

March 21, 2006

Mr. Paul A. Harden
Site Vice President
Nuclear Management Company, LLC
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES NUCLEAR PLANT — REQUEST FOR AUTHORIZATION OF
RELIEF REQUEST NO. 1 FOR CERTAIN REQUIREMENTS IN ASME CODE,
SECTION XI, CODE CASE N-638-1 AT PALISADES NUCLEAR POWER
PLANT (TAC NO. MC7993)

Dear Mr. Harden:

Nuclear Management Company, LLC's (NMC's) letter of July 22, as supplemented November 22, 2005, and January 6, 2006, submitted a request for authorization to use an alternative to certain requirements of American Society of Mechanical Engineers' (ASME's) *Boiler and Pressure Vessel* (B&PV) Code Case N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine Temper Bead Technique." NMC intends to use the alternative for weld repair of pressurizer vessel nozzle heater sleeves at Palisades Nuclear Power Plant.

The staff has completed its review of NMC's request, and concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the use of the proposed alternative for the repair of pressurizer vessel nozzle heater sleeves during the spring 2006 outage. Enclosed is our safety evaluation.

Sincerely,

/RA/

L. Raghavan, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR AUTHORIZATION OF RELIEF REQUEST NO. 1 FOR CERTAIN

REQUIREMENTS IN ASME CODE, SECTION XI, CODE CASE N-638-1

NUCLEAR MANAGEMENT COMPANY, LLC

PALISADES NUCLEAR PLANT

DOCKET NO. 50-255

1.0 INTRODUCTION

Nuclear Management Company, LLC's (NMC's) letter of July 22, as supplemented November 22, 2005, and January 6, 2006, submitted a request for authorization to use an alternative to certain requirements of American Society of Mechanical Engineers' (ASME's) *Boiler and Pressure Vessel* (B&PV) Code Case N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine Temper Bead Technique." NMC intends to use the alternative for weld repair of pressurizer vessel nozzle heater sleeves at Palisades Nuclear Power Plant (Palisades). Specifically, NMC proposed performing the weld overlay repair with Alloy 52 filler material using the machine Gas Tungsten Arc Welding (GTAW) process and an ambient temperature temper bead method with 50 degrees F minimum preheat temperature and no post weld heat treatment (PWHT).

2.0 REGULATORY REQUIREMENTS

Title 10 of the *Code of Federal Regulations* (CFR) 50.55a(g)(4), specifies that ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. Paragraph IWA-4120(a) of ASME Section XI requires that, "Repairs shall be performed in accordance with the owner's design specification and the original construction code of the component or system. Later editions and addenda of the Construction Code or of Section III, either in their entirety or portions thereof, and Code Cases may be used."

The applicable Code edition and addenda of the ASME B&PV, Section XI, is the 1989 Edition, no Addenda, which requires a PWHT at elevated temperature. ASME Code Case N-638-1 provides for machine GTAW temper bead weld repairs at ambient temperature using dissimilar materials and without need for PWHT. Therefore, NMC is requesting authorization to use ASME Code Case N-638-1. This Code Case was conditionally approved in Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability - ASME Section XI Division 1," Revision 14, dated August 2005. NMC will meet the condition required by the Code

Case, but due to component interferences, it is unable to meet the requirement for final weld examination area specified in paragraph 4.0(b) of the Code Case.

Pursuant to 10 CFR 50.55a(a)(3), the Nuclear Regulatory Commission (NRC) may authorize alternatives to ASME Code requirements if the licensee demonstrates that: (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. NMC submitted the subject relief request pursuant to 10 CFR 50.55a(a)(3)(i), as a proposed alternative to the requirements of ASME Code Case N-638-1.

3.0 TECHNICAL EVALUATION

3.1 Components for which Relief is Requested

The affected components are the Palisades' pressurizer vessel heater sleeves. Palisades has 120 pressurizer heater sleeves penetrating the bottom head. The pressurizer assembly was fabricated in accordance with the ASME Code, Section III, Class A components.

3.1.1 Applicable Code Edition and Addenda

The applicable code edition and addenda for the pressurizer vessel heater sleeve repair is the ASME B&PV Code, Section XI, 1989 Edition with no addenda. Palisades is currently in the third 10-year inservice inspection interval. The original construction code of record for the Palisades' pressurizer vessel is ASME Section III, Class A, 1965 Edition, including addenda through winter 1965.

3.2 NMC's Proposed Alternative and Basis for Use

NMC plans to implement an outer-diameter pad plug design if a repair is necessary for Palisades. Therefore, in support of the proposed repair design, NMC is requesting relief from the applicable ASME Code requirements.

As previously mentioned, Code Case N-638-1 was conditionally approved in RG 1.147. NMC will meet the condition required by the Code Case. However, it will be unable to meet the requirement for final weld examination area specified in paragraph 4.0(b) of the Code Case due to component interferences.

Code Case N-638-1, paragraph 4.0(b), requires that the final weld, and the band around the area defined in paragraph 1.0(d), shall be examined using surface and ultrasonic methods when the completed weld has been at ambient temperature for at least 48 hours. The area to be examined, as defined in paragraph 1.0(d), is the area to be welded and a band around the area of at least 1-1/2 times the component thickness, or 5-inches, whichever is less. The vessel thickness at the lower head is nominally 4-1/8 inches. Applying paragraph 1.0(d) would require that the examination area include the weld pad area and the area extending 5-inches on each side of the weld pad. The weld pad has square dimensions of approximately 3-1/4 inches on a side. Adding the examination area of 5 additional inches around provides a total area defined by a square with dimensions of approximately 13-1/4 inches x 13-1/4 inches. Other pressurizer penetrations are positioned at distances less than 13-1/4 inches and would interfere

with the Code Case defined area. Code Case N-638-1, paragraph 4.0(e), allows for additional acceptance criteria to be specified by the owner to account for differences in weld configuration. Due to the configuration of the weld pad repair, NMC proposed to use the examination area defined by ASME Code Section III, 1992 Edition, subsection NB-5244, "Weld Buildup Deposits at Openings for Nozzles, Branch, and Piping Connections." This area consists of the weld metal buildup, the fusion zone and the parent metal beneath the weld metal buildup. NMC would examine the entire fusion zone and the parent metal beneath the weld metal buildup using liquid penetrant and ultrasonic examinations. NMC proposed the following inspection plan:

- Perform surface examination of the base material prior to weld buildup. The surface examination would be evaluated to the 1992 Edition of ASME Code Section III, subsection NB-5350.
- Perform ultrasonic examination of the base material prior to weld buildup. The ultrasonic examination would be evaluated in accordance with the 1992 Edition of ASME Section III, subsection NB-2532.1(b)(1).
- Perform nondestructive examination of welded pad. Pre-service inspection would be performed using liquid penetrant and ultrasonic examination techniques after the completed weld has been at ambient temperature for at least 48 hours. The examination area is defined in ASME Code Section III, 1992 Edition, subsection NB-5244, which consists of the weld buildup surface for liquid penetrant and the weld buildup fusion zone to parent metal to ensure freedom from lack of fusion and laminar defects for ultrasonic examination. The acceptance standards for the welded pad are ASME Code Section III, 1992 Edition, subsection NB-5350, for the liquid penetrant examination, and ASME Code Section III, 1992 Edition, subsection NB-5330, for the ultrasonic examination.
- In accordance with the condition required by RG 1.147, NMC will also perform ultrasonic examination demonstrations using samples which represent the repaired volume as a performance demonstration to ensure a quality repair. These samples will contain construction type flaws.

The proposed alternative provides an acceptable level of quality and safety, pursuant to 10 CFR 50.55a(a)(3)(i). NMC will implement the proposed alternative during the spring 2006 outage at Palisades for the proposed repair of the pressurizer heater sleeve penetrations.

3.3 NRC Staff Evaluation

NMC plans to implement an outer-diameter pad plug design repair during the spring 2006 outage, if a repair is necessary for Palisades. Therefore, in support of the proposed repair design, NMC is requesting relief from the applicable ASME Code requirements.

The applicable Code edition and addenda of the ASME B&PV Code, Section XI, requires a PWHT at elevated temperature. ASME Code Case N-638-1 provides for machine GTAW temper bead weld repairs at ambient temperature using dissimilar materials and without the need for PWHT. Therefore, NMC is requesting authorization to use ASME Code Case N-638-1. This Code Case was conditionally approved in RG 1.147. NMC will meet the condition required by the Code Case, but due to component interferences they will be unable to

meet the requirement for final weld examination area as specified in paragraph 4.0(b) of the Code Case. This paragraph requires that the final weld, and the band around the area defined in paragraph 1.0(d) of the Code Case, shall be examined using surface and ultrasonic methods when the completed weld has been at ambient temperature for at least 48 hours. The area to be examined as defined in paragraph 1.0(d), is the area to be welded, and a band around the area of at least 1-1/2 times the component thickness or 5-inches, whichever is less. Application of this Code Case requirement would require an examination area of approximately 13-1/4 inches x 13-1/4 inches. The location of other pressurizer penetrations would interfere with the Code Case defined area. Code Case N-638-1, paragraph 4.0(e), allows for additional acceptance criteria to be specified by the owner to account for differences in weld configuration. Due to the configuration of the weld pad repair, NMC proposed to use the examination area defined by ASME Code Section III, 1992 Edition, subsection NB-5244. This area consists of the weld metal buildup, the fusion zone and the parent metal beneath the weld metal buildup. NMC would examine the entire weld buildup pad area using liquid penetrant and ultrasonic examinations.

Code Case N-638 was originally written to be applied to the repair of partial and full penetration groove welds. However, nothing in the Code Case precludes its use in other applications, such as the current NMC application of an alloy 52 weld pad deposited over an outer diameter plug of alloy 690. The welding principles involved and application of the weld filler metal are the same as for a groove weld design. When performing a full penetration groove weld between two pieces of thick low alloy steel (over 1-inch thick) using a low alloy steel filler metal, there can be significant residual stresses built up in the base metal from contraction of the weldment. These stresses can cause distortion and cracking of the base metal a significant distance from the weld groove. To make certain that these types of defects do not remain in the weld area away from the weld groove, the Code has extended the area of the non-destructive examination well into the base metal. The filler metal used in the subject repair is alloy 52, which is more ductile than the low alloy steel. The thickness of filler metal applied to the pressurizer shell is 0.25 inches, which is much less than the 4-1/8 inch pressurizer shell thickness. Therefore, due to the more ductile weld filler metal, and the much thinner weld being applied to the pressurizer shell, the residual stresses built up in the base metal from contraction of the weldment will be much less than for a full penetration groove weld. Examination of large areas of base metal outside the weld area, as required by the Code Case, provide no additional information in this type of weld since the examination would be in base metal which is unaffected by the repair. In addition, in accordance with the condition required by RG 1.147, NMC will also perform ultrasonic examination demonstrations using samples which represent the repaired volume. These samples will contain construction type flaws which are more pertinent to the type of weld being performed. This additional performance demonstration will provide the required level of quality and safety.

Based on the above evaluation, the staff has determined that NMC's proposed alternative to the requirements of ASME Code Case N-638-1 for the outer diameter pad plug design repair is acceptable, because it provides an acceptable level of quality and safety.

4.0 CONCLUSION

Based on the information provided in NMC's submittals, the NRC staff has determined that NMC has provided an acceptable alternative to certain requirements of ASME Code Case N-638-1. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), NMC's proposed alternative is

authorized for the outer-diameter pad plug design repair for pressurizer vessel nozzle heater sleeves during the spring 2006 outage at Palisades.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: E. Andruszkiewicz

Date: March 21, 2006