September 29, 2004

Mr. J. W. Moyer, Vice President
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550

SUBJECT: THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN REQUEST FOR RELIEF NO. 34 FOR H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 (TAC NO. MB7932)

Dear Mr. Moyer:

By letter dated February 11, 2003, as supplemented by letters dated December 30, 2003, and April 16, 2004, Carolina Power & Light Company (the licensee), submitted Request for Relief No. 34 for relief from 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 request is for the third 10-year inservice inspection (ISI) interval at H. B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2). By letter dated April 16, 2004, the licensee withdrew the Category B-G-1 reactor coolant pump Stud 7 portion of Request for Relief No. 34.

The NRC staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by the licensee. The NRC staff concludes that the ASME Code examination coverage requirements are impractical for the subject components listed in Request for Relief No. 34. Further, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for the third 10-year ISI interval at HBRSEP2, which ended on February 18, 2002.

The NRC staff has determined that granting Request for Relief No. 34 pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the significant burden upon the licensee that could result if the requirements were imposed on the facility. All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

The NRC staff's evaluation and conclusions are contained in the enclosed Safety Evaluation. Attachment 1 of the Enclosure lists each relief request by ASME Boiler and Pressure Vessel Code examination category and the status of approval. Attachment 2 of the Enclosure is the PNNL Technical Letter Report.

Sincerely,

/RA/

Michael L. Marshall, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure:
Safety Evaluation w/attachments

cc w/enclosure:
See next page

September 29, 2004

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INTERVAL INSERVICE INSPECTION

REQUEST FOR RELIEF NO. 34

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

CAROLINA POWER & LIGHT COMPANY

DOCKET NO. 50-261

1.0 INTRODUCTION

The NRC staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by Carolina Power and Light Company (the licensee) in its letter dated February 11, 2003. The licensee submitted Request for Relief No. 34 for relief from 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* for H. B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2). In response to an NRC request for additional information, the licensee revised its Request for Relief No. 34 in its letters dated December 30, 2003, and April 16, 2004. By letter dated April 16, 2004, the licensee withdrew the Category B-G-1 reactor coolant pump Stud 7 portion of Request for Relief No. 34.

2.0 REGULATORY REQUIREMENTS

Inservice inspection (ISI) of nuclear power plant components is performed in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the

requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of Record for the HBRSEP2 third 10-year interval ISI program, which began on February 19, 1992, is the 1986 Edition of ASME Code, Section XI, with the extent of Class 1 Category B-J piping welds having been determined by the 1974 Edition through Summer 1975 Addenda of Section XI, as allowed by 10 CFR 50.55a(b)(2)(ii).

3.0 TECHNICAL EVALUATION

The NRC staff adopts the evaluations and recommendations for granting reliefs contained in the Technical Letter Report (TLR) prepared by PNNL, included as Attachment 2. Attachment 1 lists each relief request by ASME Code examination category and the status of approval.

For Request for Relief No. 34, Examination Category B-A, Items B1.11 Lower Head to Lower Shell Weld, B1.12 Lower Shell Longitudinal Weld at 0°, B1.21 Lower Head Ring to Lower Head Weld, B1.22 Lower Head Meridional Weld and Reactor Vessel Closure Head Meridional Weld, and B1.30 Upper Shell to Flange Weld require “essentially 100%” volumetric examination of the length of ASME Code Class 1 pressure-retaining welds in the reactor pressure vessel (RPV). Complete examinations are restricted by several geometric factors, including the position of core barrel support lugs, in-core instrumentation nozzles, and the vessel flange configuration. These conditions make 100-percent volumetric examinations impractical to perform for these welds. To gain access for examination, the RPV would require design modifications. Imposition of this requirement would be a significant burden on the licensee. Therefore, the ASME Code-required 100-percent volumetric examinations are impractical.

The licensee obtained from 5-percent to 73-percent volumetric coverage of the subject welds. Thus, considering these limited coverages obtained in conjunction with full ASME Code coverages on other RPV shell welds, any significant patterns of degradation, if any, would have been detected. Therefore, reasonable assurance of the continued structural integrity of the RPV has been provided.

For Request for Relief No. 34, Examination Category B-D, Item B3.90 requires 100-percent volumetric examination of RPV Outlet Nozzle Welds 101A/20,101A/30, and 101A/33 during each inspection interval. Component geometry restricts the scanning surface and precludes achieving 100 percent of volumetric coverage from both sides of the weld. For the licensee to achieve 100-percent ASME Code, Section XI volumetric coverage, the subject main reactor coolant nozzles would have to be redesigned and modified. This would place a significant burden on the licensee; thus, the ASME Code-required 100-percent volumetric examination, performed from both sides of the weld, is impractical.

The licensee obtained 55-percent volumetric coverage on each of the subject nozzle welds. The licensee obtained significant volumetric weld coverage from the shell side of the nozzle with an automated inspection device having multiple angle beam transducers. Round robin tests, as reported in NUREG/CR-5068, have demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90 percent or greater) for both near- and far-side cracks in blind inspection trials. Therefore, the limited examinations performed, in conjunction with 100-percent ASME Code volumetric coverages of

other RPV nozzle and shell welds, should have detected any significant degradation that might be present, providing reasonable assurance of the continued structural integrity of these nozzle-to-vessel welds.

For Request for Relief No. 34, Examination Category B-F, Items B5.40 and B5.70 require 100-percent volumetric examination of the accessible length of the subject steam generator and pressurizer nozzle dissimilar metal welds. Complete examinations are restricted by outside diameter (OD) nozzle design geometry. The configurations make 100-percent volumetric examinations impractical to perform for these welds. Achieving 100-percent ASME Code-required examination coverage would require redesigning the steam generators and pressurizer. Imposition of this requirement would create a significant burden on the licensee; therefore, the ASME Code-required 100-percent volumetric examinations are impractical.

The licensee obtained volumetric coverages ranging from approximately 51 percent to 88 percent for these welds. No indications were detected during the examinations. Therefore, based on the volumetric coverages obtained, any significant patterns of degradation should have been detected by the examinations that were completed, providing reasonable assurance of continued structural integrity for the subject welds.

For Request for Relief No. 34, Examination Category B-G-1, pressure-retaining bolting greater than 2 inches in diameter, the licensee withdrew this portion of the subject request for relief in its letter dated April 16, 2004.

For Request for Relief No. 34, Examination Category B-J requires 100-percent volumetric and/or surface examination for pressure-retaining welds Nominal Pipe Size (NPS) 4-inch or greater. The volumetric examinations must be performed using two beam path directions and performed from both sides of the weld, when accessible. Many of the subject welds connect piping to components such as nozzles, valves, elbows, or pumps which, due to their outside surface geometries, allow only single-sided scan access for volumetric examinations. For the licensee to achieve 100-percent volumetric coverage of these welds from two beam directions, the subject welds and connected components would need to be redesigned and modified. This would place a significant burden on the licensee; therefore, the ASME Code-required 100-percent volumetric examinations are impractical.

The licensee obtained volumetric coverages ranging from 51 percent to 84 percent for the subject welds. In addition, all ASME Code-required surface examinations for these welds were completed. For socket Weld 133/10, only a surface examination is required. The licensee was unable to obtain essentially 100-percent ASME Code surface examination because the pipe location is near the ceiling of the cubicle. The licensee obtained 90 percent of the required surface area and could not obtain coverage at the 12:00 o'clock position on the pipe. The licensee did not find any service-induced flaws during any of the volumetric or surface examinations. Furthermore, these welds are part of a larger population of B-J welds that are being examined to the extent required by the ASME Code. Therefore, the NRC staff determined that any significant patterns of degradation would have been detected, providing reasonable assurance of the continued structural integrity of these components.

For Request for Relief No. 34, Examination Category C-A, Item C1.20 requires volumetric examination of essentially 100-percent volumetric coverage of ASME Code Class 2 vessel circumferential shell-to-head welds. The component geometry of the HBRSEP2 boron injection

tanks and residual heat removal heat exchanger restricts the scanning surface so that essentially 100 percent of the weld cannot be examined from both sides of the weld, as required. For the licensee to achieve essentially 100-percent volumetric coverage, the subject components would have to be redesigned and modified. This would place a significant burden on the licensee; thus, the ASME Code-required 100-percent volumetric examination, performed from both sides of the weld, is impractical.

The licensee obtained 83-percent and 89-percent volumetric coverage, respectively, for the boron injection tank upper and lower circumferential shell-to-head Welds 202/01 and 202/01 (both welds are designated by the same number). Scans were limited due to the location of attached insulation rings and support legs for the tank. For residual heat removal heat exchanger lower circumferential shell-to-head Weld 204/A02, ultrasonic scan limitations are caused by the proximity of inlet and outlet nozzles and welded supports, with coverage limited to 68 percent of the ASME Code-required volume. The licensee has obtained a significant level of volumetric coverage for the subject welds, with no service-related flaws having been observed. In addition, other pressure-retaining welds on these components have been examined to the extent required by the ASME Code. Therefore, it is concluded that any significant patterns of degradation would have been detected, providing reasonable assurance of the continued structural integrity of these components.

For Request for Relief No. 34, Examination Category C-B, Item C2.21 requires 100-percent volumetric and surface examinations of the ASME Code Class 2 Boron Injection Tank Lower Head-to-Nozzle Weld, Boron Injection Tank Upper Head-to-Nozzle Weld, Steam Generator “A” and “B” Upper Shell-to-Feedwater Nozzle weld, and Steam Generator “B” Upper Head-to-Steam Nozzle weld. The ASME Code requires 100-percent volumetric and surface examination of the subject pressure-retaining nozzle welds. Complete examinations are restricted by several factors, including nozzle configuration and adjacent welds, which make 100-percent volumetric examinations impractical to perform for these welds. To gain access for examination, the vessels would require design modifications. Imposition of this requirement would create a significant burden on the licensee; therefore, the ASME Code-required 100-percent volumetric examinations are impractical.

The licensee obtained 100-percent surface examination coverage and volumetric examination coverages ranging from approximately 44 percent to 84 percent for the subject welds. No service-related flaws were detected during these examinations. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of these welds.

For Request for Relief No. 34, Examination Category C-C, Items C3.10 and C3.20 require 100-percent surface examination for integrally welded attachments on ASME Code Class 2 vessels and piping. The ASME Code requires 100-percent surface examination of the subject integral attachment welds. Complete examinations are restricted by the support configuration and other support structures near the subject attachments. Limitations included locations of the welds in relation to seismic restraints, embed plates and structural steel, and actual component configurations that restrict access for surface examinations. Achieving 100 percent of the ASME Code-required surface examinations would involve redesign of the components and their attachments. Imposition of this requirement would create a significant burden on the licensee; therefore, the ASME Code-required 100-percent examinations are impractical.

The licensee obtained coverages ranging from approximately 50 percent to 88 percent of the required surface examination for the subject welds. No service-related flaws were discovered during the examinations or during the examination of similar items for which the full Code-required coverages have been obtained. The similar welds are made of the same materials and are exposed to similar operating conditions. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of these welds.

For Request for Relief No. 34, Examination Category C-F-1, Item C5.10 requires 100-percent volumetric and surface examinations of selected austenitic stainless steel or high alloy piping welds NPS 4 inches and greater with wall thickness equal to or greater than 3/8 inch. The licensee obtained 100 percent of the surface examination coverage and approximately 75 percent to 89 percent of the volumetric examination coverages for the subject welds. The limitations for these restricted examinations are due to pipe-to-elbow, pipe-to-reducer, or pipe-to-tee configurations of these components, which preclude full scans from both sides of the welds. These limitations cannot be overcome without redesigning the subject piping welds, attached components, and portions of the associated piping systems. No service-related flaws were detected during any of these examinations. Therefore, any structurally significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued integrity of these welds.

For Request for Relief No. 34, Examination Category C-F-2, Item C5.51 requires 100-percent volumetric and surface examination for selected carbon steel or low alloy piping welds NPS 4 inches and greater with wall thickness equal to or greater than 3/8 inch. Complete examinations are restricted by the component pipe-to-valve configurations. The limitations for these restricted examinations are due to pipe-to-valve body configurations, which preclude full scans from both sides of the welds. These limitations cannot be overcome without redesigning the subject piping welds, attached valves, and portions of the associated piping systems. Therefore, these conditions make compliance with ASME Code-required volumetric examinations impractical to perform for these welds. In order for the licensee to perform the ASME Code-required examinations, substantial portions of the piping runs would need to be redesigned. Imposition of this requirement would create a significant burden on the licensee; therefore, the ASME Code-required 100-percent examinations are impractical.

The licensee obtained 100 percent of the surface examination coverage and approximately 71 percent to 87 percent of the volumetric examination coverages for the subject welds. No service-related flaws were detected during any of these examinations. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of these welds.

4.0 CONCLUSION

The NRC staff adopts the evaluations and recommendations for granting reliefs contained in the TLR prepared by PNNL, included as Attachment 2. Attachment 1 lists each relief request and the status of approval.

The NRC staff has reviewed the licensee's submittal and concludes that the ASME Code examination coverage requirements are impractical for the subject components listed in

Request for Relief No. 34. Further, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for the third 10-year ISI interval at HBRSEP2, which ended on February 18, 2002.

The NRC staff has determined that granting Request for Relief No. 34 pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest giving due consideration to the significant burden upon the licensee that could result if the requirements were imposed on the facility. All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributors: T. McLellan
B. Fu

Date: September 29, 2004

Attachments:
1. Summary of Relief Requests
2. PNNL TLR

TECHNICAL LETTER REPORT
ON THIRD 10-YEAR INSERVICE INSPECTION INTERVAL
REQUEST FOR RELIEF NO. 34
FOR
CAROLINA POWER AND LIGHT COMPANY
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NUMBER 50-261

1.0 SCOPE

By letter dated February 11, 2003, the licensee, Carolina Power & Light Company, submitted Request for Relief No. 34 from 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 request is for the third 10-year inservice inspection (ISI) interval at H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP-2). In response to NRC Requests for Additional Information (RAI), the licensee revised the request and provided further clarification in letters dated December 30, 2003 and April 16, 2004. In Section 3.0 below, Pacific Northwest National Laboratory (PNNL) has evaluated the revised request for relief and supporting information submitted by the licensee.

2.0 REGULATORY REQUIREMENTS

Inservice inspection of the ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (B&PV Code), and applicable addenda, as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, which was incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of Record for the HBRSEP-2 third 10-year interval ISI program, which began on February 19, 1992, is the 1986 Edition of ASME Section XI, with the extent of Class 1 Category B-J piping welds having been determined by the 1974 Edition through Summer 1975 Addenda of Section XI, as allowed by 10CFR50.55a(b)(2)(ii).

3.0 TECHNICAL EVALUATION

The information provided by Carolina Power and Light (CP&L) in support of the request for relief from Code requirements has been evaluated and the bases for disposition are documented below. For clarity, the request has been evaluated in multiple parts, according to ASME Code Examination Category.

3.1 Request for Relief 34, Examination Category B-A, Pressure Retaining Welds in Reactor Vessel

Code Requirement: Examination Category B-A, Items B1.11, B1.12, B1.21, B1.22, and B1.30 require "essentially 100%" volumetric examination, as defined by Figures IWB-2500-1, -2, -3, and -4, of the length of Class 1 pressure retaining welds in the reactor pressure vessel (RPV). "Essentially 100%," as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the "essentially 100%" volumetric examination coverage requirement for pressure retaining RPV shell and head welds designated by the licensee as 101/03, 101/06, 101/07, 101/08, 101/22, 101/23, 101/24, 101/25, 101/26, 101/27, and 101/28. More detailed descriptions, along with percent coverage and stated limitations are shown in Table 3.1, below.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Automated ultrasonic examinations were performed on the HBRSEP, Unit No. 2, reactor vessel in accordance with the requirements of 10 CFR 50.55a, the Technical Specifications, and the 1986 Edition of the ASME Section XI Code. These examinations had ten B-A welds that could not achieve the required 100% (>90%) coverage. The following descriptions, coupled with the tables and figures[1], are the requested details of the examination limitations. The accompanying figures graphically depict the extent of the limitations. The table quantifies the extent of Code required volume that was examined.

During the review process it was determined that welds 101/14, 101/15, and 101/16 had coverage in excess of the required 90% and these welds are not included in this submittal.

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1. Figures contained in the licensee' submittal are not included in this report.

TABLE 3.1 - Reactor Pressure Vessel Weld Coverage And Limitations				
Drawing/ Component	**Item**	**Description**	**Coverage**	**Limitation/ Comment**
101/03	B1.30	Upper Shell to Flange	73%	Limited examination due to proximity of flange taper
101/06	B1.11	Lower Head to Lower Shell Weld	82%	Limited due to proximity of core support lugs
101/07	B1.21	Lower Head Ring to Lower Head	5%	Limited due to proximity of lower head bottom-mounted instrumentation (BMI) tubes
101/22	B1.12	Lower Shell Longitudinal Weld @ 0°	73%	Limited due to proximity of core support lug
101/23	B1.22	Lower Head Meridional	63%	Limited due to proximity of lower head BMI tubes
101/24	B1.22	Lower Head Meridional	44%	Limited due to proximity of lower head BMI tubes and core support lug at 0°
101/25	B1.22	Lower Head Meridional	66%	Limited due to proximity of lower head BMI tubes
101/26	B1.22	Lower Head Meridional	56%	Limited due to proximity of lower head BMI tubes
101/27	B1.22	Lower Head Meridional	44%	Limited due to proximity of lower head BMI tubes and core support lug at 270°
101/28	B1.22	Lower Head Meridional	69%	Limited due to proximity of lower head BMI tubes
101/08	B1.22	Reactor Vessel Closure Head Meridional Weld	49%	Scan Limited Due to Component Configuration, Head Flange and CRDM Penetrations

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires essentially 100% volumetric examination of the accessible length of the subject RPV welds. However, complete examinations are restricted by several factors, including the position of core barrel support lugs, in-core instrumentation nozzles and the vessel flange configuration. These conditions make 100% volumetric examinations impractical to perform for these welds. To gain access for examination, the RPV would require design modifications. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% volumetric examinations are impractical.

Drawings and descriptions[2] included in the licensee's submittal show that examinations of the subject welds have been performed to the maximum extent practical, with the licensee obtaining volumetric coverages ranging from approximately 5% to 82% (see Table 3.1). In the case of lower head meridional, lower head-to-shell and -ring, and lower shell longitudinal welds, scanning is limited due to the presence of bottom mounted in-core instrumentation tubes and reactor core barrel guide lugs. These appurtenances are located physically over, or adjacent to, the welds so that the RPV automated inspection device may not be properly positioned to scan the welds in order to achieve the full Code-required coverage. Volumetric coverage on the upper shell-to-flange weld is limited due to the tapered configuration of the forged vessel flange, which restricts scans performed from the flange side.

The reactor vessel closure head meridional weld received limited coverage due to the location of control rod drive mechanism (CRDM) penetrations and the head flange cross-sectional configuration. This weld was examined using manual inspection procedures and personnel that were qualified under the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI).

The lower head ring weld received only 5% volumetric coverage due to geometric interferences from the lower head bottom mounted instrumentation tubes. Examination results from other RPV welds, made of the same materials under similar operating conditions showed that no indications of degradation were detected. Reasonable assurance of structural integrity of the weld has been provided to the weld since any significant degradation pattern should have been detected by the examination of other similar welds.

Based on the impracticality of performing complete volumetric examinations on the subject welds, and considering the limited coverages obtained on these, in conjunction with full Code coverages on other RPV shell welds, it is believed that any significant patterns of degradation would have been detected. Therefore, reasonable assurance of the structural integrity of the RPV has been provided. Pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.2 Request for Relief 34, Examination Category B-D, Full Penetration Welded Nozzles in Vessels

Code Requirement: Examination Category B-D, Item B3.90 requires 100% volumetric examination, as defined in Figures IWB-2500-7(a) through (d), as applicable, of RPV nozzle-to-vessel welds during each inspection interval. At least 25% of the nozzles must be examined by the end of the first inspection period, with the remainder being examined by the end of the interval. Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

2. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the 100% coverage requirement for full penetration RPV primary outlet nozzle-to-vessel Welds 101A/29, 101A/31, and 101A/33.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Automated ultrasonic examinations were performed on the RPV in accordance with the requirements of 10 CFR 50.55(a), the Technical Specifications, and the 1986 Edition of the ASME Section XI Code. These examinations included three B-D weld examinations that did not achieve the required 100% (>90%) coverage. The following descriptions, coupled with the tables and figures, are details of the examination limitations. The accompanying figures depict the extent of the limitations. Table 3.2 provides the estimated required volume that was covered for the subject welds.

During the review process it was determined that welds 101A/30 and 101A/32 had coverage in excess of the required 90% and these welds are not included in this submittal.

TABLE 3.2 - RPV Nozzle-to-Shell Weld Coverage And Limitations

Drawing/ Component	Item	Description	Coverage	Limitation
101A/29	B3.90	Outlet Nozzle to Shell Weld @ 10°	55%	Limited due to proximity of nozzle integral extension
101A/31	B3.90	Outlet Nozzle to Shell Weld @ 130°	55%	Limited due to proximity of nozzle integral extension
101A/33	B3.90	Outlet Nozzle to Shell Weld @ 250°	55%	Limited due to proximity of nozzle integral extension

The limitations relating to the transverse examinations of the hot leg reactor pressure vessel (RPV) nozzle to shell welds (101A/29, 101A/31, 101A/33) resulted in examination coverage that was reported as 10%. The reason for this low value is a combination of the physical obstruction presented by the nozzle integral extensions, the size of the transducers, and transducer mounting bracket. For these exams, a series of five (5) transducers are mounted on a crescent shaped bracket and are skewed to direct their respective beams towards the nozzle to shell weld in order to detect reflectors orientated transverse to the weld. However, due to the proximity of the weld to the outside diameter of the nozzle integral extension, the taper between the weld and the nozzle extension, and the narrow weld configuration (approximately 1½ inches), the transducer assembly is physically restricted from the weld inner diameter surface. Also, because

the nozzle forging is inserted into a curved vessel, the weld extends away from the inside diameter of the vessel at an angle approximately 15 degrees greater than the vessel radius, which further complicates the examination. As with all estimations of examination coverage, it should be noted that the coverage calculation is based on a theoretical point extending from the centerline of the transducers to the outer surface of the vessel at an angle normal to the vessel inside diameter. This calculation does not reflect the actual amount of ultrasound that has interrogated the weld due to beam-spread.

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% volumetric coverage of the reactor pressure vessel outlet nozzle Welds 101A/20,101A/30, and 101A/33. The licensee was unable to obtain the Code required 100% volumetric coverage because the subject reactor pressure vessel outlet nozzle geometry restricts the scanning surface so that the welds cannot be examined from both sides of the welds. For the licensee to achieve 100% volumetric coverage, the subject main reactor coolant nozzles would have to be redesigned and modified. This would place a significant burden on the licensee, thus the Code-required 100% volumetric examination, performed from both sides of the weld, is impractical.

Drawings and descriptions[3] included in the licensee's submittal show that examinations of the subject welds have been performed to the maximum extent practical, with the licensee obtaining volumetric coverages of approximately 55% (see Table 3.2). The restrictions for ultrasonic scans on these nozzles are a result of the nozzle design; these are "set-in" nozzles with integral extensions that protrude beyond the inner surface of the RPV shell. This configuration makes examining the welds from the nozzle side impractical and severely limits scans directed parallel to the weld to detect axial flaws, if present. The licensee obtained significant volumetric weld coverage from the shell side of the nozzle with an automated inspection device having multiple angle beam transducers. Round robin tests, as reported in NUREG/CR-5068, have demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90% or greater) for both near- and far-side cracks in blind inspection trials.

While the licensee may not have achieved complete examination coverage (from both sides) as required by the ASME code, the ultrasonic examinations performed from the shell side of the carbon steel nozzle-to-vessel welds meet the inspection procedure guidelines documented in NUREG/CR-5068. The limited examinations performed, in conjunction with 100% Code coverages of other RPV nozzle and shell welds, should have detected any significant degradation that might be present. Therefore, the coverage achieved provided reasonable assurance of the structural integrity of these nozzle-to-vessel welds. In addition, industry experience has not shown any history of

3. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report.

integrity concerns associated with RPV nozzle-to-vessel welds nor have any unusual service loadings been identified which were not considered in the original design of these nozzle connections. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.3 Request for Relief 34, Examination Category B-F, Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles

Code Requirement: Examination Category B-F, Items B5.40 and B5.70 require 100% volumetric and surface examinations, as defined by Figure IWB-2500-8, of Class 1 dissimilar metal nozzle-to-vessel welds. Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the 100% coverage requirement for dissimilar metal nozzle-to-pipe welds at several pressurizer and steam generator nozzles. These welds are listed in Table 3.3, along with percentage completed and stated limitations.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

During the review process performed on the subject welds, it was identified that the ISI Program description included steam generator nozzle safe end welds. After further review, it appears that the steam generators were provided with a stainless steel build-up on the hot leg and cold leg nozzles and that there is no weld in this location. Therefore, these welds are not included in this RAI response and have been deleted from the ISI Program description. Table 3.3, below, quantifies the extent of required volume that was covered.

Ultrasonic examination techniques utilized during the Third Ten-Year Interval on the loop piping welds were consistent with industry standards during the time frame the examination occurred. The weld profiles provided depict the configurations as well as the scans performed inclusive of beam path coverage. Beam path coverage does not account for beam spread, which would increase the actual coverage for each weld. Scan directions utilized are as follows:

Scan 1 With flow
Scan 2 Against flow
Scan 3 Clockwise, looking in the direction of flow
Scan 4 Counterclockwise, looking in the direction of flow

Each scan direction was assigned a value of 100% of the required scan volume for each direction. Each scan percentage was compiled and divided by the four directions to arrive at a cumulative coverage percentage. Additional information included in support of this relief request are Inservice Inspection Determination of Percent Coverage Worksheets and associated weld coverage plots for examination coverage.

TABLE 3.3 - Category B-F Nozzle Coverage And Limitations

Drawing/ Component	Description	Item	Exam Coverage	Limitation/ Comment
107/04DM	Hot Leg Loop "A" Elbow to Hot Leg Nozzle	B5.70	61%	Centrifugally cast stainless steel elbow to carbon steel cast nozzle
107/05DM	Crossover Leg Loop "A" S/G Nozzle to Elbow	B5.70	61.75%	Carbon cast nozzle to centrifugally cast stainless steel elbow
107A/04DM	Hot Leg Loop "B" Elbow to Hot Leg Nozzle	B5.70	60.35%	Centrifugally cast stainless steel elbow to carbon steel cast nozzle
107A/05DM	Crossover Leg Loop "B" S/G Nozzle to Elbow	B5.70	60.52%	Carbon cast nozzle to centrifugally cast stainless steel elbow
107B/04DM	Hot Leg Loop "C" Elbow to Hot Leg Nozzle	B5.70	51.50%	Centrifugally cast stainless steel elbow to carbon steel cast nozzle
107B/05DM	Crossover Leg Loop "C" S/G Nozzle to Elbow	B5.70	55.75%	Carbon cast nozzle to centrifugally cast stainless steel elbow
117/01DM	Pressurizer Relief Nozzle to Safe-End	B5.40	74.80%	Nozzle configuration
118/01DM	Pressurizer Safety Nozzle to Safe-End	B5.40	88.25%	Nozzle configuration

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% volumetric examination of the accessible length of the subject steam generator and pressurizer nozzle dissimilar metal welds. However, as shown in Table 3.3, complete examinations are restricted by outside diameter (OD) nozzle design geometry. The configurations make 100% volumetric examinations impractical to perform for these welds. Achieving 100% code required examination coverage would require re-designing the steam generators and pressurizer. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% volumetric examinations are impractical.

Drawings and descriptions[4] included in the licensee's submittal clearly show that examinations of the subject welds have been performed to the extent practical, with the licensee obtaining significant volumetric coverages ranging from approximately 51% to

4. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report.

88%) for these welds (see Table 3.3). Typical scan limitations were caused by nozzle and elbow outside surface tapers which precluded obtaining 100% Code coverage from the nozzle/elbow side of the weld. Welds 107B/04DM, 107B/05DM, 117/01DM and 118/01DM were examined using procedures and personnel qualified through the industry's Performance Demonstration Initiative (PDI) program, administered by the Electric Power Research Institute (EPRI). Other B-F Category welds included in this request were examined prior to the implementation of ASME Appendix VIII. No flaws were detected during any of the examinations. Based on the impracticality of examining 100% of the subject welds, and the volumetric coverages obtained, any significant patterns of degradation should have been detected by the examinations that were completed, providing reasonable assurance of continued structural integrity for these welds. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.4 Request for Relief 34, Examination Category B-G-1, Pressure retaining Bolting Greater than 2-Inches in Diameter

Note: As a result of an NRC request for additional information, this portion of Request for Relief 34, was withdrawn by the licensee in a letter dated April 16, 2004. The licensee stated the following:

The original relief request identified stud No. 7 for the reactor coolant pump (RCP) "C" as a limited examination based on the NDE datasheet, which stated that the examination of the lower eight (8) inches was restricted due to taper. This datasheet was located in the final report for the refueling outage (RO) performed, which was RO-15. Subsequent to the examination of stud No. 7 on May 5, 1995, eight (8) studs were replaced (stud Nos. 1, 2, 3, 4, 5, 6, 23, and 24) due to a main flange leak. After additional visual and magnetic particle examinations, three (3) additional studs were replaced (studs Nos. 7, 8, and 21). Preservice examinations were performed prior to installation of the studs. Based on this additional information, it has been determined that the ASME Section XI Code requirements have been met and that the examination of the installed components meet the applicable ASME Section XI Code requirements. Therefore, relief from the Code-required examination coverage is not being requested for RCP "C" stud No. 7.

3.5 Request for Relief 34, Examination Category B-J, Pressure Retaining Welds in Piping

Code Requirement: Examination Category B-J, Items B9.11, B9.31 and B9.40 require "essentially 100%" volumetric and/or surface examinations, as defined by Figures IWB-2500-8, -9, -10, or -11, as applicable, of the length of Class 1 full penetration piping welds. "Essentially 100%," as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code volumetric and/or surface examination coverage requirements for the HBRSEP-2 reactor coolant system piping associated with loop welds identified in Table 3.5.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Table 3.5 - Category B-J Piping Weld Limitations

Drawing/ Component	Description	Item	Exam Coverage	Limitation/ Comment
107A/07	Crossover Leg Loop "B" Pipe to Elbow	B9.11	84%	Wrought stainless steel pipe to centrifugally cast stainless steel elbow
107B/11	Cold Leg Loop "C" RCP to Pipe	B9.11	57%	Centrifugally cast stainless steel elbow to wrought stainless steel pipe
108/01BC	Loop Pipe to 12" Branch Connection	B9.31	62%	Nozzle configuration
112/01BC	Loop Pipe to 10" Branch Connection	B9.31	60%	Nozzle configuration
112/19	Safety Injection Accumulator Discharge Elbow to Tee	B9.11	66%	Elbow to Tee configuration
113/01	RHR Return Line 10" X 8" Reducer to Valve SI-876A	B9.11	66%	Reducer to valve configuration
114/03	RHR Return Line Pipe to Valve SI-876B	B9.11	56.70%	Pipe to valve configuration
115/04	RHR Return Line Pipe to Valve SI-876C	B9.11	56.70%	Pipe to valve configuration
116B/18	Pressurizer Spray Line Elbow to Pipe	B9.11	75%	Elbow to Pipe configuration
116B/19	Pressurizer Spray Line Pipe to Safe-End	B9.11	51%	Pipe to safe-end configuration
118A/01	Pressurizer Safety Line Safe-End to Pipe	B9.11	62.5%	Safe-end to pipe configuration
118B/08	Pressurizer Spray Line Elbow to Flange	B9.11	75%	Elbow to flange configuration
133/10	Seal Injection Pipe to Elbow Socket Weld	B9.40	90%	Limited at 0° due to proximity of the elbow to the ceiling *Surface exam only*

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% volumetric and/or surface examination for Class 1 Category B-J pressure retaining welds NPS 4-inch or greater. The volumetric examinations must be performed using two beam path directions and performed from both sides of the weld, when accessible. Many of the subject welds connect piping to components such as nozzles, valves, elbows, or pumps, which, due to their outside surface geometries, allow only single-sided scan access for volumetric examinations (see Table 3.5). The licensee uses both shear wave and dual element refracted longitudinal wave transducers; the latter are known to provide superior penetration in austenitic materials. For the licensee to achieve 100% volumetric coverage of these welds from two beam directions would require that the subject welds and connected components be redesigned and modified. This would place a significant burden on the licensee; therefore, the Code-required 100% volumetric examinations are impractical.

The licensee has examined a substantial portion of the Code-required inspection volumes, obtaining coverages ranging from 51% to 84% for the subject welds. In addition, all Code-required surface examinations for these welds were completed. For socket Weld 133/10, only a surface examination is required, however, due to the pipe location near the ceiling of the cubicle, 90% of the required surface area could be examined (no coverage at the 12:00 position on the pipe could be obtained). No service-induced flaws were discovered during any of the volumetric or surface examinations. Furthermore, these welds are part of a larger population of B-J welds that are being examined to the extent required by Code. Therefore, it is concluded that any significant patterns of degradation would have been detected, providing reasonable assurance of the continued structural integrity of these components. Based on the impracticality of performing the Code-required 100% volumetric and/or surface examinations, and considering the extent of coverages obtained by the licensee, it is recommended that relief be granted, pursuant to 10 CFR 50.55a(g)(6)(i).

3.6 Request for Relief 34, Examination Category C-A, Pressure Retaining Welds in Pressure Vessels

Code Requirement: Examination Category C-A, Item C1.20 requires volumetric examination, as defined by Figure IWC-2500-1, of "essentially 100%" of the length of circumferential head welds in Class 2 vessels. "Essentially 100%," as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the "essentially 100%" volumetric coverage requirement for the shell-to-upper head Welds 202/01 and 202/02 on HBRSEP-2 boron injection tanks, and shell-to-lower head Weld 204/A02 on residual heat removal heat exchanger "A".

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires essentially 100% volumetric coverage of Class 2 vessel circumferential shell-to-head welds. However, for the HBRSEP-2 boron injection tanks and residual heat removal heat exchanger, component geometry restricts the scanning surface so that 100% of the weld cannot be examined from both sides of the weld, as required. For the licensee to achieve 100% volumetric coverage, the subject components would have to be redesigned and modified. This would place a significant burden on the licensee, thus the Code-required 100% volumetric examination, performed from both sides of the weld, is impractical.

For boron injection tank upper and lower circumferential shell-to-head Welds 202/01 and 202/01 (both welds are designated by the same number), the licensee obtained 83% and 89% volumetric coverage, respectively. Scans were limited due to the location of attached insulation rings and support legs for the tank. For residual heat removal heat exchanger lower circumferential shell-to-head Weld 204/A02, ultrasonic scan limitations are caused by the proximity of inlet and outlet nozzles and welded supports, with coverage limited to 68% of the Code-required volume. The licensee has obtained a significant level of volumetric coverage for the subject welds, with no service-related flaws having been observed. In addition, other pressure-retaining welds made of the same material and are exposed to similar operating conditions have been examined to the extent required by the Code. Therefore, it is concluded that any significant patterns of degradation would have been detected, providing reasonable assurance of the continued structural integrity of these components. Based on the impracticality of performing the Code-required 100% volumetric examinations, and considering the significant coverages obtained by the licensee, it is recommended that relief be granted, pursuant to 10 CFR 50.55a(g)(6)(i).

3.7 Request for Relief 34, Examination Category C-B, Pressure Retaining Nozzle Welds in Vessels

Code Requirement: Examination Category C-B, Item C2.21 requires 100% volumetric and surface examinations, as defined by Figures IWC-2500-4 (a) and (b), of the nozzle-to-shell welds in Class 2 vessels. Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100% volumetric coverage requirement for nozzles on the steam generator and boron injection tank at HBRSEP-2. More detailed descriptions, along with percent coverage and stated limitations are shown in Table 3.7 below.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Ultrasonic examination techniques utilized during the Third Ten-Year Interval on the nozzle configurations were consistent with industry standards during the time frame the examination occurred. The weld profiles provided show the configurations as well as the scans performed inclusive of beam path coverage. Beam path coverage does not account for beam spread, which would increase the identified coverage for each weld.

Typically, a branch connection only allows for axial scanning from one side, and circumferential scans do not allow complete coverage of the Code-required volume due to the nozzle connection design configuration. Table 1 quantifies the extent of required volume that was covered, and Table 2 identifies the materials joined. Scan directions utilized are as follows:

Scan 1 With flow
Scan 2 Against flow
Scan 3 Clockwise, looking in the direction of flow
Scan 4 Counterclockwise, looking in the direction of flow

Each scan direction was assigned a value of 100% of the required scan volume for each direction. Each scan percentage was compiled and divided by the four directions to arrive at a cumulative coverage percentage.

TABLE 3.7 - Category C-B Nozzle-to-Vessel Weld Limitations				
Drawing/ Component	**Description**	**Item**	**Exam Coverage**	**Limitation/ Comment**
202/03	Boron Injection Tank Lower Head to Nozzle Weld	C2.21	74.25%	Vessel weld/nozzle configuration
202/04	Boron Injection Tank Upper Head to Nozzle Weld	C2.21	84%	Vessel weld/nozzle configuration
205/08	Steam Generator "A" Upper Shell to Feedwater Nozzle	C2.21	53%	Nozzle configuration
205A/07	Steam Generator "B" Upper Head to Steam Nozzle	C2.21	44%	Nozzle configuration
205A/08	Steam Generator "B" Upper Shell to Feedwater Nozzle	C2.21	56%	Nozzle configuration

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% volumetric and surface examination of the subject pressure retaining nozzle welds. However, as listed in Table 3.7, complete examinations are restricted by several factors, including nozzle configuration and adjacent welds. These conditions make 100% volumetric examinations impractical to perform for these welds. To gain access for examination, the vessels would require design modifications. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% volumetric examinations are impractical.

Drawings and descriptions[5] included in the licensee's submittal show that examinations of the subject welds have been performed to the extent practical, with the licensee obtaining 100% surface examination coverages and volumetric examination coverages ranging from approximately 44% to 84% for these welds (see Table 3.7). The limitations for ultrasonic examinations are due to the configuration of the components, or the location of adjacent welds, and cannot be overcome without entirely redesigning the boric acid injection tank and portions of the steam generator shell. No service-related flaws were detected during these examinations. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of these welds. Based on the impracticality of examining 100% of the subject welds, and the examination coverages obtained, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

5. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report .

3.8 Request for Relief 34, Examination Category C-C, Integral Attachments for Vessels, Piping, Pumps and Valves

Code Requirement: Examination Category C-C, Items C3.10 and C3.20 require 100% surface examination, as defined in Figure IWC-2500-5, for integrally welded attachments on Class 2 vessels and piping. Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100% required surface examination coverage for integrally welded attachments on the boron injection tank, residual heat exchanger, main steam and safety injection system piping at HBRSEP-2. More detailed descriptions, along with percent coverages and stated limitations are shown in Table 3.8 below.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Surface examination techniques utilized during the Third Ten-Year Interval on the affected configurations were consistent with industry standards during the time frame the exam occurred and were essentially unchanged during the interval. The affected configurations depict the support integral attachments and the examination area covered during the examination. Physical restrictions due to support configuration were the limiting factor which resulted in limited examination of the attachment welds.

Additional information included in support of this relief request are Inservice Inspection Determination of Percent Coverage Worksheets, associated sketches for surface examination coverage limitations, and supplemental photographs showing component configurations, as applicable.

Table 3.8 - Category C-C Integral Attachment Limitations				
Drawing/ Component	**Description**	**Item**	**Exam Coverage**	**Limitation/ Comment**
202/WS-1 202/WS-2 202/WS-3 202/WS-4	Boron Injection Tank Integral Attachments (Support Legs)	C3.10	88%	Boron Injection Tank support leg configuration. Insulation ring and support lug
204/WS1-A	Residual Heat Exchanger Integral Attachments (Support Legs)	C3.10	80%	Residual Heat Exchangers exam is limited by physical access/component configuration
212/A-WS	Main Steam System Integral Attachment	C3.20	50%	Support configuration
212/R-WS	Main Steam System Integral Attachment	C3.20	50%	Support configuration
213/F-WS	Main Steam System Integral Attachment	C3.20	84%	Support configuration
214/K-WS	Main Steam System Integral Attachment	C3.20	50%	Support configuration
216/G-WS	Feedwater System Integral Attachment	C3.20	50%	Support configuration
221A/I-WS	Safety Injection System Integral Attachment	C3.20	75%	Support configuration
233/D-WS	Safety Injection System Integral Attachment	C3.20	50%	Support configuration

Typical integrally welded piping attachments that received ASME Section XI Code-required examinations consisted of piping lugs, ears, stanchions, pads, and saddles. Components for which the Code-required examination coverage was achieved did not have physical limitations that prevented the Code-required surface area from being examined. The examinations for which Code-required examination coverage was not achieved, as identified in Relief Request No. 34, were due to physical access restrictions that did not allow access for liquid penetrant or magnetic particle examination.

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% surface examination of the subject integral attachment welds. However, as listed in Table 3.8, complete examinations are restricted by the support configuration and other support structures near the subject attachments. Achieving 100% of the Code-required surface examinations would involve redesign of the components and their attachments. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% examinations are impractical.

Drawings, pictures and descriptions[6] included in the licensee's submittal show that examinations of the subject welds have been performed to the extent practical, with the licensee obtaining coverages ranging from approximately 50% to 88% of the required surface examination for these welds (see Table 3.8). Limitations include locations of the welds in relation to seismic restraints, embed plates and structural steel, and actual component configurations that restrict access for surface examinations. No service-related flaws have been discovered during the subject examinations, or during the examination of similar items for which the full Code-required coverages have been obtained. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of these welds. Based on the impracticality of examining 100% of the subject welds, and the examination coverages obtained, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.9 Request for Relief 34, Examination Category C-F-1, Pressure Retaining Welds in Austenitic or High Alloy Piping

Code Requirement: Examination Category C-F-1, Item C5.10 requires 100% volumetric and surface examinations, as defined by Figure IWC-2500-7, of selected austenitic stainless steel or high alloy piping welds NPS 4-inch and greater, with wall thickness equal to or greater than 3/8-inch. Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100% volumetric coverage requirement for several austenitic piping weld configurations at HBRSEP-2. More detailed descriptions, along with percent coverage and stated limitations are shown in Table 3.9 below.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided.

Ultrasonic examination techniques utilized during the Third Ten-Year Interval on the piping configurations were consistent with industry standards during the time frame the examination occurred. The weld profiles provided show the configurations as well as the scans performed inclusive of beam path coverage. Beam path coverage does not account for beam spread, which would increase the coverage for each weld.

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6. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report .

TABLE 3.9 - Category C-F-1 Austenitic or High Alloy Piping Weld Limitations				
Drawing/ Component	**Description**	**Item**	**Exam Coverage**	**Limitation/ Comment**
219A/203	Safety Injection System Reducer to Pipe	C5.11	75%	Reducer to pipe
220/38	RHR System Pipe to Elbow	C5.11	82.50%	Pipe to elbow configuration
220A/69	RHR System Pipe to Elbow	C5.11	71.50%	Pipe to elbow configuration
239/01	Safety Injection System Tee to Pipe	C5.21	89.50%	Pipe to tee configuration

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% volumetric and surface examination of the subject pressure retaining high and low alloy piping welds. However, as listed in Table 3.9, complete examinations are restricted by the component configurations (e.g., pipe-to-tee or elbow-to-pipe). These conditions make compliance with Code-required volumetric examinations impractical to perform for these welds. To provide access for examination, substantial portions of the piping runs would need to be redesigned. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% examinations are impractical.

Drawings and descriptions[7] included in the licensee's submittal show that examinations of the subject welds have been performed to the extent practical, with the licensee obtaining 100% of the surface examination coverage and approximately 75% to 89% of the volumetric examination coverages for these welds (see Table 3.9). The limitations for these restricted examinations are due to pipe-to-elbow, -reducer, or -tee configurations of these components which preclude full scans from both sides of the welds. These limitations cannot be overcome without redesigning the subject piping welds and attached components, and portions of the associated piping systems. Except for weld 220A/69, the examinations were completed using EPRI PDI qualified procedures, personnel and equipment (the examination of weld 220A/69 was completed prior to the implementation of Appendix VIII). No service-related problems or reportable indications have been detected during any of these examinations. Therefore, any structurally-significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued integrity of these welds. Based on the impracticality of examining 100% of the subject welds, and the examination coverages obtained, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

7. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report .

3.10 Request for Relief 34, Examination Category C-F-2, Pressure Retaining Welds in Carbon or Low Alloy Piping

Code Requirement: Examination Category C-F-2, Item C5.51 requires 100% volumetric and surface examination, as defined in Figure IWC-2500-7, for selected carbon steel or low alloy piping welds NPS 4-inch and greater, with wall thickness equal to or greater than 3/8-inch. Code Case N-460, as an alternative approved for use by the NRC Staff, states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10%, i.e., greater than 90% examination coverage is obtained.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100% volumetric coverage requirement for several carbon steel piping weld configurations at HBRSEP-2. More detailed descriptions, along with percent coverage and stated limitations are shown in Table 3.10 below.

Licensee's Basis for Relief Request (as stated):

This relief is requested pursuant to 10 CFR 50.55a(g)(6)(i) on the basis that compliance with the referenced Code requirements is impractical and that public health and safety will not be endangered by allowing the proposed alternatives in lieu of Code requirements. Substantial burden would be incurred to achieve additional coverage of these components. It is judged that patterns of degradation of the listed components would have been detected by the coverage that was achieved. Therefore, reasonable assurance of the integrity of the listed components has been provided. Ultrasonic examination techniques utilized during the Third Ten-Year Interval on the piping configurations were consistent with industry standards during the time frame the examination occurred. The weld profiles provided show the configurations as well as the scans performed inclusive of beam path coverage. Beam path coverage does not account for beam spread, which would increase the coverage for each weld.

Typically, a one-sided exam a on a valve to pipe or flange with an as-welded crown will result in a limitation of 50% when the examination is performed on stainless steel utilizing the applicable PDI technique. If the crown is ground flush, a maximum credit for coverage would typically be 75%. Table 5, below, quantifies the extent of coverage, and Table 2 identifies the materials joined. Scan directions utilized are as follows:

Scan 1 With flow
Scan 2 Against flow
Scan 3 Clockwise, looking in the direction of flow
Scan 4 Counterclockwise, looking in the direction of flow

Each scan direction was assigned a value of 100% of the required scan volume for each direction. Each scan percentage was compiled and divided by the four directions to arrive at a cumulative coverage percentage. Additional information included in support of this relief request are Inservice Inspection Determination of Percent Coverage Worksheets, associated weld coverage plots for examination coverage, or weld scan limitation details, as applicable.

TABLE 3.10 - Category C-F-1 Carbon or Low Alloy Piping Weld Limitations				
Drawing/ Component	**Description**	**Item**	**Exam Coverage**	**Limitation/ Comment**
212/21	Main Steam System Pipe to Valve MS-V1-3A	C5.51	75%	Pipe to valve configuration
213/17	Main Steam System Pipe to Valve MS-V1-3B	C5.51	85%	Pipe to valve configuration
213/22	Main Steam System Branch Connection to Valve SV1-1B	C5.51	87.50%	Pipe to valve configuration
214/19	Main Steam System Pipe to Valve MS-V1-3C	C5.51	75%	Pipe to valve configuration
216/15	Main Feedwater System Pipe to Valve FW-8B	C5.51	71%	Pipe to valve configuration

Licensee's Proposed Alternative Examination:

None.

Evaluation: The Code requires 100% volumetric and surface examination of the subject pressure retaining high and low alloy piping welds. However, as listed in Table 3.10, complete examinations are restricted by the component pipe-to-valve configurations. These conditions make compliance with Code-required volumetric examinations impractical to perform for these welds. To provide access for examination, substantial portions of the piping runs would need to be redesigned. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% examinations are impractical.

Drawings and descriptions[8] included in the licensee's submittal show that examinations of the subject welds have been performed to the extent practical, with the licensee obtaining 100% of the surface examination coverage and approximately 71% to 87% of the volumetric examination coverages for these welds (see Table 3.10). The limitations for these restricted examinations are due to pipe-to-valve body configurations of these components which preclude full scans from both sides of the welds. These limitations cannot be overcome without redesigning the subject piping welds and attached valves, and portions of the associated piping systems. Welds 212/21 and 212/14 were completed using EPRI PDI qualified procedures, personnel and equipment (the examination of all other welds was completed prior to the implementation of Appendix VIII). No service-related problems or reportable indications have been detected during any of these examinations. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of these welds. Based on the

8. Drawings, pictures, descriptions and reports of examinations provided by the licensee for review are not included in this report .

impracticality of examining 100% of the subject welds, and the examination coverages obtained, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

4.0 CONCLUSIONS

The PNNL staff has reviewed the licensee's submittal and concludes that the Code examination coverage requirements are impractical for the subject components listed in Request for Relief No. 34, as shown in Sections 3.1 through 3.10 of this report. Further, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted for the second 10-year ISI interval at H.B. Robinson Unit 2, which ended on February 18, 2002.

The licensee withdrew the Category B-G-1 reactor coolant pump Stud 7 portion of Request for Relief 34, as described in Section 3.4 of this report, corrected several omissions and clarified changes in the relief request in the submittal dated April 16, 2004.

TABLE 1
SUMMARY OF RELIEF REQUESTS

Relief Request Number	PNNL TLR Sec.	System or Component	Exam. Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Proposed Alternative	Relief Request Disposition
34	3.1	Reactor Pressure Vessel welds	B-A	B1.11 B1.12 B1.21 B1.22 B1.30	Pressure-retaining vessel shell and head welds	Volumetric	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.2	RPV Nozzle-to-vessel welds	B-D	B3.90	Pressure-retaining nozzle-to-vessel welds in RPV	Volumetric	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.3	Dissimilar metal welds in SG and PZR nozzles	B-F	B5.40 B5.70	Pressure-retaining dissimilar metal nozzle-to-pipe welds	Volumetric and Surface	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.4	RCP “C” closure flange stud 7	B-G-1	B6.180	Pressure-retaining bolting in the reactor coolant pumps	Volumetric	Perform exams to extent practical	Withdrawn by licensee
34	3.5	Class 1 piping welds	B-J	B9.11 B9.31	Pressure-retaining circumferential piping welds	Volumetric and Surface	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.6	Class 2 vessel welds	C-A	C1.20	Pressure-retaining head welds in boron injection tanks	Volumetric	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.7	Class 2 nozzle-to-vessel welds	C-B	C2.21	Pressure-retaining nozzle-to-vessel welds in steam generator and boron injection tank	Volumetric and Surface	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.8	Class 2 integral attachments	C-C	C3.10 C3.20	Integral attachment welds on Class 2 vessels and piping	Surface	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.9	Class 2 piping welds	C-F-1	C5.10	Pressure-retaining circumferential welds in austenitic or high alloy piping	Volumetric and Surface	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)
34	3.10	Class 2 piping welds	C-F-2	C5.51	Pressure-retaining circumferential welds in carbon or low alloy piping	Volumetric and Surface	Perform exams to extent practical	Granted 10CFR50.55a(g)(6)(i)

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