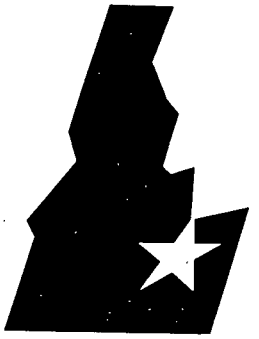

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Technical Evaluation Report on the Third 10-year Interval Inservice Inspection Program Plan: Consolidated Edison Co. of New York, Indian Point Unit 2, Docket Number 50-247

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ABSTRACT

This report presents the results of the evaluation of the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, submitted January 24, 1994, including the requests for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, requirements that the licensee has determined to be impractical. The *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, is evaluated in Section 2 of this report. The ISI Program Plan is evaluated for (a) compliance with the appropriate edition/addenda of Section XI, (b) acceptability of the examination sample, (c) correctness of the application of system or component examination exclusion criteria, and (d) compliance with ISI-related commitments identified during previous Nuclear Regulatory Commission (NRC) reviews. The requests for relief are evaluated in Section 3 of this report.

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Technical Assistance in Support
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SUMMARY

The licensee, Consolidated Edison Company of New York, Inc. has prepared the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, to meet the requirements of the 1989 Edition except that the extent of examination of Class 1 piping welds has been determined by the 1974 Edition with Addenda through Summer 1975 as permitted by 10 CFR 50.55a(b). The third 10-year interval began July 1, 1994, and ends June 30, 2004.

The information in the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, submitted January 24, 1994, was reviewed. Included in the review were the requests for relief from the ASME Code Section XI requirements that the licensee has determined to be impractical. As a result of this review, a request for additional information (RAI) was prepared describing the information and/or clarification required from the licensee in order to complete the review. The licensee provided the requested information in a submittal dated November 16, 1994.

Based on the review of the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, the licensee's response to the Nuclear Regulatory Commission's RAI, and the recommendations for granting relief from the ISI examinations that cannot be performed to the extent required by Section XI of the ASME Code, no deviations from regulatory requirements or commitments were identified in *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan* except for Requests for Relief 12 and 32.

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TECHNICAL EVALUATION REPORT ON THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PLAN CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. INDIAN POINT UNIT 2 DOCKET NUMBER 50-247

1. INTRODUCTION

Throughout the service life of a water-cooled nuclear power facility, 10 CFR 50.55a(g)(4) (Reference 1) requires that components (including supports) that are classified as American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Class 1, Class 2, and Class 3 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 of Nuclear Power Plant Components* (Reference 2), to the extent practical within the limitations of design, geometry, and materials of construction of the components. This section of the regulations also requires that inservice examinations of components and system pressure tests conducted during successive 120-month inspection intervals shall comply with the requirements in the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) on the date 12 months prior to the start of the 120-month inspection interval, subject to the limitations and modifications listed therein. The components (including supports) may meet requirements set forth in subsequent editions and addenda of this Code that are incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein, and subject to Nuclear Regulatory Commission (NRC) approval. The licensee, Consolidated Edison Company of New York, Inc. (Con Edison), has prepared the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0 (Reference 3), to meet the requirements of the 1989 Edition, except that the extent of examination of Class 1 piping welds has been determined by the 1974 Edition with Addenda through Summer 1975 as permitted by 10 CFR 50.55a(b). The third 10-year interval began July 1, 1994, and ends June 30, 2004.

As required by 10 CFR 50.55a(g)(5), if the licensee determines that certain Code examination requirements are impractical and requests relief from them,

the licensee shall submit information and justification to the NRC to support that determination.

Pursuant to 10 CFR 50.55a(g)(6), the NRC will evaluate the licensee's determination that Code requirements are impractical to implement. The NRC may grant relief and may impose alternative requirements that are determined to be authorized by law, will not endanger life, property, or the common defense and security, and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Alternatively, pursuant to 10 CFR 50.55a(a)(3), the NRC will evaluate the licensee's determination that either (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) Code compliance would result in hardship or unusual difficulty without a compensating increase in safety. Proposed alternatives may be used when authorized by the NRC.

The information in the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, submitted January 24, 1994, has been reviewed, including the requests for relief from the ASME Code Section XI requirements that the licensee has determined to be impractical. The review of the ISI Program Plan was performed using the Standard Review Plans of NUREG-0800 (Reference 4), Section 5.2.4, "Reactor Coolant Boundary Inservice Inspections and Testing," and Section 6.6, "Inservice Inspection of Class 2 and 3 Components."

In a letter dated October 13, 1994 (Reference 5), the NRC requested additional information that was required to complete the review of the ISI Program Plan. The requested information was provided by the licensee in the "Response to Request for Additional Information, Third Ten-Year Interval ISI Program (TAC No. M88559)", dated November 16, 1994 (Reference 6). In the response, the licensee revised nine requests for relief, submitted one new request for relief, and withdrew one. As a result of telephone conversations with the licensee on November 2, 1994, and December 20, 1994, the licensee provided further clarification for Requests for Relief 7, 8, 11, and 30. By letter dated January 6, 1995 (Reference 7), the licensee submitted Revision 2 to Request for Relief 8 .

The *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, is evaluated in Section 2 of this report. The ISI Program Plan is evaluated for (a) compliance with the appropriate edition/addenda of Section XI, (b) acceptability of examination sample, (c) correctness of the application of system or component examination exclusion criteria, and (d) compliance with ISI-related commitments identified during the NRC's previous reviews.

The requests for relief are evaluated in Section 3 of this report. Unless otherwise stated, references to the Code refer to the ASME Code, Section XI, 1989 Edition. Specific inservice test (IST) programs for pumps and valves are being evaluated in other reports.

2. EVALUATION OF INSERVICE INSPECTION PROGRAM PLAN

This evaluation consists of a review of the applicable program documents to determine whether or not they are in compliance with the Code requirements and any previous license conditions pertinent to ISI activities. This section describes the submittals reviewed and the results of the review.

2.1 Documents Evaluated

Review has been completed on the following information from the licensee:

(a) *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, submitted January 24, 1994 (Reference 3).

(b) Responses to Request for Additional Information, dated November 16, 1994, (Reference 6) and January 6, 1995 (Reference 7).

2.2 Compliance with Code Requirements

2.2.1 Compliance with Applicable Code Editions

The Inservice Inspection Program Plan shall be based on the Code editions defined in 10 CFR 50.55a(g)(4) and 10 CFR 50.55a(b). Based on the starting date of July 1, 1994, the Code applicable to the third interval ISI program is the 1989 Edition. As stated in Section 1 of this report, the licensee has prepared the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0 to meet the requirements of the 1989 Edition except that the extent of examination of Class 1 piping welds has been determined by the 1974 Edition with Addenda through Summer 1975 as permitted by 10 CFR 50.55a(b).

2.2.2 Acceptability of the Examination Sample

Inservice volumetric, surface, and visual examinations shall be performed on ASME Code Class 1, 2, and 3 components and their supports using sampling schedules described in Section XI of the ASME Code and 10 CFR 50.55a(b). The sample size and weld selection have been

implemented in accordance with the Code and 10 CFR 50.55a(b) and appear to be correct.

In the response to the NRC's RAI, the licensee requested approval for use of Code Case N-509, *Alternative Rules for the Selection and Examination of Class 1, 2, and 3 Integrally Welded Attachments Section XI, Division 1.* The use of Code Case N-509 provides an alternative to the examination of Code Class 1, 2, and 3 integral attachments. The INEL staff believes that the use of the alternative rules of this Code case is acceptable provided that the licensee schedules a minimum of 10% of the integral attachments in Code Class 1, 2, and 3 systems. Ambiguity in the notes of Code Case N-509 could result in component supports being selected that do not have associated integral attachments. As a result, the examination of piping integral attachments could be completely eliminated or substantially reduced. Therefore, the use of Code Case N-509 should be approved only with the above condition.

2.2.3 Exemption Criteria

The criteria used to exempt components from examination shall be consistent with Paragraphs IWB-1220, IWC-1220, IWC-1230, IWD-1220, and 10 CFR 50.55a(b). The exemption criteria have been applied by the licensee in accordance with the Code as discussed in the ISI Program Plan, and appear to be correct.

2.2.4 Augmented Examination Commitments

In addition to the requirements specified in Section XI of the ASME Code, the licensee has committed to perform the following augmented examinations:

(a) Reactor pressure vessel examinations in accordance with Regulatory Guide 1.150, Rev. 1 (Reference 8).

(b) Examination of Reactor Coolant Pump flywheels in accordance with plant Technical Specification 4.2.3.

(c) Examination of Class 2 piping welds otherwise excluded from examination based on pipe wall thickness (See Request for Relief 34, Revision 1).

2.3 Conclusion

Based on the review of the documents listed above, no deviations from regulatory requirements were identified in the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan* with the exceptions discussed in the following section.

3. EVALUATION OF RELIEF REQUESTS

The requests for relief from the ASME Code requirements that the licensee has determined to be impractical for the third 10-year inspection interval are evaluated in the following sections.

3.1 Class 1 Components

3.1.1 Reactor Pressure Vessel

3.1.1.1 Request for Relief 6, Rev. 1, Examination Category B-A, Items B1.21 and B1.22, Reactor Vessel Closure Head and Bottom Head Circumferential and Meridional Welds

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-A, Items B1.21 and B1.22 require volumetric examination of essentially 100% of the accessible length of all circumferential and meridional reactor pressure vessel head welds, as defined by Figure IWB-2500-3.

Licensee's Code Relief Request: The licensee requested relief from the Code-required examination of essentially 100% of circumferential and meridional reactor pressure vessel head Welds RVHC-1, RPVC-5, RVHM-1 thru RVHM-6, and RPVM-1 through RPVM-6.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the code requirement is impractical.

"The Reactor Pressure Vessel was designed and fabricated to codes in effect during the late 1960's. These Codes did not require that there be full access for inservice inspection, as was required by later Codes.

"The closure head peel segment to disc circumferential weld (RVHC-1) is completely enclosed within the pattern of CRDM penetrations inside the shroud and, as such, is completely inaccessible for volumetric examination as would be required by IWB-2500. Portions of the intersecting meridional welds (RVHM-1 thru 6) are also obstructed by the CRDM penetrations.

"Access to the bottom head peel segment to disc circumferential weld (RPVC-5) from inside the vessel is restricted by the location of adjacent in-core instrumentation penetrations, and this weld is also completely inaccessible for volumetric examination. Portions of the intersecting meridional welds (RPVM-1 thru 6) are also obstructed by the instrumentation penetrations. Volumetric examination from the outside of the vessel is restricted by in-core instrumentation conduits which preclude removal of the insulation to provide access for scanning path for volumetric examination."

Licensee's Proposed Alternative Examination (as stated):

"The reactor vessel closure head meridional welds will be volumetrically examined to the extent possible. Three of six meridional welds are available for approximately 91% of their length for volumetric examination. The remaining three meridional welds are further restricted by lifting lugs attached to the head at their location, precluding the axial scan. These latter welds are examined by surface techniques in addition to the volumetric examinations scheduled for the period.

"The reactor vessel lower head circumferential and meridional welds will be examined by a redesigned remote inspection tool. It is estimated that greater than 90% coverage can be accomplished using the redesigned equipment. Historically, this was not possible during the previous examination of these areas.

"Based on the coverage actually accomplished during the ten-year ISI scheduled to be performed during the 1995 refueling outage, coverage of less than 90% will be included in the ISI summary report.

"The Reactor Vessel closure head and bottom head areas will be visually examined (VT-2) each refueling outage for evidence of leakage during system pressure tests performed in accordance with IWB-2500, Category B-P, and Code Case N-498. It is expected that any through wall defects would be detected by this examination prior to failure of the vessel. This is based on the expectation that the component would experience leakage before a catastrophic failure ("leak before break").

"In addition, the Reactor Coolant System (RCS) is continuously monitored for leakage in accordance with Technical Specifications. During plant operations, the RCS leak rate is limited by Technical Specification 3.1.F.2.c(1) to 1 gpm from unidentified sources and 10 gpm total from identified sources. The various diverse means of leak detection are described in the associated Technical Specification Basis."

Evaluation: Based on the review of the reactor pressure vessel drawings, obtaining 100% volumetric coverage of the reactor pressure vessel closure head peel segment to disc circumferential

weld is impractical due to inaccessibility caused by the shroud and control rod drive mechanisms. However, the accessible portions of the closure head meridional welds can and will be examined. For three of the six closure head meridional welds, approximately 91% of the weld is available for examination. For the other three welds, 75% Code coverage is obtainable.

For the reactor pressure vessel lower head meridional and circumferential weld examinations, scanning limitations caused by the lower head instrumentation penetrations have limited coverage. However, the licensee estimates that greater than 90% coverage can be achieved on these welds with the redesigned remote inspection tool.

Based on the information provided, it appears that the licensee is performing the subject examinations to the extent practical. Increasing the coverage is impractical without redesign and modifications to the upper and lower heads. Imposing this requirement on the licensee would result in a hardship without a compensating increase in safety.

Conclusion: Complete Code coverage of the reactor pressure vessel upper and lower circumferential and meridional welds is impractical due to shroud, control rod drive, and instrumentation interferences. The licensee is examining the meridional and circumferential welds of the reactor pressure vessel closure and lower head to the extent practical. Based on the significant coverages being obtained, reasonable assurance of component integrity is provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.1.1.2 Request for Relief 11, Rev. 1, Examination Category B-F, Item B5.10, and Examination Category B-J, Item B9.11, Reactor Vessel Nozzle-to-Safe End and Safe End-to-Pipe Welds

Code Requirement: Section XI, Table IWB-2500-1, Examination Categories B-F and B-J, Items B5.10 and B9.11 require surface and

volumetric examination of nozzle-to-safe end and safe end-to-pipe welds, as defined by Figure IWB-2500-8.

Licensee's Code Relief Request: The licensee requested relief from the Code-required surface examinations for the following nozzle-to-safe end and safe end-to-pipe welds:

RPVS21-1A	RPVS23-1A
RPVS21-14A	RPVS23-14A
RPVS-22-1A	RPVS24-1A
RPVS22-14A	RPVS24-14A
RCC 21.1	RCC 21.14
RCC 22.1	RCC 22.14
RCC 23.1	RCC 23.14
RCC 24.1	RCC 24.14

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested from performance of surface examination on the basis that the implementation of Code requirements is impractical.

"The reactor vessel cavity and RPV support system were designed and fabricated to Codes in effect during the late 1960s. The Codes used did not provide for full access for inservice inspection. The access which is available would permit examination of only a very limited amount of the O.D. surface.

"The only access to the reactor nozzle safe ends from the outside surface would be through removable plugs in the primary shield. These plugs are located above the nozzle safe ends and would be removable through the refueling cavity floor. With the plugs removed, the top insulated surfaces (approximately 25%) of the nozzle safe-ends would be visible; however, the fixed insulation, designed as non-removable, precludes surface examination. The safe-ends are clad on the I.D. with inconel and partly clad on the O.D. with stainless steel.

"Insulation modifications to permit surface examination, even for a limited 25% of the weld area, are considered impractical for the following reasons: 1) a two to three rem/hr. exposure field on contact, 2) extremely confined work area, 3) restrictive clothing required for anti-contamination, 4) hazards associated with removal of asbestos insulation, 5) the minimal value in determining the overall integrity of the weld that would be derived from the limited inspection possible, and 6) the requirement to use non-asbestos material, of differing insulation performance, to reinsulate the examination areas."

Licensee's Proposed Alternative Examination (as stated):

"The subject welds are dissimilar metal welds between the carbon steel nozzle forgings and the stainless steel transition (spool) pieces of the reactor coolant piping. It is proposed the these welds be volumetrically examined during the inspection interval from the inside diameter with the automated reactor vessel inspection tool. Visual examinations (VT-2) for evidence of leakage during the system pressure tests will be performed at each refueling outage in accordance with IWB-2500, Category B-P, and Code Case N-498.

"The alternative proposed does provide for a 100% volumetric examination from the I.D. using the automated reactor vessel tool. The examination techniques are the same as those employed during the first and second interval and are adequate to detect a significant flaw. A visual examination (VT-2) will be performed, during each refueling outage, which would be capable of detecting any through wall defects prior to a catastrophic failure ("leak before break")."

Evaluation: The licensee requested relief from the Code-required surface examination of the subject pipe welds. In the NRC's RAI, the licensee was asked to verify that the ultrasonic testing instrumentation and procedures are demonstrated to be capable of detecting OD surface-connected defects, in the circumferential orientation, in a laboratory test block containing cracks and not machined notches.

During a conference call between the NRC and the licensee on January 10, 1995, the licensee committed to performing a procedure qualification on actual crack samples. This qualification was witnessed by the NRC on January 26, 1995. The licensee successfully demonstrated to the NRC the capability of detecting actual cracks, simulated as inside and outside flaws in a mockup.

Conclusion: Based on the qualification of the licensee's volumetric technique for detecting outside connected cracks in a mockup, it is reasonable to conclude that degradation, if present, will be detected. As a result, an acceptable level of quality and safety is provided. Therefore, it is recommended

that the proposed alternative examination be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

3.1.1.3 Request for Relief 12, Examination Category B-F, Items B5.40 and B5.70, Pressurizer and Steam Generator Nozzle-to-Safe End Welds

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-F, Items B5.40 and B5.70 require surface and volumetric examination of nozzle-to-safe end welds, as defined by Figure IWB-2500-8.

Licensee's Code Relief Request: The licensee requested relief from the Code-required volumetric examination of pressurizer nozzle-to-safe end Welds PZRS1 through PZRS6 and steam generator nozzle-to-safe end Welds SGS21-4, SGS21-5, SGS22-4, SGS22-5, SGS23-4, SGS23-5, SGS24-4, and SGS24-5.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested from performing volumetric examinations of 100% of the code required volume on the basis that implementation of the Code requirements is impractical.

"The Pressurizer and Steam Generators were designed and fabricated to Codes in effect during the late 1960s. The Codes did not require these components be designed for full access for inservice inspection. The conditions noted below restrict areas for a complete examination.

"The 100% volumetric examination requirements for the nozzle-to-safe end weld surfaces of the pressurizer and steam generators are limited by the following:

* Contours of the nozzle-to-safe end weld surfaces. Specifically, the as-fabricated contours of these welds are rounded with relatively high crowns of non-uniform heights.

* The as-cast geometry of the nozzles and vessel head.

* Nozzle weld reinforcement.

* Adjacent welds on thermal sleeves and rolled-in liners.

* The configuration of elbows connected to safe ends.

"The combination of weld crown contours, the as-cast geometry of nozzles, nozzle reinforcement welds, adjacent welds, and elbows preclude complete volumetric examination of nozzle-to-safe end welds as required by Code."

"Based on the reliable operating history of these and similar nozzles at other plants and the performance of surface examination and partial ultrasonic examination; and a visual examination (VT-2) capable of detecting any through-wall defects prior to a catastrophic failure ("leak before break"), granting of this relief will not result in a decrease in the overall level of quality and safety."

Licensee's Proposed Alternative Examination (as stated):

"Surface examinations will be performed on all nozzle-to-safe end welds as required by Items B5.40 and B5.70. Best effort volumetric examinations by ultrasonic methods will be performed on all welds. The examinations to be performed will be consistent with those performed during the preservice inspection and the first and second inspection intervals. The examination techniques are the same as those employed during the first and second interval. Portions of the required volume not examined will be identified. Visual examinations (VT-2) for evidence of leakage during the system pressure test will be performed at each refueling in accordance with IWB-2500, Category B-P and Code Case N-498."

Evaluation: The Code requires 100% volumetric and surface examination of the steam generator and pressurizer nozzle-to-safe end welds. The licensee proposes to perform the Code-required surface examination and a best effort volumetric examination. In the case of the pressurizer nozzle safe-end welds, the licensee stated in the response to the RAI, that they are fabricating a full-size mockup of the elbow to safe-end weld to support the ultrasonic technique development and confirmation of flaw detection.

During a December 20, 1994, conference call between the licensee and the NRC, the licensee provided additional information to clarify the response to the RAI. The licensee stated that they could theoretically meet the Code-required coverage. However, from a conservative point of view, the licensee believed that due to the geometry and metallurgical properties of the subject

examination areas, the resultant examinations may have limitations associated with flaw detection.

Based on the review of the licensee's basis for relief, the INEL staff does not believe that the licensee has provided adequate supporting information to conclude that the Code-required volumetric examination is impractical. The licensee has stated that a best-effort volumetric examination by ultrasonic methods will be performed on all welds. These examinations will be consistent with those performed during the preservice inspection and the first and second inspection intervals. The examination techniques are the same as those employed during the first and second interval. The licensee has not discussed state-of-the-art volumetric examination techniques that will be implemented during the interval or a quantitative estimate of coverage that will be obtained.

The licensee stated that portions of the required volume not examined will be identified. The licensee should submit requests for relief on a case by case basis for the actual examinations performed during the interval. Since this request for relief does not include this information, it is recommended that relief be denied.

Conclusions: Because the licensee has not presented specific information regarding examination techniques employed or quantitative examination coverage being obtained, it is recommended that relief be denied.

3.1.2 Pressurizer

3.1.2.1 Request for Relief 7, Examination Category B-B, Items B2.11 and B2.12, Pressurizer Upper Shell-to-Head Circumferential and Longitudinal Welds

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-B, Items B2.11 and B2.12 require volumetric

examination of essentially 100% of the upper and lower circumferential welds and one foot of longitudinal weld intersecting each circumferential weld, as defined by Figure IWB-2500-1 and 2.

Licensee's Code Relief Request: The licensee requested relief from the Code-required examination of Pressurizer Upper Shell to Head Circumferential Weld PZRC-5 and Longitudinal Weld PZRL-4.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the Code requirement is impractical.

"The pressurizer was designed and fabricated to Codes in effect during the late 1960's. The Codes used did not provide for full access for inservice inspection as required by later Codes.

"The upper circumferential (PZRC-5) and longitudinal (PZRL-4) weld are enclosed in a biological and missile shield and are therefore completely inaccessible for volumetric examination.

"The level of inspections proposed for the third interval has been in effect for the first two inspection intervals. Based on the reliable operating history of this and similar vessels at other plants and the performance of VT-2 examinations for leakage, granting of this relief will not decrease the overall level of quality and safety of this component."

Licensee's Proposed Alternative Examination (as stated):

"Examination of the accessible portions of the shell-to-bottom head circumferential and longitudinal welds (PZRC-1 and PZRL-4) will be performed as required by IWB-2500. The welds will be visually examined (VT-2) during each refueling outage for evidence of leakage during system pressure tests performed in accordance with IWB-2500, Category B-P, and Code Case N-498.

"It is expected that any through wall defects would be detected by this examination prior to the failure of the pressurizer based on the expectation that the component will experience leakage before a catastrophic failure ("leak before break")."

Evaluation: The Code requires 100% volumetric examination of the pressurizer upper head circumferential weld and associated longitudinal weld. However, these welds are inaccessible for

volumetric examination due to permanent insulation and minimal clearances for access. As a result, the Code-required volumetric examination of the subject welds is impractical. In order to obtain Code examination coverage, design modifications would be required. The imposition of this requirement would present a considerable burden on the licensee.

The licensee is performing the Code-required volumetric examination of the pressurizer lower head circumferential weld and associated longitudinal weld. These welds are subject to similar service as the upper head circumferential and associated longitudinal welds. Therefore, the examination of the lower head welds should provide an indication of the general state of the head welds in the pressurizer. As a result, reasonable assurance of structural integrity will be maintained.

Conclusion: The Code-required volumetric examination of the pressurizer upper head circumferential and associated longitudinal weld is impractical because of permanent insulation and limited access. The examination of the lower head circumferential and associated longitudinal weld should provide reasonable assurance of the vessel integrity. Therefore, it is recommended relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.1.2.2 Request for Relief 9, Rev. 1, Examination Category B-D, Item B3.120 Pressurizer Nozzle Inside Radius Sections

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-D, Item B3.120 requires 100% volumetric examination of the pressurizer nozzle inner radius sections once each inspection interval as defined by Figure IWB-2500-7.

Licensee's Code Relief Request: The licensee requested relief from the Code-required volumetric examination of the pressurizer nozzle inner radius sections PZRS-1, PZRS-2, PZRS-3, PZRS-4, PZRS-5, and PZRS-6.

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

"Pursuant to 10 CFR 50.55a(g)(6)(i), relief is requested from performing volumetric examination of the pressurizer nozzle inner radius sections on the basis that compliance with the code requirement is impractical.

"The pressurizer was designed and fabricated to Codes in effect during the late 1960's. The Codes used did not provide for full access for inservice inspection nor did they require a surface finish in the nozzle area suitable for UT examination. The design of the nozzles, utilizing a gradual inside radius section, is specifically intended to reduce stress in this area and minimize the conditions that might lead to cracking.

"The nozzles on the pressurizer are cast with the vessel heads. The as cast surface of the heads, combined with the geometry of this area makes ultrasonic examination of the nozzle inner radii impractical.

"The geometry and size of the nozzles are such that a radiographic examination is not feasible. Specifically, the radiographic test film cannot be situated properly from the ID due to a lack of interior structure. Placement of the source on the ID will not allow proper film to source distance, resulting in greatly reduced sharpness due to part geometry.

"Additionally, with the manway slightly lifted from the manway flange, fields exterior to the pressurizer in the vicinity of the manway are 3-5 rem/hr. Although the fields within the pressurizer have not been specifically measured, they are considerably higher and preclude the placement of radiographic film on the interior of the pressurizer."

Licensee's Proposed Alternative Examination (as stated):

"In lieu of the volumetric examination requirements for relief line nozzle welds PZR2, PZRS-3, PZRS-4, and PZRS-5, we are proposing the following additional alternate examinations. We will perform a remote visual examination on each of those inner radius areas, as planned maintenance makes access available. Valves on PZR-3 to PZRS-5 are removed periodically for maintenance. Once per interval, when the valve is removed, we will use a remote visual chip camera to examine each of the inner radius areas. Once per interval, PZRS-2 will be examined, if we remove the pressurizer access manway for planned maintenance. PZRS-2 does not have the removable safety valve at the same location as the others, requiring access to be gained from a different location.

"Neither PZRS-1 nor PZRS-6 are accessible. PZRS-1 is covered by an array of nozzle heads and PZRS-6 is covered by a retaining basket. During the 1995 refueling outage we plan to perform an in-field assessment of the feasibility of performing the required

examination of either of these nozzles using computerized scanning (state-of-the-art) technology. If the results are favorable, we will withdraw or modify this portion of Relief Request 9.

"All nozzles will be visually examined (VT-2) at each refueling outage during system pressure tests in accordance with IWB-2500, Category B-P, and Code Case N-498 in lieu of the Code-required volumetric examination once in ten years. While we are not proposing "leak before break" as an alternative to performing these examinations, it is expected that any through wall defects would be detected by the proposed alternate examination prior to failure of the component. This is based on the expectation that the components will experience leakage before a catastrophic failure ("leak before break")."

Evaluation: The volumetric examination of the subject pressurizer nozzle inner radius sections has been determined to be impractical because the nozzles are integrally cast to the pressurizer heads and have a surface finish and geometry that are not conducive to volumetric examination. The licensee has proposed, as an alternative to the Code-required volumetric examination, to perform a remote visual examination on nozzle inner radius sections for nozzles PZRS-2, PZRS-3, PZRS-4, and PZRS-5 when planned maintenance makes access available. The INEL staff believes that the licensee's proposed alternative visual examination will provide an acceptable level of quality and safety provided that the visual examination is a VT-1 visual examination with color capability.

For nozzles PZRS-1 and PZRS-6, an alternative visual examination is impractical due to accessibility. A remote visual examination of the inside radius section of the spray nozzle (PZRS-1) is restricted by an array of spray nozzles. The pressurizer surge nozzle (PZRS-6) examination is restricted by the retaining basket. The licensee is performing an in-field assessment during the 1995 refueling outage to determine the feasibility of performing computerized scanning with state-of-the-art technology to examine these welds.

Conclusion: A VT-1, color, visual examination of the inner radius sections of the subject nozzles that are accessible for visual examination should detect a pattern of degradation, if present. As a result, reasonable assurance of structural integrity will be provided. Therefore, it is recommended that relief be granted for PZRS-2, PZRS-3, PZRS-4, and PZRS-5 pursuant to 10 CFR 50.55a(g)(6)(i), provided that the visual examination is a VT-1 visual examination with color capability.

For pressurizer nozzles PZRS-1 and PZRS-6, the INEL staff recommends that relief be denied at this time. The licensee should address the Code-required volumetric examination of these nozzles following the in-field assessment. If the volumetric examination of these nozzles is feasible, the licensee should also determine the feasibility of applying the technique to nozzles PZRS-2, PZRS-3, PZRS-4, and PZRS-5.

3.1.3 Heat Exchangers and Steam Generators

3.1.3.1 Request for Relief 8, Rev. 2, Examination Category B-B, Items B2.51 and B2.80, Regenerative Heat Exchanger Circumferential Weld and Tubesheet-to-Shell Weld Examinations, Examination Category B-D, Items 3.150 and 3.160, Nozzle-to-Vessel Welds and Nozzle Inside Radius Section Examinations

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-B, Item B2.51 requires 100% volumetric examination of circumferential heat exchanger head welds as defined by Figures IWB-2500-1 and -3. Examination Category B-B, Item B2.80 requires volumetric examination of the tubesheet-to-shell welds as defined by Figure IWB-2500-6.

Examination Category B-D, Items B3.150 and B3.160 require a volumetric examination of the nozzle-to-shell weld and nozzle inner radius sections as defined by Figure IWB-2500-7.

Licensee's Code Relief Request: The licensee requested relief from the Code-required examination of the following regenerative heat exchanger welds:

Circumferential Head Welds (Item B2.51)	
50% Estimated Coverage:	**75% Estimated Coverage:**
RGXC 1-1, RGXC 2-1, RGXC 3-1	RGXC 1-4, RGXC 2-4, RGXC 3-4
Tubesheet-to-Shell Welds (Item B2.80)	
50% Estimated Coverage:	**75% Estimated Coverage:**
RGXC 1-2, RGXC 2-2, RGXC 3-2	RGXC 1-3, RGXC 2-3, RGXC 3-3
Nozzle-to-Vessel Welds (Item No. B3.150)	
50% Estimated Coverage:	**75% Estimated Coverage:**
RGXN 1-1, RGXN 1-2	RGXN 1-3, RGXN 1-4
RGXN 2-1, RGXN 2-2	RGXN 2-3, RGXN 2-4
RGXN 3-1, RGXN 3-2	RGXN 3-3, RGXN 3-4
Nozzle Inside Radius Sections (Item B3.160)	
50% Estimated Coverage:	**75% Estimated Coverage:**
RGXN 1-1, RGXN 1-2	RGXN 1-3, RGXN 1-4
RGXN 2-1, RGXN 2-2	RGXN 2-3, RGXN 2-4
RGXN 3-1, RGXN 3-2	RGXN 3-3, RGXN 3-4

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the Code requirement is impractical.

"The regenerative heat exchanger was designed and fabricated to Codes in effect during the late 1960's. These Codes did not require that there be full access for inservice inspection, as was required by later Codes. The component was designed before

inspection, ample access and weld configuration conducive for examination were required.

"The UT scan paths for the examination of the circumferential head, the tubesheet-to-shell and nozzle welds are limited by the proximity of these welds to each other and the weldolets proximate to those welds. Drawing A206921 (Appendix B of ISI Program Summary) and photograph A14511-3 (attached) illustrate the problem with obtaining the required 90% coverage and support our estimates of actual coverage described in the table on pages 2 and 3.[1]"

Licensee's Proposed Alternative Examination (as stated):

"All subject welds will be UT examined to the extent possible. The estimated examination coverage is provided in the table on page 2.

"The nozzle welds will also be surface-examined (liquid penetrant) in accordance with requirements for B9.32 (branch pipe connection) welds. This type of examination is appropriate and adequate due to the similarity of weld details between these nozzles and the configuration depicted in ASME Boiler & Pressure Vessel Code, Section XI, Figure IWB-2500-10, which illustrates a typical branch pipe connection.

In addition, all component parts and the welds associated with the regenerative heat exchanger will be visually examined during hydrostatic testing as required by IWB-2500, category B-P, and in accordance with Code Case N-498."

Evaluation: The licensee has requested relief from complete Code-required volumetric coverage of the regenerative heat exchanger circumferential head welds, tubesheet-to-shell welds, nozzle-to-vessel welds, and nozzle inside radius sections. In support of this request, the licensee submitted drawings and pictures that depict the restrictions that limit scanning for complete Code coverage. It is clear that the Code-required volumetric coverage is impractical. To perform the examination to the extent required by the Code, design modifications and/or replacement of the component with one of a design that allows for complete coverage would be required.

[1]Drawings, photographs, and tables are not included with this report.

The licensee has provided estimated volumetric examination coverages of 50% to 75% for the subject examination areas. In addition, for the nozzle-to-vessel welds, the licensee will also perform a surface examination. The limited volumetric examinations, in conjunction with the supplemental surface examination of the nozzle-to-vessel welds, will provide reasonable assurance of the structural integrity of these regenerative heat exchanger welds.

Conclusion: Complete Code-required volumetric examination for the regenerative heat exchanger circumferential head welds, tubesheet-to-head welds, nozzle-to-vessel welds, and nozzle inside radius sections is impractical for Indian Point 2 due to scanning restrictions and/or geometric configurations of the examination areas. Imposing the Code requirements on the licensee would result in a burden. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.1.3.2 Request for Relief 10, Rev. 1, Examination Category B-D, Item B3.140, Steam Generator Nozzle Inside Radius Sections

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-D, Item B3.140 requires volumetric examination of steam generator nozzle inner radius sections as defined by Figure IWB-2500-7.

Licensee's Code Relief Request: The licensee requested relief from the Code-required volumetric examination of the steam generator primary nozzle inner radius sections for Steam Generator Numbers 21, 22, 23, and 24.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the Code requirement is impractical.

"The steam generator was designed and fabricated to Codes in effect during the late 1960's. The Codes used did not provide

for full access for inservice inspection nor did they require a surface finish in the nozzle area suitable for UT examination. The design of the nozzles, utilizing a gradual inside radius section, is specifically intended to reduce stress in this area and minimize the conditions that might lead to cracking.

"The nozzles on the steam generator are integrally cast with the vessel heads. The irregular as-cast surface of the heads, combined with the geometry of this area, effectively precludes transmission of ultrasound into the part, preventing a meaningful ultrasonic examination of the nozzle inner radii.

"The inner radius surface is a rough, manually deposited cladding which is not conducive to meaningful surface examinations.

"Historically, the radiation levels in the interior vicinities of the nozzles have been determined to range from 25 to 40 rem/hr. These levels make radiographic examination impractical."

Licensee's Proposed Alternative Examination (as stated):

"As an alternative examination, we propose performing a visual examination of the inner radius surfaces of the inlet and outlet nozzles during the interval.

"All nozzles will be visually examined (VT-2) at each refueling outage during system pressure tests in accordance with IWB-2500 and Code Case N-498 in lieu of the Code-required volumetric examination once in ten years. It is expected that any through wall defects would be detected by the proposed alternate examination prior to failure of the component. This is based on the expectation that the component will experience leakage before a catastrophic failure ("leak before break")."

Evaluation: The steam generator primary nozzles are integrally cast with the vessel head. Examination of the inner radius section from the outside surface requires scanning on an irregular, as-cast surface using a long metal path through a complex geometry. To perform a meaningful, complete volumetric examination, design modifications or replacement of the nozzles with ones of an inspectable design would be required.

The licensee has proposed to perform, during the interval, a visual examination of the inside radius sections of the inlet and outlet nozzles as an alternative. The INEL staff believes that an acceptable level of quality and safety will be provided by the

visual examination if it is a VT-1 visual examination with color capability.

Conclusion: The Code requires that all of the steam generator primary side nozzle inner radii be volumetrically examined during the 10-year interval. The licensee has proposed to perform a visual examination of the inner radius sections in lieu of the Code-required volumetric examinations. The INEL staff finds this alternative acceptable provided that the visual examination is a VT-1 visual examination with color capability. Therefore, it is recommended that the proposed alternative be authorized pursuant to 10 CFR 50.55a(3)(i), provided that the visual examination is a VT-1 visual examination with color capability.

3.1.4 Piping Pressure Boundary

3.1.4.1 Request for Relief 27, Examination Category B-J, Item B9.12, Pressure-Retaining Class 1 Longitudinal Piping Welds

Code Requirement: Section XI, Table IWB-2500-1, Examination Category B-J, Item B9.12 requires surface and volumetric examination of at least a pipe diameter but not more than 12 inches of longitudinal piping welds as defined by Figure IWB-2500-8.

Licensee's Code Relief Request: The licensee requested relief from the Code-required volumetric examination of longitudinal welds in eight reactor coolant loop elbows that are fabricated in two halves and welded together.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the Code requirement is impractical.

"The primary coolant piping was designed and constructed to Codes in effect in the late 1960's. The original fabrication codes and specifications did not anticipate the periodic ultrasonic examination of these welds. Based on industry research, as

described below, the code specified UT examination techniques will not be effective in detecting service related defects.

"Eight ninety-degree elbows in the reactor coolant system piping were fabricated in two halves from austenitic stainless steel castings and welded together by the electroslag process. The structure of the material is such that ultrasonic examinations cannot be performed as required by IWB-2500-1, Item B9.12. The large and varying granularity of the statically cast crystalline structure, combined with the geometry of the elbow, precludes ultrasonic examination of the longitudinal welds.

"There are no practical signal processing techniques for ultrasonically examining coarse-grained statically cast elbows. EPRI Project Report 1570-2 entitled "Signal Processing for Coarse-Grained Materials", dated July 1987, supports this conclusion. Additionally, the elbow's curved geometry and the curved elbow surfaces on either side of the longitudinal weld would largely preclude meaningful scanning patterns. Even if manual scanning were utilized it would be impractical to assure proper coverage of required weld and base metal volume. EPRI Project Report 2405-16 entitled "Detection and Characterization of Defects in Centrifugally Cast Stainless Steel", dated June 1987, supports the conclusion that attenuation caused by grain structure, in combination with manual scanning, would not result in reliable examinations."

"The proposed alternative examination, as described below, are the same techniques used during the first two ten-year inservice inspection intervals. Throughout the industry there is a history of satisfactory reactor coolant elbow performance. The continued integrity of the elbows at Indian Point Unit No. 2 has been demonstrated by satisfactory operation since the early 1970's. The proposed examination techniques will provide reasonable assurance that the overall level of plant safety will be maintained consistent with the original plant design and fabrication bases. Granting of this relief will not decrease the overall level of plant quality and safety."

Licensee's Proposed Alternative Examination (as stated):

"The RCS longitudinal weld seams will be surface examined pursuant to IWA-2220 and visually examined (VT-2) for evidence of leakage during system pressure testing in accordance with IWB-5200 and Code Case N-498. It is expected that any through wall defects would be detected by these examinations prior to failure of the piping based on the expectation that the piping will experience leakage before a catastrophic failure ("leak before break")."

Evaluation: The licensee has requested relief from performing the Code-required volumetric examination of the longitudinal welds in centrifugally cast reactor coolant loop elbows. The

licensee believes that due to the coarse grain structure of the material and the geometry of the elbows, a meaningful examination cannot be obtained. The licensee proposed as an alternative to perform a surface and VT-2 visual examination of the longitudinal elbow welds.

The INEL staff concurs that meaningful volumetric examination of the subject cast stainless steel welds is impractical because of the coarse grain structure and the geometry of the elbows. To obtain a meaningful, complete volumetric examination, design modifications or replacement of the elbows with ones of a design compatible with volumetric examination techniques would be required.

The INEL staff believes that the licensee's proposed surface examination and VT-2 examination, in combination with the examination performed on the associated circumferential weld, will provide an acceptable level of quality and safety.

Conclusion: The Code-required volumetric examination of the subject reactor coolant loop elbow longitudinal welds is impractical due to material properties and geometric configuration of the elbows. The licensee has proposed a surface and VT-2 visual examination of the elbow longitudinal welds. These examinations, in combination with examination of the associated circumferential welds, will provide an acceptable level of quality and safety. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.1.5 Pump Pressure Boundary

3.1.5.1 Request for Relief 30, Rev. 1, IWA-5250, Corrective Measures When Leakage Occurs at a Bolted Connection

Code Requirement: Section XI, IWA-5250(a)(2), states that if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

Licensee's Code Relief Request: The licensee requested relief from the Code-required removal of bolting in Reactor Coolant Pump 23 for VT-3 visual examination where known leakage and degradation has occurred.

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

"Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested on the basis that compliance with the Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

"Disassembly of a reactor coolant pump main flange to support a visual examination of the bolting is not warranted when other means exist that will provide an equivalent examination.

"Compliance with the new code (i.e., removal of the studs for visual examination) would result in an estimated additional personnel exposure of 8-10 person-rem."

Licensee's Proposed Alternative Examination (as stated):

"A visual examination of each reactor coolant pump main flange bolting is performed each refueling outage when the reactor coolant system is at cold shutdown. In conjunction with decontamination efforts, a visual examination is performed. Areas of boron crystals are identified and evaluated. Following the decontamination, areas that had appreciable amounts of boron crystals present are re-examined to evaluate for potential corrosive attack.

"If corrosive attack is identified on the bolting, then accessible areas are measured using standard measuring devices. The corroded area is also measured using straight beam ultrasonic examination with a transducer inserted down the center drilled hole for the length of the bolt. The ultrasonic examination measures the metal thickness between the inner diameter of the

center drilled hole and the outside diameter of the bolt. The cross section area is then evaluated to the requirements of IWB-3517.1(C).

"This examination is conducted prior to the system pressure test and establishes the acceptability of the bolting."

Evaluation: The licensee has requested relief from the removal of reactor coolant pump studs in Reactor Coolant Pump 23. The licensee noted boric acid attack of studs in this pump during examinations performed in 1989 and examined the studs for degradation in 1991 and 1993. A visual examination supplemented by mechanical measurement of the accessible area of the degraded studs and a straight beam ultrasonic measurement to determine the remaining stud diameter is being used to monitor the studs. Reactor Coolant Pump 23 is scheduled to be overhauled during the 1997 refueling outage, at which time bolting examinations will be performed again.

The Code requires the removal of bolting for evaluation when leakage occurs. Because degradation rates cannot be reliably predicted, it is essential that the licensee monitor the subject bolting on an regular basis. The licensee stated that the next scheduled bolting examination for this pump is in 1997. The INEL staff believes that the licensee should monitor the bolting both mechanically and from the center drilled holes during each outage leading up to the overhaul.

Conclusion: The licensee is monitoring the studs in Reactor Coolant Pump 23, which has known stud degradation, to assure the continued operability of these studs. Based on the examination history developed for the subject studs, removal of the degraded bolts would result in a hardship without a compensating increase in the level of quality and safety. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(ii), provided that mechanical and ultrasonic examinations are performed during each outage leading up to the pump overhaul.

3.1.6 Valve Pressure Boundary (No relief requests)

3.1.7 General

3.1.7.1 Request for Relief 33, IWA-5250, Corrective Measures When Leakage is Detected at a Bolted Connection

Code Requirement: Section XI, IWA-5250(a)(2), states that if leakage occurs at a bolted connection, the bolting shall be removed, VT-3 visually examined for corrosion, and evaluated in accordance with IWA-3100.

Licensee's Code Relief Request: The licensee requested relief from the Code-required removal of bolting for VT-3 visual examination when leakage occurs at a bolted connection during a pressure test if that bolting had been inspected and found satisfactory or had been replaced by new bolting during the same outage as the pressure test.

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

"Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested on the basis that compliance with the Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety."

"Relief is requested from removal and visual inspection of bolting at a bolted connection for leakage discovered during a system pressure test when the bolting was inspected and found satisfactory or replaced during the same outage as the pressure test. Removal and reinspection of bolting inspected or replaced during the same outage will not add to the assurance of pressure boundary integrity, because there is insufficient time for any corrosion mechanism to degrade the bolting condition."

"Since there is no safety or quality benefit from re-examining new or recently inspected bolting, as described above, granting of this relief will not decrease the overall level of quality and safety."

Licensee's Proposed Alternative Examination (as stated):

"None"

Evaluation: In accordance with the 1989 Edition of the Code, when leakage occurs at bolted connections, all bolting is required to be removed for VT-3 visual examination. The licensee has requested relief from removal of bolting that has either been installed new or has received a VT-3 visual examination prior to installation when leakage is found prior to or during startup. Requiring the licensee to remove new bolts or just-examined bolts is a hardship without a compensating increase in safety.

The INEL staff believes that reasonable assurance of operational readiness is provided by new bolts or bolts that received a VT-3 visual examination prior to service. When leakage does occur, the licensee should take corrective measures to stop the leak and remove boric acid from bolting if the bolting is susceptible to boric acid attack.

Conclusion: Bolting will not exhibit degradation without related service time. Requiring the licensee to remove bolting in these cases results in a hardship without a compensating increase in safety. Therefore, it is recommended that the licensee's proposal be authorized pursuant to 10 CFR 50.55a(a)(3)(ii), provided that corrective measures are taken to stop the leak and remove boric acid from bolting when the bolting is susceptible to boric acid attack.

3.2 Class 2 Components

3.2.1 Pressure Vessels

3.2.1.1 Request for Relief 16, Examination Categories C-A, C-B, and C-C, Items C1.10, C1.20, C2.31, and C3.10, Residual Heat Removal Exchanger Shell and Head Circumferential Welds, Reinforcing Plate-to-Nozzle Welds and Vessel Integral Attachments

Code Requirement: Section XI, Table IWC-2500-1, Examination Category C-A, Item C1.10 requires 100% volumetric examination of shell circumferential welds at gross structural discontinuities

and Item C1.20 requires volumetric examination of the Residual Heat Removal Heat Exchanger head circumferential welds of one of multiple vessels as defined in Figure IWC-2500-1.

Examination Category C-B, Item C2.31 requires a surface examination of the welds between the nozzle reinforcing plate and the nozzle and the vessel of one of multiple vessels as defined by Figure IWC-2500-4(c).

Examination Category C-C, Item C3.10 requires a surface examination of integrally-welded attachments to pressure vessels as defined by Figure IWC-2500-5.

Licensee's Code Relief Request: The licensee requested relief from the Code-required surface and volumetric examinations of the shell and head circumferential welds, reinforcing plate-to-nozzle welds, and vessel integral attachment welds for the residual heat removal heat exchangers.

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

"Pursuant to 10 CFR 50.55a(a)(3)(ii) relief is requested on the basis that compliance with the code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

"The RHR Heat Exchangers and their insulation system were designed and fabricated during the late 1960s and early 1970s. The Codes in effect at that time did not require access to RHR Heat Exchangers for inservice inspection examination.

"Access for examination of the shell and head circumferential welds, reinforcing plate welds to nozzle and vessel and integrally welded attachments is precluded by insulation which was not designed for removal and replacement for examination purposes. The Residual Heat Removal (RHR) heat exchangers are vertically mounted. The insulation on the bottom head is designed as essentially one unit supported by the shaping of the insulation around the inlet and outlet piping. Removing the portion of the insulation required for examination access will result in removing vertical support for the insulation on the head. Carefully controlled removal of the insulation will require erection of scaffolding and significant work activity near the head where radiation fields are on the order of 30-35 rem/hr. The effort to erect scaffolding, remove the

insulation, prepare surfaces for examination, conduct the examinations, replace the insulation, and disassemble the scaffolding will result in significant personnel radiation exposure. Based on the reliable operating history of these heat exchangers and similar units at other nuclear plants, the increase in assurance of component integrity that would result from these examinations is not sufficient to compensate for the personnel hazard that would result from performing these examinations."

"The level of inspections proposed for the third interval have been in effect for the first two inspection intervals. The expected exposure of personnel to radiation in order to remove the insulation and prepare the component for examination will not provide a significant enough increase in quality and safety to justify the hazards involved. Based on the reliable operating history of this and similar vessels at other plants, granting of this relief will not decrease the level of quality and safety."

Licensee's Proposed Alternative Examination (as stated):

"The RHR heat exchangers will be visually examined once each inspection period for leakage during the system pressure test in accordance with IWC-2500, Category C-H, and Code Case N-498.

"It is expected that any through wall defects would be detected by this examination prior to the failure of the heat exchanger based on the expectation that the component will experience leakage before a catastrophic failure ("leak before break")."

Evaluation: The residual heat exchanger at the Indian Point 2 plant is designed with essentially nonremovable insulation. To examine the Residual Heat Exchanger shell and head circumferential welds, reinforcing plate-to-nozzle welds and vessel integral attachments, removal of essentially permanent insulation in high radiation fields would be required. Steps to ready these areas for examination require work in 30-35 rem/hr fields. Therefore, imposing the Code surface and volumetric examination requirements on the licensee would result in a hardship.

Conclusion: Removal of essentially permanent insulation in high radiation fields is required to examine Residual Heat Exchanger shell and head circumferential welds, reinforcing plate-to-nozzle welds and vessel integral attachments. As a result, the licensee would be subjected to a considerable hardship. The licensee's

continued VT-2 visual examinations on a periodic basis should provide reasonable assurance of continued operational readiness. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

3.2.1.2 Request for Relief 25, Examination Category C-B, Item C2.22, Steam Generator Feedwater Inlet Nozzle and Main Steam Outlet Nozzle Inside Radius Sections

Code Requirement: Section XI, Table IWC-2500-1, Examination Category C-B, Item C2.22 requires volumetric examination of nozzle inner radius sections in one of multiple vessels as defined by Figure IWB-2500-4(a) or (b).

Licensee's Code Relief Request: The licensee requested relief from the Code-required volumetric examination of the feedwater nozzle and main steam nozzle inner radius sections.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the Code requirement is impractical.

"MAIN STEAM NOZZLE

Meaningful ultrasonic examination of the inside radius sections of the steam outlet nozzles from the OD is essentially precluded by the complex geometry resulting from the combination of a small nozzle inside radius (1 3/4"R) and a large non-concentric outer nozzle radius section (5"R). In addition, the short flat section on the nozzle barrel section precludes scanning the nozzle in the axial direction and the curved non-spherical top dome precludes scanning the nozzle in the radial direction. General access to the inside of the steam generator outlet nozzle requires that the plant be shut down, and the secondary side manway be opened. Specific access to the inside of the steam outlet nozzle for potential radiographic examinations or visual examinations is precluded by the mist extractors.

"FEEDWATER NOZZLE

Meaningful ultrasonic examination of the feedwater nozzle inside radius is essentially precluded by the complex geometry resulting from the combination of a small nozzle inside radius (1 3/4"R) and a large non-concentric outer nozzle radius (5"R). The

geometry is also complicated by the intersection of the nozzle and the cylindrical shell section. General access to the inside radius area of the feedwater inlet nozzles is also limited by a combination of factors, requiring shutting down the plant, opening the secondary side manway,. and grinding out the welded plates to gain access to the feed ring area and the confined area in the feedwater nozzle vicinity. The fixed thermal sleeve is part of the feedwater internal header and limits access to the lower shell area. The access to the feedwater nozzle inside radius is estimated to be 30% of the Code required volume.

"The steam generators were designed and fabricated to Codes in effect during the late 1960s. The codes in effect at the time the steam generators were constructed did not require a capability for volumetric examination of the inner radius of nozzles. The Codes used did not provide for full access for inservice inspection. Gaining access to the steam and feedwater nozzles from the I.D. of the steam generator would require removal of internal components not designed to be removed for inspection purposes. Moreover, the design of the inside radius sections minimizes stresses to assure reliable operation. The design of these nozzles, utilizing a gradual radius section and the use of thermal sleeves on the feedwater nozzles, is specifically intended to reduce stress in this area and minimize conditions that might lead to cracking.

"In the case of the feedwater nozzles, thermal stress in the nozzle inside radius section is minimized by a thermal sleeve and Altran seal which prevents significant exposure of the hot inside radius to colder incoming feedwater. Thermal stresses are minimized in the steam generator nozzle inside radius section via direct exposure to main steam in combination with insulation on the nozzle outside surface."

"The type and frequency of examinations proposed for the steam generator nozzles have been in effect for the first two inspection intervals. Based on a reliable operating history of these and similar nozzles at other plants, the alternate examinations proposed for feedwater nozzle inside radius, and the inherent risks to the steam generators by removing internal permanent equipment, granting of this relief will not decrease the overall level of plant quality and safety that would be achieved had the Code requirements been implemented."

Licensee's Proposed Alternative Examination (as stated):

"Visual examinations (VT-2) of the nozzle areas will be performed to detect evidence of leakage during system pressure tests, in accordance with IWC-2500, Category C-H and Code Case N-498. In addition, the inside radius section of one feedwater inlet nozzle will be visually and magnetic particle examined to the extent permitted by the thermal sleeve connected to the feedwater ring assembly. This will be performed once per interval. The VT-2 visual examinations combined with the magnetic particle

examination of the nozzle's inside surface once per interval are considered sufficient to assure a continued overall satisfactory level of plant quality and safety."

Evaluation: The Code requires volumetric examination of the steam generator main steam outlet nozzle inner radii and feedwater nozzle inner radii. The licensee indicated that the small inside radii of the subject nozzles (1 3/4 inches) precludes a meaningful examination. The licensee has proposed to perform a VT-2 visual examination of the nozzle areas for evidence of leakage during system pressure tests. In addition, one feedwater inlet nozzle will have a visual and magnetic particle examination to the extent practicle to assess the condition of the nozzle. Based the proposed alternative examinations, it is believed that reasonable assurance of structural integrity will be provided.

Conclusion: Performing the Code-required examinations on the subject steam generator main steam nozzle inner radius and feedwater nozzle inner radius is impractical because of the complex geometry resulting from the small nozzle inside radius and a large non-concentric outer nozzle radius. Based on the licensee's proposed alternative, it is believed that reasonable assurance of structural integrity will be provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i)

3.2.2 Piping

3.2.2.1. Request for Relief 34, Rev. 1, Examination Category C-F-1, Item C5.10, Class 2 Piping Welds Greater or Equal to 3/8-Inch Nominal Wall Thickness For Piping Greater Than 4-Inch NPS

Code Requirement: Section XI, Table IWC-2500-1, Examination Category C-F-1, Item C5.10 requires surface and volumetric examination of a sample of Class 2 piping welds greater than or

equal to 3/8-inch nominal wall thickness for piping greater than 4-inch NPS as defined by Figure IWC-2500-7.

Licensee's Code Relief Request: The licensee requested relief from complying with "Parts Examined" of Table IWC-2500-1, Examination Category C-F-1, for selection criteria for Class 2 piping welds.

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

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is required on the basis that the proposed alternative provides an acceptable level of quality and safety.

"The NRC staff, in reviewing the Indian Point 2 third interval inservice inspection program, indicated that the Code does not include volumetric examination requirements for thin wall piping, <3/8 inch. The staff further stated that it is prudent to perform augmented volumetric examinations in thin walled piping.

"We agree to perform these augmented examinations. However, in applying the current Code rules and meeting the staff's request, the impact of agreeing to perform these examinations is to inappropriately require the counting of the population of thin wall piping twice, once for determining thin wall examinations and again for thicker wall piping. We believe this increases the weld examinations required unintentionally and without a technical basis. We consider that the more appropriate population to use for volumetrically examining both thin and thick wall population of welds is the population of welds in piping greater than 1/5 inch wall thickness. These are capable of being ultrasonically tested."

Licensee's Proposed Alternative Examination (as stated):

"It is proposed that the weld population to which the 7.5% sample is applied be that piping >1/5 inch wall thickness and >4 inch NPS. The weld examinations shall be distributed within this population based on system, terminal ends, and line sizes to the degree practicable."

Evaluation: The Code requires a surface and volumetric examination of Class 2 piping welds greater than or equal to 3/8-inch nominal wall thickness for piping greater than 4-inch NPS. The licensee recognized that this Code requirement results in the exclusion of Class 2 piping welds in systems that may be

critical to plant safety from inservice examinations. As a result, the licensee proposed to distribute the selection of Class 2 piping welds among the piping with >1/5-inch wall thickness and >4-inch NPS.

The licensee's proposed alternative to the selection of Class 2 piping welds will include 20 weld examinations in piping with wall thicknesses between 1/5-inch and 3/8-inch, and 22 weld examinations in piping with wall thicknesses greater than 3/8 inch. The INEL staff believes that the licensee's expanded scope of Class 2 welds, which includes welds otherwise excluded from examination because of wall thickness, will provide an acceptable level of quality and safety.

Conclusion: The licensee has proposed to distribute the selection of Class 2 piping welds among the piping >1/5-inch wall thickness and >4-inch NPS. The proposed alternative will provide information on the integrity of Class 2 welds that would otherwise not be subjected to nondestructive examination. This alternative provides an acceptable level of quality and safety. Therefore, it is recommended that the proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

3.2.3 Pumps (No relief requests)

3.2.4 Valves (No relief requests)

3.2.5 General

3.2.5.1 Request for Relief 31, IWF-5000, Inservice Inspection Requirements for Snubbers

Note: This request for relief is considered a part of the Inservice Testing (IST) Program and is, therefore, not included in this evaluation. The Snubber Testing Program will be evaluated by the Mechanical Engineering Branch of the NRC.

3.3 Class 3 Components (No relief requests)

3.4 Pressure Tests

3.4.1 Class 1 System Pressure Tests (No relief requests)

3.4.2 Class 2 System Pressure Tests (No relief requests)

3.4.3 Class 3 System Pressure Tests

3.4.3.1 Request for Relief 1, IWA-4700, Pressure Test Requirements Following Repair or Replacement

Code Requirement: Section XI, IWA-4700, states that after repairs by welding on the pressure-retaining boundary, a system hydrostatic test shall be performed in accordance with IWA-5000, "System Pressure Tests".

Licensee's Code Relief Request: The licensee requested relief from the hydrostatic test requirements for Code Class 3 systems following a repair or replacement.

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

"Pursuant to 10 CFR 50.55a(3)(i), relief is requested on the basis that the proposed alternatives provide an acceptable level of quality and safety.

"ASME Boiler and Pressure Vessel Code Case N-416 (Approval Date: December 5, 1984), "Alternate Rules for Hydrostatic Testing of Repair or Replacement of Class 2 Piping," identified the provisions stipulated in the Proposed Alternate Examination Section as acceptable alternate inspections for assuring the integrity of Class 2 piping following repairs or replacement. The alternate provisions stipulated in Code Case N-416 would be extended to include Class 3 piping systems, since the rationale of substituting examination during fabrication, and leakage testing, as an alternative to immediate hydrostatic tests is equally applicable to Class 3 systems.

"The requirement to secure safety or relief valves and/or lack of ability to isolate portions of pipe systems make the requirement to perform immediate hydrostatic testing impractical. The deferral of the hydrostatic tests allows for orderly design and

implementation of any system modifications to support performance of hydrostatic tests subsequent to repairs or replacements. The alternate examination proposed below provides increased plant operating flexibility while still assuring the suitable quality of repairs and replacements."

"The proposed alternative examination requires that welds resulting from repairs, replacement or modifications be subjected to NDE examination. The proposed alternatives, which are weld examination and leakage testing, are sufficient to ensure integrity of the welds and will therefore not result in a decrease in plant quality or safety."

Licensee's Proposed Alternative Examination (as stated):

"It is proposed that the alternative rules by Code Case N-416 for Class 2 piping be accepted for Class 3 piping, for the same reasons that justified their acceptability for Class 2. These alternate rules would apply in cases where Class 3 piping cannot be isolated by existing valves or cases that require securing safety or relief valves for isolation. In these cases, the system hydrostatic test required subsequent to repair or replacement of Class 3 piping may be deferred until the next regularly scheduled system hydrostatic test, provided both of the following conditions are met:

(a) Prior to or immediately upon return to service, a visual examination (VT-2) for leakage shall be conducted during a system functional test or during a system inservice test in the repaired or replaced portion of the piping system.

(b) The repair or replacement welds shall be examined in accordance with IWA-4000 and IWA-7000 using volumetric examination methods (IWA-2230) for full penetration welds or surface examination methods (IWA-2220) for partial penetration welds."

Evaluation: The licensee has proposed a VT-2 visual examination during a system functional test or during a system inservice test as an alternative to performing a hydrostatic test of repaired/replaced Class 3 components and piping. In addition, the licensee will perform a volumetric examination of full penetration repair welds or a surface examination of partial penetration repair welds.

The INEL staff believes that the increased assurance of the integrity of Class 1 and Class 2 welds provided by the hydrostatic test is not commensurate with the burden of isolating

and securing systems to perform the hydrostatic test. For Code Class 3 components, however, there are no ongoing NDE requirements, except for visual examination for leaks in conjunction with the 10-year hydrostatic tests and the periodic pressure tests. Therefore, eliminating the hydrostatic test and only performing system pressure test should only be considered acceptable if additional surface examinations are performed in accordance with Section III. The surface examinations should be performed on the root pass layer and the final weld of butt and socket welds on the pressure-retaining boundary of Class 3 components during repair or replacement.

Conclusion: Compliance with the Code hydrostatic testing requirements for welded repairs and replacements of Code Class 3 components will result in hardship without a compensating increase in the level of quality and safety. Therefore, it is recommended that the licensee's proposed alternative, to perform a VT-2 visual examination during a system functional test or inservice test and a volumetric examination of full penetration repair welds or a surface examination of partial penetration repair welds, be authorized pursuant to 10 CFR 50.55a(a)(3)(ii), provided that additional surface examinations are performed on the root pass layer of butt and socket welds in accordance with ASME Code, Section III.

3.4.3.2 Request for Relief 19, Examination Category D-B, Item D2.10, Pressure Testing of Open-Ended Suction Lines in the Service Water System

Note: In the response to the NRC's request for additional information dated November 16, 1994, the licensee withdrew Request for Relief 19.

3.4.4 General

3.4.4.1 Request for Relief 20, IWA-5211(d), System Hydrostatic Tests Performed During Plant Shutdown

Code Requirement: Section XI, IWA-5211(d) states that the system pressure tests and examinations referenced in Table IWA-5210-1 may be conducted during one or more of the following system tests or operations: (d) a system hydrostatic test conducted during a plant shutdown at a pressure above nominal operating pressure or system pressure for which over pressure protection is provided.

Licensee's Code Relief Request: The licensee requested relief from performing the hydrostatic pressure test only during plant shutdown.

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

"Pursuant to 10 CFR 50.55a(g)(5)(iii) and (g)(6)(i), relief is requested on the basis that compliance with the Code requirement is impractical.

"The provisions of IWA-5211(d) stipulate that hydrostatic tests be performed during plant shutdown only. However, the referenced code "requirement" was intended as a definition and was not intended to limit performance of hydrostatic tests to plant outage periods only. Greater scheduling flexibility and more efficient use of plant resources will result if hydrostatic tests are permitted to be performed during plant operation."

Licensee's Proposed Alternative Examination (as stated):

"System hydrostatic tests may be conducted while the plant is either in operation or shutdown.

Evaluation: The licensee proposes to perform hydrostatic pressure tests during either plant shutdown or during operation. IWA-5211, which describes conditions under which VT-2 visual examinations can be performed, does not preclude hydrostatic tests during operation. The limiting factor for hydrostatic

tests is more likely described in plant technical specifications.

Performing a hydrostatic test during operation on a system critical to the safe shutdown of a plant could compromise plant safety. However, hydrostatic tests on systems not critical to the safe shutdown of the plant could be considered acceptable.

The INEL staff believes that a hydrostatic test of a system during operation is acceptable under the following conditions: (1) the test pressure complies with approved alternatives, allowing the hydrostatic test to be performed at operating pressures; (2) if an elevated test pressure is applied, the system does not perform a critical function in the safe shutdown of the plant; and (3) the test is performed as allowed by the technical specifications.

Conclusion: The licensee proposed performing hydrostatic tests of systems during either plant shutdown or during operation. In consideration of the proposed alternative, it is believed that an acceptable level of quality and safety will be maintained provided that the licensee complies with the conditions stated above. Therefore, it is recommended that, pursuant to 10 CFR 50.55a(a)(3)(i), authorization be given for the hydrostatic testing of systems during operation provided that test pressures do not exceed operating pressure or, if elevated pressures are applied, the system being tested does not provide a safety-related shutdown function and the test pressure is within plant technical specifications.

3.5 General

3.5.1 Ultrasonic Examination Techniques

3.5.1.1 Request for Relief 32, Appendix I, Article I-2200, Ultrasonic Examinations of Vessel Welds Less than 2-inch Thickness and All Piping Welds; Appendix III, Article III-4511(b), Ultrasonic Recording Requirements

Code Requirement: Section XI, Appendix I, Article I-2200 states that ultrasonic examination of vessel welds ≤ 2 inches thick and of all piping welds shall be conducted in accordance with Appendix III, as supplemented by this Appendix. In addition, supplements identified in Table I-2000-1 shall be applied.

Appendix III, Article III-4511(b) states that any indications that are not determined to be of geometrical or metallurgical origin shall be recorded if they are 20% of DAC or greater.

Licensee's Code Relief Request: The licensee requested relief from the ultrasonic indication recording level criteria required by Code.

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

"Pursuant to 10 CFR 50.55a(a)(3)(i) and (ii), relief is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety and that compliance with the specified requirement would impose a burden not commensurate with a compensating increase in the level of quality and safety. Relief is requested from using the newer 20% DAC ultrasonic recording criterion. Con Edison proposed to continue using the current 50% DAC recording criterion that was used during preservice examinations and has been used for the past two intervals.

"Preservice and all existing inservice ultrasonic examination data are based on the 50% of DAC recording criterion used since 1974. This means that previously detected indications were recorded and accepted at 50% DAC.

"Absent the requested relief, indications between 20% and 50% of DAC would have to be recorded and evaluated. Such evaluations

would be hindered by the completed absence of comparable previous records (from pre-service or inservice inspection) of these indications. In effect, a new baseline record would need to be established. That would require increased time, increased personnel exposure and increased cost, with no commensurate increased level of plant safety. One of the principle motivating factors for lowering the recording levels from 50% DAC to 20% DAC was the inability of UT techniques to reliable detect IGSCC in the RCS system of Boiling Water reactors. IGSCC is generally not a significant problem in Pressurized Water reactors due to a better water chemistry control.

"There is no evidence at Indian Point to indicate that increasing the sensitivity (lowering DAC from 50% to 20%) would be more effective than our current criterion in identifying the indications prior to failure. Indeed, the existing recording level, used for the past twenty years, has not led to a component failure due to an indication being missed or misinterpreted. The advantages of comparability of 50% DAC examination results with prior examination results more than outweigh the potential benefits of any new testing protocols.

"The recording level Con Edison proposes to use has proven to be effective in identifying potential failures for the past 2 intervals (20 years) without degradation of plant safety or quality. Further, all baseline data for the unit is based on the 50% recording criterion. To increase the recording sensitivity level would introduce issues of noncomparability of examination results with prior examination results, and would thus require inherently uncertain reevaluations of previously acceptable indications at considerable monetary costs and radiological exposure, without providing a reliable indication of changes in vessel weld condition or an increase in the level of plant safety or quality."

Licensee's Proposed Alternative Examination (as stated):

"Con Edison proposes in lieu of using the newer 20% recording criterion to continue using the existing 50% DAC recording criterion. This criterion has proven effective in identifying potential failures over the past 20 years, and will continue to provide a continued acceptable level of safety and quality.

Evaluation: The INEL staff has reviewed studies performed to determine the flaw detection reliability associated with recording criteria (References 9, 10 and 12). It was found that flaws may not be detected when procedures requiring a recording level of 50% DAC are utilized. In the case of ultrasonic examinations of vessels, the INEL staff does not view the 20% recording criteria as having a major impact on vessel

examinations. It is typically not difficult to determine geometric indications from flaw indications in vessels because vessel welds are flush ground with the base metal and geometric reflectors, the result of attachments, are readily identifiable. The examination of piping welds may be somewhat more difficult, however, automated systems and examiners trained to differentiate between relevant and nonrelevant reflectors make the 20% recording criteria practical.

Conclusion: Recent studies on flaw detection have shown that a 20% DAC recording level is more reliable. Therefore, it is recommended that relief from the recording criteria be denied.

3.5.2 Exempted Components (No relief requests)

3.5.3 Other

3.5.3.1 Request for Relief 2, IWA-2200(b), Surface Preparation for Nondestructive Examination

Code Requirement: Section XI, IWA-2200(b), states that when preparation of a surface for nondestructive examination is required, the preparation shall be by a mechanical method. Such surfaces shall be blended into the surrounding area as may be required to perform the examination. The wall thickness shall not be reduced below the minimum thickness required by design.

Figures IWB-2500-8 and IWC-2500-7(a) provide the examination volume and scan surface requirements for ultrasonic examination of piping welds.

Table IWB-2500-1, Category B-J, and Table IWC-2500-1, Categories C-F-1 and C-F-2, specify the extent and frequency of examination for transverse reflectors.

Mandatory Appendix III, Subarticle III-4430 states that the angle beam examination for reflectors transverse to the weld shall be

performed from the weld crown to examine the weld root by one-half V path in two directions along the weld.

Licensee's Code Relief Request: The licensee requested relief from the Code requirement for surface preparation of welds as stated in Subarticle IWA-2200(b) and the examination from the weld crown.

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

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety. Relief is requested from performing the ultrasonic examination required by the Code for transverse reflectors from the weld crown surface and the need to mechanically prepare the weld crown surface to support such exams.

"All stainless steel pipe welds and carbon steel pipe welds with baseline transverse indication are required to be inspected from the weld crown for reflectors transverse to the weld. To comply with this requirement, the stainless steel pipe welds would need to be mechanically prepared to permit the ultrasonic transducer to pass over the welded surface. EPRI has developed techniques to aid in the identification of intergranular stress corrosion cracking in stainless steel pipe welds. During the research and development process it was noted that even when the stainless steel weld crown had been mechanically prepared according to the code, the ultrasonic beam could change its angle of refraction as a result of the varying dendritic structure of the weld material. For example, in one location of a weld the ultrasonic beam would measure 45 degrees from the OD to the ID, while at another location of the weld the ultrasonic beam would change from 45 degrees to 0 degrees. This makes ultrasonic examinations of stainless steel welds for transverse reflectors using the code specified technique an inconsistent examination at best. EPRI then developed a technique, similar to what has been used by Con Edison during the Second Interval, to examine for transverse reflectors by scanning parallel to the weld and skewing the transducer 0 to 45 degrees towards the weld. This technique has been in use for more than five years and has proven successful in identifying transverse reflectors without requiring mechanical preparation of the weld crown.

"The technique that Con Edison proposes to use is similar to one developed by EPRI which provides superior coverage for ultrasonic angle beam circumferential examinations (to detect transverse reflectors) of stainless steel pipe welds, as compared to the technique described in Appendix III, subparagraph 4430. Granting of this request will not decrease the overall level of plant quality and safety."

Licensee's Proposed Alternative Examination (as stated):

"In lieu of mechanically preparing the surface of welds for circumferential ultrasonic examinations from the weld crown surface using the technique specified in Appendix III subparagraph III-4430, Con Edison proposed using a superior technique based on EPRI's R&D and field experience. This technique places the search unit on the surface adjacent to the weld and directs the sound beam into the material parallel to the weld axis. The search unit is then angled a maximum of 45 degrees towards the weld while moving along each edge around the weld joint, indexing with at least a 10% overlap. The examination is then repeated in the reverse direction along the same weld edge. Calibration of the technique will be done with the sound beam directed into the material normal to the axis of the calibration reflector."

Evaluation: The Code requires that welds be scanned from the weld crown in two directions to detect flaws that are transverse to the weld root. The licensee has stated that scanning from the top of the weld crown for transverse reflectors may not provide meaningful results due to beam redirection. Therefore, the licensee proposes to perform the scanning for transverse reflectors in the root area from the base metal adjacent to the weld. The licensee's technique will include skewing the transducer to direct the sound beam under the weld crown. This technique is required for examination of stainless steel welds susceptible to intergranular stress corrosion cracking (IGSCC) and has been effective in detecting IGSCC flaws in piping. As a result, it can be concluded that an acceptable level of quality safety and will be provided by the proposed scanning technique.

Conclusion: Scanning for flaws transverse to the weld root from the base metal in lieu of scanning from the weld crown has been found to be effective. As a result, an acceptable level and quality will be provided. Therefore, it is recommended that the proposed alternative be authorized pursuant to 10 CFR 50.55(a)(3)(i) .

3.5.3.2 Request for Relief 3, IWA-2600, Weld Reference System

Code Requirement: Section XI, IWA-2620 states that a reference system shall be established for all welds and areas subject to surface or volumetric examination. Each such weld and area shall be located and identified by a system of reference points. The system shall permit identification of each weld, location of weld center line, and designation of regular intervals along the length of the weld.

Licensee's Code Relief Request: The licensee requested relief from establishing a weld reference system for all welds and areas subject to surface or volumetric examination.

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

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that complying with the code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

"At the time of construction of Indian Point Unit No. 2, application of a reference system was not required by Code. Application of such marking to each and every item or area subject to surface or volumetric examination at an operating plant would require expending significant plant resources and result in significant additional personnel radiation exposure. In many instances, very limited or no physical access is available to permit such markings. The alternate provisions below will provide adequate traceability between the areas inspected and recorded indications and assure the repeatability of inspection results."

"Since the alternative method proposed provides an acceptable level of quality and safety, and will be as effective at locating previous indications as that required by the Code, there will be no change in the level of plant quality and safety by granting this request."

Licensee's Proposed Alternative Examination (as stated):

"Datum reference markings will be established in the event that recordable indications are to be reported. Such datum points shall either be marked on the components or have their locations adequately described in inspection documentation so that subsequent relocation can be achieved.

"The method proposed for the identification of indication locations is identical to the one employed by IP-2 during the first and second inspection intervals. This method was previously evaluated and approved by the NRC."

Evaluation: The Code requires that the licensee establish a reference system for all welds subject to surface or volumetric examination. However, the licensee stated that the Code in effect at the time of construction did not require the establishment of a reference system. To mark all welds subject to surface or volumetric examination would require scaffold erection/removal, insulation removal/replacement, and high radiation exposure. This requirement would result in a hardship or unusual difficulty without a compensating increase in the level of quality or safety.

The INEL staff believes that an acceptable alternative to implementing the Code-required reference system is to establish reference markings on each examination area in the future, at the time the examination is performed. This reference system will assure the reproduction of examinations during successive intervals.

Conclusion: The licensee's alternative, to establish a reference at the time that a flaw is detected, will provide a means to monitor the flaw. However, to assure that the same welds are examined during successive intervals, a system of permanent identification should be established for welds being examined. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(ii), provided that a permanent reference system is established for each weld at the time it is examined, regardless of the presence of recordable indications.

3.5.3.3 Request for Relief 29, IWA-5242(a), Visual Examination of Insulated Components

Code Requirement: Section XI, IWA-5242(a) states that for systems borated for the purpose of controlling reactivity, insulation shall be removed from pressure-retaining bolted connections for VT-2 visual examination. For other components, VT-2 visual examination may be conducted without the removal of insulation by examining the accessible and exposed surfaces and joints of the insulation.

Licensee's Code Relief Request: The licensee requested relief from the Code requirement to remove insulation from bolted connections in borated systems.

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

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety."

"The leakage/bolting inspection program performed each refueling outage will detect damage resulting from boric acid corrosion. This program combined with operational leakage monitoring in accordance with Technical Specifications provides an acceptable level of quality and safety."

Licensee's Proposed Alternative Examination (as stated):

"A leakage/bolting inspection program was established in 1983 as a result of NRC Bulletin 82-02. The leakage/bolting inspection program for borated water systems provides for visual examination for evidence of boric acid leakage at all bolted connections 1" NPS and larger in Class 1 systems and 2" and larger in Class 2 systems. The visual examination is performed at the bolted connection and is directed at determining whether or not there is evidence of boric acid crystal accumulation or wetting of insulation indicative of leakage. It is our experience that leakage is obvious without the need to remove the insulation. The examinations are performed for all bolting in the program every refueling outage except that connections exhibiting no leakage for two successive outages may be examined every other outage.

"In addition, the Reactor Coolant System (RCS) and portions of the Chemical and Volume Control System (i.e., Charging, Letdown

and Reactor Coolant Pump Seal Return) are continuously monitored for leakage in order to satisfy Technical Specifications. During plant operation the RCS leak rate is limited by plant Technical Specification 3.1.F.2.c(1) to 1 GPM from unidentified sources and 10 GPM total from identified sources. The various diverse means of leak detection are described in the associated Technical Specification Basis."

Evaluation: Paragraph IWA-5242(a) requires the removal of insulation from pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity when performing VT-2 visual examination during system pressure tests. The licensee stated that leakage is obvious without the need for insulation removal.

The licensee established a leakage/bolting inspection program in 1983, the result of NRC Bulletin 82-02. Visual examinations are performed at bolted connections without insulation removal each refueling outage, except for connections that exhibit no leakage, the examination is performed every other refueling outage.

The licensee's proposed alternative to monitor insulated bolted connections for leakage during the current interval is acceptable provided that the licensee's leakage/bolting program is supplemented by the following:

1) The licensee shall remove all existing removable insulation each refueling outage at bolted connections in systems borated for the purpose of controlling reactivity and perform a VT-2 visual examination for evidence of leakage; and

2) Where nonremovable insulation exists at bolted connections, the licensee may visually examine the joint without removing the insulation provided that a 4-hour hold time is satisfied prior to the VT-2 visual examination.

Conclusion: The licensee's proposed alternative to perform examinations of the bolted connections in borated water systems is acceptable provided that the licensee remove all existing

removable insulation of bolted connections in systems borated for the purpose of controlling reactivity and perform VT-2 visual examination for evidence of leakage each refueling outage. Where nonremovable insulation exists at bolted joints, a 4-hour hold time is required prior to the VT-2 visual examination.

The INEL staff believes that the proposed alternative provides an acceptable level of quality and safety provided that the licensee satisfy the conditions stated above. Therefore, it is recommended that the licensee's proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i), provided that the licensee satisfy the above mentioned conditions.

4. CONCLUSION

Pursuant to 10 CFR 50.55a(g)(6)(i), it has been determined that certain inservice examinations cannot be performed to the extent required by Section XI of the ASME Code at the Indian Point Unit 2 facility. In the cases of Requests for Relief 6 (Rev. 1), 7, 8 (Rev. 2), 25, and 27, the licensee has demonstrated that specific Section XI requirements are impractical; it is therefore recommended that relief be granted as requested. The granting of relief will not endanger life, property, or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

In the case of Request for Relief 9 (Rev. 1), the licensee has demonstrated that specific Section XI requirements are impractical for pressurizer nozzle inside radius sections PZRS-2, -3, -4, and -5; it is therefore recommended that relief be granted as requested for these inside radius sections. For pressurizer nozzle inside radius sections PZRS-1 and -6, the licensee is performing a feasibility study for applying volumetric techniques. Therefore, it is recommended that relief be denied at this time for PZRS-1 and -6.

Pursuant to 10 CFR 50.55a(a)(3), it is concluded that for Requests for Relief 2, 11 (Rev. 1), 16, and 34 (Rev. 1), either the licensee's proposed alternative will (i) provide an acceptable level of quality and safety, or (ii) Code compliance will result in hardship or unusual difficulty without a compensating increase in safety. In these cases, it is recommended that the proposed alternative be authorized. For Requests for Relief 1, 3, 10 (Rev. 1), 20, 29, 30 (Rev. 1), and 33, it is recommended that the proposed alternative be authorized *only* if the licensee satisfies the conditions stated in the Request for Relief evaluations.

For Requests for Relief 12 and 32, it is concluded that the licensee has not provided sufficient justification to support the determination that the Code requirements are impractical, and that requiring the licensee to comply with the Code requirements would not result in hardship. Therefore, in these cases it is recommended that relief be denied.

Request for Relief 19 was withdrawn by the licensee (Reference 6), and deleted from the ISI Program Plan. Request for Relief 31 addresses inservice inspection requirements for snubbers, which is considered a part of IST and is, therefore, not included in this report.

This technical evaluation has not identified any practical method by which the licensee can meet all the specific inservice inspection requirements of Section XI of the ASME Code for the existing Indian Point Station, Unit 2, facility. Compliance with all of the Section XI examination requirements would necessitate redesign of a significant number of plant systems, procurement of replacement components, installation of the new components, and performance of baseline examinations for these components. Even after the redesign efforts, complete compliance with the Section XI examination requirements probably could not be achieved. Therefore, it is concluded that the public interest is not served by imposing certain provisions of Section XI of the ASME Code that have been determined to be impractical.

The licensee should continue to monitor the development of new or improved examination techniques. As improvements in these areas are achieved, the licensee should incorporate these techniques in the ISI program plan examination requirements.

Based on the review of the *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, the licensee's response to the NRC's request for additional information, and the recommendations for granting relief from the ISI examinations that cannot be performed to the extent required by Section XI of the ASME Code, no deviations from regulatory requirements or commitments were identified, except those noted for Requests for Relief 12 and 32.

5. REFERENCES

1. Code of Federal Regulations, Title 10, Part 50.

2. American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Division 1:

   1989 Edition
   1974 Edition Summer 1975 Addenda

3. *Indian Point Station, Unit 2, Third 10-Year Interval Inservice Inspection Plan*, Revision 0, submitted January 24, 1994.

4. NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants*, Section 5.2.4, "Reactor Coolant Boundary Inservice Inspection and Testing," and Section 6.6, "Inservice Inspection of Class 2 and 3 Components," July 1981.

5. Letter dated October 13, 1994, F. J. Williams Jr. (NRC) to W. E. Quinn (Consolidated Edison Company of New York, Inc.) containing NRC Request for Additional Information (RAI).

6. Letter dated November 16, 1994, W. E. Quinn (Consolidated Edison Company of New York, Inc.) to Document Control Desk (NRC) containing response to October 13, 1994 Request for Additional Information.

7. Letter dated January 6, 1995, W. E. Quinn (Consolidated Edison Company of New York, Inc.) to Document Control Desk (NRC) containing revised Request for Relief 8, Revision 2.

8. NRC Regulatory Guide 1.150, *Reactor Pressure Vessel Beltline Weld Examinations*, Rev. 1, February 1983.

9. S. H. Bush, "Impact of PISC II on ASME XI Rules for In-Service Inspection of Nuclear Power Plant Components," *Ultrasonic Inspection of Nuclear Power Plant Components: The PISC II Final Results*, R. W. Nichols and S. Crutzen (eds.), Elsevier Applied Science, London, 1988, p. 617.

10. P. Dombret, "Main Results of PISC III Action 3: Nozzles and Dissimilar Welds," Department of Research and Development AIB-Vincotte, Brussels, Belgium, PVP-Vol. 276/NDE-Vol. 12, ASME, 1994.

11. NRC Event Number 26899, Degraded Condition of Bolting During Operation, March 1994. NRC Event Number 26992, Degraded/Unanalyzed Condition of Bolting, March 1994.

12. NUREG/CR-1957, "Evaluation of ASME Section XI Reference Level Sensitivity for Initiation of Ultrasonic Inspection Examination", April 1981.111

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11. ABSTRACT *(200 words or less)*

This report documents the results of the evaluation of the *Indian Point Unit 2, Third 10-Year Interval Inservice Inspection Program Plan*, Revision 0, submitted January 24, 1994, including the request for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section XI requirements that the licensee has determined to be impractical. The *Indian Point Unit 2, Third 10-Year Interval Inservice Inspection Program Plan*, Revision 0, is evaluated in Section 2 of this report. The ISI Program Plan is evaluated for (a) compliance with the appropriate edition/addenda of Section XI, (b) acceptability of examination sample, (c) correctness of the application of system or component examination exclusion criteria, and (d) compliance with ISI-related commitments identified during previous Nuclear Regulatory Commission (NRC) reviews. The request for relief is evaluated in Section 3 of this report.

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