

May 3, 2011

MEMORANDUM TO: Kenneth G. O'Brien, Deputy Director
Division of Reactor Safety
Region III

FROM: Thomas B. Blount, Deputy Director **/RA/**
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

SUBJECT: FINAL RESPONSE TO TASK INTERFACE AGREEMENT 2011-006,
PALISADES NUCLEAR PLANT REACTOR VESSEL BARE METAL
HEAD EXAMINATION – COMPLIANCE WITH CODE CASE N-729-1

By letter dated January 20, 2011 (Agencywide Documents Access and Management System Accession No. ML110200648), the U.S. Nuclear Regulatory Commission Region III Office requested the Office of Nuclear Reactor Regulation (NRR) to determine if the Palisades Nuclear Plant (Palisades) licensee had completed an enhanced visual (VE) bare metal visual examination of their reactor pressure vessel (RPV) upper head in compliance with American Society of Mechanical Engineer's Boiler and Pressure Vessel (ASME) Code Case (CC) N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure Retaining Partial Penetration Welds Section XI, Division 1," by providing answers to the following Task Interface Agreement questions:

1. Is the corrosion or wastage identified on the Palisades RPV upper head during the ASME CC N-729-1 VE examination, which the licensee determined to not be the result of head penetration nozzle leakage, a relevant condition as defined in paragraph 3141(c) of CC N-729-1 and as such, required to be evaluated in accordance with paragraph 3142.1.b.2?
2. Do the corrosion areas or other deposits present on the Palisades' RPV upper head surface (as identified in Report VT-10-088; Visual Examination for Boric Acid Detection - Reactor Vessel Head; dated October 17, 2010) represent obstructions for the VE examination as discussed in Footnote 1(a) for Table 1 "Examination Categories" of CC N-729-1? If so, must these affected areas be subtracted from the coverage area identified in Figure 1 "PWR [Pressurized Water Reactor] Reactor Vessel Upper Head Extent of Visual Examination" of CC N-729-1?

The NRR staff's assessment is documented in the enclosed evaluation.

Enclosure:
As stated

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TASK INTERFACE AGREEMENT 2011-006

REACTOR VESSEL BARE METAL HEAD EXAMINATION –

COMPLIANCE WITH CODE CASE N-729-1

1.0 INTRODUCTION

By letter dated January 20, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110200648), the U.S. Nuclear Regulatory Commission (NRC) Region III Office requested the Office of Nuclear Reactor Regulation (NRR) to determine if the Palisades Nuclear Plant (Palisades) licensee had completed an enhanced visual (VE) bare metal visual (BMV) examination of their reactor pressure vessel (RPV) upper head in compliance with American Society of Mechanical Engineer's Boiler and Pressure Vessel (ASME) Code Case (CC) N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure Retaining Partial Penetration Welds Section XI, Division 1," by providing answers to the following Task Interface Agreement (TIA) questions:

1. Is the corrosion or wastage identified on the Palisades RPV upper head during the ASME CC N-729-1 VE examination, which the licensee determined to not be the result of head penetration nozzle leakage, a relevant condition as defined in paragraph 3141(c) of CC N-729-1 and as such, required to be evaluated in accordance with paragraph 3142.1.b.2?
2. Do the corrosion areas or other deposits present on the Palisades' RPV upper head surface (as identified in Report VT-10-088; Visual Examination for Boric Acid Detection - Reactor Vessel Head; dated October 17, 2010) represent obstructions for the VE examination as discussed in Footnote 1(a) for Table 1 "Examination Categories" of CC N-729-1? If so, must these affected areas be subtracted from the coverage area identified in Figure 1 "PWR [Pressurized Water Reactor] Reactor Vessel Upper Head Extent of Visual Examination" of CC N-729-1?

2.0 BACKGROUND

During the 2010 Inservice Inspection at Palisades, NRC inspectors observed the licensee conducting a VE of the RPV upper head. The NRC inspectors identified an unresolved item related to the licensee's interpretation of the VE requirements identified in ASME Code Case N-729-1, with respect to areas of corrosion and white deposits present on the RPV upper head.

By rule, on December 31, 2008, the regulation at Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(ii)(D) was enacted to require all US licensees of PWRs to implement ASME Code Case N-729-1, that, in part, requires a VE of RPV upper heads. A VE requires a qualified inspector to examine the bare metal RPV upper head surface to look for relevant conditions (areas of corrosion, boric acid deposits, discoloration, and other evidence of nozzle leakage) that could cause degradation of the upper head or indicate potential nozzle penetration leakage. The inspection requires coverage of at least 95 percent of the total inspection surface area of an RPV upper head, allowing only welded or bolted connections to the RPV upper head to be obstructions.

ENCLOSURE

On October 17, 2010, the licensee completed a VE examination and documented the results in Report VT-10-088, "Visual Examination for Boric Acid Detection- Reactor Vessel Head," dated October 17, 2010.

The NRC inspectors observed areas of corrosion and shallow areas of wastage on the vessel head during their inspection which were not caused by vessel head penetration nozzle leakage. The NRC inspectors noted that the licensee did not record any areas of head corrosion as "relevant conditions" and the licensee's examiners did not record an assessment or a review of changes to the head condition (e.g., corrosion) in 2010, which may have occurred since the 2003 baseline examination. The licensee believed this corrosion was caused by leakage of water sources above the head, which occurred prior to its 2003 baseline head inspection. The licensee documented the completion of the 2003 BMV examination of the vessel head in the licensee's document CAP 034719, "Head Staining and Scaling," dated March 31, 2003. The document notes that a visual record of the inspection was made using a digital camcorder. The licensee documented in CAP 034719, that the head was satisfactorily inspected, and stains were removed to allow inspection of underlying metal and that scaling present did not appear to impact the base metal to any significant depth.

Additionally, the NRC inspectors noted that the licensee did not record areas of corrosion or other deposits present on the vessel head surface as limitations with respect to completing a VE examination of at least 95 percent of the area defined in ASME Code Case N-729-1. The NRC inspectors identified this item as unresolved item (URI) number URI 05000255/2010005-03.

Licensee Position

The licensee's analysis and conclusions for the application of ASME Code Case N-729-1 are based upon its review of the statement of considerations published in the *Federal Register* for the 10 CFR 50.55a(g)(6)(ii)(D) rule and were documented in CR-PLP-2010-05407, "Reactor Head Corrosion," dated October 21, 2010, and "Entergy Position Paper- Bare Metal Visual Examinations In Accordance with Code Case N-729-1," dated November 1, 2010. The licensee interpreted the requirements of ASME Code Case N-729-1 to apply only to corrosion, boric acid deposits, and discoloration as relevant conditions if they were caused by boric acid leakage from J-groove welds and nozzles. The licensee staff believed that any corrosion induced by boric acid contacting the vessel head from sources above the head would have been properly addressed through the Corrective Action and Boric Acid Corrosion Control Programs.

3.0 EVALUATION

Question 1: Is the corrosion or wastage identified on the Palisades RPV upper head during the ASME CC N-729-1 VE examination, which the licensee determined to not be the result of head penetration nozzle leakage, a relevant condition as defined in paragraph 3141(c) of CC N-729-1 and as such, required to be evaluated in accordance with paragraph 3142.1.b.2?

Response: Yes.

Subarticle -3140, "Inservice Visual Examinations (VE)," of ASME Code Case N-729-1 states under -3141(c) that, "Relevant conditions for the purposes of the VE shall include areas of corrosion, boric acid deposits, discoloration and other evidence of nozzle leakage." If a licensee identifies any indication of corrosion, boric acid deposits, discoloration or other evidence of

nozzle leakage a “relevant condition” under the VE inspection has been identified. The licensee would then proceed to Subarticle -3142.1(b) which states that, “A component whose VE detects a relevant condition shall be unacceptable for continued service until the requirements of -3142.1(b)(1), (b)(2) and (c) below are met.”

Subarticle -3142.1(b)(1) states, “Components with relevant conditions require further evaluation. This evaluation shall include determination of the source of the leakage and correction of the source of leakage in accordance with -3142.3.” The licensee’s conclusion that a “relevant condition” is only an item which is clearly from nozzle leakage is inconsistent with this requirement. It is at this point in the process that a licensee would determine the source of leakage from a “relevant condition.” Subarticle -3142.1(b) clearly states that a relevant condition is unacceptable for continued service until -3142.1(b)(1), (b)(2), and (c) are met. The licensee is required to follow -3142.1(b)(2) regardless of the source of the relevant condition.

Subarticle -3142.1(b)(2) states:

All relevant conditions shall be evaluated to determine the extent, if any, of degradation. The boric acid crystals and residue shall be removed to the extent necessary to allow adequate examinations and evaluation of degradation, and a subsequent VE of the previously obscured surfaces shall be performed, prior to return to service, and again in the subsequent refueling outage. Any degradation detected shall be evaluated to determine if any corrosion has impacted the structural integrity of the component. Corrosion that has reduced component wall thickness below design limits shall be resolved through repair /replacement activity in accordance with IWA-4000.

Again, these requirements are required to be implemented regardless of the source of the relevant indication. The NRC would expect the licensee to perform the evaluation of Subarticle -3142.1(b)(2) in accordance with the licensee’s Boric Acid Program to address any degradation and remaining relevant conditions left in service. This requirement is reinforced for all relevant conditions regardless of source of leakage by -3142.1(c) which states additional requirements for those relevant conditions which indicate even possible nozzle leakage.

Subarticle -3142.1(c) states:

A nozzle whose VE indicates relevant conditions indicative of possible nozzle leakage shall be unacceptable for continued service unless it meets the requirements of -3142.2 or -3142.3.

Given this regulatory basis, the NRR staff concludes that corrosion or wastage identified on the Palisades RPV upper head during the CC N-729-1 VE examination performed during the fall 2010 outage is a relevant condition as defined in Subarticle -3141(c) of CC N-729-1, and as such, is required to be evaluated in accordance with paragraph 3142.1(b)(2).

Additionally, NRR staff review of the licensee's Report VT-10-088, "Visual Examination for Boric Acid Detection- Reactor Vessel Head," dated October 17, 2010, raises concerns regarding the effectiveness of the licensee in meeting Subarticle -3142.1(b)(1). Graphic files IMG_0372.jpg, IMG_0360.jpg, and IMG_0364.jpg show a bare metal head surface condition with a significant amount of surface corrosion and discoloration such that an effective examination would require photographic or video capture to verify no change in these indications on the head or at any nozzle to head interface. Complete documentation of the Palisades RPV upper head bare metal surface does not appear to have been performed for this inspection. Without this video or picture documentation, the ability of an inspector to identify a future small amount of boric acid or new small corrosion area, such as those typically seen as an indication of nozzle leakage, is questioned. Further, given the history of the Palisades RPV upper head repair of two penetration nozzles based, in part, on positive volumetric leak path indications with no visual indication of boric acid or corrosion products being identified, a detailed inspection history of the upper head bare metal surface would be expected to ensure effective determination of the source of any leakage in accordance with Subarticle -3142.1(b)(1).

Question 2: Do the corrosion areas or other deposits present on the Palisades' RPV upper head surface (as identified in Report VT-10-088; Visual Examination for Boric Acid Detection - Reactor Vessel Head; dated October 17, 2010) represent obstructions for the VE examination as discussed in Footnote 1(a) for Table 1 "Examination Categories" of CC N-729-1? If so, must these affected areas be subtracted from the coverage area identified in Figure 1 "PWR Reactor Vessel Upper Head Extent of Visual Examination" of CC N-729-1?

Response: No.

Note (1)(a) for Table 1 of ASME Code Case N-729-1 states the following:

A direct examination of the bare-metal surface of the entire outer surface of the head, including essentially 100% of the intersection of each nozzle with the head. If welded or bolted obstructions are present (i.e. mirror insulation, insulation support feet, shroud support ring/lug), the examination shall include $\geq 95\%$ of the area in the region of the nozzles as defined in Fig. 1 and the head surface uphill and downhill of any such obstructions. The examination may be performed with insulation in place using remote equipment that provides resolution of the component metal surface equivalent to a bare-metal direct examination.

The corrosion areas or other deposits present on the Palisades' RPV upper head surface are not "welded or bolted obstructions." Corrosion areas as discussed in the response to question 1 are "relevant conditions" that require disposition. Other deposits may or may not be relevant conditions depending on the disposition of such items through the inspection. However, it should be noted, that no allowance for "other deposits" is permitted for the inspection of the entire outer surface of the head in ASME Code Case N-729-1. Typically, "other deposits" if not recorded as "relevant conditions" such as dust or lagging debris should be moved to examine the bare metal head surface underneath. Cleaning techniques or low pressure air are acceptable methods to move "other deposits" to perform a VE examination of a RPV upper head.

4.0 CONCLUSION

Based on its review of TIA 2011-006, the NRR staff finds the following:

1. The corrosion or wastage identified on the Palisades RPV upper head during the ASME Code Case N-729-1 VE examination performed during the fall 2010 outage is a relevant condition as defined in Subarticle -3141(c) of ASME Code Case N-729-1, and as such, is required to be evaluated in accordance with paragraph 3142.1(b)(2).
2. The corrosion areas or other deposits present on the Palisades' RPV upper head surface are not "welded or bolted obstructions" and therefore do not represent obstructions for the VE examination as discussed in Footnote 1(a) for Table 1 "Examination Categories" of ASME Code Case N-729-1.

Principal Contributor: Jay Collins

Date: