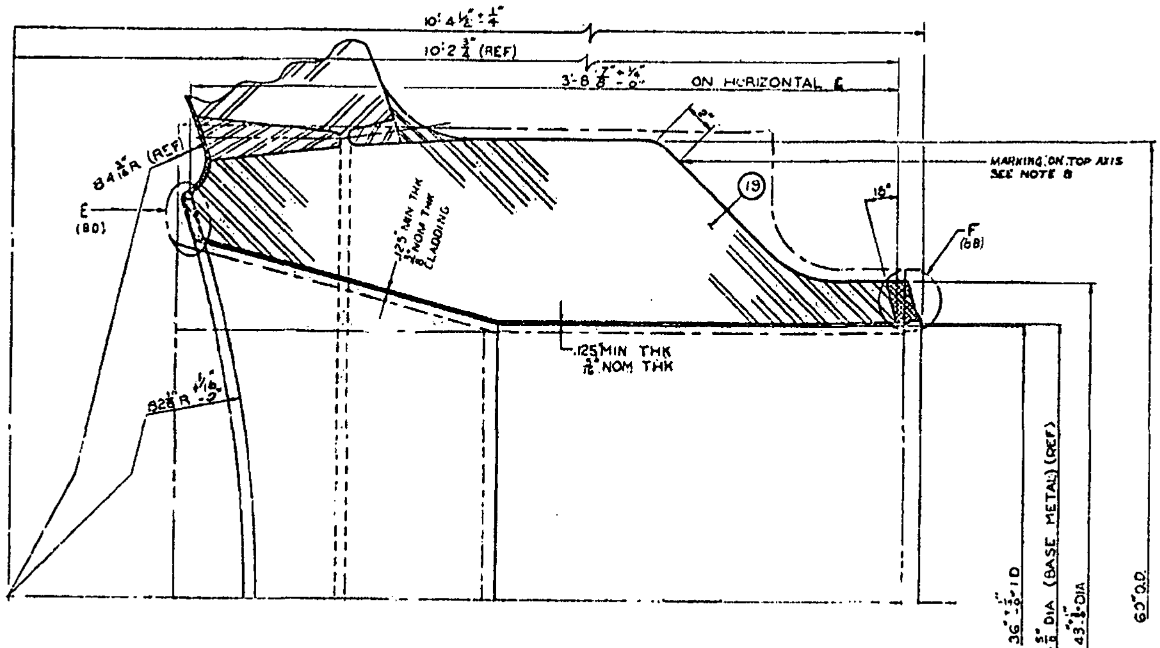
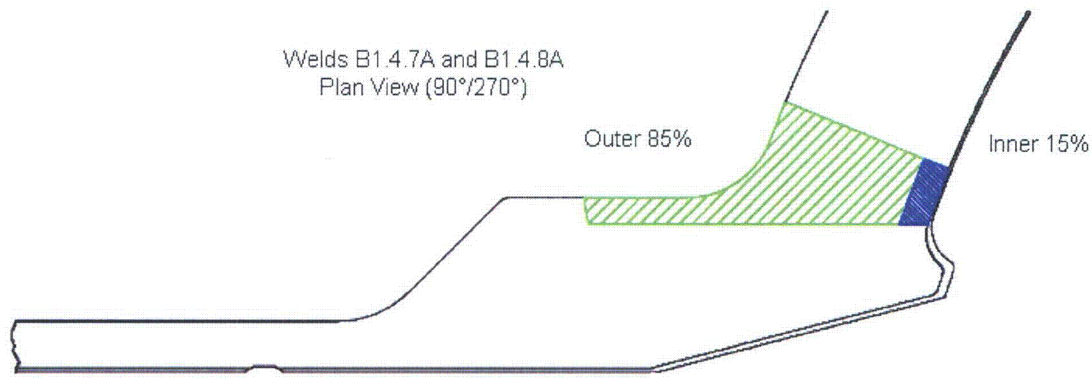


Figure 35

The nozzle boss is labeled as "E" above.



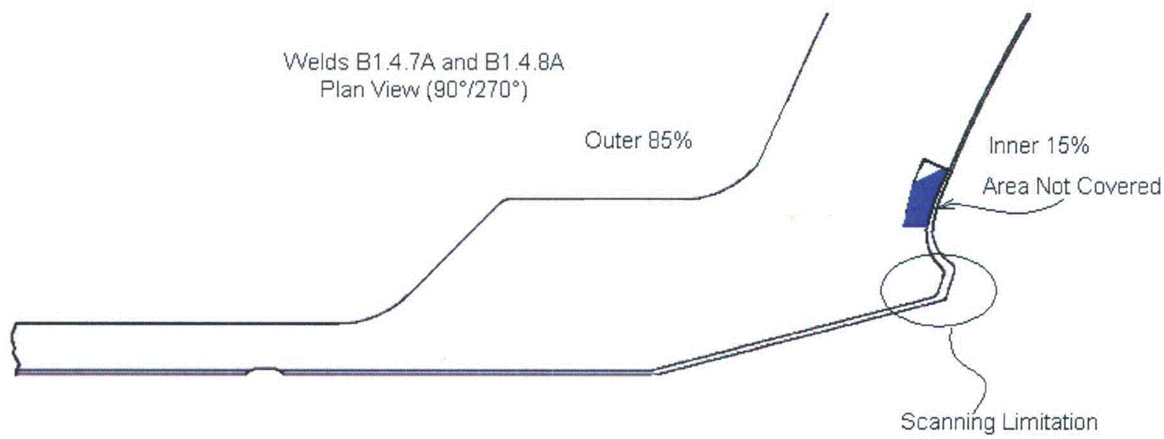


Figure 36

The top view shows the weld coverage area, as detailed by cross hatch. The bottom view shows the area not covered due to the scanning limitation, caused by nozzle boss extension.

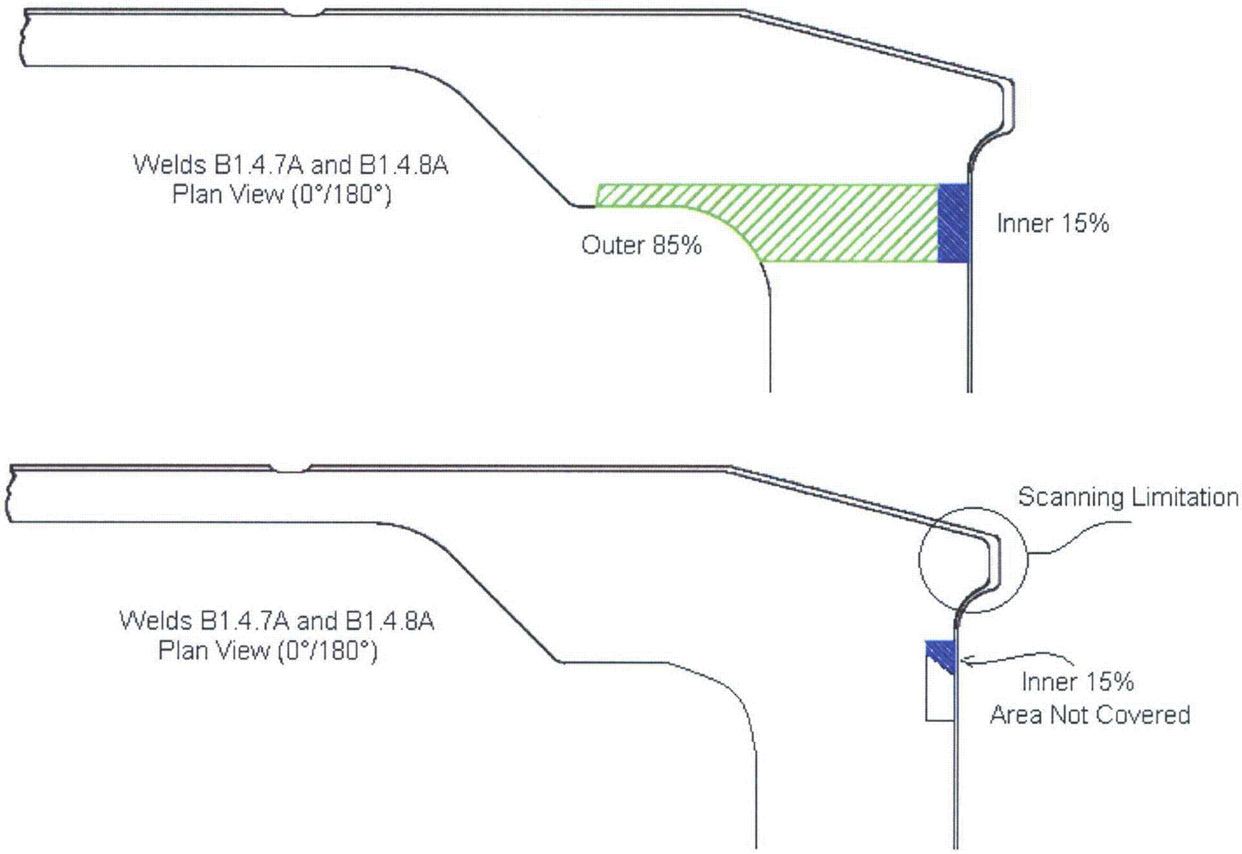


Figure 37

The top view shows the weld coverage area, as detailed by cross hatch. The bottom view shows the area not covered due to the scanning limitation, caused by nozzle boss extension.