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WOLF CREEK
NUCLEAR OPERATING CORPORATION

October 20, 2016
ET 16-0028

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference: Letter ET 16-0027, from J. H. McCoy, WCNOC, to USNRC dated October 14, 2016, "Relief Request Number I4R-03, Request for Relief from Paragraph-3200(b) of ASME Code Case N-729-1 for Reactor Vessel Head Penetration Nozzle Welds and Relief Request I4R-04, Request for Relief from the Requirements of ASME Code Case N-729-1"

Subject: Docket No. 50-482: Response to Verbal Request for Additional Information Related to Relief Request Number I4R-03, Request for Relief from Paragraph-3200(b) of ASME Code Case N-729-1 for Reactor Vessel Head Penetration Nozzle Welds

Gentlemen:

The Reference provided Wolf Creek Nuclear Operating Corporation (WCNOC) 10 CFR 50.55a Relief Request Number 14R-03 "Request for Relief from Paragraph-3200(b) of ASME Code Case N-729-1 for Reactor Vessel Head Penetration Nozzle Welds" and Relief Request I4R-04, "Request for Relief from the Requirements of ASME Code Case N-729-1." In a teleconference on October 17, 2016 between NRC staff and WCNOC personnel, the staff verbally requested additional information to support their review of Relief Request I4R-03.

The Attachment provides WCNOC's response to the verbal request for additional information. This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4156, or Cynthia R. Hafenstine (620) 364-4204.

Sincerely,

Jaime H. McCoy

JHM/rlt

Attachment

cc: K. M. Kennedy (NRC), w/a
R. J. Pascarelli (NRC), w/a
B. K. Singal (NRC), w/a
N. H. Taylor (NRC), w/a
Senior Resident Inspector (NRC), w/a

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Response to Verbal Request for Additional Information

Reference 1 provided Wolf Creek Nuclear Operating Corporation (WCNOC) 10 CFR 50.55a Relief Request Number I4R-03 "Request for Relief from Paragraph-3200(b) of ASME Code Case N-729-1 for Reactor Vessel Head Penetration Nozzle Welds" and Relief Request I4R-04, "Request for Relief from the Requirements of ASME Code Case N-729-1." During a teleconference on October 17, 2016 between Nuclear Regulatory Commission (NRC) staff (R. Pascarelli, J. Drake, and R. Kopriva) and WCNOC personnel (J. McCoy, S. Smith, T. Baban, D. Tougaw, R. Barraclough, and C. Hafenstine), the staff verbally requested additional information to support the review of Relief Request Number I4R-03. Based on the teleconference, below is WCNOC's understanding of the additional information being requested. WCNOC's understanding of the verbal request is provided in italics.

1. *Provide WCNOC's disposition of the potential relevant indications of the control rod drive mechanism (CRDM) penetration nozzles and the results of the reactor vessel head examination.*

Response:

Penetrations with Relevant Conditions Identified

As per Code Case N-729-1, the requirement is the ability to perform an adequate inspection to confirm no evidence indicative of nozzle leakage. Following insulation removal, but prior to any cleaning of the reactor vessel head surface, a visual examination was performed using remote video augmentation for improved certainty of the "As Found" condition. All nozzles were examined using this approach. The WCNOC Boric Acid Program Owner/Engineer was present and engaged for the examinations. Two quality control (QC) level III examiners identified eight penetrations (59, 77, 47, 71, 46, 70, 58, and 63) for follow-up. All penetrations were assessed by the QC level III examiners as having no boron in the annulus area, substantiating the supposition of no pressure boundary leakage - penetration 70 was identified as having rust in the annulus. A detailed review of the video footage was performed by the Boric Acid Program Owner/Engineer and four additional penetrations (35, 27, 20, and 40) were identified for supplemental examination based on insufficient evidence to confirm the absence of potential nozzle leakage. A conservative approach was used in defining the nozzles to be included for supplemental examination. If there was any ambiguity in ability to confirm the absence of leakage from below, the nozzle was included.

An Ultrasonic Test (Leak Path Assessment and Volumetric Examination) has been completed on the 12 nozzles selected for supplemental examination. There were no indications identified during the supplemental examination, with the same results as the examinations previously performed (Refueling Outage 19 and Refueling Outage 15). These results provide additional confidence that none of the boric acid residue identified on the top surfaces of the vessel closure head came from the penetrations. This is in alignment with the original supposition that all residue identified came from the leak on the canopy seal weld from Penetration 77.

Reactor Vessel Head Insulation

The remaining nozzles were also carefully reviewed both in person and via video footage. The nozzles with residue buildup were carefully examined to the point that WCNOC is confident the residue was not originating from a crack in the Alloy 600 material or the partial penetration weld on each nozzle. The evidence led to the conclusion that this residue came from the insulation removal process.

Borated water saturated both layers of insulation in the areas nearest the leak source resulting in dried boric acid buildup developing on the top surfaces most impacted. The insulation used is "NUKON" blanket type and has two layers installed. The bottom layer is installed in one direction with all sections installed parallel to each other. The second layer is installed and oriented 90° from the first layer to improve the insulating characteristics. The total thickness of these two layers is around 5-6 inches. This can be observed in pictures depicted by the clean area of the nozzles adjacent to the head top surface and have varying amounts of boric acid residue above the portion shielded by the insulation.

During the insulation removal process, the dried crusty residue crumbled and some migrated to the uphill side of the nozzle, while the saturated portions left boric acid streaks on the nozzles where contacted. The insulation must be removed from one of three "windows" in the lower shroud area; the window chosen is based on whichever of the three is most convenient. In some cases, the saturated portion was pulled across the clean(er) portion of the vessel closure head leading to streaks and clumps on nozzles contacted.

Evidence of this is depicted in several pictures of nozzles having residue on the uphill side. Pictures also depict boric acid smear and residue markings on the nozzles that were contacted by the saturated insulation blanket sections.

Evaluation of Vessel Closure Head Visual Examination Results

All penetrations that had corrosion, boric acid deposits, discoloration, and other evidence of nozzle leakage were included in the list of nozzles with relevant conditions (which includes the 11 penetrations noted by the NRC) – this included any with dry granules that came from the insulation removal process. The logic used in evaluating the penetrations with relevant conditions was the ability to determine visually that the accumulation could not have come from the partial penetration weld or a nozzle crack. Additionally, surface rust was identified, but none was characteristic of wastage with potential to compromise pressure boundary structural integrity. The three individuals involved provided challenging feedback for some details, resulting in agreement on the examination results.

Rough cleaning was performed using a vacuum cleaner. The suction created by the vacuum cleaner was minimal and incapable of removing particulate from surfaces with geometry that encumbered the ability to get the 1.5" diameter stiff hose nozzle close enough to the loose particulate. Videos (1825.avi, 2024.avi, 2147.avi, and 2637.avi) were taken of a portion of the investigation activities on a number of nozzles with the most significant relevant conditions, attempting to show how this was performed.

There were relevant conditions in close proximity to many nozzles as well as a large percentage of the vessel head surface not included in the examination areas adjacent to the nozzles. These encompassed various forms of relevant conditions, but none were/are indicative of pressure boundary leakage from the vessel closure head. These indications ranged from chunks of dried boric acid to insulation material and dust. The boric acid saturated and encrusted insulation in concert with the insulation removal process discussed previously was determined to be the source of these conditions.

WCNOC will install new insulation and perform a Bare Metal Visual Exam (VE) before placing the vessel closure head back in service prior to the end of Refueling Outage 21 (in progress), and again at the beginning of the Refuel Outage 22 (scheduled for Spring 2018) as prescribed

by Code Case N-729-1. The plan is to perform final cleaning of the entire exterior surface of the vessel closure head following completion of work on the areas above. Postponing of the cleaning is to limit the number of times the vessel head is soaked with water and reduce the potential for injury of personnel. This cleaning is necessary for removing the remaining residue and granules of boric acid and other debris from the top surface of the closure head.

References:

1. WCNOC Letter ET 16-0027, "Relief Request Number I4R-03, Request for Relief from Paragraph-3200(b) of ASME Code Case N-729-1 for Reactor Vessel Head Penetration Nozzle Welds and Relief Request I4R-04, Request for Relief from the Requirements of ASME Code Case N-729-1," October 14, 2016.