

July 13, 2001

Mr. Robert P. Powers, Senior Vice President
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Nuclear Generation Group
500 Circle Drive
Buchanan, MI 49107

SUBJECT: DONALD C. COOK NUCLEAR POWER PLANT, UNITS 1 AND 2 - SAFETY
EVALUATION FOR PROPOSED ALTERNATIVE IN ACCORDANCE WITH
10 CFR 50.55a(a)(3)(ii) FOR CONTAINMENT INSPECTIONS (TAC NO. MB1249
AND MB1250)

Dear Mr. Powers:

By letter dated February 20, 2001, as supplemented May 23, 2001, Indiana Michigan Power Company, the licensee for Donald C. Cook Nuclear Plant, Units 1 and 2, requested the Nuclear Regulatory Commission's (NRC) approval of alternatives to the containment inspection requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*, Section XI, subsections IWE and IWL. Inspection of the containment structure in accordance with ASME XI, Division 1, 1992 Edition with the 1992 Addenda is required by 10 CFR 50.55a(g)(6)(ii)(B).

The NRC staff has reviewed the licensee's Relief Requests CISIR-01 through CISIR-04. Based on the information provided by the licensee, the staff concludes that compliance with the code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, and that the licensee's proposed alternatives will provide reasonable assurance of containment pressure integrity. Therefore, these proposed alternatives may be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

If you have any questions regarding this matter, please contact John Stang at 301-415-1345.

Sincerely,

/RA/

Claudia M. Craig, Section Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-315 and 50-316

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE RELIEF REQUESTS FROM

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

SECTION XI REQUIREMENTS

FOR CONTAINMENT INSPECTION

INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-315 AND 50-316

1.0 INTRODUCTION

In the *Federal Register* dated August 8, 1996 (61 FR 41303), the Nuclear Regulatory Commission (NRC) amended its regulations to incorporate by reference the 1992 edition with the 1992 addenda of Subsections IWE and IWL of Section XI of the ASME Boiler and Pressure Vessel Code (Code). Subsections IWE and IWL provide the requirements for inservice inspection (ISI) of Class CC (concrete containment), and Class MC (metallic containment) of light-water cooled power plants. The effective date for the amended rule was September 9, 1996, and it requires the licensees to incorporate the new requirements into their ISI program plans and to complete the first containment inspection by September 9, 2001. However, a licensee may propose alternatives to or submit a request for relief from the requirements of the regulation pursuant to 10 CFR 50.55a(a)(3) and 50.55a(g)(5).

By the letter dated February 20, 2001, Indiana Michigan Power Company, the licensee, proposed several alternatives to the requirements of Subsection IWE of Section XI of the ASME Code (Relief Requests CISIR-01 through CISIR-04) for its Donald C. Cook Nuclear Plant (CNP), Units 1 and 2. In response to the staff's concern raised during a May 8, 2001, telephone conversation, the licensee expanded the basis for relief of Relief Request CISIR-02 by letter dated May 23, 2001. The NRC's findings with respect to authorizing the alternatives or denying the proposed requests are discussed in this evaluation.

2.0 EVALUATION

2.1 Relief Request CISIR-01:

2.1.1 Code Requirements:

ASME Section XI, 1992 Edition with 1992 Addenda, Table IWE-2500-1, Examination Category E-D, Items E5.10 and E5.20 require a VT-3 visual examination to be performed on

seals and gaskets that assure containment leak tight integrity. Examination is required once each 10-year inspection interval.

IWE-3513, "Standards for Examination Category E-D, Seals, Gaskets and Moisture Barriers," requires seals, gaskets and moisture barriers to be examined for wear, damage, erosion, tear, surface cracks or defects that may violate the leak-tight integrity.

2.1.2 Code Requirement from Which Relief Is Requested:

Relief is requested from the ASME Section XI, 1992 Edition, 1992 Addenda, Table IWE-2500-1, Examination Category E-D requirement to VT-3 examine seals and gaskets on airlocks, hatches, and other devices to assure containment leak-tight integrity.

2.1.3 Basis for Relief:

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

The following components include seals and gaskets:

Electric Penetrations

Electric penetrations use a closure plate that is welded to the containment penetration. Modules through which electrical conductors pass are installed in the closure plate. The type of seals used on the modules are compression fittings that are manufactured by Conax. These seals cannot be inspected without disassembly of the penetrations to gain access to the seals.

Piping Penetrations

Blind flanged piping penetrations employ gasket and O-ring seals in conjunction with pressure retaining bolting to maintain containment leak-tight integrity. These seals and gaskets cannot be inspected without disassembly of the penetration bolting.

Equipment Hatch and Personnel Airlocks

The equipment hatch and personnel airlocks utilize inner and outer door seals to ensure leak-tight integrity. The hatches and personnel airlocks also contain hand wheel seals, electrical penetration seals, view port gaskets, and equalizing valve seals that require disassembly to gain access to the seals and gaskets.

Due to component configurations, visual examination of seals and gaskets in most cases would require the associated joints to be disassembled. Electrical penetrations would need a pre-maintenance 10 CFR Part 50, Appendix J test, de-termination of the electrical cables if enough cable slack is not available, disassembly of the joint, removal and examination of the seals and gaskets, reassembly of the joint, re-termination of the cables, post maintenance testing of cables, and a post maintenance 10 CFR Part 50, Appendix J test of the penetration. The work required for other containment penetrations would be similar except for the de-termination, re-termination and testing of the cables.

The 1993 Addenda to Section XI recognizes that disassembly of joints to perform examinations on seals and gaskets is not warranted. Note 1 in Examination Category E-D was modified in the 1993 Addenda to Section XI to state that sealed or gasket connections need not be disassembled solely for the performance of examinations. However, without disassembly, most of the surface of the seals and gaskets would be inaccessible. Therefore, the examination provides little useful information.

The components described above are currently tested in accordance with 10 CFR Part 50, Appendix J, Type B requirements. Degradation of the seal and gasket material is revealed by an increase in the leak rate. When leakage rates exceed the acceptance standards, corrective measures are applied and the component is re-tested.

2.1.4 Proposed Alternative:

The licensee proposes to verify the pressure retaining capability of seals and gaskets by the performance of 10 CFR Part 50, Appendix J, Type B testing once each inspection interval.

2.1.5 Staff Evaluation of CISIR-01:

As an alternative to the requirements (VT-3 examinations) of the ASME Section XI, Subsection IWE, 1992 Edition, 1992 Addenda, the licensee proposed to use leak-rate testing in accordance with 10 CFR Part 50, Appendix J to examine the leak-tight integrity of containment seals and gaskets.

In its request, the licensee stated that, because the seals and gaskets associated with these penetrations are not accessible for examination when the penetration is assembled, containment penetration seals and gaskets must be disassembled and re-assembled for the purpose of performing the VT-3 visual examination. These activities (a pre-maintenance Appendix J test, de-termination of cables at electrical penetrations if enough cable slack is not available, disassembly of the joints, removal and examination of the seals and gaskets, re-assembly of the joints, re-termination of the cables if necessary, post-maintenance testing of cables, and post-maintenance Appendix J testing of the penetration) associated with a VT-3 visual examination would result in hardship without a compensating increase in the level of quality and safety, and also would introduce the possibility of component damage that would not otherwise occur. The periodic test in accordance with 10 CFR Part 50, Appendix J will detect and measure local leakage of containment or penetrations whose design incorporates resilient seals, gaskets, sealant compounds, and electrical penetrations fitted with flexible metal seal assemblies. If unacceptable leakage is identified during the test, corrective measures would be taken and the components would be re-tested.

In the staff's review of the changes to ASME Section XI, 1992 Edition, 1993 Addenda it was determined that disassembly of joints for the sole purpose of performing visual examination is unwarranted. Requiring the licensee to disassemble components for the sole purpose of inspecting seals and gaskets would place a significant hardship on the licensee without a compensating increase in the level of quality and safety.

On the basis discussed above, the staff concludes that the alternative proposed by the licensee will provide reasonable assurance of the functional capability and integrity of the containment penetration seals and gaskets during the testing required by 10 CFR Part 50, Appendix J.

Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the specific requirements of the Code would result in hardship without a compensating increase in the level of quality and safety.

2.2 Relief Request CISIR-02:

2.2.1 Code Requirements:

ASME Section XI, 1992 Edition, 1992 Addenda, IWL-2310, "Visual Examination and Personnel Qualification," and IWA-2210, "Visual Examinations," specify minimum illumination and maximum direct examination distance for all concrete surfaces:

- (a) VT-1C visual examinations are conducted to determine concrete deterioration and distress for suspect areas detected by VT-3 visual examinations, and conditions (e.g., cracks, wear, or corrosion) of tendon anchorages and wire or strands. Minimum illumination, maximum direct examination distance, and maximum procedure demonstration lower case character height shall be as specified in IWA-2210 for the VT-1 visual examination.
- (b) VT-3C visual examinations are conducted to determine the general structural condition of concrete surfaces of containment by identifying areas of concrete deterioration and distress, such as defined in ACI 201.1 R-68. The minimum illumination, maximum direct examination distance, and maximum procedure demonstration lower case character height shall be as specified in IWA-2210 for the VT-3 visual examination.

2.2.2 Code Requirement from Which Relief Is Requested:

Relief is requested for IWA-2210, visual examination requirements for minimum illumination and maximum direct examination distance of Class CC components under IWL-2310.

2.2.3 Basis for Relief:

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

For example, the containment dome concrete surfaces are difficult to inspect because the original design did not provide ladders or other access means. As a result, the Section XI maximum direct examination distance and minimum illumination requirements are difficult to meet and would necessitate the installation of extensive temporary scaffold systems or a climbing scaffold system to access these portions of containment. These scaffolds would provide only limited access due to containment geometric restrictions, as well as structural and equipment interferences; however, their installation, use, and removal could jeopardize personnel safety.

2.2.4 Proposed Alternative:

The licensee proposes modifying the direct examination distance and the illumination requirements when performing visual examinations remotely. Specifically, when performing the visual examinations required per IWL-2310 remotely, the maximum direct examination distance

specified in Table IWA-2210-1 may be increased and the minimum illumination requirements specified in Table IWA-2210-1 may be decreased. This will be done provided that the conditions or indications for which the visual examination is performed can be detected at the chosen distance and illumination.

2.2.5 Staff Evaluation of CISIR-02:

As described in "Basis for Relief" section above, the containment dome concrete surfaces are difficult to inspect because the original design did not provide ladders or other access means. As a result, the requirements for the maximum direct examination distance and minimum illumination are difficult to meet and would necessitate the installation of extensive temporary scaffold systems or a climbing scaffold system to access these portions of containment. These scaffolds would provide only limited access due to containment geometric restrictions, as well as structural and equipment interferences. The installation, use, and removal of the scaffold could jeopardize personnel safety. Because of the lack of access to higher portions of the dome and the containment building itself will make it a hardship to meet the maximum direct examination distance and minimum illumination requirements, the licensee proposed an alternative to the requirements for the measurement of illumination and examination distance for visual examinations specified in ASME Section XI, 1992 Edition, 1992 Addenda, IWL-2310, "Visual Examination and Personnel Qualification," and IWA-2210, "Visual Examination." The alternate examinations state that the code required maximum direct examination distance may be increased and the minimum illumination may be decreased provided that the conditions or indications for which the visual examination is performed can be detected at the chosen distance and illumination.

Visual examinations on the containment are performed to determine if damage or degradation (cracks, corrosion or other physical damage) warrant additional evaluation or repair of the structure. In order for the visual examinations to be performed in such a way as to detect critical flaws, proper lighting is essential. IWA-2210 allows for remote examination as long as the remote examination procedure is demonstrated to resolve the selected test chart characters. By letter dated May 23, 2001, the licensee responded to concerns raised by the staff in a telephone conversation held on May 8, 2001. In the May 23, 2001, letter, the licensee added that the alternative visual examination will be performed by, or under the direction of, a CNP Registered Professional Engineer (RPE). The RPE will determine the acceptable minimum illumination and maximum direct examination distance by providing criteria, which will be based on the minimum size of each indication of interest, for the qualification of the alternate remote visual examination. In accordance with IWA-2240, "Alternative Examinations," of ASME Section XI, the procedure and equipment to be used will be demonstrated to the satisfaction of the RPE and the Authorized Nuclear Inservice Inspector. In accordance with IWL-2320, "Responsible Engineer," the RPE will perform a final review of all examination results.

On the basis discussed above, the staff concludes that the examination requirements proposed by the licensee will provide reasonable assurance of the functionality and integrity of the concrete containment. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the specific requirements of the Code would result in hardship without a compensating increase in the level of quality and safety.

2.3 Relief Request CISIR-03:

2.3.1 Code Requirements:

ASME Section XI, 1992 Edition with 1992 Addenda, IWE-2420(b), "successive Inspections," states that, when component examination results require evaluation of flaws, areas of deterioration, or repairs in accordance with IWE-3000, "Acceptance Standards," and the component is found to be acceptable for continued service, the areas containing such flaws, deterioration, or repairs shall be examined during the next inspection period listed in the schedule of the inspection program of IWE-2411, "Inspection Program A," or IWE-2412, "Inspection Program B," in accordance with Table IWE-2500-1, "Examination Category E-C."

2.3.2 Code Requirement from Which Relief Is Requested:

Relief is requested from the IWE-2420(b) requirement to perform successive examination of a flaw area that was repaired in accordance with the requirements of IWE-3122.2, "Acceptance by Repair," and IWE-3122.3, "Acceptance by Replacement."

2.3.3 Basis for Relief:

Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested as compliance with the specified requirements result in a hardship, or unusual difficult 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. When a repair is performed, IWA-4150, "Verification of Acceptability," requires the owner to conduct an evaluation of the suitability of the repair, including consideration of the cause of the failure. If the repair has restored the component to an acceptable condition per IWE-3122.2 or the component has been replaced per IWE-3122.3, successive examinations are not warranted.

Repairs of components determined to be unsuitable per IWA-4150 evaluations do not meet code requirements and are thereby unacceptable for continued service. Furthermore, if the repair area is subject to accelerated degradation, it would still require augmented examination in accordance with IWE-1240, "Surface Areas Requiring Augmented Inspection."

Acceptance of the components for continued service per IWE-3122 is summarized below:

IWE-3122.2 Specifies that a flaw shall be unacceptable unless it is removed by mechanical means or the component is repaired to the extent necessary to meet the acceptance standards of IWE-3000. IWE-3122.2 does not specify that a successive examination is required. Furthermore, when this repair is performed, IWA-4150 requires the owner to conduct an evaluation of the suitability of the repair including consideration of the cause of the failure. When a component has been repaired, successive examinations would be performed on the areas that have been repaired and evaluated as acceptable, and not on the original flawed component.

- IWE-3122.3 Specifies that as an alternative to IWE-3122.2, the component or the portion of the component containing the flaw or degradation shall be replaced in accordance with IWE-7000. IWE-3122.3 does not specify that a successive examination is required. When a component has been replaced, successive examinations would not be performed on the original flawed component, but the replaced component.
- IWE-3122.4(b) Specifies that when a flaw or relevant condition is accepted by engineering evaluation, the area containing the flaw or degradation shall be examined in accordance with IWE-2420(b) and (c).

2.3.4 Proposed Alternative:

The licensee proposes to limit the successive examinations required by IWE-2420(b) to components accepted by evaluation per IWE-3122.4.

2.3.5 Staff Evaluation of CISIR-03:

In lieu of meeting ASME Section XI, Subparagraph IWE-2420(b) that requires the performance of successive examinations of a flaw area that was repaired in accordance with the requirements of subparagraphs IWE-3122.2, "Acceptance by Repair," and IWE-3122.3, "Acceptance by Replacement," the licensee proposes to limit the successive examinations required by IWE-2420(b) to components accepted by evaluation per IWE-3122.4.

When repairs are complete, IWA-4150 requires licensees to conduct an evaluation of the suitability of the repair. When a repair is required because of the failure of an item, the evaluation shall consider the cause of failure to ensure that the repair is suitable. If the failure mechanism is identified and corrected as required and the repair to restore the component to an acceptable condition per IWE-3122.2 or to replace the component is performed per IWE-3122.3, the proposed alternative will provide reasonable assurance of structural integrity. If the repair area is subject to accelerated degradation, it would still require augmented examination in accordance with IWE-1240, "Surface Areas Requiring Augmented Inspection." In addition to the justification provided by the licensee, the staff notes that IWB-2420(b), IWC-2420(b), and IWD-2420(b) do not require the successive inspection of repairs for Class 1, 2 and 3 components as required in IWE-2420(b) for the containment. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the specific code requirements would result in hardship without a compensating increase in the level of quality and safety.

2.4 Relief Request CISIR-04:

2.4.1 Code Requirements:

ASME Section XI, 1992 Edition with 1992 Addenda, Table IWE-2500-1, Examination Category E-G, Item E8.20 requires pressure retaining bolting that has not been disassembled and reassembled during the inspection interval to be torque or tension tested.

Table IWE-2500-1, Examination Category E-G, Item E8.10 requires that the surfaces of bolted connections be VT-1 visually examined.

Table IWE-2500-1, Examination Category E-P, Item E9.40 requires leakage testing and examination in accordance with 10 CFR Part 50, Appendix J.

2.4.2 Code Requirement from Which Relief Is Requested:

Relief is requested from the ASME Section XI, 1992 Edition, Table IWE-2500-1, Examination Category E-G, Item E8.20, requirement to torque or tension test pressure retaining bolting that has not been disassembled and reassembled during the inspection interval.

2.4.3 Basis for Relief:

Pursuant to 10 CFR 50.55a(a)(3)(ii), relief is requested as compliance with the specified requirements results in a hardship, or unusual difficulty without a compensating increase in the level of quality and safety.

Determination of the pressure retaining bolting torque or tension values require that the bolting be de-tensioned and then re-tensioned. This activity is considered maintenance and would, therefore, require a 10 CFR Part 50, Appendix J, Type B test to be performed after the joint is re-torqued or re-tensioned. 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 loads that would cause it to experience significant damage.

The verification of torque or tension values on bolt joints that have been proven leak-tight through 10 CFR Part 50, Appendix J, testing and visual inspection is deemed a hardship because of the additional resources required for torque/tension testing and the follow-up 10 CFR Part 50, Appendix J testing. Additionally, the de-tensioning or re-tensioning activities may damage the components.

Torque or tension testing is not required on any other ASME Section XI, Class 1, 2 or 3 bolted connections (for their supports) as part of the inservice inspection program.

2.4.4 Proposed Alternative:

The licensee proposes no alternative examinations because the following examination and tests required by Subsection IWE ensure the structural integrity and leak-tightness of Class MC pressure retaining bolting:

Exposed surfaces of bolted connections shall be visually examined in accordance with the requirements of Table IWE-2500-1, Examination Category E-G, "Pressure Retaining Bolting," Item E8.10.

Bolted connections shall meet the pressure test requirements of Table IWE-2500-1, Examination Category E-P, "All Pressure Retaining Components, Item E9.40.

2.4.5 Staff Evaluation of CISIR-04:

ASME Section XI, 1992 Edition with the 1992 Addenda, Table IWE-2500-1, Examination Category E-G, Pressure Retaining Bolting, Item E8.20 requires bolt torque or tension testing on bolted connections that have not been disassembled and reassembled during the inspection interval. This examination is used to aid in the determination that leak-tight seals exist and that the structural integrity of the subject bolted connections is maintained. In lieu of meeting the requirement that a bolt torque or tension test be performed where the connection has not been disassembled or reassembled during the inspection interval, the licensee proposes to rely on the 10 CFR Part 50, Appendix J, Type B test together with the visual examination in accordance with requirements of Table IWE-2500-1, Item E8.10 as an alternative to the Code requirement to verify the integrity of penetrations with bolted connections.

The staff finds that bolt torque or tension testing on bolted connections that have not been disassembled and reassembled during the inspection interval would require the bolting be un-torqued and then re-torqued or re-tensioned, whereas the leak testing as required by 10 CFR Part 50, Appendix J would adequately verify the leak-tight integrity of the containment. Compliance with ASME Code requirements will cause a hardship or unusual difficulty because un-torquing and subsequent re-torquing or re-tensioning bolted connections involve unnecessary radiation exposure and costs to perform the work without a compensating increase in the level of quality and safety. The staff also finds that the alternative approach proposed by the licensee (the test required by 10 CFR Part 50, Appendix J together with VT-1 visual examination to verify the leak-tight integrity of bolted connections for containment vessel leak-tight integrity) will provide reasonable assurance of the containment pressure boundary integrity. On this basis, the staff concludes that the alternative proposed by the licensee is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

3.0 CONCLUSION:

Based on our review of the information provided in the request for relief (Relief Requests CISIR-01 through CISIR-04), the staff concludes that compliance with the code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, and that the licensee's proposed alternatives will provide reasonable assurance of containment pressure integrity. Therefore, these proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

Principal Contributor: T. Cheng

Date: July 13, 2001