

REQUEST FOR ADDITIONAL INFORMATION
RELIEF REQUEST 36, REVISION 1
FULL STRUCTURAL WELD OVERLAY OF DISSIMILAR METAL WELDS
AT COLD LEG NOZZLES
PALO VERDE UNITS 1, 2, AND 3
ARIZONA PUBLIC SERVICE COMPANY

By letter dated June 4, 2009, Arizona Public Service Company (the licensee) submitted Relief Request 36, Revision 1, as an alternative to certain requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Relief Request 36, Revision 1, proposes to use full structural weld overlays (FSWOL) to preemptively repair Alloy 82/182 dissimilar metal welds (DMWs) at various cold leg nozzles at Palo Verde Nuclear Generating Station, Units 1, 2, and 3. To complete its review, the staff requests the following additional information.

1. Section 1.0 of Relief Request 36, Revision 1, lists the affected Alloy 82/182 DMWs. The licensee stated that it will not ultrasonically examine the subject DMWs prior to weld overlay installation. Discuss the inspection history, including examination results, of the subject DMWs.
2. In Section 3.0, the licensee cited the ASME Code, Section XI, Code Case N-504-2 as applicable code requirements. Code Case N-504-2 has been superseded by Code Case N-504-3 and the staff has approved Code Case N-504-3 with conditions as shown in Table 2 of Regulatory Guide 1.147, Revision 15. Code Case N-504-3 is the appropriate case for the subject relief request. Please provide a comparison of the differences between N-504-2 and N-504-3, identify any deficiencies in the proposed relief request as a result of not using N-504-3, determine the significance of the deficiencies, and submit a supplement or a revised relief request, as appropriate.
3. Recent operating experience of weld overlay installations has shown that hot cracking occurs in the base metal and/or deposited weld when Alloy 52 or 52M is deposited on the stainless steel base metal that contains relatively high sulfur. To solve the problem, some licensees have deposited a buffer layer of stainless steel weld metal on the stainless steel base metal (pipe) to minimize hot cracking. Discuss whether a buffer layer will be applied on the stainless steel pipe prior to depositing Alloy 52 weld metal. If so, provide weld requirements for the buffer layer (e.g., paragraph (e) of ASME Section XI Code Case N-504-3 and weld material specification).
4. Section 5.2(b)2 requires that the end transition slope of the overlay not exceed 45 degrees. However, the latest version of Code Case N-740-2 requires that the transition slope not exceed 30 degrees. The staff has approved the 45-degree transition slope in the original Relief Request 36 because at the time, Code Case N-740 specified 45 degrees for the transition slope. However, a 30-degree slope would reduce the stress concentration at the toe of the weld more than a 45-degree slope. Discuss the acceptability of the 45-degree slope in light of the 30-degree slope required by Code Case N-740-2.
5. Section 5.2(b)4.i states that a stress analysis will be performed to demonstrate that the nozzles will perform their intended design function with the weld overlay and the analysis will be available for NRC review. Although submittal of that analysis not a requirement, licensees who have requested similar weld overlay relief requests have typically submitted a summary of the stress analysis to the NRC staff at headquarters prior to the unit achieving Mode 4 of operation. Please indicate whether APS plans to submit the stress analysis for the weld overlay of the subject DMWs to the NRC prior to Mode 4 entry for each unit.

6. Sections 5.3(a)2 and 5.3(a)3 state that the liquid penetrant examination and ultrasonic examination shall be conducted at least 48 hours after the completed overlay has returned to ambient temperature when ambient temperature temper bead welding is used. However, Section 5.3(a)3 also states that “APS will be using Relief Request 37, previously approved on June 21, 2007, which authorized the 48-hour hold time to begin following the completion of the third layer of the weld overlay...” The staff has permitted the 48-hour hold time to begin following the completion of the third layer of the weld overlay. However, the statements in Sections 5.3(a)2 and 5.3(a)3 regarding “...48 hours after the completed overlay has returned to ambient temperature...,” should be either revised or eliminated to avoid ambiguity.

7. Sections 5.3(a)4, 5.3(a)5.ii, 5.3(b)2 requires that wall thickness of “ t_w ” be the thickness of the weld overlays to disposition indications detected in accordance with Table IWB-3514-2 of the ASME Code, Section XI, during the acceptance and pre-service examination. However, Section 5.3(c)3 does not provide a definition of the wall thickness in dispositioning indication(s) detected during inservice examinations. Discuss the wall thickness that will be used to disposition indications detected using Table IWB-3514-2 during the inservice examinations.

8. Section 5.5 (third paragraph on page 13) states that “...If a flaw is detected in the upper 25% of the original material during the pre-service examination, the actual flaw size would be used for the crack growth evaluations...” In Section 5.3, the licensee states that ultrasonic testing (UT) will not be performed on DMWs prior to overlay installation. Therefore, the condition of the DMWs will not be known prior to weld overlay installation. Also, UT is not qualified to detect flaws in the inner 75% of the weld thickness of the DMW once the weld overlay is installed on the DMW. Therefore, the condition of the inner 75% of the DMW wall thickness will not be known after overlay installation. In such case, the postulated flaw in the above statement is not conservative. The staff’s position is that a worst case flaw (i.e., 75% through wall depth) should be assumed in the inner 75% region of the DMW at a minimum. If a flaw is detected in the upper 25% of the original material during the pre-service or inservice examinations, the flaw depth used for the crack growth evaluations should be the actual detected flaw depth plus the flaw of 75% through-wall depth assumed in the inner (lower) 75% wall thickness region. Please clarify the size of the flaw that will be assumed in the crack growth calculations.

9. In previous NRC-approved weld overlay relief requests, the staff has requested that licensees submit the following information within 14 days of completion of the weld overlay examination:

(a) A discussion of any repairs to the overlay material and/or base metal and the reason for the repair.

(b) A listing of indications detected. The recording criteria of the ultrasonic examination procedure to be used for the examination overlays requires that all indications, regardless of amplitude, be investigated to the extent necessary to provide accurate characterization, identity, and location. Additionally, the procedure requires that all indications, regardless of amplitude, that cannot be clearly attributed to the geometry of the overlay configuration be considered flaw indications.

(c) The disposition of all indications using the standards of ASME Code Section XI, IWB-3514-2 and/or IWB-3514-3 criteria and, if possible, the type and nature of the indications need to be submitted. The ultrasonic examination procedure requires that all suspected flaw indications are to be plotted on a cross-sectional drawing of the weld and that the plots should accurately identify the specific origin of the reflector.

Please commit to submit the information within 14 days of completion of examination of the installed weld overlays or explain why the information need not be submitted.

10. Discuss whether any component in the subject nozzle configurations (e.g., nozzles, safe ends, and pipes) is fabricated with cast austenitic stainless steel (CASS) material. If CASS material is used in the nozzle configurations, discuss how the inspection of the DMW can be accomplished because the ultrasonic signals passing through the CASS component located adjacent to the DMW will distort the ultrasonic signals.

11. Relief Request 36, Revision 1, does not explain the technical basis for the alternative and the differences between the performance demonstration Initiative (PDI) program and the requirements of Supplement 11, Appendix VIII to the ASME Code, Section XI. In Attachment 3, page 6, of the original Relief Request 36, dated May 8, 2008, the licensee stated that it did not provide a comparison of the differences between the PDI program and Supplement 11 to Appendix VIII because the PDI program status for Code Compliance and Applicability developed in June 2005 indicates that the PDI program is in compliance with Appendix VIII, 2001 Edition of ASME, Section XI. The staff cannot make a finding on the adequacy of the PDI program for Palo Verde without reviewing a comparison of the PDI program with Supplement 11 to Appendix VIII of the ASME Code, Section XI, in the submittal. Please submit the comparisons and associated technical basis of the PDI program to demonstrate that it complies with Supplement 11 or provide technical basis of the PDI program.

12. (a) Discuss any welding or cracking problems that occurred during the weld overlay installation on the pressurizer and shutdown cooling line nozzles per the original Relief Request 36 during the previous refueling outages.

(b) If welding or cracking problems occurred, discuss how welding procedures will be revised to eliminate the same problems for the upcoming weld overlay campaign based on Relief Request 36, Revision 1.

(c) Discuss whether the same welding contractors and welding qualification procedures will be used for the upcoming cold leg weld overlay campaign.

13. Discuss whether a new weld overlay is permitted to be applied on the top of a degraded weld overlay.

14. Provide material specifications of the subject nozzles, DMWs, safe ends, and pipe, and associated drawings. This information should be similar to the material specification tables and drawings in Enclosure 2 of the original Relief Request 36, dated February 8, 2007.

15. Provide the end date of the third inservice inspection interval for each of the Palo Verde Units.