Exelon Generation Company, LLC
Byron Station
4450 North German Church Road
Byron, IL 61010-9794

www.exeloncorp.com

Exelon Nuclear

10 CFR 50.55a

January 12, 2007

LTR: BYRON 2007-0006
File: 1.10.0101

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

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. 50-454 and 50-455

Subject: Inservice Inspection Program Second Interval Relief Requests I2R-21, I2R-22, I2R-23, I2R-25 and I2R-53

In accordance with 10 CFR 50.55a, "Codes and standards," paragraph (g)(5)(iv), Exelon Generation Company, LLC (EGC), is submitting five requests for relief due to impracticality of satisfying the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." The relief requests are associated with the second interval, which ended January 15, 2006.

The relief requests are based on limitations that precluded full code examination requirements of ASME Class 1 and 2 welds during the second interval. Code examination of the welds is limited due to materials of construction and design configurations.

Should you have any questions concerning this submittal, please contact William Grundmann at 815 406-2800.

Respectfully,

David M. Hoots
Site Vice President
Byron Nuclear Generating Station

DMH\JEL\rah

Enclosures:

1. Byron Station Second Interval Relief Request I2R-21
2. Byron Station Second Interval Relief Request I2R-22
3. Byron Station Second Interval Relief Request I2R-23
4. Byron Station Second Interval Relief Request I2R-25
5. Byron Station Second Interval Relief Request I2R-53

Enclosure 1

Byron Station Second Interval

Relief Request I2R-21

10 CFR 50.55a RELIEF REQUEST I2R-21
Revision 0

Request for Relief for Alternative Rules for the Inservice Inspection of Inaccessible Pressurizer Seismic Restraint Integral Attachment Welds In Accordance with 10 CFR 50.55a(g)(5)(iii)

1. **ASME CODE COMPONENT(S) AFFECTED:**

Code Class:	1
Reference:	IWB-2500-1
Examination Category:	B-K
Item Number:	B10.10
Description:	Alternate Rules for the Inservice Inspection of the Pressurizer Seismic Lug Welds.
Component Numbers:	1RY-01-S, PSL-1, PSL-2, PSL-3, and PSL-4 2RY-01-S, PSL-1, PSL-2, PSL-3, and PSL-4

2. **APPLICABLE CODE EDITION AND ADDENDA:**

The current Inservice Inspection program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 Edition with no Addenda.

3. **APPLICABLE CODE REQUIREMENTS:**

Subsection IWB, Table IWB-2500-1, Examination Category B-K, Item B10.10 requires surface examination of Integrally Welded Attachments to the Pressurizer, Figure IWB-2500-15. Component category and item number designations used in this request for relief are taken from Code Case N-509 that was approved for use by Regulatory Guide 1.147.

4. **IMPRACTICALITY OF COMPLIANCE:**

Pursuant to 10CFR50.55a(g)(5)(iii), conformance with these code requirements is impractical. Relief is requested from the surface examination coverage requirements of Figure IWC-2500-15.

10 CFR 50.55a(g)(4) states; "Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2 and Class 3 must meet the requirements ... set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code and Addenda ... to the extent practical within the limitations of design, geometry and materials of construction of the components." The geometry and design of the piping penetration attachment welds result in limited access to the entire examination surface. The limiting factor in the examination is the minimum access to the entire surface around each of the seismic restraining lugs.

Byron Units 1 and 2 Pressurizer seismic lugs are welded to the Pressurizer shell. There are four seismic lugs per vessel, located 90° apart (see Figure 1). These restraints are designed to resist rotational and translational movements by providing lateral support during a seismic event (Byron/Braidwood UFSAR, Section 3.9.3.4.1.2). During normal operations, the seismic lugs are under no load.

In order to perform examinations on the seismic lug welds, the outside surface of the lower vessel shell to lug area must be accessible. The entire exam surface is not accessible since it is covered by the seismic lug restraint and lower Pressurizer shell insulation. In addition, the configuration of the Pressurizer coffin limits access to the seismic lugs. The impact of removing the seismic lug restraint, altering the Pressurizer coffin, and removing the lower shell insulation is presented below.

The seismic lug restraint (see Figure 2), which surrounds the lug, prohibits access needed to perform a meaningful surface exam. There are four restraints located at about the 428' elevation, one for each lug, which were not designed for removal. The top of the concrete floor at this location is at the 428' elevation.

Insulation on the lower shell of the Pressurizer prohibits access needed to perform a meaningful surface examination of the seismic lug weld areas. The removal of the insulation covering the lower Pressurizer shell to seismic lug area will result in high radiation dose to plant personnel. Access from below would require scaffolding from the 401' elevation grating to the 428' elevation of the seismic restraint. To remove the Pressurizer shell insulation, access would be required from both sides. As stated above, access to the top of three of the seismic lugs restraints is limited by the Pressurizer coffin configuration (see Figure 1) and the concrete floor will limit access from the bottom of all four lugs (see Figure 2). The current configuration of the seismic restraint also only allows limited access for surface examination. To provide suitable access for all four seismic lug restraints would require major modifications and significant resources.

Even if the insulation is removed, a full surface examination of the seismic lugs cannot be achieved. The Pressurizer coffin, concrete floor, and seismic restraint geometry would greatly limit access to all sides. The resulting coverage would only be a small percentage of the necessary weld surface. The limited data obtained from these examinations do not provide a compensatory increase in quality and safety to justify the hazards of personnel radiation exposure to obtain the data.

Full removal of the insulation would only be possible with the construction of a 20' scaffold 360° around the pressurizer. The ring of insulation at the level of the top surface of the 428' elevation concrete platform and below is overlapped by and riveted to the ring below. These two insulation rings would have to be removed before limited access to the lower surface of the lugs can be achieved. This access would be limited by the narrow distance between the pressurizer and the attachment plate and the bottom of the lug and the bottom of floor at 428' elevation (see Figure 2, View B-B). The floor, which is 2'-6" thick, limits access and places the lug beyond reach from below.

During the Unit 1 B1R12 and the Unit 2 B2R12 outages, attempts were made to perform a surface examination of the seismic lugs. The extent of the coverage obtained is shown in Figure 3. The coverage achieved was limited by the restraint, floor, and the amount of insulation that could be removed.

5. BURDEN CAUSED BY COMPLIANCE:

Current examination techniques are not capable of achieving the required examination surface entirely around each seismic restraint lug. Access could only be gained by a complete redesign and modification of the embed plates, the surrounding floor, and the seismic lugs. All of the restraint plates, which are embedded in the concrete, would require major modification to the existing Pressurizer coffin to allow for removal and access. This modification would require the redesign of the seismic restraint and Pressurizer coffin to allow for periodic removal and access to

the seismic restraints. Implementation of this redesign would require significant engineering resources, construction resources, and significant dose to plant personnel. See Attachment 1 for the dose and work estimates.

To perform this modification to achieve the necessary access would be a prohibitive option. The limitation caused by the configuration is inherent in the design of the vessel lug and placement inside the containment building.

6. PROPOSED ALTERNATIVE AND BASIS FOR USE:

For the Second Inspection Interval, the following examinations were performed:

As a minimum, a surface (PT) examination of all accessible portions of the upper surface of the restraint lugs has been performed to the extent achievable. This examination was performed with the lower insulation panels in place.

This exam along with the periodic VT-2 examinations in accordance with the requirements of ASME Section XI, Table IWB-2500-1, Examination Category B-P, and applicable reactor coolant systems monitoring requirements specified in the Technical Specifications, has provided reasonable assurance of continued structural integrity of the Pressurizer shell and seismic lugs.

7. DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the Second Inspection Interval for Byron Units 1 and 2.

8. PRECEDENTS:

Braidwood; Approval of Relief Requests for 2nd 10-Year Interval, January 6, 2000 (ML003673725).

9. ATTACHMENTS:

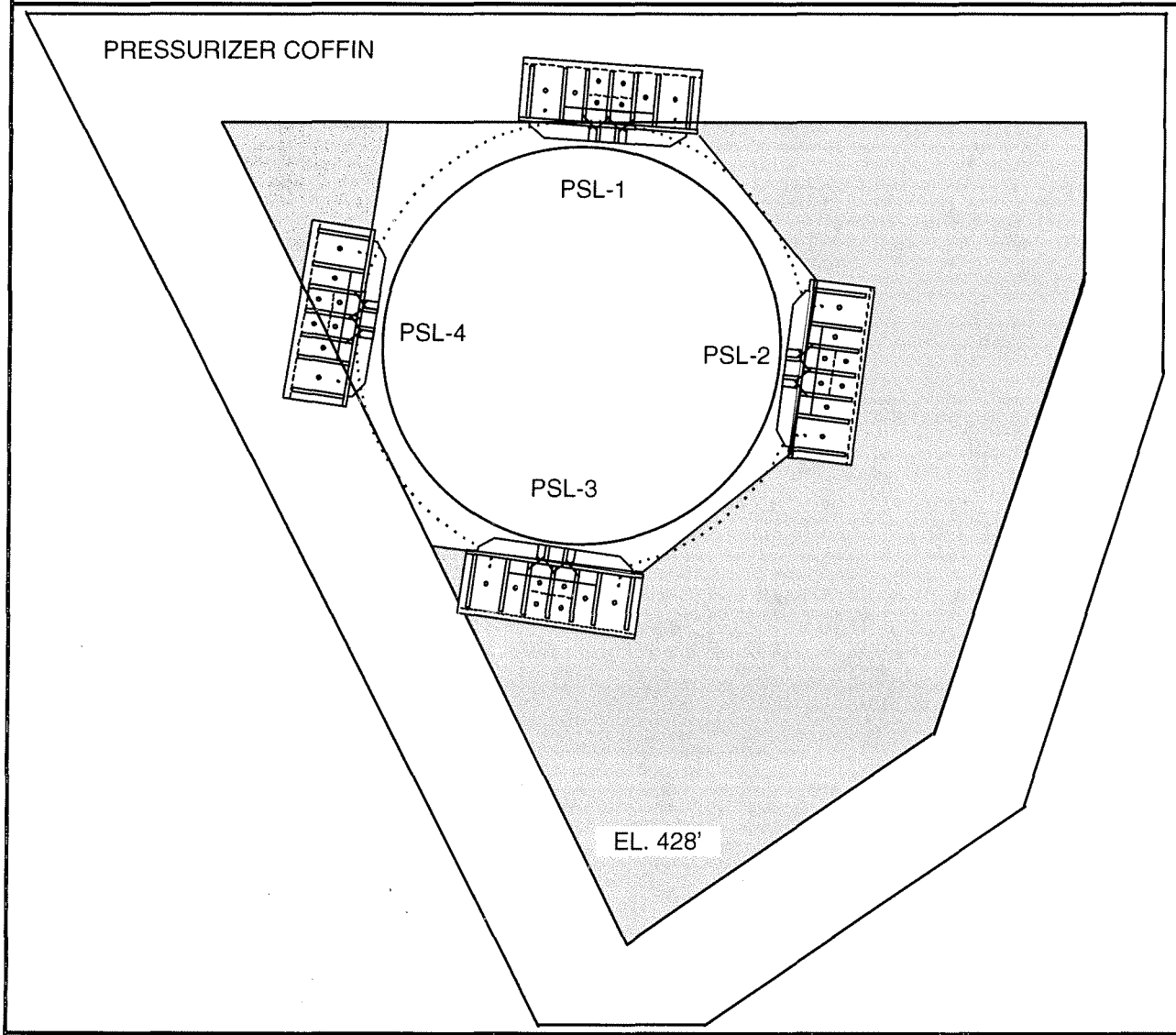
Figure 1: Plan at Elevation 428'

Figure 2: Pressurizer Seismic Restraint Details

Figure 3: Surface Examination Coverage Obtained

Attachment 1: Estimated Man Hours and Dose

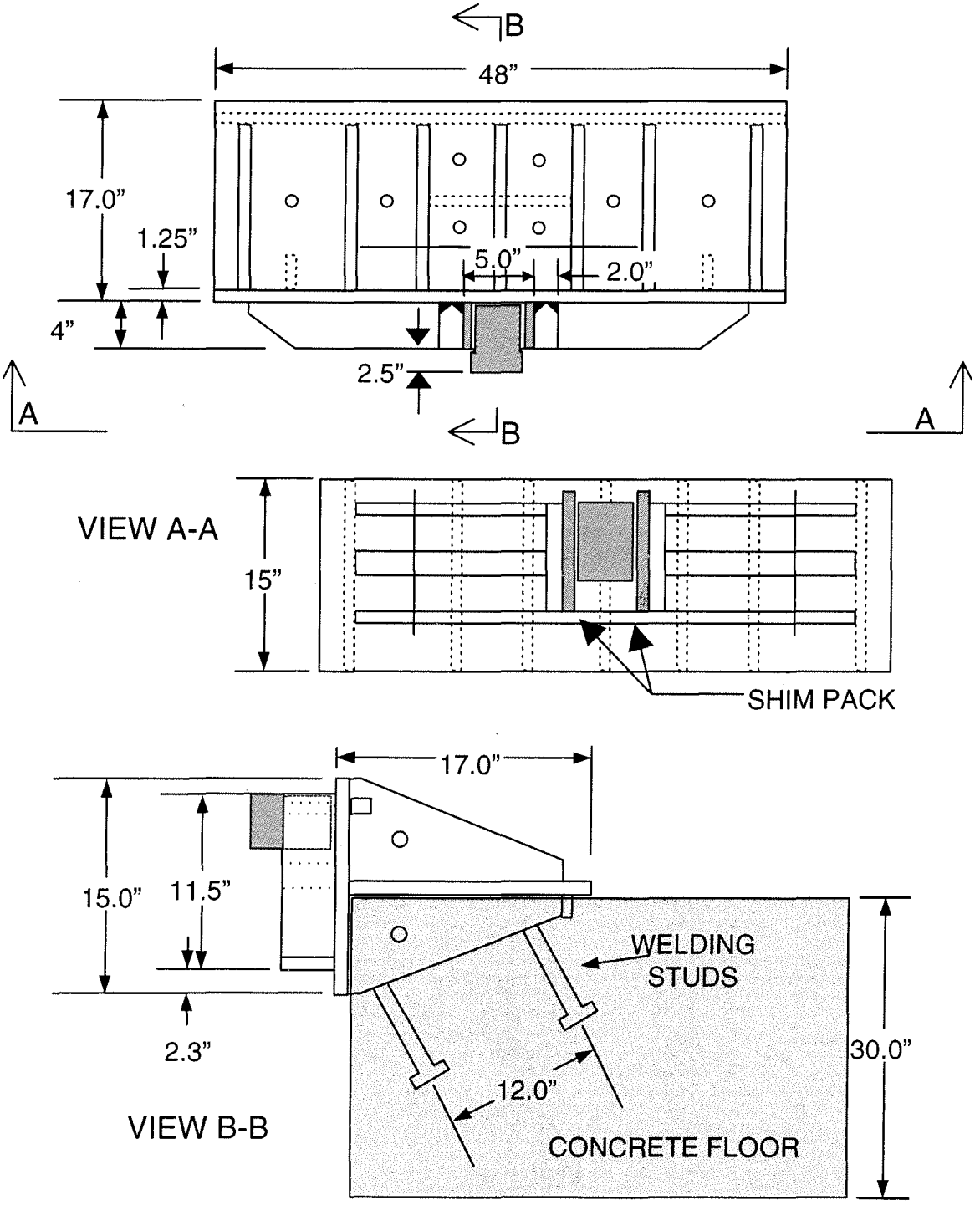
Figure 1: Plan at Elevation 428'



General Pressurizer Arrangement (Drawing not to scale)
UNIT 1 AS SHOWN, UNIT 2 REVERSED

10 CFR 50.55a RELIEF REQUEST I2R-21
Revision 0
(Page 5 of 7)

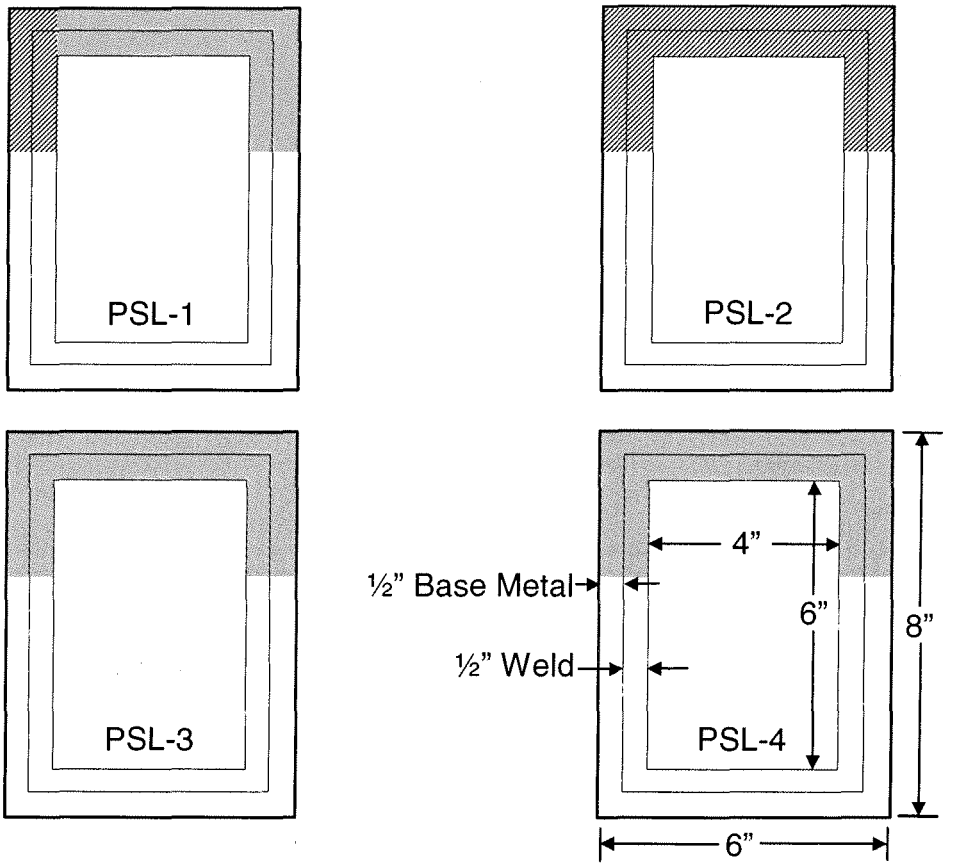
Figure 2: Pressurizer Seismic Restraint Details



(Drawing not to scale)

10 CFR 50.55a RELIEF REQUEST I2R-21
Revision 0
(Page 6 of 7)

Figure 3: Surface Examination Coverage Obtained



Total Required per Lug: 28" Perimeter (112" total for 4 lugs)

(Drawing not to scale)

Support Lug	B1R12		B2R12	
	Perimeter Length Examined	Percentage Examined	Perimeter Length Examined	Percentage Examined
PSL-1	6"	21.4%	7"	25.0%
PSL-2	12"	42.9%	0"	0.0%
PSL-3	6"	21.4%	12"	42.9%
PSL-4	0"	0.0%	12"	42.9%
Total Achieved	**24"**	**21.4%**	**31"**	**27.7%**
Report #	2003-379		B2R12-PT-006	

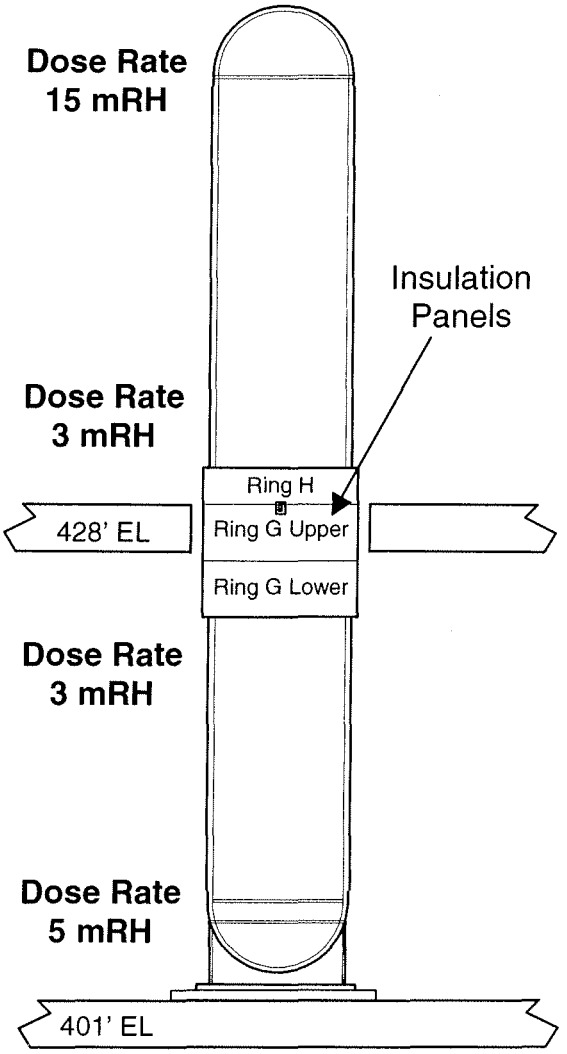
10 CFR 50.55a RELIEF REQUEST I2R-21
Revision 0
(Page 7 of 7)

Attachment 1: Estimated Man Hours and Dose

Estimates provided by the support organizations.
Dose rates established by RP survey #96-3105 on 9/11/96

TASK	PERSON-HOURS
Carpenters	160
Labors	120
Insulators	280
Inspectors	10
TOTAL	**570**

PERSONNEL	DOSE RATE	TOTAL DOSE
Carpenters	5 mRH	800 mR
Labors	3 mRH	360 mR
Insulators	3 mRH	840 mR
Inspectors	3 mRH	30 mR
TOTAL		**2030 mR**



Enclosure 2

Byron Station Second Interval

Relief Request I2R-22

10 CFR 50.55a RELIEF REQUEST I2R-22
Revision 0

Request for Relief for Alternative Rules for the Inservice Inspection of Inaccessible Welds on Welded Penetration Integral Attachments In Accordance with 10 CFR 50.55a(g)(5)(iii)

---

1. **ASME CODE COMPONENT(S) AFFECTED:**

Code Class:	2
Reference:	IWC-2500-1
Examination Category:	C-C
Item Numbers:	C3.20
Description:	Alternative Rules for the Inservice Inspection of Inaccessible Welds on Welded Penetration Integral Attachments
Component Number(s):	See Table 1 for component listings.
Component Drawings:	Mechanical Drawing M-197 Series for Containment Penetrations Mechanical Drawing M-521 Series for Auxiliary Building Penetrations

2. **APPLICABLE CODE EDITION AND ADDENDA:**

The current Inservice Inspection program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 Edition with no Addenda.

3. **APPLICABLE CODE REQUIREMENTS:**

Subsection IWC, Table IWC-2500-1, Examination Category C-C, Item C3.20 requires surface examination of the Integrally Welded Attachments to Piping.

4. **IMPRACTICALITY OF COMPLIANCE:**

Pursuant to 10CFR50.55a(g)(5)(iii), conformance with these code requirements is impractical. Relief is requested from the surface examination coverage requirements of Figure IWC-2500-5(a).

10 CFR 50.55a(g)(4) states; "Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2 and Class 3 must meet the requirements ... set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code and Addenda ... to the extent practical within the limitations of design, geometry and materials of construction of the components." The geometry and design of the piping penetration attachment welds result in limited access to the entire examination surface.

The two limiting factors in the examination of the inner portion of the attachment welds are as follows:

a) The minimum access to the inside surface of an assembled penetration (component geometry), and

b) Attachment welds or closure plate configuration (component design).

10 CFR 50.55a RELIEF REQUEST I2R-22
Revision 0

Some penetrations at Byron were originally designed where one of the integral attachment welds is inside the penetration assembly, thus making the welds inaccessible for inservice inspection. Access from outside of the closed end of the penetration assembly for examination is prohibited by the integral attachment. Access from the open end of the penetration is severely restrained due to the penetration geometry. See Figures 1 and 2 for penetration details. The integral attachment weld is set back some distance inside the penetration assembly and the clearance between the pipe and penetration sleeve is small. See Table 1 for these dimensions.

To satisfy the Code requirement to perform a surface examination of this weld, modification to the penetration assembly and/or piping to allow access would be required. Byron would incur significant engineering and installation costs to perform such a modification without a compensating increase in the level of quality and safety to justify such modifications.

The limited access to these welds, as described in this relief request, was later acknowledged in later editions of the ASME Code. Subarticle IWC-1200 exempts from examination welds or portions of welds that are located inside a penetration.

5. BURDEN CAUSED BY COMPLIANCE:

Current examination techniques available for field use are not capable of achieving the required examination surface on the inside of the various penetrations. To replace all the existing penetration assemblies to achieve access to the inside surface would be a prohibitive option. The limitation caused by the configuration is inherent in the design of piping penetrations.

6. PROPOSED ALTERNATIVE AND BASIS FOR USE:

When a weld was scheduled for inspection, a surface examination of the accessible weld on the exposed outside surface of the penetration was performed. In conjunction with the surface examination, the periodic VT-2 examinations in accordance with the requirements of ASME Section XI, Table IWC-2500-1, Examination Category C-H will provide reasonable assurance of continued structural integrity of the piping systems.

7. DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the Second Inspection Interval for Byron Units 1 and 2.

8. PRECEDENTS:

Similar relief requests have been granted to:

Salem, Unit 1, Relief, ASME Code Requirements Related to the Salem Inservice Inspection Program, Relief Request S1-RR-B01 and S1-RR-C01 January 16, 2003 (ML030160750).

Dresden, Units 2 & 3, Relief Request CR-24 for Third 10-Year Inservice Inspection Interval, January 8, 2003 (ML023610374)

H. B. Robinson Steam Electric Plant, Unit 2, Third 10-Year Interval Inservice Inspection Program Plan Request for Relief No. 34 September 29, 2004 (ML042740082)

Surry Unit 1, Relief Request, re: ASME Section XI ISI on Partial Examination September 28, 2005 (ML052690317)

10 CFR 50.55a RELIEF REQUEST I2R-22
Revision 0

9. ATTACHMENTS:

Table 1: Unit 1 & Unit 2 Penetrations Subject to Examination during 2nd Inspection Interval

Figure 1: Typical Containment Penetrations

Figure 2: Typical Auxiliary Building Penetrations

10 CFR 50.55a RELIEF REQUEST I2R-22
Revision 0

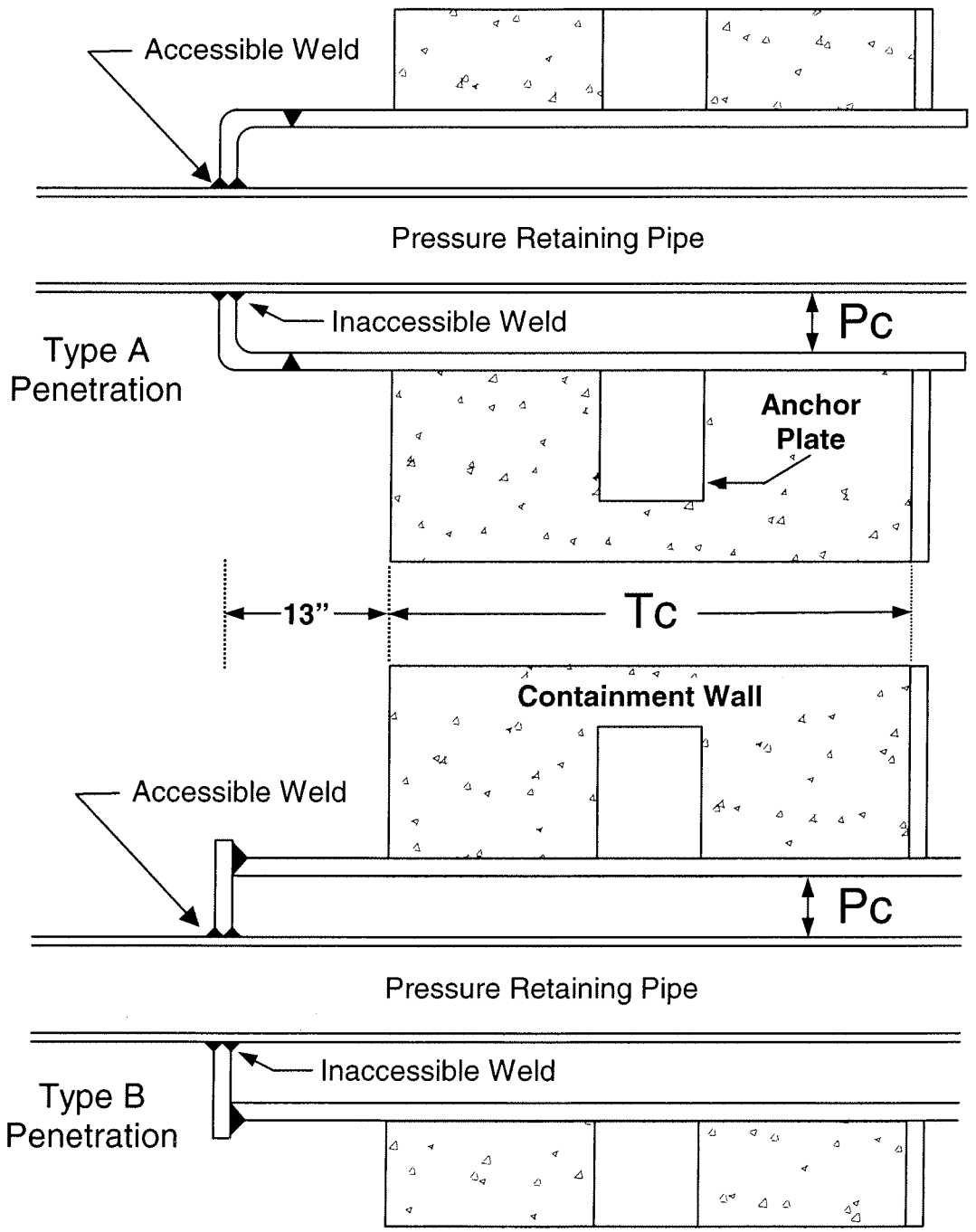
TABLE 1: Unit 1 & 2 Penetrations Subject to Examination during 2nd Inspection Interval

PEN. TYPE	PEN. NUMBER	ISI IDENTIFICATION		DRAWING NUMBER	PIPE THICK (T_P)	ATT. THICK (T_A)	WALL THICK (T_C)	PEN. SIZE	PEN. CLEAR. (P_C)	SELECTED FOR EXAM
		LINE	WELD							
A	1PC-7	1SX06BB-16"	C10A	1SX-04	0.375"	2"	3' - 6"	30"Ø	6.5"	X
A	1PC-9	1SX07FB-16"	C12A	1SX-07	0.375"	2"	3' - 6"	30"Ø	6.5"	
A	1PC-14	1SX07FA-16"	C11A	1SX-10	0.375"	2"	3' - 6"	30"Ø	6.5"	X
A	1PC-15	1SX06BA-16"	C01A	1SX-01	0.375"	2"	3' - 6"	30"Ø	6.5"	
A	1PC-66	1SI04B-12"	C15	1SI-12	1.125"	2"	3' - 6"	24"Ø	4.9"	
A	1PC-68	1RH01BA-12"	C03	1RH-04	0.375"	2"	3' - 6"	24"Ø	4.9"	X
A	1PC-75	1RH01BB-12"	C03	1RH-08	0.375"	2"	3' - 6"	24"Ø	4.9"	
B	1AB-111	1RH03AA-8"	C33	1RH-03	0.322"	1"	3' - 0"	18"Ø	4.3"	
B	1AB-115	1RH03AB-8"	C52	1RH-07	0.322"	1"	3' - 0"	18"Ø	4.3"	
B	1PC-50	1SI05BA-8"	C01A	1SI-04	0.906"	2"	3' - 6"	24"Ø	7.0"	X
B	1PC-51	1SI05BB-8"	C01A	1SI-26	0.906"	2"	3' - 6"	24"Ø	7.0"	
C	1AB-64	1RH02AA-8"	C20	1RH-05	0.322"	1"	3' - 0"	28"Ø	5.0"	X
C	1AB-74	1RH02AB-8"	C25	1RH-09	0.322"	1"	3' - 0"	26"Ø	5.0"	
A	2PC-7	2SX06BB-16"	C01A	2SX-04	0.375"	2"	3' - 6"	30"Ø	6.5"	X
A	2PC-9	2SX07FB-16"	C12A	2SX-07	0.375"	2"	3' - 6"	30"Ø	6.5"	
A	2PC-14	2SX07FA-16"	C10A	2SX-10	0.375"	2"	3' - 6"	30"Ø	6.5"	X
A	2PC-15	2SX06BA-16"	C01A	2SX-01	0.375"	2"	3' - 6"	30"Ø	6.5"	
A	2PC-66	2SI04B-12"	C02	2SI-12	1.125"	2"	3' - 6"	24"Ø	4.9"	X
A	2PC-68	2RH01BA-12"	C03	2RH-12	0.375"	2"	3' - 6"	24"Ø	4.9"	
A	2PC-75	2RH01BB-12"	C03	2RH-11	0.375"	2"	3' - 6"	24"Ø	4.9"	
B	2AB-128	2RH03AA-8"	C49	2RH-10	0.322"	1¼"	3' - 0"	18"Ø	4.3"	X
B	2AB-133	2RH03AB-8"	C51	2RH-07	0.322"	1¼"	3' - 0"	18"Ø	4.3"	
B	2PC-50	2SI05BA-8"	C02	2SI-04	0.906"	2"	3' - 6"	24"Ø	7.0"	X
B	2PC-51	2SI05BB-8"	C02	2SI-26	0.906"	2"	3' - 6"	24"Ø	7.0"	
B	2PC-99	2FW87CD-6"	C04	2FW-12	0.432"	2"	4' - 6"	16"Ø	3.8"	
B	2PC-100	2FW87CA-6"	C04	2FW-11	0.432"	2"	4' - 6"	16"Ø	3.8"	X
B	2PC-101	2FW87CB-6"	C04	2FW-06	0.432"	2"	4' - 6"	16"Ø	3.8"	
B	2PC-102	2FW87CC-6"	C04	2FW-10	0.432"	2"	4' - 6"	16"Ø	3.8"	
C	2AB-36	2RH02AA-8"	C47	2RH-05	0.322"	1"	3' - 0"	29"Ø	5.0"	X
C	2AB-68	2RH02AB-8"	C53	2RH-09	0.322"	1"	3' - 0"	26"Ø	5.0"	

Note: See Figures 1 and 2 for drawings of the penetration configurations.

10 CFR 50.55a RELIEF REQUEST I2R-22
Revision 0
(Page 5 of 6)

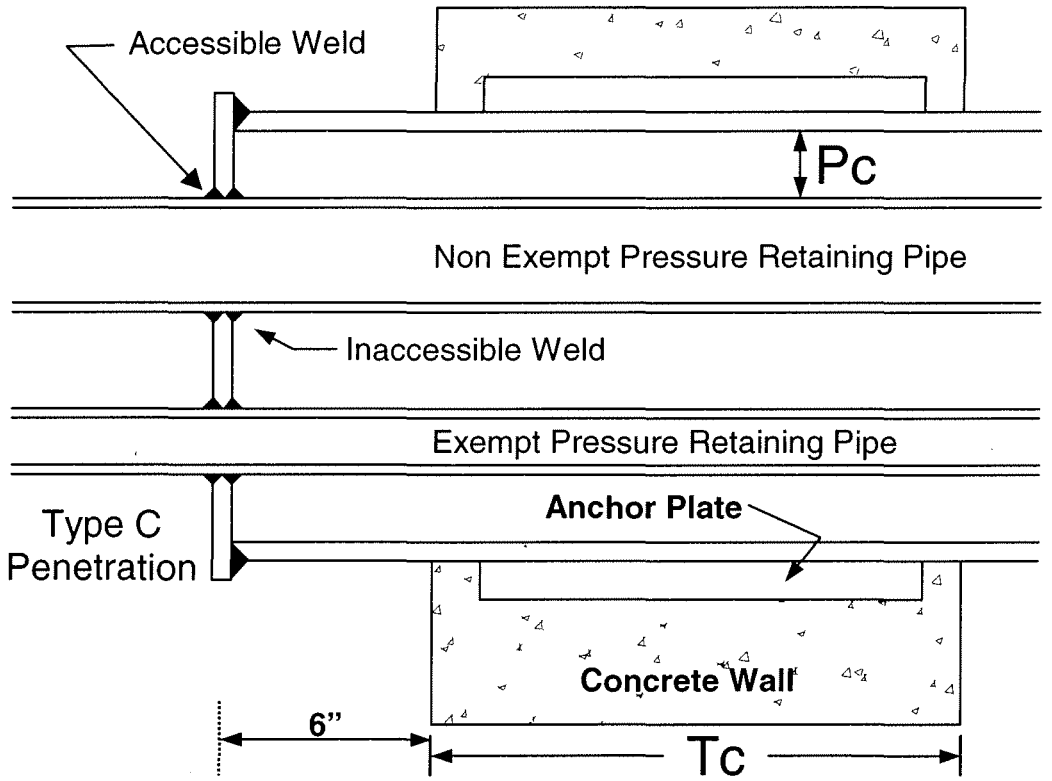
FIGURE 1: Typical Containment Penetrations



Note: See Table 1 for dimensions as applied to each penetration. (Drawing not to scale)

10 CFR 50.55a RELIEF REQUEST I2R-22
Revision 0
(Page 6 of 6)

FIGURE 2: Typical Auxiliary Building Penetrations



Note: See Table 1 for dimensions as applied to each penetration. (Drawing

Enclosure 3

Byron Station Second Interval

Relief Request I2R-23

10 CFR 50.55a RELIEF REQUEST I2R-23
Revision 0

Request for Relief from ASME Section XI Requirements for Limited Volumetric Examination of Pressurizer Nozzle to Vessel Welds In Accordance with 10 CFR 50.55a(g)(5)(iii)

---

1. ASME CODE COMPONENT(S) AFFECTED:

Code Class:	1
Reference:	IWB-2500-1
Examination Category:	B-D
Item Number:	B3.110
Description:	Limited Examinations on Pressurizer Spray, Safety, and Relief Nozzle-to-Vessel Welds
Component Numbers:	1RY-0-1S, PN-02, PN-03, PN-04, PN-05, and PN-06 2RY-0-1S, PN-02, PN-03, PN-04, PN-05, and PN-06
Drawing Numbers:	1PZR-1-ISI, Sheet 1 (Unit 1) 2PZR-1-ISI, Sheet 1 (Unit 2)

2. APPLICABLE CODE EDITION AND ADDENDA:

The current Inservice Inspection program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 Edition with no Addenda.

3. APPLICABLE CODE REQUIREMENTS:

ASME Section XI, 1989 Edition, Subsection IWB, Table IWB-2500-1, Examination Category B-D, Item B3.110 requires volumetric examination of full penetration nozzle-to-vessel welds (Figure IWB-2500-7(b)). ASME Section V, 1989 Edition, Article 4, has the following requirements for the examination of these components:

A. T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

B. T-441.3.2.5 Angle Beam Scanning: ... Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from opposite directions and parallel to the weld from opposite directions. ...

C. T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions ...

D. T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld: The angle beam search units shall be aimed parallel to the axis of the longitudinal and circumferential welds.

The search unit shall be manipulated so that the ultrasonic beams pass through all of the examination volume. Scanning shall be done in two directions 180° to each other to the extent possible. Areas blocked by geometric conditions shall be examined from at least one direction.

4. **IMPRACTICALITY OF COMPLIANCE:**

Relief is requested from the examination coverage requirements of Figure IWB-2500-7(b). 10 CFR 50.55a(g)(4) states; "Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2 and Class 3 must meet the requirements ... set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code and Addenda ... to the extent practical within the limitations of design, geometry and materials of construction of the components." The geometry and materials of construction of the subject pressurizer nozzles results in limited access to the entire examination volume. See Figures 1 and 2 for the nozzle configurations.

The two limiting factors in the scanning of these nozzles are as follows:

A. The minimum scanning surface available on the nozzle side of the weld (component geometry) and
B. The inability of the ultrasonic beam to reach beyond a ½V distance (due to the materials of construction).

The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surface and create two axis equivalent to two beams from opposite directions. This technique is not possible due to the stainless steel cladding on the inside of the vessel. The ultrasonic beam would not be completely reflected from the shell/clad interface. Most of the sound energy would be refracted through this layer and would be scattered as it reflected from the as welded clad inside surface. What sound energy reflected from the shell/clad interface would be of such low amplitude that it would be useless for examination purposes.

The current transducer sizes and designs available do not allow a significant portion of the examination volume to be scanned from the nozzle side. See Table 1 for the determination of actual coverage percentages achieved for each examination during the interval.

For B1R08, the coverage obtained from the examinations was calculated using methods developed by ComEd Corporate Systems, Materials Analysis Division (pre-Exelon organization). The required examination volume was divided into zones of base and weld material for the determination of coverage. These zones were assigned a percentage of coverage for each of nine scans for different angles and directions as required by ASME Section V. See Figure 3 for the examination volume required by ASME Section XI. The coverage obtained by each scan for each zone was averaged. Each zone received a weighting factor based on its total volume in relationship to the entire examination volume. This weighting factor is finally used to establish a single percentage of coverage for the nozzle as a whole. For later outages, the calculation method was simplified using vendor procedures and the scanning requirements for the weld zone were applied to the entire weld/base material volume. This later method resulted in a slightly lower coverage percentage than the more complicated initial method.

10 CFR 50.55a RELIEF REQUEST I2R-23
Revision 0

5. **BURDEN CAUSED BY COMPLIANCE:**

Pursuant to 10CFR50.55a(g)(5)(iii), conformance with these Code requirements is impractical, as conformance would require extensive structural modifications to the pressurizer vessel.

6. **PROPOSED ALTERNATIVE AND BASIS FOR USE:**

The Code required VT-2 examination during system pressure testing per Category B-P is performed on the Pressurizer each refueling outage to verify the continued structural integrity of these nozzle areas. The obstructed volumetric examination along with the VT-2 examinations will provide reasonable assurance of the continued structural integrity of the welds. Byron Station will perform the Code required volumetric examination of the Pressurizer nozzle welds to the maximum extent possible for current techniques.

7. **DURATION OF PROPOSED ALTERNATIVE:**

Relief is requested for the second inspection interval for Byron Units 1 and 2.

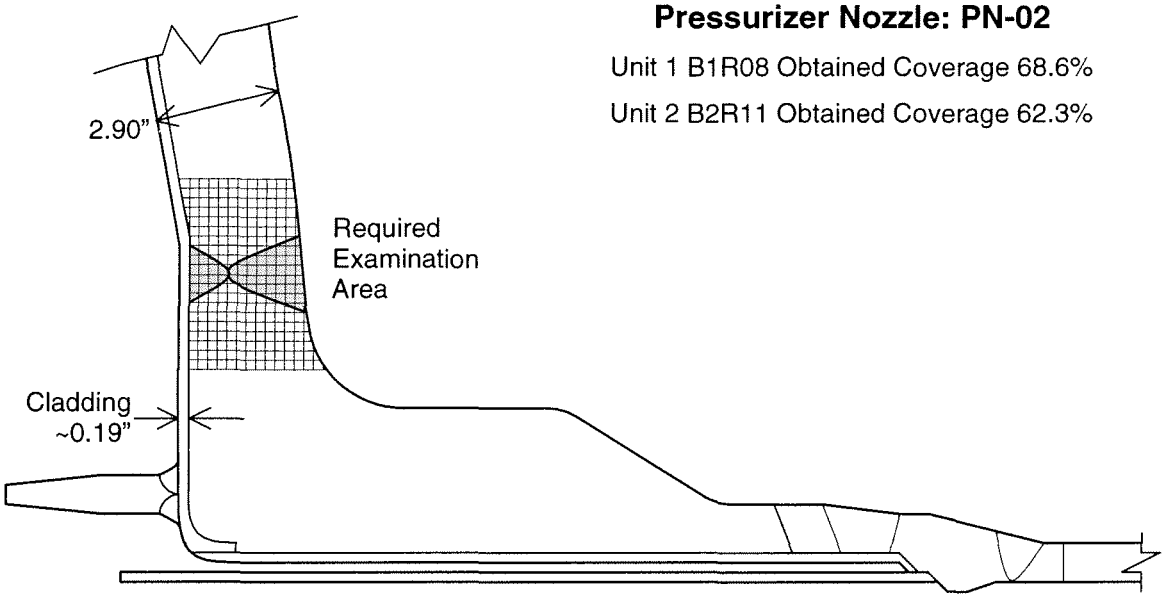
8. **PRECEDENTS:**

Second 10-Year Interval Inservice Inspection Program Plan Requests for Relief Nos. 2IR-1, 2IR-2, 2IR-4, 2IR-6, 2IR-10, 2IR-11, and 2IR-12 For Seabrook Station, Unit No. 1 authorized March 21, 2001 (ML010540162)

Calvert Cliffs Nuclear Power Plant, Units 1 and 2 - Evaluation of Request for Relief No. ISI-6 authorized July 7, 2001 (ML011860464).

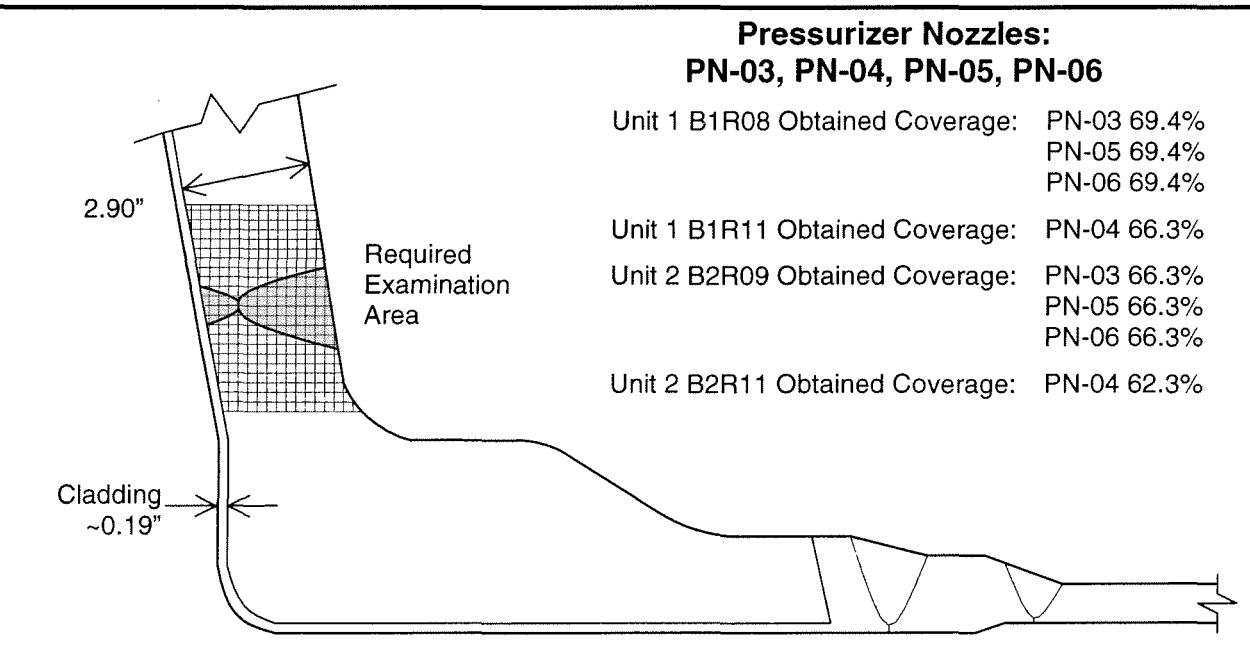
10 CFR 50.55a RELIEF REQUEST I2R-23
Revision 0

Figure 1: Pressurizer 84 Series Model D 4"Ø Spray Nozzle



Ref: Westinghouse Drawing EDSK379445 B (Drawing not to scale)

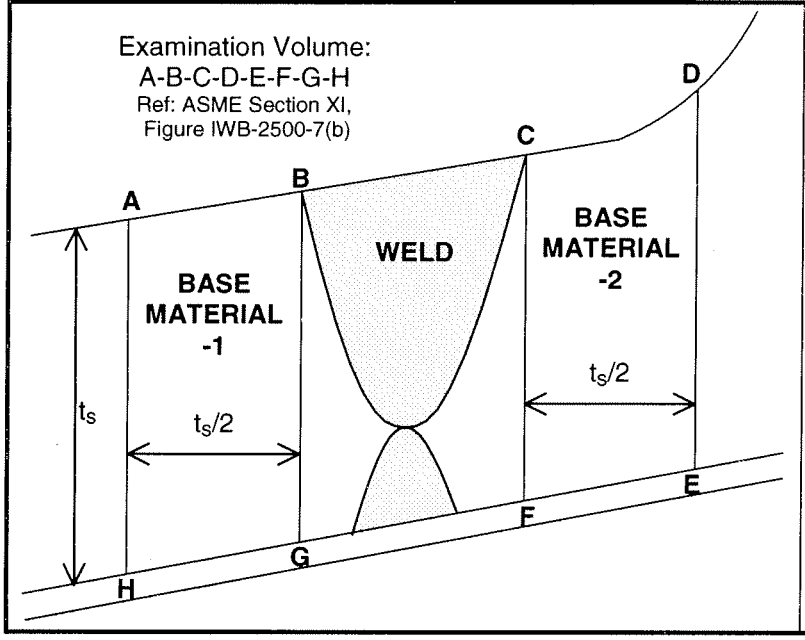
Figure 2: Pressurizer 84 Series Model D 6"Ø Safety and Relief Nozzles



Ref: Westinghouse Drawing EDSK379558 B (Drawing not to scale)

10 CFR 50.55a RELIEF REQUEST I2R-23
Revision 0
(Page 5 of 5)

Figure 3: Required Examination Volume



Minimum Scanning Requirements
(From ASME Section V, 1989 Edition)

Weld: B-C-F-G
Two beam angles from two directions in both the perpendicular and parallel axis to the weld.

Base Material: A-B-G-H and C-D-E-F
Two beam angles from one direction in both the perpendicular and parallel axis to the weld.

Where these requirements cannot be met due to component configuration, this shall be documented on the report.

(Drawing not to scale)

Table 1: Examination Coverage Obtained for Each Angle and Direction

OUTAGE	UNIT 1					UNIT 2	
	B1R08				B1R11	B2R09	B2R11
NOZZLE	PN-02		PN-03 PN-05 PN-06		PN-04	PN-03 PN-05 PN-06	PN-02 PN-04
SCAN TYPE & DIRECTION	BASE MATERIAL	WELD MATERIAL	BASE MATERIAL	WELD MATERIAL	BASE+WELD MATERIAL	BASE+WELD MATERIAL	BASE+WELD MATERIAL
0°	53.9%	100.0%	55.8%	100.0%	72.8%	72.8%	64.2%
45° Perpendicular Up	90.3%	100.0%	88.6%	100.0%	83.5%	83.5%	29.8%
45° Perpendicular Down		0.0%		0.0%	33.7%	33.7%	92.0%
45° Clockwise	53.9%	100.0%	55.8%	100.0%	72.8%	72.8%	64.2%
45° Counter-Clockwise	53.9%	100.0%	55.8%	100.0%	72.8%	72.8%	
60° Perpendicular Up	91.1%	100.0%	89.1%	100.0%	96.3%	96.3%	26.5%
60° Perpendicular Down		0.0%		0.0%	19.0%	19.0%	95.0%
60° Clockwise	53.9%	100.0%	55.8%	100.0%	72.8%	72.8%	64.2%
60° Counter-Clockwise	53.9%	100.0%	55.8%	100.0%	72.8%	72.8%	
AVERAGE COVERAGE	**64.4%**	**77.8%**	**65.2%**	**77.8%**	**66.3%**	**66.3%**	**62.3%**
WEIGHING FACTOR*	0.682	0.318	0.667	0.333	-	-	-
TOTAL COVERAGE	**68.7%**		**69.4%**		**66.3%**	**66.3%**	**62.3%**

*The weighing factor is the total volume of each area (weld and base material) in relationship to the entire examination volume.

Enclosure 4

Byron Station Second Interval

Relief Request I2R-25

10 CFR 50.55a RELIEF REQUEST I2R-25
Revision 0

Request for Relief from ASME Section XI Requirements for Limited Volumetric Examination of Reactor Pressure Vessel Head-to-Flange Weld
In Accordance with 10 CFR 50.55a(g)(5)(iii)

---

1. **ASME CODE COMPONENT(S) AFFECTED:**

Code Class:	1
References:	IWB-2500, Table IWB-2500-1
Examination Category:	B-A
Item Number:	B1.40
Component Numbers:	1RC-01R, RVHC-01 (Unit 1) 2RC-01R, RVHC-01 (Unit 2)
Drawing Numbers:	1RPV-1-ISI Sheet 3 (Unit 1) 2RPV-1-ISI Sheet 3 (Unit 2)

2. **APPLICABLE CODE EDITION AND ADDENDA:**

The current Inservice Inspection program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 Edition with no Addenda.

3. **APPLICABLE CODE REQUIREMENTS:**

ASME Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-A, Item B1.40, requires a surface and volumetric examination of essentially 100% of reactor vessel head-to-flange weld once each ten-year inspection interval (Figure IWB-2500-5). ASME Section V, 1989 Edition, Article 4, has the following requirements for the volumetric examination of these components:

A. T-441.3.2.4 Extent of Scanning: Wherever feasible, the scanning of the examination volume shall be carried out from both sides of the weld on the same surface. Where the configuration or adjacent parts of the component are such that scanning from both sides is not feasible, this fact shall be included in the report of the examination.

B. T-441.3.2.5 Angle Beam Scanning: ... Wherever feasible, each examination shall be performed in two directions, i.e., approaching the weld from opposite directions and parallel to the weld from opposite directions. ...

C. T-441.3.2.6 Scanning for Reflectors Oriented Parallel to the Weld: The angle beam search units shall be aimed at right angles to the weld axis, with the search unit manipulated so that the ultrasonic beams pass through the entire volume of weld metal. The adjacent base metal in the examination volume must be completely scanned by two angle beams, but need not be scanned by both angle beams from both directions ...

10 CFR 50.55a RELIEF REQUEST I2R-25
Revision 0
(Page 2 of 5)

4. IMPRACTICALITY OF COMPLIANCE:

Pursuant to 10CFR50.55a(g)(5)(iii), conformance with these code requirements is impractical. Relief is requested from the volumetric examination coverage requirements of Figure IWB-2500-5.

10 CFR 50.55a(g)(4) states; "Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2 and Class 3 must meet the requirements ... set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code and Addenda ... to the extent practical within the limitations of design, geometry and materials of construction of the components." The geometry and materials of construction of the reactor vessel head-to-flange weld results in limited access to the entire examination volume. See Figures 1 and 2 for the scanning obstructions.

The three limiting factors in the scanning of the head to flange weld are as follows:

A. The minimum scanning surface available on the flange side of the weld (component geometry),

B. The inability of the ultrasonic beam to reach beyond a ½V distance (component materials of construction), and

C. Obstructions on the head side of weld (component design).

The Reactor Vessel flange physically obstructs the ultrasonic transducer movement that is needed to examine the Code required volume from the flange side. Figure 1 shows the position of the weld and flange. The propagation for the ultrasonic beam was in the shear mode. Normally this mode would allow the ultrasonic beam to reflect off the inside surface and create two-beam axis at right angles to each other. This technique is not possible due to the stainless steel cladding on the inside of the vessel. The ultrasonic beam would not be completely reflected from the shell/clad interface. Most of the sound energy would be refracted through this layer and would be scattered as it reflected from the as welded clad inside surface. What sound energy reflected from the shell/clad interface would be of such low amplitude that it would be useless for examination purposes.

In addition to the flange, parts of the three large head lifting lugs also fall in the required scan area. A diagram of the transducer position for actual and required coverage is shown in Figure 2 illustrating the obstructed areas.

During B1R11 outage in the Spring of 2002, the Unit 1 head-to-flange weld was examined using volumetric and surface techniques. Calculations of the examination data estimated that 73.0% of the required Code volume was examined. The code required surface exam was also performed on the accessible areas and 100% of the code surface was achieved. The same examination results were obtained for the Unit 2 examination performed during B2R10 in the Fall of 2002.

5. BURDEN CAUSED BY COMPLIANCE:

Current ultrasonic examination techniques available for field use are not capable of achieving the required examination volume. To replace the reactor vessel head because of the unachieved volume would be a prohibitive option. The limitation caused by the configuration is inherent in the design of the reactor head.

10 CFR 50.55a RELIEF REQUEST I2R-25
Revision 0
(Page 3 of 5)

6. **PROPOSED ALTERNATIVE AND BASIS FOR USE:**

The obstructed volumetric examination, along with the surface examination, and the visual (VT-2) examinations that are performed every refuel outage will provide reasonable assurance of the continued structural integrity of the weld. Furthermore, past Preservice and First Interval examinations have revealed no recordable indications. Byron Station performed the Code required volumetric examination of the Reactor Vessel Head-to-Flange weld to the maximum extent possible for current techniques.

7. **DURATION OF PROPOSED ALTERNATIVE:**

Relief is requested for the Second Ten-Year Inspection Interval.

8. **PRECEDENTS:**

Similar relief requests have been granted to:

Braidwood; Approval of Relief Requests for 2nd 10-Year Interval, January 6, 2000 (ML003673725).

Second 10-Year Interval Inservice Inspection Program Plan Requests for Relief Nos. 2IR-1, 2IR-2, 2IR-4, 2IR-6, 2IR-10, 2IR-11, and 2IR-12 For Seabrook Station, Unit No. 1, March 21, 2001 (ML010540162).

Prairie Island, Unit 2, Relief, Evaluation of Relief Request No. 8 for the Third 10-Year Interval Inservice Inspection Program Plan, Limited Examination, August 8, 2000 (ML003738379).

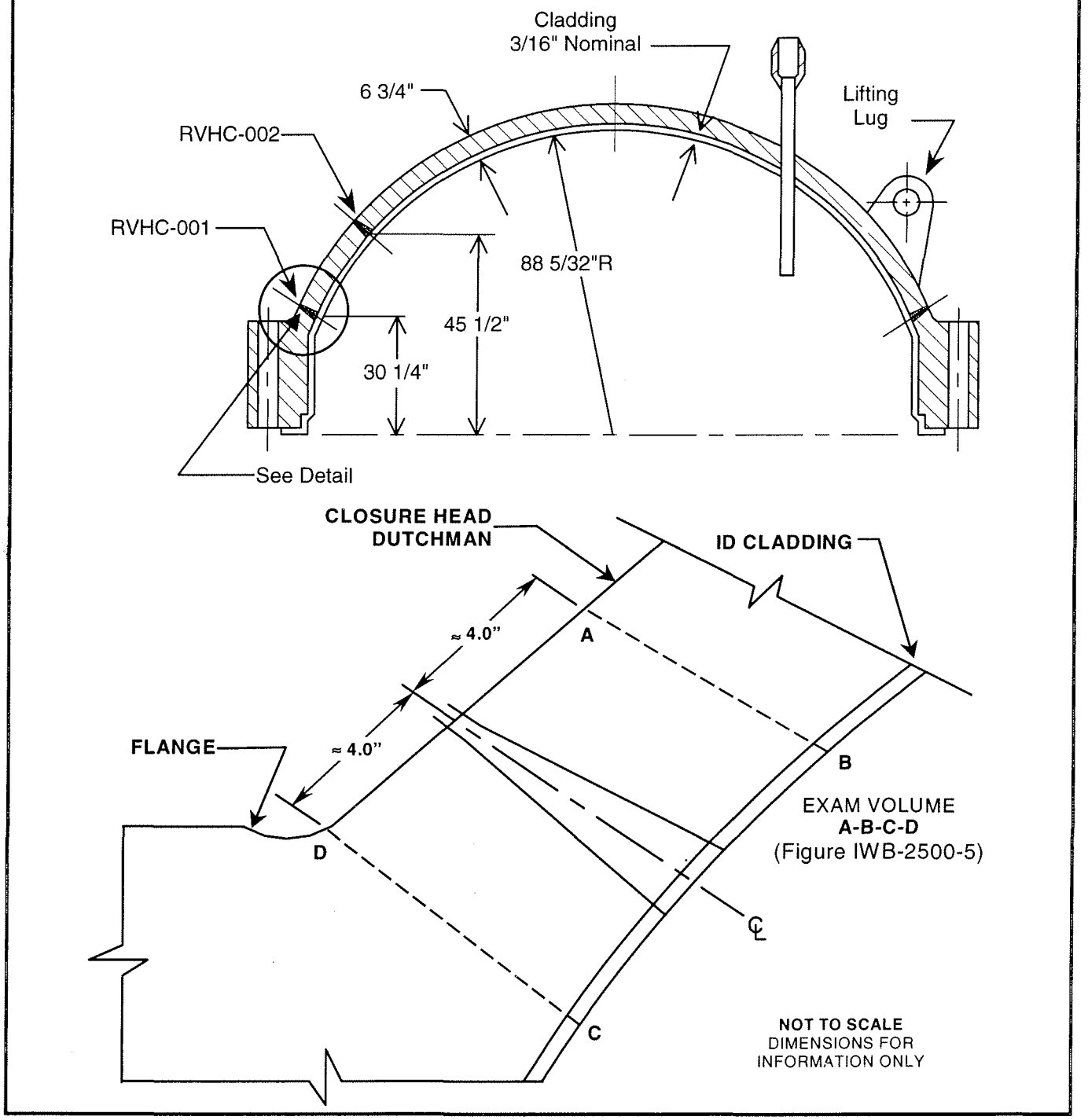
9. **ATTACHMENTS:**

Figure 1: Reactor Vessel Head Configuration

Figure 2: Scan Obstructions

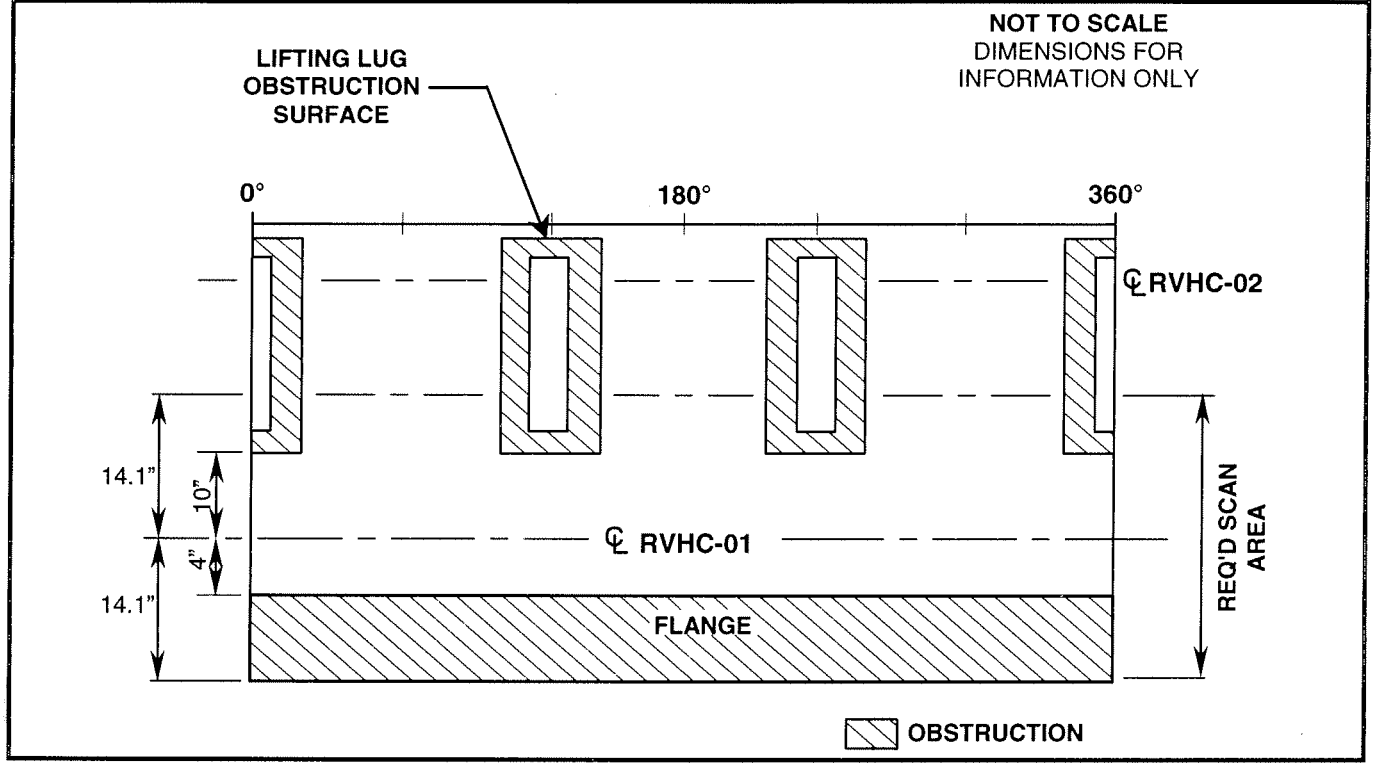
10 CFR 50.55a RELIEF REQUEST I2R-25
Revision 0
(Page 4 of 5)

Figure 1: Reactor Vessel Head Configuration



10 CFR 50.55a RELIEF REQUEST I2R-25
Revision 0
(Page 5 of 5)

Figure 2: Scan Obstructions



Enclosure 5

Byron Station Second Interval

Relief Request I2R-53

10 CFR 50.55a RELIEF REQUEST I2R-53
Revision 0

Request for Relief from ASME Section XI Requirements for Limited Volumetric Examination of Residual Heat Removal Heat Exchanger Vessel Shell-to-Flange Weld In Accordance with 10 CFR 50.55a(g)(5)(iii)

1. **ASME CODE COMPONENT(S) AFFECTED:**

Code Class:	2
References:	IWC-2500, Table IWB-2500-1
Examination Category:	C-A
Item Number:	C1.10
Component Numbers:	1RH-02-AB, RHEC-01 (Unit 1)
	2RH-02-AA, RHEC-01 (Unit 2)
Drawing Numbers:	1RHX-1-ISI (Unit 1)
	2RHX-1-ISI (Unit 2)

2. **APPLICABLE CODE EDITION AND ADDENDA:**

The current Inservice Inspection program is based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 Edition with no Addenda.

3. **APPLICABLE CODE REQUIREMENTS:**

ASME Section XI, 1989 Edition, Table IWC-2500-1, Examination Category C-A, Item C1.10, requires a volumetric examination of essentially 100% of Residual Heat Removal Heat Exchanger (RHRHX) shell-to-flange weld once each ten-year inspection interval (Figure IWC-2500-1). ASME Section XI, 1989 Edition, Article III, has the following requirements for the volumetric examination of these components:

A. III-3230 Angle Beam Calibration: *(a)* Obtain the angle beam paths required ... Variables such as weld preparation, weld crown width, or physical interference may preclude obtaining two-beam path direction coverage of the complete examination volume with half-V examination from two sides as shown in Fig. III-3230-1. If this interference with examination coverage occurs, the beam path shall be increased as required to obtain full coverage of the examination volume from two directions.

B. III-4420 Reflectors Parallel to the Weld Seam: The examination shall be performed using a sufficiently long examination beam path to provide coverage of the required examination volume in two-beam path directions. The examination shall be performed from two sides of the weld, where practicable, or from one side of the weld, as a minimum.

C. Supplement 4 - Austenitic and Dissimilar Metal Welds: Paragraph b(2) III-4430 Reflectors Transverse to the Weld Seam - Substitute: The angle beam examination for reflectors transverse to the weld shall be performed in two directions covering the minimum area from ½ in. from one side of the weld crown to ½ in. from the other side of the weld crown including the crown.

10 CFR 50.55a RELIEF REQUEST I2R-53
Revision 0

4. IMPRACTICALITY OF COMPLIANCE:

Pursuant to 10CFR50.55a(g)(5)(iii), conformance with these code requirements is impractical. Relief is requested from the volumetric examination coverage requirements of Figure IWC-2500-1.

10 CFR 50.55a(g)(4) states; "Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) which are classified as ASME Code Class 1, Class 2 and Class 3 must meet the requirements ... set forth in Section XI of editions of the ASME Boiler and Pressure Vessel Code and Addenda ... to the extent practical within the limitations of design, geometry and materials of construction of the components." The geometry and materials of construction of the RHRHX shell-to-flange weld results in limited access to the entire examination volume. The limiting factor in the scanning of the flange weld is the minimum scanning surface available on the flange side of the weld (component geometry). See Figure 1 for the scanning obstruction.

The RHRHX flange physically obstructs the ultrasonic transducer movement that is needed to examine the Code required volume from the flange side. Figure 1 shows the position of the weld and flange. The propagation for the ultrasonic beam was in the refracted longitudinal (RL) mode for 60° ½ V scanning and in the shear (S) mode for 45° full-V scanning. The 60° RL was needed to increase the obtained range on the flange side ID portion. The 45°S full-V was needed to increase the obtained range on the flange side OD portion.

Calculations for the final coverage achieved during the Second Inspection Interval resulted in 71.75% obtained. See Table 1 for the coverage calculations.

5. BURDEN CAUSED BY COMPLIANCE:

Current ultrasonic examination techniques available for field use are not capable of achieving the required examination volume. Removal of the studs and nuts on the flange will not significantly increase the examination volume achieved. To replace or redesign the RHRHX vessel flange because of the unachieved volume would be a prohibitive option. The limitation caused by the configuration is inherent in the design of the vessel.

6. PROPOSED ALTERNATIVE AND BASIS FOR USE:

The volumetric examination along with the visual (VT-2) examinations that are performed once per Inspection Period under Examination Category C-H will provide reasonable assurance of the continued structural integrity of the weld. Byron Station will perform the Code required volumetric examination of the Residual Heat Removal Heat Exchanger Vessel Shell-to-Flange Weld to the maximum extent possible with current ultrasonic techniques.

7. DURATION OF PROPOSED ALTERNATIVE:

Relief is requested for the Second Ten-Year Inspection Interval.

10 CFR 50.55a RELIEF REQUEST I2R-53
Revision 0

8. PRECEDENTS:

Similar relief requests have been granted to:

Salem, Unit 1, Relief, ASME Code Requirements Related to the Salem Inservice Inspection Program, Relief Request S1-RR-B01 and S1-RR-C01, January 16, 2003 (ML030160750)

Davis-Besse, Unit 1, Relief, Third 10-Year Interval Inservice Inspection Program Plan, September 30, 2002 (ML022700279)

9. ATTACHMENTS:

Calculation of Volumetric Examination Coverage

10 CFR 50.55a RELIEF REQUEST I2R-53
Revision 0

Calculation of Volumetric Examination Coverage

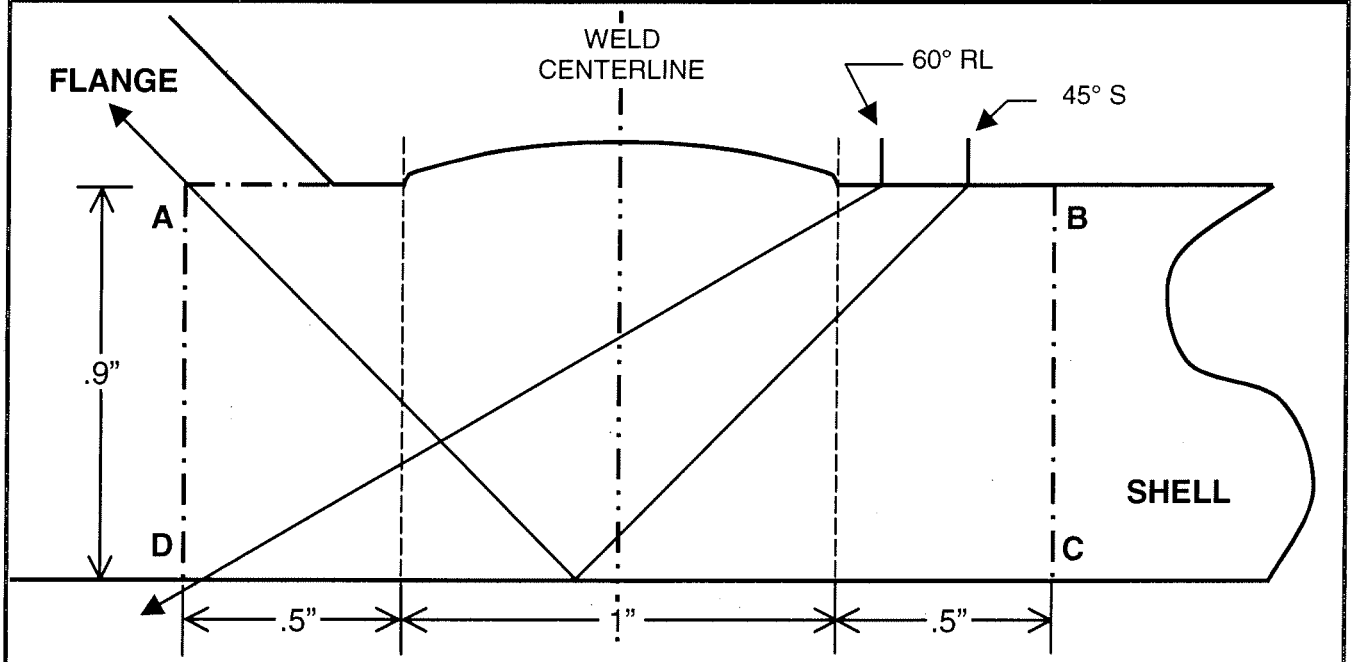
The volumetric examination of the shell-to-flange weld is obstructed on the flange-side due to the proximity of the flange. Scanning perpendicular (axial) to the weld was restricted to the shell-side only. The 45° Shear wave examination was supplemented with scanning from the shell-side with a 60° Refracted Longitudinal beam. Additionally, the transducers were obstructed from scanning forward of the points shown by the transducer lift-off at the toe of the weld resulting in loss of signal. There are no additional obstructions for the entire length of the weld.

Scanning requirements

At least one angle from two directions in both the perpendicular and parallel axis to the weld.

Single side access limitations shall be noted in the examination data record.

Figure 1: Component Configuration, Required Area, and Beam Angles Used



Reference: Examination Figure IWC-2500-1
Required Examination: Volume A-B-C-D

Calculation Method

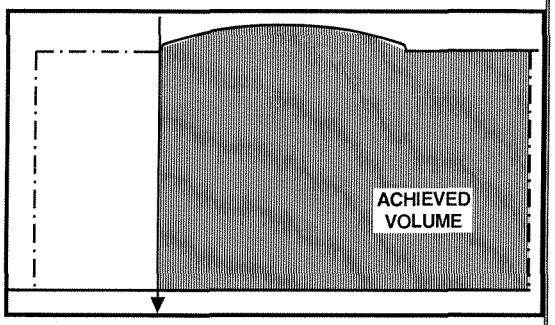
1. The minimum distance for the transducer exit point was determined by the UT report.
2. The maximum coverage obtained was determined using a scaled drawing in a CAD program based on measurements in the UT report and Joseph Oat Corporation drawing #5624, "Vertical Residual Heat Exchanger Details".
3. The cross section of the weld is 1.872 square inches (A-B-C-D). This consists of the 2" by 0.9" weld and base material thickness with 0.072 square inches added for the weld crown.
4. The beam locations were plotted and the area achieved was measured. See Figure 2.
5. The coverage achieved for each of the four scan directions was averaged.

10 CFR 50.55a RELIEF REQUEST I2R-53
Revision 0

Figure 2: Area Achieved for Each Beam Angle

Circumferential Scan Direction:

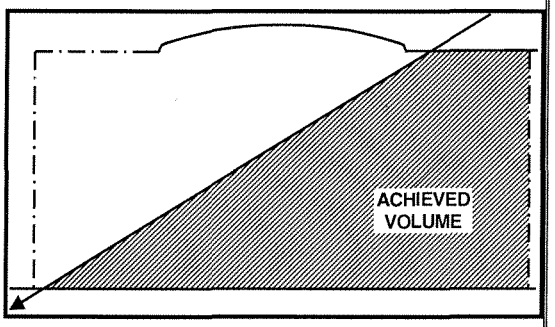
For the 45°Shear, the area obtained was from the flange-side of the weld to a distance of ½ inch beyond the weld toe on the shell side (B-C).



Axial Scan Direction #1:

Shell side beam direction using ½ V path.

For the 60°RL, the area obtained was the from the maximum exit point to the required area on the shell side (B-C).



Axial Scan Direction #2:

Equivalent to a flange side beam direction using Full-V path.

For the 45°Shear, the area obtained was the from the 2nd leg maximum exit point to the required area on the shell side (B-C).

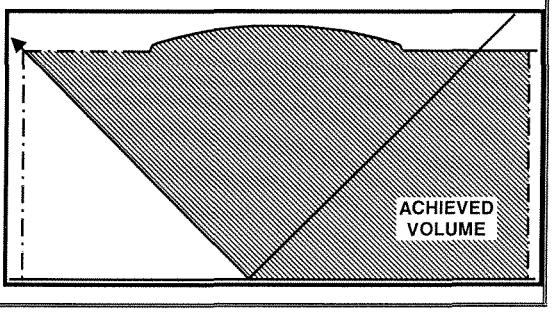


Table 1: Coverage Obtained Using 45°S Full V Path and 60°RL From Shell-Side Only

SCAN	DIRECTION	REQUIRED AREA	ACHIEVED AREA	PERCENTAGE
Circumferential 45°S	Clock-Wise	1.872*	1.422*	75.96%
	Counter Clock-Wise		1.422*	75.96%
Axial	Direction#1 60°RL		1.061	56.68%
	Direction#2 45°S		1.467*	78.37%
		AVERAGE PERCENTAGE ACHIEVED:		**71.75%**

* Includes 0.072 for weld crown.