



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20585-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO IMPLEMENTATION OF ASME, SECTION XI, SUBSECTION IWE  
FOR CONTAINMENT INSPECTION  
COMMONWEALTH EDISON COMPANY  
QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2  
DOCKET NOS. 50-254 AND 50-265

## 1.0 INTRODUCTION

By letter dated July 2, 1998 (Reference 1) Commonwealth Edison Company (ComEd, the licensee) submitted Relief Request Nos. CR-21, CR-22, CR-23 and CR-24, seeking relief from some of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Subsection IWE, requirements for Quad Cities Nuclear Power Station, Units 1 and 2. By letter dated September 3, 1998 (Reference 2), ComEd withdrew Relief Request No. CR-22. These relief requests have been submitted during the third 10-year inservice inspection (ISI) interval. However, ComEd has elected to begin a separate interval for containment inspection.

Pursuant to 10 CFR 50.55a(b) and (g), inservice inspection of containment must meet the requirements of the 1992 Edition, 1992 Addenda of Section XI, Subsections IWE and IWL. Pursuant to 10 CFR 50.55a(g)(6)(ii)(B), the first period containment examinations must be completed by September 9, 2001. Alternatives to the requirements of 10 CFR 50.55a(g) may be authorized under 10 CFR 50.55a(a)(3), if (i) the proposed alternative provides an acceptable level of quality and safety, or (ii) compliance with the specific requirement of the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The staff, with the assistance of the Idaho National Engineering and Environmental Laboratory (INEEL) evaluated the information provided by the licensee. Based on its review, the staff adopts INEEL's conclusions and recommendations as provided in its Technical Letter Report (attached).

## 2.0 EVALUATION

### Request for Relief No. CR-21

Code Requirement: Examination Category E-D, Items E5.10 and E5.20 require VT-3 visual examination of seals and gaskets on airlocks, hatches, and other devices that are required to ensure the containment's leak-tight integrity. These visual examinations are to be performed once each inspection interval.

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Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(i), ComEd proposed to perform the Code-required VT-3 visual examination only if containment penetrations are disassembled. The licensee stated: "If the containment penetrations are disassembled, the gaskets and seals will be inspected per the requirements of Table IWE-2500-1, Category E-D. The joints need not be disassembled solely for the performance of examination. The leak testing, currently performed in accordance with 10 CFR Part 50, Appendix J, provides adequate assurance that the pressure retaining capability of the subject seals and gaskets are intact on the joints that are not disassembled."

Evaluation: Based on its review, the staff concluded that the proposed alternative will provide an acceptable level of quality and safety since proper functioning of containment seals and gaskets will be verified. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

Request for Relief No. CR-22

This relief request was related to alternative requirements for VT-2 visual examination performed in conjunction with the pressure testing following a repair, replacement, or modification. By letter dated September 3, 1998, the ComEd withdrew Request for Relief CR-22. Therefore, no evaluation is provided.

Request for Relief No. CR-23

Code Requirement: Paragraph IWE-2420(b) requires that areas containing flaws, degradation, or repairs that require evaluation in accordance with IWE-3000, and whose components are found to be acceptable for continued service, be re-examined during the next inspection period listed in the schedule of the inspection program of IWE-2411 or IWE-2412, in accordance with Table IWE-2500-1, Examination Category E-C.

Licensee's Proposed Alternative: In lieu of the IWE-2420(b) requirement to examine, during the next inspection period, a flaw area that was repaired in accordance with the requirements of IWE-3122.2 (Acceptance by Repair) or IWE-3122.3 (Acceptance by Replacement), ComEd proposes that "successive examinations will be scheduled and performed when required, in accordance with the rules of IWE-3122."

Evaluation: As ComEd will perform successive examinations in accordance with the requirement of IWE-3122, which will prove assurance of structural integrity, the staff concludes that the successive examination of repairs in accordance with IWE-2420(b) constitutes a burden without a compensating increase in quality or safety. Therefore, the requested relief is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

Request for Relief No. CR-24

Code Requirement: Examination Category E-G, Item E8.20 requires that pressure-retaining bolted connections that have not been disassembled and reassembled during the inspection interval be torque or tension tested.

Licensee's Proposed Alternative: ComEd proposed to perform 10 CFR Part 50, Appendix J, Type B testing in lieu of de-tensioning and re-tensioning IWE bolted connections.

Evaluation: The staff concludes that the Appendix J, Type B test to verify the adequacy of pressure retaining bolting to ensure an acceptable penetration pressure seal and the Code-required VT-1 visual examination to verify penetration integrity will provide an acceptable level of quality and safety. Therefore, the proposed alternative to the torque or tension requirement of Category E-G, Item No. E8.20 of Table IWE-2500-1 is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

### 3.0 CONCLUSION

Based on the information provided in the relief requests, the staff concludes that for Relief Requests CR-21 and CR-24, the proposed alternatives provide an acceptable level of quality and safety and may be authorized pursuant to 10 CFR 50.55a(a)(3)(i). For Relief Request CR-23, the proposed alternative provides reasonable assurance of structural integrity of containment repairs and replacements and compliance with the Code requirement would result in hardship without a compensating increase in the level of quality and safety. Therefore, the proposed alternative may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Relief request CR-22 was withdrawn by the licensee.

Attachment: Technical Letter Report

Principle Contributor: H. Asher

Dated: November 30, 1998

#### 4.0 REFERENCES

1. Letter from Joel P. Dimmett, Jr. (ComEd) to NRC, "Relief Requests CR-21, CR-22, CR-23, and CR-24," July 2, 1998.
2. Letter from Joel P. Dimmett, Jr. (ComEd) to NRC, "Withdrawal of Relief Request CR-22," September 3, 1998.

TECHNICAL LETTER REPORT  
ON THE FIRST 10-YEAR CONTAINMENT INSPECTION INTERVAL (IWE/IWL) PROGRAM  
REQUESTS FOR RELIEF NOS. CR-21, CR-22, CR-23 AND CR-24  
FOR  
COMMONWEALTH EDISON COMPANY  
QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2  
DOCKET NUMBERS: 50-254 AND 50-265

**1. INTRODUCTION**

By letter dated July 2, 1998, the licensee, Commonwealth Edison Company, submitted Requests for Relief Nos. CR-21, CR-22, CR-23, and CR-24, seeking relief from the requirements of the ASME Code, Section XI, Subsection IWE requirements for Quad Cities Nuclear Power Station, Units 1 and 2. By letter dated September 3, 1998, the licensee withdrew Relief Request CR-22. These relief requests have been submitted during the third 10-year inservice inspection (ISI) interval. However, the licensee has elected to begin a separate interval for *containment inspection*. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject requests for relief are in the following section.

**2. EVALUATION**

The information provided by Commonwealth Edison Company in support of the requests for relief from Code requirements has been evaluated and the bases for disposition are documented below. The Code of record for the Quad Cities Nuclear Power Station, Units 1 and 2, third 10-year ISI intervals, which end in February, 2003 and March, 2003, respectively, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code. The containment inspection plans were developed in accordance with the requirements of the 1992 Edition, 1992 Addenda of Section XI (IWE and IWL), as required by 10 CFR 50.55a(g)(6)(ii)(B). The Regulation requires that first period containment examinations be completed by September 9, 2001.

**A. Request for Relief No. CR-21, Examination Category E-D, Items E5.10 and E5.20, Examination Requirements for Containment Seals and Gaskets.**

Code Requirement: Examination Category E-D, Items E5.10 and E5.20 require VT-3 visual examination of seals and gaskets on airlocks, hatches, and other devices that are required to ensure the containment's leak-tight integrity. These visual examinations are to be performed once each inspection interval.

Licensee's Proposed Alternative: In accordance with 10 CFR 50.55a(a)(3)(I), the licensee proposed to perform the Code-required VT-3 visual examination only if containment penetrations are disassembled. The licensee stated:

"If the containment penetrations are disassembled, the gaskets and seals will be inspected per the requirements of Table IWE-2500-1, Category E-D. The joints

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need not be disassembled solely for the performance of examination. The leak testing, currently performed in accordance with 10 CFR 50, Appendix J, provides adequate assurance that the pressure retaining capability of the subject seals and gaskets are intact on the joints that are not disassembled."

Licensee's Basis for Proposed Alternative (as stated):

"Visual examination of seals and gaskets would require the associated joints, which are proven adequate through Appendix J testing, to be disassembled. For electrical penetrations, this would involve: (1) a pre-maintenance Appendix J test; (2) termination of cables at electrical penetrations if enough cable slack is not available; (3) disassembly of the joint; (4) removal and examination of the seals and gaskets; (5) reassembly of the joint; (6) re-termination of the cables, if necessary; (7) post maintenance testing of the cables, and (8) a post maintenance Appendix J test of the penetration. The work required for the containment hatches would be similar, except for the termination, re-termination, and testing of cables. This would require the use of outage staff hours and imposes the risk that equipment could be damaged. The 1993 Addenda of Section XI recognizes that disassembly of joints to perform these examinations is not warranted. Note 1 in Examination Category E-D was modified in the 1993 Addenda of Section XI to state that sealed or gasket connections need not be disassembled solely for performance of examinations. However, without disassembly, most of the surface of the seals and gaskets would be inaccessible. Therefore, the examination would be meaningless.

"Seals and gaskets are not part of the containment pressure boundary under current ASME Section III rules [see NE-2110(b)]. Currently, the airlocks, hatches and containment penetrations are tested in accordance with 10 CFR 50, Appendix J. Degradation of the seal or gasket material would be revealed by an increase in the leakage rate. Corrective measures would be applied and the component retested. Repair or replacement of seals and gaskets is not subject to Section XI, 1992 Edition, 1992 Addenda rules [see IWA-4111(b)(5)]."

Evaluation: The Code requires that seals and gaskets on airlocks, hatches, and other devices be VT-3 visually examined once each interval to ensure the containment's leak-tight integrity. The licensee's alternative is to perform the Code-required VT-3 examination only when a containment penetration is disassembled.

The licensee proposes to use the existing 10 CFR 50, Appendix J testing as a verification of containment integrity. When joints are disassembled, the gaskets and seals will be inspected per the requirements of Table IWE-2500-1, Category E-D. The 1993 Addenda to Section XI has recognized that disassembly of joints solely to perform the visual examination is unwarranted. The INEEL staff believes that proper functioning of the containment penetration seals and gaskets will be verified during the Type B testing required by 10 CFR Part 50, Appendix J. Consequently, the proposed 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).

- B. Request for Relief No. CR-22, Alternative Requirements for VT-2 Visual Examination Performed in Conjunction With the Pressure Testing Following a Repair, Replacement, or Modification

**NOTE:** By letter dated September 3, 1998, the licensee withdrew Request for Relief CR-22.

- C. Request for Relief No. CR-23, Paragraph IWE-2420(b), Alternative Requirements for Successive Examination for Repairs

Code Requirement: Paragraph IWE-2420(b) requires that areas containing flaws, degradation, or repairs that require evaluation in accordance with IWE-3000, and whose components are found to be acceptable for continued service, be re-examined during the next inspection period listed in the schedule of the inspection program of IWE-2411 or IWE-2412, in accordance with Table IWE-2500-1, Examination Category E-C.

Licensee's Proposed Alternative: In lieu of the IWE-2420(b) requirement to examine, during the next inspection period, a flaw area that was repaired in accordance with the requirements of IWE-3122.2 (Acceptance by Repair) or IWE-3122.3 (Acceptance by Replacement), the licensee proposes that "successive examinations will be scheduled and performed when required, in accordance with the rules of IWE-3122."

Licensee's Basis for Proposed Alternative (as stated):

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

The purpose of a repair is to restore the component to an acceptable condition for continued service in accordance with the acceptance standards of IWE-3000. IWA-4150 requires the owner to conduct an evaluation of the suitability of the repair, including consideration of the cause of failure. If the repair has restored the component to an acceptable condition, as directed by the requirements of IWE-3122.2 (Acceptance by Repair) and IWE-3122.3 (Acceptance by Replacement), successive examinations are not warranted. If the repair was not suitable, then the repair does not meet code requirements and the component is not acceptable for continued service. IWB-2420(b), IWC-2420(b), and IWD-2420(b) do not require a repair to be subject to successive examination requirements. Furthermore, if the repair area is subject to accelerated degradation, it would still require augmented examination in accordance with Table IWE-2500-1, Examination Category E-C. The successive examination of

repairs in accordance with IWE-2420(b) constitutes a burden without a compensating increase in quality or safety."

Evaluation: Paragraph IWE-2420(b) requires that when examination results require evaluation of flaws or areas of degradation in accordance with IWE-3000, and the component is acceptable for continued service, or when a repair/replacement activity results from an examination, the areas containing such flaws or areas of degradation, or areas subjected to a repair/replacement activity, shall be re-examined during the next inspection period. The licensee is proposing that when repairs or replacements occur the component is restored to an acceptable condition for continued service in accordance with the acceptance standards of IWE-3000 and, therefore, the requirement for successive examinations will be eliminated. This approach is consistent with the successive examination requirements of Class 1, 2, and 3 components.

The INEEL staff agrees with the licensee that successive examinations after an acceptable repair is performed are not warranted. This position is expected to be reflected in the 1998 Edition of Section XI. However, when flaws or areas of degradation are accepted by engineering evaluation in accordance with the requirements of IWE-3122.4, *Acceptance by Evaluation*, successive examinations are required per the requirements of IWE-2420(b) and (c) to validate the analysis and determine that the flaws or areas of degradation are not propagating.

It is concluded that compliance with IWE-2420(b) requirements for successive examinations, as listed in the 1992 Edition with 1992 Addenda, results in hardship without a compensating increase in the level of quality and safety. The Section XI Code has recognized this oversight and is expected to remove the re-examination requirement from Subsection IWE for repaired areas. Therefore, the licensee's proposed alternative, to remove repair and replacement activities from the IWE-2420(b) requirements, will provide reasonable assurance of continued structural integrity and should be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

D. Request for Relief No. CR-24, Examination Category E-G, Item E8.20, Alternative Requirements for Torque/Tension Testing of Pressure-Retaining Bolting

Code Requirement: Examination Category E-G, Item E8.20 requires that pressure-retaining bolted connections that have not been disassembled and reassembled during the inspection interval be torque or tension tested.

Licensee's Proposed Alternative: The licensee proposed to perform 10 CFR 50, Appendix J, Type B testing in lieu of de-tensioning and re-tensioning IWE bolted connections.

Licensee's Basis for Proposed Alternative (as stated):

"Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Bolt torque or tension testing is required on bolted connections that have not been disassembled and reassembled during the inspection interval. Determination of the torque or tension value requires that the bolting be un-torqued and then re-torqued or re-tensioned. This activity is considered maintenance, and therefore would require a 10 CFR 50 Appendix J, Type B test. The performance of the Type B test itself proves that the bolt torque or tension remains adequate to provide a leak rate that is within acceptable limits. The torque or tension value of bolting only becomes an issue if the leak rate is excessive. Once a bolt is torqued or tensioned, it is not subject to dynamic loading that could cause it to experience significant change. Verification of bolt torque or tension values on bolted joints, that are proven adequate through Appendix J testing and visual inspection to demonstrate that design function is met, is not required. Experience has shown that penetrations, containment personnel hatches, and escape hatches have not exhibited excessive leakage due to inadequate bolt torque or tension. As part of the Inservice Inspection Program, bolt torque or tension testing is not required on any other ASME Section XI, Class 1, 2, or 3 bolted connections or their supports."

Evaluation: The Code requires that pressure-retaining bolting that has not been disassembled and reassembled during the inspection interval be torque or tension tested. The licensee proposes to use the 10 CFR 50, Appendix J, Type B test as an alternative to the Code requirement to verify the integrity of penetrations with bolted connections.

Containment penetration integrity can be verified physically with the Code-required VT-1 visual examination, and mechanically using the Type B test. It is the opinion of the INEEL staff that bolt torque or tension testing does not provide assurance that a pressure seal exists at a containment penetration. Type B testing of "pressure seating" connections, with the joint seal or gasket in compression, does not provide any verification of the bolt torque, but still verifies that a pressure seal exists. "Pressure unseating" connections rely on the tension of the bolting to compress the seal or gasket and maintain a uniform seal. Therefore, an acceptable Type B test implies that the bolt tension is acceptable. In either case, the Type B test is the final verification of an acceptable pressure seal at the containment penetration and the VT-1 visual examination verifies the integrity of the bolted connection.

The Appendix J, Type B test to verify the containment pressure seal and the Code-required VT-1 visual examination to verify penetration integrity will provide an acceptable 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)(I).

3. CONCLUSION

The INEEL staff evaluated the licensee's submittal for the Quad Cities Nuclear Power Station, Units 1 and 2, and concluded that for Request for Relief CR-21 and CR-24, the proposed alternatives provide an acceptable level of quality and safety and should be authorized pursuant to 10 CFR 50.55a(a)(3)(i). For Request for Relief CR-23, the proposed alternative provides reasonable assurance of structural integrity of containment repairs and replacements and compliance with the Code requirement would result in hardship without a compensating increase in the level of quality and safety. Therefore, the proposed alternative should be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

Request for Relief CR-22 was withdrawn by the licensee.