

October 26, 2000

Mr. James Knubel
Chief Nuclear Officer
Power Authority of the State of
New York
123 Main Street
White Plains, NY 10601

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT (FITZPATRICK)--
ALTERNATIVE TO AMERICAN SOCIETY OF MECHANICAL ENGINEERS
BOILER AND PRESSURE VESSEL CODE (ASME CODE) REQUIREMENTS
FOR REPAIR OF REACTOR PRESSURE VESSEL NOZZLE TO CONTROL ROD
DRIVE RETURN LINE CAP WELD (TAC NO. MB0252)

Dear Mr. Knubel:

By letter dated October 15, 2000, as supplemented October 18, 2000, you proposed an alternative to the ASME Code, Section XI, repair requirements pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i). The proposed alternative consists of the use of Code Cases N-504-1, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping," and N-638, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [gas tungsten arc welding] Temper Bead Technique," with modifications to perform weld overlay repair of the flawed reactor pressure vessel (RPV) nozzle (N-9) to the control rod drive (CRD) return line cap weld at FitzPatrick.

We have reviewed your submittals and have determined that the proposed alternative, to use Code Cases N-638 and N-504 with modifications for the weld overlay repair of the flawed RPV nozzle (N-9) to the CRD return line cap weld at FitzPatrick, is acceptable because it will provide reasonable assurance of structural integrity based on maintaining the applicable code safety margins. Details of our review are set forth in the enclosed safety evaluation.

We conclude that your proposed alternative will result in an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the use of Code Cases N-638 and N-504-1 with modifications as identified in your submittals to perform weld overlay repair of the flawed (RPV) nozzle (N-9) to the CRD return line cap weld at FitzPatrick is authorized for the duration of the repair.

J. Knubel

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This completes all our action on your October 15 and 18, 2000, submittals. Please contact the project manager, Mr. Guy S. Vissing (301-415-1441, electronic mail at gsv@nrc.gov) if you have any questions.

Sincerely,

/RA/

Marsha Gamberoni, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: Safety Evaluation

cc w/encl: See next page

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This completes all our action on your October 15 and 18, 2000, submittals. Please contact the project manager, Mr. Guy S. Vissing (301-415-1441, electronic mail at gsv@nrc.gov) if you have any questions.

Sincerely,

/RA/

Marsha Gamberoni, Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: Safety Evaluation

cc w/encl: See next page

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Accession No. ML003762146 *Safety evaluation transmitted my memo of 10/29/00
no major changes were made.

OFFICE	PDI-1/PM	PDI-1/LA	PDI-1/SC	OGC	EMCB
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DATE	10/24/00	10/24/00	10/26/00	10/24/00	10/19/00

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ALTERNATIVE TO ASME CODE, SECTION XI, REPAIR REQUIREMENTS
FOR WELD OVERLAY REPAIR OF REACTOR PRESSURE VESSEL NOZZLE TO
THE CONTROL ROD DRIVE RETURN LINE CAP WELD
NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated October 15, 2000, as supplemented October 18, 2000, the Power Authority of the State of New York (the licensee) proposed an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI, repair requirements pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i). The proposed alternative consists of the use of Code Cases N-504-1, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping," and N-638, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW [gas tungsten arc welding] Temper Bead Technique," with modifications to perform weld overlay repair of the flawed reactor pressure vessel (RPV) nozzle (N-9) to the control rod drive (CRD) return line cap weld at James A. FitzPatrick Nuclear Power Plant (FitzPatrick).

During the current refueling outage (RF14), an intergranular stress corrosion cracking (IGSCC) inspection was performed in accordance with Generic Letter 88-01. Unacceptable indications were found at the subject nozzle to the CRD return line cap weld and, thus, require weld overlay repair. The RPV nozzle and the CRD return line cap are made of SA-508, Class 2 low-alloy steel and Inconel 600 (SB166), respectively. The subject weld is fabricated with Inconel 182/82 material. The nozzle side of the weld is buttered with Inconel 182 material. The licensee-proposed weld overlay design has a portion of the overlay extended into the RPV nozzle. Since the nozzle was made of low-alloy carbon steel, a temper bead welding technique as prescribed in Code Case N-638, is needed to fabricate the weld overlay on the low-alloy carbon steel nozzle. The temper bead technique is designed to avoid excessive hardening of the low-alloy carbon steel material when welding is performed on this material without preheat and postweld heat treatment.

Pursuant to 10 CFR 50.55a(a)(3)(i), proposed alternatives to the requirements of 10 CFR 50.55a(g) may be used when authorized by the U.S. Nuclear Regulatory Commission (NRC). The licensee must demonstrate that the proposed alternative would provide an acceptable level of quality and safety.

2.0 EVALUATION

2.1 ASME Section XI Code Repair Requirement

The current applicable ASME Code, Section XI, to FitzPatrick is the 1989 Edition with no addenda. Article IWB-4000, "Repair Procedures," of the subject Section XI Code Edition provides rules and requirements for repair of the pressure retaining boundary for Class 1 components and their supports. To perform a Code repair, Sub-article IWB-4120 "Procedure" requires that defects will be removed from the degraded components prior to performing a repair by welding.

2.2 Proposed Alternative

Instead of removing the defect, the licensee proposed to weld an overlay over the defect. The licensee proposed to use a combination of the requirements from ASME Code Cases N-504-1 for austenitic weld overlay using Alloy 52 or Alloy 152 for local repair and N-638 for ambient temperature temper bead welding technique as an alternative to the repair requirements in ASME Code, Section XI, IWB-4000, to perform weld overlay repair on the flawed RPV nozzle (N-9) to the CRD return line cap weld at FitzPatrick.

2.3 Licensee's Bases for the Proposed Alternative

The licensee's bases for the proposed alternative are summarized below:

- (1) It is necessary to use the Code Cases N-504-1 and N-638 for weld overlay repair of the flawed RPV nozzle (N-9) to the CRD return line cap weld because it is not practical to perform the code repair, which requires the removal of the defects from the flawed component as the defect is initiated from the inside-diameter surface of the component.
- (2) The weld overlay will be made of nickel-based Alloy 52 (ASME Code Case 2142-1) instead of austenitic stainless steel material as specified in Code Case N-504-1, since the referenced weld and weld butter are made of an austenitic nickel-based Alloy 182 or Alloy 82. When necessary during the repairing activities, nickel-based Alloy 152 (ASME Code Case 2143-1) will be used for local weld repair with a manual shielded metal arc welding process. Alloy 52 or 152 is resistant to IGSCC and is compatible with the existing Alloy 182 or 82 weld metal.
- (3) The overlay is designed as a full structural overlay in accordance with the guidelines in NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR [Boiling Water Reactor] Coolant Pressure Boundary Piping," and the ASME Code Case N-504-1 modified for use on the referenced RPV nozzle to CRD return line cap weld. The overlay will cover the subject weld and portion of the nozzle adjacent to the weld. The overlay design assumes the subject nozzle weld to be completely cracked and will restore the code safety margins in the overlay repair.
- (4) The ambient temperature temper bead welding technique prescribed in Code Case N-638 is needed to fabricate the weld overlay on the pressure vessel nozzle made of low-alloy carbon steel to avoid embrittlement of the low-alloy carbon steel without the need of preheat and

postweld heat treatment. The licensee stated that it is not practical to perform preheat and postweld heat treatment without the draining of the vessel and the removal of the fuel. The draining of the vessel would result in a significant increase of the radiation level and personnel radiation exposure, which is contrary to the as low as is reasonably achievable principle.

2.4 NRC Staff's Evaluation

The licensee's proposed alternative to the ASME Code, Section XI, repair is based on the use of Code Cases N-638 and N-504-1 with modifications to perform weld overlay repair on the flawed RPV nozzle (N-9) to the CRD return line cap weld. The Code Case N-504-1 has been approved by the NRC and incorporated in Regulatory Guide (RG) 1.147, "In-service Inspection Code Case Acceptability, ASME Section XI, Division 1," for generic use. The licensee's proposed alternative extends the application of Code Case N-504-1 for welding P-43 materials (Inconel) on P-3 materials (low-alloy carbon steel) rather than P-8 (stainless steel) materials. This is technically acceptable as long as the overlay design is based on the allowable stress limits for P-43 materials and the qualified welding procedures and personnel are used in welding fabrication. Such extended application of Code Case N-504-1 was approved by the NRC for a similar weld overlay repair performed on a feedwater nozzle-to-safe-end at the Perry Nuclear Power Plant.

Code Case N-638 has not yet been approved by the NRC for incorporation in RG 1.147. However, the NRC staff has reviewed the supporting data for Code Case N-638. Code Case N-638 allows the use of the machine GTAW at ambient temperature without the use of preheat or postweld heat treatment for repair of Class 1, 2, and 3 components. The NRC staff notes that the temper bead technique prescribed in Code Case N-638 is similar to that in Code Case N-606. In Code Case N-606, the application of the temper bead technique at ambient temperature is limited to boiling-water reactor control rod housing or stub tube and, in Code Case N-638, the allowable application is extended to all Class 1, 2, and 3 components. Code Case N-606 has been reviewed by the NRC staff and is scheduled to be endorsed by the NRC staff in future updates of regulatory documents. The NRC staff has approved the use of the temper bead technique at ambient temperature for overlay weld repair of recirculation and feedwater nozzle-to-safe-end welds at Nine Mile Point Nuclear Station, Unit No. 2, on March 30, 2000.

The NRC staff has reviewed the licensee's submittal, and has determined that the proposed alternative, to use Code Cases N-638 and N-504-1 with modifications for the weld overlay repair of the flawed RPV nozzle (N-9) to the CRD return line cap weld at FitzPatrick, is acceptable because it will provide reasonable assurance of structural integrity based on maintaining the applicable code safety margins.

3.0 CONCLUSION

Based on a review of the licensee's submittals, the NRC staff concludes that the licensee's proposed alternative will result in an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the licensee's proposed use of Code Cases N-638 and N-504-1 with modifications as identified in the licensee's submittals to perform weld overlay repair of the flawed RPV nozzle (N-9) to the CRD return line cap weld at FitzPatrick for the duration of the repair.

Principal Contributor: W. Koo

Date: October 26, 2000