**10 CFR 2.390**
**10 CFR 50.55a(g)(4)(iv)**
**10 CFR 50.55a(a)(3)(i)**

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102-05641-CDM/SAB/RJR
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Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

**SUBJECT: Palo Verde Nuclear Generating Station (PVNGS)**
**Units 1, 2 and 3**
**Docket Nos. STN 50-528/529/530**
**Proposed Alternative for PVNGS Units 1, 2 and 3: Use of Full–Structural Weld Overlays in the Repair of Dissimilar Metal Welds – Relief Request No. 36 -10 CFR 50.55a(a)(3)(i), and Request to Use a Later Edition and Addenda of the ASME Boiler and Pressure Vessel Code, Section XI, for Repair and Replacement Activities at PVNGS Units 1 and 3 in accordance with 10 CFR 50.55a(g)(4)(iv)**

In preparation for performing full-structural weld overlays in the repair of dissimilar metal welds at Palo Verde Units 1, 2 and 3 and pursuant to 10 CFR 50.55a(a)(3)(i), Arizona Public Service Company (APS) is proposing alternatives to the requirements of the ASME Boiler and Pressure Vessel Code, 2001 Edition, 2003 Addenda, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." Specifically, APS Relief Request 36 proposes alternatives to Section IWA-4110 which stipulates that weld repairs be performed in accordance with Articles IWA-4000 and IWA-4300 which requires that defects be removed or reduced to an acceptable size. The proposed alternatives and request for relief are discussed in Enclosure 1.

Enclosure 2 contains material tables and non-proprietary drawings of the Palo Verde Units 1, 2 and 3 Pressurizers and RCS nozzles. Enclosure 4 of this request contains the proprietary version of the information in Enclosure 2. This information is considered proprietary to Westinghouse Electric Company LLC, and is supported by an affidavit signed by Westinghouse, the owner of the information. Westinghouse requests that this proprietary information be withheld from public disclosure pursuant to 10 CFR 2.390.

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In developing Relief Request 36, APS has reviewed various sets of questions posed by the NRC and the responses from Licensees who have proposed similar alternatives. APS has provided its responses to these questions in Enclosure 3 of the request. Although the questions were generally left in their original format, the responses address the question as if it were asked of APS.

APS requests NRC approval of the proposed Relief Request 36 by June 1, 2007, to support startup of Unit 1 from the spring 2007 refueling outage in which the first full-structural weld overlays will be applied.

Pursuant to 10 CFR 50.55a(g)(4)(iv) and in accordance with the guidance provided in NRC Regulatory Issue Summary (RIS) RIS 2004-16, "Use of Later Editions and Addenda to ASME Code Section XI for Repair/Replacement Activities" dated October 19, 2004, APS requests NRC approval to use the American Society of Mechanical Engineers (ASME) Section XI, IWA-4000, "Repair/Replacement Activities," of the 2001 Edition and Addenda through 2003. Use of the 2001 Edition and Addenda through 2003 will be subject to the limitations and modifications listed in 10 CFR 50.55a(b)(2) for the repair/replacement activities on Class 1, 2, and 3 components at PVNGS Units 1 and 3.

APS intends to use this later edition for the duration of the current Palo Verde Units 1 and 3 inservice inspection (ISI) second 10-year intervals in support of the full-structural weld overlay commitments made in APS letter 102-05640, dated January 31, 2007. APS will be implementing the 2001 Edition through the 2003 Addenda of the ASME Code for Palo Verde Unit 2's third 10-year interval starting on March 18, 2007. Therefore, APS requests approval by June 1, 2007, to transition Units 1 and 3 to the same Edition and Addenda of the Code at the same time. Palo Verde Units 1 and 3 will be entering the third inspection interval on July 18, 2008 and January 11, 2008, respectively. A similar request to update a repair/replacement program was granted to Dominion Nuclear Connecticut, Inc. on September 13, 2005.

This letter contains no new commitments. If you have any questions about this change, please telephone Thomas N. Weber at (623) 393-5764.

Sincerely,

CDM/SAB/RJR/gt

Enclosure 1: Relief Request No. 36 - Proposed Alternative: Use of Full–Structural Weld Overlays in the Repair of Dissimilar Metal Welds

Enclosure 2: Material Tables and Non-Proprietary Drawings of Palo Verde Units 1, 2 and 3 Pressurizers and RCS Nozzles

Enclosure 3: APS Response to Questions Asked regarding Proposed Alternative ISI-GEN-ALT-06-03, Southern Company - Joseph M. Farley Nuclear Plant - Vogtle Electric Generating Plant

Enclosure 4: Palo Verde Units 1, 2 and 3 Proprietary Pressurizer and RCS Nozzle Drawings, and Application for Withholding Proprietary Information

cc: B. S. Mallett NRC Region IV Regional Administrator
M.T. Markley NRC NRR Project Manager
G. G. Warnick NRC Senior Resident Inspector for PVNGS

# ENCLOSURE 1

## Relief Request No. 36
## Proposed Alternative: Use of Full–Structural Weld Overlays in the Repair of Dissimilar Metal Welds

1. Appendix 1 - Ambient Temperature Temper Bead Welding Procedure
2. Appendix 2 - Comparison of APS proposed Alternative Verses Code Cases N-504-2 and N-638-1

**Relief Request No. 36**
**Proposed Alternative: Use of Full–Structural Weld Overlays in the Repair of Dissimilar Metal Welds**

## 1.0 ASME Code Component(s) Affected

PVNGS Unit: 1, 2 and 3
Description: Category R-A welds on the pressurizer. Palo Verde has implemented a risk-informed inservice inspection program.
Item numbers: See table below
Code Class: 1

| U-1 | Description | Zone | Size | DM Weld Item Number | SM Weld Item Number |
|---|---|---|---|---|---|
| Pressurizer | Spray nozzle to safe end | 29 | 4 | 5-33 | 29-1 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-32 | 31-13 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-29 | 31-1 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-30 | 31-5 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-31 | 31-9 |
| Pressurizer | Surge nozzle to safe end | 20 | 12 | 5-34 | 20-1 |
| Hot Leg | Surge nozzle to safe end | 20 | 12 | 6-4 | 20-11 |
| Hot Leg | SDC nozzle to safe end | 21 | 16 | 6-11 | 21-20 |
| Hot Leg | SDC nozzle to safe end | 22 | 16 | 7-9 | 22-1 |

| U-2 | Description | Zone | Size | DM Weld Item Number | SM Weld Item Number |
|---|---|---|---|---|---|
| Pressurizer | Spray nozzle to safe end | 29 | 4 | 5-33 | 29-1 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-32 | 31-13 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-29 | 31-1 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-30 | 31-5 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-31 | 31-9 |
| Pressurizer | Surge nozzle to safe end | 20 | 12 | 5-34 | 20-1 |
| Hot Leg | Surge nozzle to safe end | 20 | 12 | 6-10 | 20-11 |
| Hot Leg | SDC nozzle to safe end | 21 | 16 | 6-11 | 21-20 |
| Hot Leg | SDC nozzle to safe end | 22 | 16 | 7-9 | 22-1 |

| U-3 | Description | Zone | Size | DM Weld Item Number | SM Weld Item Number |
|---|---|---|---|---|---|
| Pressurizer | Spray nozzle to safe end | 29 | 4 | 5-33 | 29-1 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-32 | 31-13 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-29 | 31-1 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-30 | 31-5 |
| Pressurizer | Safety nozzle to safe end | 31 | 6 | 5-31 | 31-9 |
| Pressurizer | Surge nozzle to safe end | 20 | 12 | 5-34 | 20-1 |
| Hot Leg | Surge nozzle to safe end | 20 | 12 | 6-10 | 20-11 |
| Hot Leg | SDC nozzle to safe end | 21 | 16 | 6-11 | 21-20 |
| Hot Leg | SDC nozzle to safe end | 22 | 16 | 7-9 | 22-1 |

## 2.0 Applicable Code Edition and Addenda

The American Society of Mechanical Engineers (ASME) ISI Code of Record for the second 10-year inservice inspection interval for Palo Verde Nuclear Generating Station (PVNGS) Units 1 and 3 is ASME Code, Section XI, 1992 Edition, 1992 Addenda. The ASME ISI Code of Record for the third 10-year inservice inspection interval code for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 will be the ASME Code, Section XI, 2001 Edition and Addenda through 2003. Palo Verde Unit 2 will be entering its third inspection interval on March 18, 2007.

Palo Verde Units 1 and 3 will be entering the third inspection interval on July 18, 2008 and January 11, 2008, respectively. However, APS has requested, as part of this submittal, that the NRC approve use of ASME Section XI, IWA-4000, "Repair/Replacement Activities," of the 2001 Edition and Addenda through 2003 starting on March 18, 2007, for repair/replacement activities in Units 1 and 3.

In addition, as allowed by 10 CFR 50.55a, ASME Section XI, 2001 Edition will be used for Appendix VIII, "Performance Demonstration for Ultrasonic Examinations."

## 3.0 Applicable Code Requirements

- IWA-4110 of ASME Section XI requires that repairs of welds shall be performed in accordance with Article IWA-4000. IWA-4300 requires that defects be removed or reduced to an acceptable size.

- Code Case N-504-2[1], Alternative Rules for Repair of Class 1, 2 and 3 Austenitic Stainless Steel Piping, Section XI, Division 1," with requirements of ASME Section XI, Non-mandatory Appendix Q, "Weld Overlay Repair of Class 1, 2 and 3 Austenitic Stainless Steal Piping Weldments."

- Code Case N-638-1[1], "Similar and Dissimilar Metal Welding using Ambient Temperature Machine GTAW Temper Bead Technique."

NOTE: See Appendix 2 for a comparison of APS proposed alternative verses Code Cases N-504-2 and N-638-1

Currently, pressurizer nozzle and hot leg dissimilar weld examinations are required to be performed at Palo Verde in accordance with MRP-139. The examinations are the same as the volumetric examinations specified in Section XI, Table IWB-2500-1, Category B-J and B-F.

## 4.0 Reason for Request

Primary Water Stress Corrosion Cracking (PWSCC) has been identified as a degradation mechanism for Alloy 82/182 welds and weld buttering. While no PWSCC flaws have been detected in Palo Verde piping, there are geometric

[1] Regulatory Guide 1.147 Revision 14 , Table 2, identifies these Code Cases as conditionally acceptable)

limitations such that the required examination volume cannot be met with qualified ultrasonic (UT) techniques. APS has concluded that the application of a full-structural weld overlay (FSWOL) over the pressurizer Alloy 82/182 welds is the most appropriate course of action to ensure the integrity of the reactor coolant pressure boundary. In addition, the overlays will be designed to improve the configurations for future examinations.

The 2001 Edition and Addenda through 2003 of the Code does not provide rules for the design of weld overlays or for repairs without removal of flaws. In addition, Code Case N-504-2, which has been approved by the NRC for use, does not provide the methodology for overlaying nickel alloy welds joining austenitic and ferritic base materials; therefore, APS proposes the following alternative.

## 5.0 Proposed Alternative and Basis for Use

### Proposed Alternative

A preemptive full-structural Alloy 52 overlay will be applied to each of the pressurizer and hot leg Alloy 82/182 dissimilar metal welds identified in this request, Section 1.0, ASME Code Component(s) Affected. For a preemptive FSWOL, a flaw will be assumed. Paragraph 2(a) below defines crack-growth requirements and paragraph 2(b) below defines the design requirements.

If through-wall leakage is detected by visual examination on any of the Palo Verde pressurizer or hot leg Alloy 82/182 safe-end welds, a contingency FSWOL will be applied.

For all nine welds identified in section 1.0, in lieu of performing ultrasonic examinations, the flaw will be assumed to be 100% through the original wall thickness for the entire circumference for preemptive as well as contingency full-structural weld overlay.

Due to the proximity of the adjacent similar metal piping welds, preemptive or contingency overlay of the dissimilar metal welds may preclude the examination of the adjacent similar metal piping welds; therefore, the overlay will be extended over the adjacent similar metal piping welds, if required. However, which similar metal welds will be overlaid will be determined after designing the dimensions of the dissimilar metal weld overlay.

These similar metal welds will not be inspected prior to installing the overlay. The selection and examination of the similar metal weld population is currently performed using an NRC approved risk-informed Relief Request 32, dated November 3, 2006. The risk-informed application uses failure probability analysis, probabilistic risk assessment, and an expert panel evaluation to identify the piping components that require examination. The piping components selected for examination are only a small portion of the total population of similar metal welds; however, the basic intent of identifying and repairing flaws before piping integrity is challenged, is maintained by the risk-informed application. As a final step in the

however, the basic intent of identifying and repairing flaws before piping integrity is challenged, is maintained by the risk-informed application. As a final step in the selection process, a statistical model was used to assure that a sufficient number of welds are being examined. The welds adjacent to the dissimilar metal welds were not selected for examination in the risk-informed application for PWSCC degradation mechanism and it is concluded that these adjacent similar metal welds do not need to be examined to maintain an acceptable level of quality and safety. After the overlay is applied, these welds will be examined in accordance with the proposed alternative.

In lieu of using the existing IWA-4000 Repair Procedures in the 2001 Edition and Addenda through 2003 Section XI Code, APS proposes to use the following alternative for the design, fabrication, pressure testing, and examination of the weld overlays. This will provide an acceptable methodology for reducing a defect in austenitic nickel alloy welds to an acceptable size by increasing the wall thickness through deposition of a weld overlay. ASME Code references in this alternative are to the 2001 Edition and Addenda through 2003 for Section III and 2001 Edition and Addenda through 2003 for Section XI as modified by 10 CFR 50.55a. This methodology is based upon ASME Code Case N-740 and only applicable requirements of the Code Case are presented below as alternatives.

**1.0 General Requirements:**

(a) A full-structural weld overlay will be applied by deposition of Alloy 52 weld reinforcement (weld overlay) on the outside surface of the carbon steel pressurizer and hot leg nozzle (P-No. 1 or P-No. 3) to the stainless steel safe end (P-No. 8), inclusive of the Alloy 82/182 weld that joins the two items. In addition, the overlay will be extended (when required) to include the adjacent wrought stainless steel to stainless steel welds (P-No. 8 to P-No. 8).

There are no requirements specified in this proposed alternative for these stainless steel to stainless steel welds (such as flaw growth calculations) because they are not susceptible to stress corrosion cracking in a PWR water environment. Enclosure 2 provides non-proprietary figures of the pressurizer and hot leg nozzles and the materials for each component. Specific dimensions of the overlay thickness will be in the design package.

(b) The Alloy 52 weld overlay filler metal is an austenitic nickel alloy having a chromium (Cr) content of at least 28%. The weld overlay is applied 360 degrees around the circumference of the item, e.g., safe end to nozzle weld, and will be deposited using a Welding Procedure Specification (WPS) for groove welding, qualified in accordance with the Construction Code and Owner's requirements and identified in the Repair/Replacement Plan. As an alternative to the post-weld heat treatment requirements of the Construction Code and Owner's requirements, the provisions for Ambient Temperature Temper Bead Welding will be used on the ferritic nozzles. (See "Ambient Temperature Temper Bead Welding," which is located in Appendix 1 to this proposed alternative). The maximum area of an individual weld overlay on

the finished surface of the ferritic material shall be no greater than 300 square inches.

(c) Prior to deposition of the weld overlay, the surface will be examined by the liquid penetrant method. Indications larger than 1/16-inch shall be removed, reduced in size, or corrected in accordance with the following requirements.

1. One or more layers of weld metal shall be applied to seal unacceptable indications in the area to be repaired with or without excavation. The thickness of these layers shall not be used in meeting weld reinforcement design thickness requirements. Peening the unacceptable indication prior to welding is permitted.

2. If correction of indications identified in 1(c) is required, the area where the weld overlay is to be deposited, including any local repairs or initial weld overlay layer, shall be examined by the liquid penetrant method. The area shall contain no indications greater than 1/16-inch prior to the application of the structural layers of the weld overlay.

(d) Weld overlay deposits shall meet the following requirements:

The austenitic nickel alloy weld overlay shall consist of at least two weld layers deposited using a filler material identified in 1(b) above. The first layer of weld metal deposited will not be credited toward the required thickness because of chemical dilution.

Alternatively, the first layer may be credited toward the required thickness, provided the portion of the layer over the austenitic base material, austenitic filler material weld and the associated dilution zone from an adjacent ferritic base material contains at least 24% Cr. The Cr content of the deposited weld metal as determined by chemical analysis of the production weld or of a representative coupon taken from a mockup prepared in accordance with the Welding Procedure Specification (WPS) for the production weld shall contain at least 24% Cr.

(e) Welding will only be performed for applications predicted not to have exceeded a thermal neutron fluence of $1 \times 10^{17}$ (E< 0.5 eV) neutrons per $cm^2$ prior to welding.

**2.0 Crack Growth Considerations and Design**

(a) Crack Growth Considerations

Crack Growth Considerations - Crack growth calculations will be performed as part of a design package. Flaw characterization and evaluation requirements shall be based on the as-found flaw in the case of a contingency overlay. For a preemptive overlay, a flaw in the original dissimilar metal weld with a depth of 75% and a circumference of 360

degrees that originates from the inside of the pipe is postulated for crack growth purposes. A 75% through-wall depth flaw is the largest flaw that could remain undetected during the FSWOL preservice examination. This preservice examination will verify there is no cracking in the upper 25% of the original weld wall thickness, and thus verify that the assumption of a 75% through-wall crack is conservative. However, if any crack-like flaws are found during the preservice examination in the upper 25% of the original weld or base materials, the as-found flaw (postulated 75% through wall, plus the portion of the flaw in the upper 25%) would be used for the crack growth analysis. The size of all flaws will be projected to the end of the design life of the overlay or until the next scheduled inservice inspection. Crack growth, including both stress corrosion and fatigue crack growth, shall be evaluated in the materials in accordance with IWB-3640. If the flaw is at or near the boundary of two different materials, evaluation of flaw growth shall consider the most limiting of the two materials.

(b) Design of the FSWOL

The design of the weld overlay shall satisfy the following, using the assumptions and flaw characterization restrictions in 2(a) above. The following design analysis shall be completed in accordance with IWA-4311.

1. The axial length and end slope of the weld overlay shall cover the weld and the heat affected zones on each side of the weld, and shall provide for load redistribution from the item into the weld overlay and back into the item without violating applicable stress limits of ASME Section III, NB-3200. Any laminar flaws in the weld overlay shall be evaluated in the analysis to ensure that load redistribution complies with the above. These requirements will usually be satisfied if the weld overlay full thickness length extends axially beyond the projected flaw by at least $0.75\sqrt{Rt}$, where $R$ is the outer radius of the item and $t$ is the nominal wall thickness of the item.

2 Unless specifically analyzed in accordance with 2(b)1 above, the end transition slope of the overlay shall not exceed 45 degrees.

3. The thickness of the FSWOL shall be determined based on the assumption of a through-wall flaw, with a length of 360 degrees in the underlying pipe. The overlay will be applied, so that the criteria of IWB-3640 are met for the assumed flaw after the overlay is applied.

4. The effects of any changes in applied loads, as a result of weld shrinkage from the entire overlay, on other items in the piping system (e.g., support loads and clearances, nozzle loads, changes in system flexibility and weight due to the weld overlay) shall be evaluated. (There are no pre-existing flaws previously accepted by analytical evaluation in the Palo Verde welds to be considered in this evaluation).

nozzles will perform their intended design function with the FSWOL installed. The stress analysis report will include results showing that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied. The stress analysis will also include results showing that the requirements of IWB-3000 of the ASME Code, Section XI, are satisfied. The results will show that the postulated crack including its growth in the nozzles will not adversely affect the integrity of the overlaid welds. This analysis will be performed as part of the overlay design package and will be available for NRC review.

ii. The original leak-before-break (LBB) analyses will be confirmed to be valid after the weld overlays are applied, the amount of shrinkage is determined, and the shrinkage stresses are calculated.

**3.0 Examination and Inspection**

In lieu of all other examination requirements, the examination requirements proposed herein shall be met. Nondestructive examination methods shall be in accordance with IWA-2200, except as specified herein. Nondestructive examination personnel shall be qualified in accordance with IWA-2300. Ultrasonic examination procedures and personnel shall be qualified in accordance with Appendix VIII, Section XI, as implemented through the EPRI Performance Demonstration Initiative (PDI).

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 Section XI as amended by 10 CFR 50.55a, Final Rule dated October 1, 2004. Ultrasonic examination will be performed to the maximum extent achievable.

Pre-Overlay Examinations

Palo Verde Units 1, 2 and 3 are scheduled for full-structural overlays during the upcoming refueling outages. APS does not plan to perform UT of the pressurizer and hot leg nozzles dissimilar metal welds or the adjacent similar metal welds on these units prior to the installation of the overlays. Since APS intends to apply full-structural overlays designed for a worst case through-wall flaw that is 360 degrees in circumference, the dose received from the examination of these welds would result in a hardship without a compensating increase in the level of quality and safety.

Post-Overlay Examinations

There are two examinations to be performed after the overlay is installed, the Acceptance Examination of the Overlay and the Preservice Examination. The purpose of the Acceptance Examination is to assure a quality overlay was installed. The purpose of the Preservice Examination is to provide a baseline for future examinations and to locate and size any cracks that might have propagated into the upper 25% of the original wall thickness and to evaluate them accordingly. While listed below as two separate examinations they will be performed during the same time period. An identification of the examination coverage of each overlay will be developed and available for NRC review prior to plant startup.

The NDE requirements listed below cover the area that will be affected by the application of the overlay. Any PWSCC degradation would be in the alloy 82/182 weld or the adjacent heat affected zone (HAZ). Further, the original weld and adjacent base materials have received a radiographic examination (RT) during installation. The proposed surface and volumetric examinations provide adequate assurance that any defects produced by welding of the overlay or by extension of pre-existing defects will be identified.

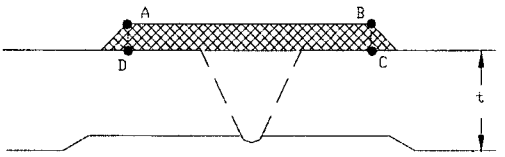
(a) Acceptance Examination

1. The weld overlay shall have a surface finish of 250 micro-inches RMS or better and a flatness sufficient to allow for adequate examination in accordance with procedures qualified per Appendix VIII. The weld overlay shall be examined to verify acceptable configuration.

2. The weld overlay and the adjacent base material for at least 1/2 inch from each side of the weld shall be examined using the liquid penetrant method. The weld overlay shall satisfy the surface examination acceptance criteria for welds of the Construction Code or ASME Section III, NB-5300. The adjacent base metal shall satisfy the surface examination acceptance criteria for base material of the Construction Code or ASME Section III, NB-2500. If ambient temperature temper bead welding is used, the liquid penetrant examination shall be conducted at least 48 hours after the completed overlay has returned to ambient temperature.

3. The examination volume A-B-C-D in Figure 1 below shall be ultrasonically examined to assure adequate fusion (i.e., adequate bond) with the base metal and to detect welding flaws, such as interbead lack of fusion, inclusions, or cracks. The interface C-D shown between the overlay and the weld includes the bond and the heat affected zone from the overlay. If ambient temperature temper bead welding is used, the UT shall be conducted at least 48 hours after the completed overlay has returned to ambient temperature.

**Figure 1:**
**ACCEPTANCE EXAMINATION**




Examination Volume A-B-C-D

4. Planar flaws shall meet the preservice examination standards of Table IWB-3514-2. In applying the acceptance standards, wall thickness "$t_w$" shall be the thickness of the weld overlay. For weld overlay examination volumes with unacceptable indications, the unacceptable indications will be removed and the volume will be re-welded. Re-examination per IWB-2420 is not required because unacceptable indications will be removed and the volume will be re-welded.

5. Laminar flaws shall meet the acceptance standards of Table IWB-3514-3 with the additional limitation that the total laminar flaw shall not exceed 10% of the weld surface area and that no linear dimension of the laminar flaw area exceeds 3.0 inches. Additional requirements are:

   i. The reduction in coverage of the examination volume in the aforementioned Figure 1 due to laminar flaws shall be less than 10%. The dimensions of the uninspectable volume are dependent on the coverage achieved with the angle beam examination of the overlay.

   ii. Any uninspectable volume in the weld overlay shall be assumed to contain the largest radial planar flaw that could exist within that volume. This assumed flaw shall meet the inservice examination standards of Table IWB-3514-2. In applying the acceptance standards, wall thickness "$t_w$" shall be the thickness of the weld overlay. Both axial and circumferential planar flaws shall be assumed.

   iii. If the preservice acceptance criteria of Table IWB-3514-2 are not met, the lamination shall be removed or reduced in area such that the assumed flaw is acceptable per IWB-3514-2.

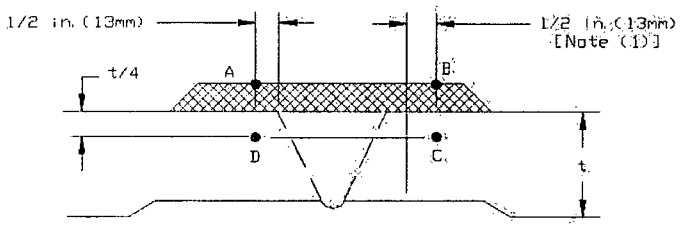
6. After completion of all welding activities, affected restraints, supports, and snubbers shall be VT-3 examined to verify that design tolerances are met.

(b) Preservice Inspection

1. The examination volume A-B-C-D in Figure 2, provided below, shall be ultrasonically examined. The angle beam shall be directed perpendicular and parallel to the piping axis, with scanning performed in four directions, to locate and size any cracks that might have propagated into the upper 25% of the base material or into the weld overlay.

**Figure 2:**

**PRESERVICE AND INSERVICE EXAMINATION VOLUME**




Examination Volume A-B-C-D

Note 1: For axial or circumferential flaws, the axial extent of the examination volume shall extend at least ½ inch beyond the toes of the original weld, including weld end butter, where applied.

2. The preservice examination acceptance standards of Table IWB-3514-2 shall be applied to planar indications in the weld overlay material. If the indication is found acceptable per Table IWB-3514-2 the weld overlay will be placed in service and the inservice schedule and acceptance criteria of 3(c) will be followed. In applying the acceptance standards, wall thickness, $t_w$, shall be the thickness of the weld overlay. Planar flaws not meeting the preservice acceptance standards of Table IWB-3514-2 shall be repaired. Re-examination per IWB-2420 is not required because unacceptable indications will be removed and the volume will be re-welded.

3. Cracks in the outer 25% of the original wall thickness shall meet the design analysis requirements as addressed in Section 2, "Crack Growth Considerations and Design," of this proposed alternative.

(c) Inservice Inspection

APS proposes that the following Inservice Inspection rules be followed.

1. The weld overlay examination volume A-B-C-D in Figure 2 shall be added to the applicable inspection plans and shall be ultrasonically examined during the first or second refueling outage following application.

2. The weld overlay examination volume in Figure 2 shall be ultrasonically examined to determine if any new or existing cracks have propagated into the upper 25% of the base material or into the overlay. The angle beam shall be directed perpendicular and parallel to the piping axis, with scanning performed in four directions.

3. The inservice examination acceptance standards of Table IWB-3514-2 shall be applied to planar indications detected in the weld overlay material. If the planar indication is found acceptable per Table IWB-3514-2, the weld overlay will be re-examined in accordance with 3(c)5. If the inservice acceptance criteria of Table IWB-3514-2 are not met, the planar flaw may be evaluated in accordance with IWB-3640. If accepted for continued service the weld overlay will be re-examined in accordance with 3(c)5. If the flaw is not acceptable for continued service per IWB-3640, then it shall be repaired.

4. Cracks in the outer 25% of the base metal shall meet the design analysis requirements as addressed in Section 2, "Crack Growth Considerations and Design," of this proposed alternative. Weld overlay examination volumes that show indication of crack growth or new cracking will be re-examined in accordance with 3(c)5. Weld overlay examination volumes that show no indication of crack growth or new cracking shall be placed into a population group for each unit to be examined on a sample basis. Twenty-five percent of this population shall be examined once every ten years.

5. Successive Examinations - The weld overlay examination volume shall be reexamined during the first or second refueling outage following discovery of:
   - Growth of indications in the overlay material or the presence of new indications in the overlay material.
   - Crack growth or new cracking in the outer 25% of the base metal.

(d) Scope Expansion - If inservice examinations reveal an unacceptable indication, crack growth into the weld overlay design thickness, or axial crack growth beyond the specified examination volume, additional weld overlay examination volumes, equal to the number scheduled for the current inspection period, shall be examined prior to return to service. If additional unacceptable indications are found in the second sample, a total of 50% of the total population of weld overlay examination volumes shall be examined

prior to operation. If additional unacceptable indications are found, the entire remaining population of weld overlay examination volumes shall be examined prior to return to service.

**4.0 Pressure Testing**

A system leakage test shall be performed in accordance with IWA-5000.

**5.0 Documentation**

Use of this proposed alternative shall be documented on ASME Form NIS-2, "Owner's Report for Repairs or Replacements."

**Basis for Use**

The use of weld overlay materials resistant to PWSCC (e.g., Alloy 52) that create low tensile or compressive residual stress profiles in the original weld provide increased assurance of structural integrity. The weld overlay is of sufficient thickness and length to meet the applicable stress limits from ASME Section III, NB-3200. Crack growth evaluations for PWSCC and fatigue of any as-found flaws or any conservatively postulated flaws will ensure that structural integrity will be maintained.

As a part of the design of the weld overlay, the weld length, surface finish, and flatness are specified in order to allow qualified ASME Section XI, Appendix VIII UT examinations, as implemented through the EPRI PDI program, of the weld overlay and the required volume of the base material and original weld. The examinations specified in this proposed alternative, versus those limited examinations performed on the original dissimilar metal welds, will provide improved assurance of structural integrity. Further, if no flaws are found in the outer 25% of the original wall thickness by the preservice UT examinations, the postulated 75% through-wall flaw for the preemptive overlays is conservative for crack growth evaluations. If a flaw is detected in the upper 25% of the original material during the preservice examination, the actual flaw size would be used for the crack growth evaluations.

The implementation of the alternative reduces the likelihood for PWSCC in the identified welds and improves piping geometries to permit Appendix VIII UT examinations as implemented through the EPRI PDI program. Weld overlay repairs of dissimilar metal welds have been installed and performed successfully for many years in both PWR and BWR applications. The alternative provides improved structural integrity and reduced likelihood of leakage for the primary system. Accordingly, the use of the alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(a)(3)(i).

## 6.0 Duration of Proposed Alternative

The proposed alternative requested would be applicable for the remainder of the Second Inservice Inspection Interval for Units 1 and 3 and the remainder of the Third Inservice Inspection Interval for Unit 2.

## 7.0 Conclusion

10 CFR 50.55a(a)(3) states:

"Proposed alternatives to the requirements of paragraphs (c), (d), (e), (f), (g), and (h) of this section or portions thereof may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant shall demonstrate that:

(i) The proposed alternatives would provide an acceptable level of quality and safety, or
(ii) Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety."

The post-overlay examinations and stress analysis, conducted prior to plant restart, discussed in this relief request provide an acceptable level of quality and safety. Additionally, not performing some volumetric examinations prior to applying the FSWOL will reduce the dose to examination personnel and keep exposure ALARA. Therefore, APS requests that the proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

APS requests NRC approval of the proposed relief request by June 1, 2007, to support startup of Unit 1 from the spring 2007 refueling outage.

## 8.0 References

1. ASME Boiler and Pressure Vessel Code, Code Case N-740
2. ASME Boiler and Pressure Vessel Code, Code Case N-504-2
3. ASME Boiler and Pressure Vessel Code, Code Case N-638-1

## 9.0 Precedent

Relief Request 36 is based on the Southern Company submittals for Farley/Vogtle plants, Relief Request ISI-GEN-ALT-06-03. These letters were dated August 10, 2006, October 20, 2006 and January 03, 2007

The request to use a later Edition/Addenda of the ASME Code is based on Dominion Nuclear Connecticut, Inc. request for Millstone Power Stations Units 2 and 3, dated June 20, 2005 and the NRC approval, dated September 13, 2005.

# Appendix 1
# Ambient Temperature Temper Bead Welding

## Ambient Temperature Temper Bead Welding

1.0 GENERAL REQUIREMENTS

(a) This appendix applies to dissimilar austenitic filler metal welds joining P-Nos. 8 or 43 materials to P-No. 1 and 3 materials.

(b) The maximum area of an individual weld overlay based on the finished surface over the ferritic base material shall be 300 square inches.

(c) Repair/replacement activities on a dissimilar-metal weld in accordance with this Appendix are limited to those along the fusion line of a nonferritic weld to ferritic base material on which 1/8- inch, or less of nonferritic weld deposit exists along the original fusion line.

(d) If a defect penetrates into the ferritic base material, repair of the base material, using a nonferritic weld filler material, may be performed in accordance with this Appendix, provided the depth of repair in the base material does not exceed 3/8-inch.

(e) Prior to welding the area to be welded, a band around the area of at least 1-1/2 times the component thickness or 5 inches, whichever is less, shall be at least 50 degrees Fahrenheit.

(f) Welding materials shall meet the Owner's Requirements and the Construction Code and Cases specified in the Repair/Replacement Plan. Welding materials shall be controlled so that they are identified as acceptable until consumed.

(g) Peening may be used, except on the initial and final layers.

2.0 WELDING QUALIFICATIONS

The welding procedures and the welding operators shall be qualified in accordance with ASME Section IX and the requirements of 2.1 and 2.2 provided below.

2.1 Procedure Qualification

(a) The base materials for the welding procedure qualification shall be of the same P-Number and Group Number, as the materials to be welded. The materials shall be postweld heat treated to at least the time and temperature that was applied to the materials being welded.

(b) The root width and included angle of the cavity in the test assembly shall be no greater than the minimum specified for the repair.

(c) The maximum interpass temperature for the first three layers of the test assembly shall be 150 degrees Fahrenheit.

(d) The test assembly cavity depth shall be at least 1 inch. The test assembly thickness shall be at least twice the test assembly cavity depth. The test assembly shall be large enough to permit removal of the required test specimens. The test assembly dimensions surrounding the cavity shall be at least the test assembly thickness and at least 6 inches. The qualification test plate shall be prepared in accordance with Figure 1-1.

(e) Ferritic base material for the procedure qualification test shall meet the impact test requirements of the Construction Code and Owner's Requirements. The location and orientation of the test specimens shall be similar to those required in (f) below, but shall be in the base metal.

(f) Charpy V-notch tests of the ferritic heat-affected zone (HAZ) shall be performed at the same temperature as the base metal test of (e) above. Number, location, and orientation of test specimens shall be as follows:

(i) The specimens shall be removed from a location as near as practical to a depth of one-half the thickness of the deposited weld metal. The coupons for HAZ impact specimens shall be taken transverse to the axis of the weld and etched to define the HAZ. The notch of the Charpy V-notch specimen shall be cut approximately normal to the material surface in such a manner as to include as much HAZ as possible in the resulting fracture. When the material thickness permits, the axis of a specimen shall be inclined to allow the root of the notch to be aligned parallel to the fusion line.

(ii) If the test material is in the form of a plate or a forging, the axis of the weld shall be oriented parallel to the principal direction of rolling or forging.

(iii) The Charpy V-notch test shall be performed in accordance with ASME Section II, Part A, SA-370. Specimens shall be in accordance with SA-370, Figure 11, Type A. The test shall consist of a set of three full-size 10 mm X 10 mm specimens. The lateral expansion, percent shear, absorbed energy, test temperature, orientation and location of all test specimens shall be reported in the Procedure Qualification Record.

(g) The average lateral expansion value of the three HAZ Charpy V-notch specimens shall be equal to or greater than the average lateral expansion value of the three unaffected base metal specimens.

2.2 Performance Qualification

Welding operators shall be qualified in accordance with ASME Section IX.

3.0 WELDING PROCEDURE REQUIREMENTS

The welding procedure shall include the following requirements.

(a) The weld metal shall be deposited by the automatic or machine GTAW process.

(b) Dissimilar metal welds shall be made using F-No. 43 weld metal (ASME Section IX QW-432) for P-No. 8 or 43 to P-No. 1 and 3 weld joints.

(c) The area to be welded shall be buttered with a deposit of at least three layers to achieve at least 1/8-inch overlay thickness with the heat input for each layer controlled to within ±10% of that used in the procedure qualification test. Particular care shall be taken in the placement of the weld layers of the austenitic overlay filler material at the toe of the overlay to ensure that the HAZ and ferritic base metal are tempered. Subsequent layers shall be deposited with a heat input not exceeding that used for layers beyond the third layer in the procedure qualification.

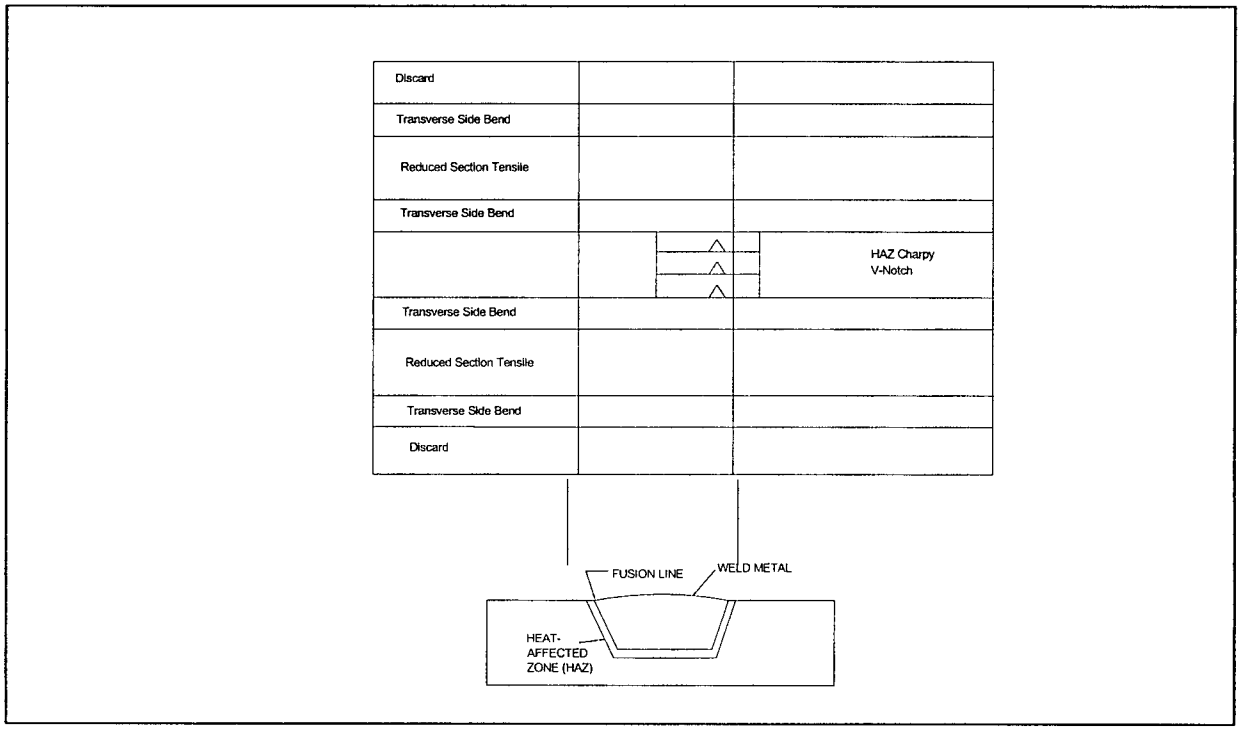
(d) The maximum interpass temperature for field applications shall be 350 degrees Fahrenheit for all weld layers regardless of the interpass temperature used during qualification.

(e) The interpass temperature shall be determined by temperature measurement (e.g., pyrometers, temperature indicating crayons, thermocouples) during welding. If it is not possible to use this method then (e)(1) and (e)(2) may be used in combination.

(1) heat flow calculations using the variables listed below as a minimum:
- (i) welding heat input
- (ii) initial base material temperature
- (iii) configuration, thickness, and mass of the item being welded
- (iv) thermal conductivity and diffusivity of the materials being welded
- (v) arc time per weld pass and delay time between each pass
- (vi) arc time to complete the weld

(2) measurement of the maximum interpass temperature on a test coupon that is equal to or less than the thickness of the item to be welded. The maximum heat input of the welding procedure shall be used in the welding of the test coupon.

(f) Particular care shall be given to ensure that the weld region is free of all potential sources of hydrogen. The surfaces to be welded, filler metal, and shielding gas shall be suitably controlled.




GENERAL NOTE: Base metal Charpy impact specimens are not shown. This figure illustrates a similar-metal weld.

**Figure 1-1**
**QUALIFICATION TEST PLATE**

# APPENDIX 2

# COMPARISON OF APS-PROPOSED ALTERNATIVE VERSUS CODE CASES N-504-2 and N-638-1

# COMPARISON OF APS-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2 and N-638-1

| Comparison of Proposed Alternative with N-504-2 | |
|---|---|
| **CODE CASE N-504-2** | **PROPOSED ALTERNATIVE** |
| | |
| N-504-2 for weld overlay repair of SS piping | Proposed alternative is for dissimilar metal weld overlay repairs. |
| | |
| *Reply*-reduce a flaw to acceptable size by weld overlay on austenitic SS piping | *Reply*- reduce a flaw to acceptable size by weld overlay on austenitic stainless steel or austenitic nickel alloy piping, components and associated welds |
| Material covered is P-8 | Per Section 1.0(a) materials covered are P-8, P-43, P-3 and P-1. Also includes P-8 to P-43, P-8 to P-8 or P-43 to P-43 joined with austenitic filler materials |
| (b) Filler Material – low C (0.035% max) SS | (b) Austenitic nickel alloy (28% Cr min.) |
| (c) (d) Repair of indications prior to overlay | (c) Repair of indications prior to overlay (Same as N-504-2) |
| (e) Weld Reinforcement<br>Min. 2 layers with-7.5 FN. In first austenitic SS layer 5 FN acceptable by evaluation. | (d) Weld Reinforcement<br>(1) Minimum of 2 layers. |
| (f) (g) Design – Requires flaw evaluation of the existing flaw based on IWB-3640 for design life. Requires postulated 100 % through wall for design of the weld overlay (full-structural) except for four or fewer axial flaws. Meet ASME Section III for primary local and bending stresses and secondary peak stresses. Requires end transition slope less than 45 degrees. Axial length requirement usually met if overlay 0.75 $(Rt)^{1/2}$ beyond flaws. Shrinkage and other applied loads evaluated on other items and other flawed welds in system. | 2.0 Design<br>Requires flaw evaluation of the existing flaw based on IWB-3640. Flaw evaluation of both materials required if flaw is at or near the boundary. Requires postulated 100 % through wall for design (full-structural) of the weld overlay. Axial length and end slope shall cover the weld and heat affected zones and shall provide for load redistribution into the item and back into the overlay either out violating stress limits. There is no exception for four or fewer axial flaws. Design analysis per IWA-4311. Meet ASME Section III, NB-3200 applicable stress limits. Any laminar flaws in the weld overlay evaluated to ensure load distribution meets NB-3200. Same as N-504-2 for shrinkage and evaluation of other existing flaws. |

## COMPARISON OF APS-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2 and N-638-1

| Comparison of Proposed Alternative with N-504-2 (Continued) | |
|---|---|
| **N-504-2** | **PROPOSED ALTERNATIVE** |
| (i) No specific reference given for acceptance examination of the weld overlay. Acceptance criteria of the Construction Code and Section III would be applicable. (Causes problems with volumetric acceptance criteria since construction criteria based on RT examination rather than UT examination. Also presents difficulty in determining applicable criteria for laminar flaws in the overlay )<br><br>Preservice Exams to the methods of IWB-2200. Exam procedures shall be specified in the Repair Program. Acceptance standard-IWB-3514-2 (planar flaws). UT exams to verify integrity of new applied weld reinforcement. Include upper 25% of pipe wall in the examination. | 3.0 Examination and Inspection<br>Examinations in the proposed alternative shall be met in lieu of all other exams. NDE methods to IWA-2200 except as specified in the case. NDE personnel qualified to IWA-2300. UT procedures and personnel qualified to Section XI, Appendix VIII.<br><br>(a) Acceptance Examinations-Surface finish 250 micro-inch and flatness sufficient to allow adequate examination in accordance with Appendix VIII procedures. PT overlay and ½-inch on either side of the overlay. Acceptance standards for PT-weld overlay, Meet weld Construction Code criteria or NB-5300, base material-Meet base material criteria or NB-2500. 48 hr hold time after item reaches room temperature imposed if ambient temperature temper bead welding imposed. UT examination for acceptance-Figure 1 shows the examination volume. 48 hour hold time after item reaches room temperature imposed if ambient temperature temper bead welding imposed. IWB-3514-2 for planar flaw acceptance. IWB-3514-3 for laminar flaw acceptance with additional limitation not to exceed 10% of the surface area and no linear dimension in excess of 3 inches. Reduction in coverage limited to 10%. Criteria for radial planar flaw size in the uninspected volume for IWB-3640 evaluation. VT-3 of affected restraints, snubbers and supports to verify design tolerances are met.<br><br>(b) Preservice Examinations Figure 2 defines the examination volume. Angle beam exam parallel and perpendicular to piping axis. Scan in four directions to locate and size flaws. Acceptance criteria IWB-3514-2 for the overlay. Wall thickness $t_w$ is the thickness of the overlay. Flaws in outer 25% of base material meet design requirements of 2.0. |

## COMPARISON OF APS-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2 and N-638-1

| Comparison of Proposed Alternative with N-504-2 (Continued) | |
|---|---|
| **N-504-2** | **PROPOSED ALTERNATIVE** |
| | (c) Inservice Examinations<br>Examination required 1st or 2nd refueling outage following application. Examination volume the same as Preservice. Acceptance standards the same as Preservice except IWB-3600 evaluation permitted as an alternative to IWB-3514-2 for the weld overlay. Future examination requirements define depending on examination results.<br><br>(d) Additional Examinations<br>Similar to Code examination expansion rules. |
| | |
| (h) System Hydrostatic Test if pressure boundary penetrated (leak). System Leakage Test if pressure boundary not penetrated (no leak). | 4.0 Pressure Testing<br>System Leakage Test per IWA-5000 |
| | |
| (k) VT-3 of snubbers, supports and restraints after welding | Covered under 3.0 (a) Acceptance Examinations |
| | |
| (l) Reference to other applicable requirements of IWA-4000 | IWA-4000 requirements will be met unless an alternative provided |
| | |
| (m) Use of case to be documented on an NIS-2 form | 5.0 Documentation<br>Use of case to be documented on an NIS-2 form |

| Comparison of Proposed Alternative with N-638-1 | |
|---|---|
| **N-638-1** | **APPENDIX 1 OF THE PROPOSED ALTERNATIVE** |
| Code Case N-638-1 provides rules for automatic or machine GTAW temper bead welding without pre-heat or post weld heat treatment. The case covers similar and dissimilar welding for cavity and overlay repairs. The code case permits the use of NDE examinations in accordance with the case in lieu of those in the Construction Code. This case has a broader scope of use then Appendix 1. | Appendix 1 invoked in 1.0 (b) for use of ambient temperature temper bead welding as an alternative to the post weld heat treatment requirements of the Construction Code and Owner's requirements. The appendix provides the ambient temperature temper bead requirements applicable to dissimilar metal weld overlay repairs. NDE requirements are in lieu of the Construction Code and were covered in Section 3.0 of the alternative. |
| | |
| 1.0 General Requirements | 1.0 General Requirements |
| | |
| Scope of welds in the Reply | (a) Scope of welds. Same as N-638-1 for RR 36 materials |
| | |
| (a) Max area of finished surface of the weld limited to 100 square inches and half of the ferritic base metal thickness. (Note: the depth requirement is for the ferritic material. There is no need to limit either surface area or depth for welding on austenitic SS or nickel alloys since no post weld heat treatment is required.) | (b) Surface area limitation 300 square inches over the ferritic material. (Note: Code Case N-638-3 which has been approved by ASME but has not been issued. Residual stress analyses results show that stresses for 100 square inches through 500 square inches surface area overlays very similar.) |
| | |
| (b) (c) (d) (e) (f) | (c) (d) (e) (f) (g) same as requirements listed for N-638-1 |
| | |
| 1.0 Welding Qualifications<br>The welding procedures and welding operators shall be qualified in accordance with Section IX and the requirements of 2.1 and 2.2 | 2.0 Welding Qualifications<br>The welding procedures and welding operators shall be qualified in accordance with Section IX and the requirements of 2.1 and 2.2 |
| | |
| 2.1 Procedure Qualification Paragraphs (a) (d) (e) (f) (g)<br><br>Paragraph (h)<br>Paragraph (i)<br>Paragraph (j)<br><br>Paragraph (b) Provisions for welding in a pressurized environment<br><br>Paragraph (c) Provisions to address radiation effects | 2.1 Procedure Qualification<br>Paragraphs (a) (d) (e) same as in N-638-1 for equivalent paragraphs.<br>Equivalent paragraph not in Appendix 1.<br>Paragraph (f) same as (i) from N-638-1.<br>(j) Paragraph (g) changed the first sentence adding "lateral expansion" in front of "value" both at the beginning and end of the sentence.<br><br>Not included for overlays in Appendix 1.<br><br>Not included in Appendix 1. Thermal neutron limitation imposed in the proposed alternative 1.0(e). |

## COMPARISON OF APS-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2 and N-638-1

| Comparison of Proposed Alternative with N-638-1 | |
|---|---|
| **N-638-1** | **APPENDIX 1 OF THE PROPOSED ALTERNATIVE** |
| 1.1 Performance Qualification<br>Welding operators shall be qualified in accordance with Section IX. | 2.2 Performance Qualification<br>Welding operators shall be qualified in accordance with Section IX. |
| | |
| 3.0 Welding Procedure Requirements | 3.0 Welding Procedure Requirements |
| | |
| (a) (b) (c)<br><br>(d) | (a) (b) (c) same as N-638-1 except last two sentences deleted in (c) from N-638-1 since not applicable to this proposed alternative.<br>(d) same as N-638-1. |
| | |
| | (e) Paragraph added to clarify temperature measurement requirements. This is identical wording to N-638-2, which has been approved by ASME. |
| | |
| (e) | (f) same as (e) from N-638-1 |
| | |
| 4.0 Examination | 3.0 Examination and Inspection in the proposed alternative for requirements. |
| | |
| 5.0 Documentation | 5.0 Documentation in the proposed alternative. |
| | |
| | 4.0 Pressure Testing in the proposed alternative. |

# Enclosure 2

## Material Tables and Non-Proprietary Drawings of Palo Verde Units 1, 2 and 3 Pressurizers and RCS Nozzles

# Material Tables and Non-Proprietary Drawings of Palo Verde Units 1, 2 and 3 Pressurizer and RCS Nozzles

## Pressurizer Safety/Relief Nozzle Materials Units 1, 2, and 3

| | Pressurizer Top Head | Nozzle | Nozzle End Buttering and Safe end to pipe Weld Material | Safe End | Pipe |
|---|---|---|---|---|---|
| Nominal Diameter | 96" | 6" | 6" | 6" | 6" |
| Material | SA 533<br>U1 Gr. B Cl 1<br>U2/3 Gr. A Cl 1 | SA 541<br>U1 Cl 2<br>U2/3 Cl 3 | Alloy 82/182 | SA 182<br>F 316 | SA 376 or<br>SA 312 Gr TP 304 |

## Pressurizer Spray Nozzle Materials Units 1, 2, and 3

| | Pressurizer Top Head | Nozzle | Nozzle End Buttering and Safe end to pipe Weld Material | Safe End | Spray Pipe |
|---|---|---|---|---|---|
| Nominal Diameter | 96" | 4" | 4" | 4" | 4" |
| Material | SA 533<br>U1 Gr. B Cl 1<br>U2/3 Gr. A Cl 1 | SA 541<br>U1 Cl 2<br>U2/3 Cl 3 | Alloy 82/182 | SA 182<br>F-316 | SA 376 or<br>SA 312 Gr. TP 304 |

## Pressurizer Surge Nozzle Materials Units 1, 2, and 3

| | Pressurizer Bottom Head | Nozzle | Nozzle End Buttering and Safe end to pipe Weld Material | Safe End | Surge Pipe |
|---|---|---|---|---|---|
| Nominal Diameter | 96" | 12" | 12" | 12" | 12" |
| Material | SA 533<br>U1 Gr. B Cl 1<br>U2/3 Gr. A Cl 1 | SA 541<br>U1 Cl 2<br>U2/3 Cl 3 | Alloy 82/182 | SA 182<br>F 316 | SA 376 or<br>SA 312 Gr. TP 304 |

## Hot Leg Surge Nozzle Materials Units 1, 2, and 3

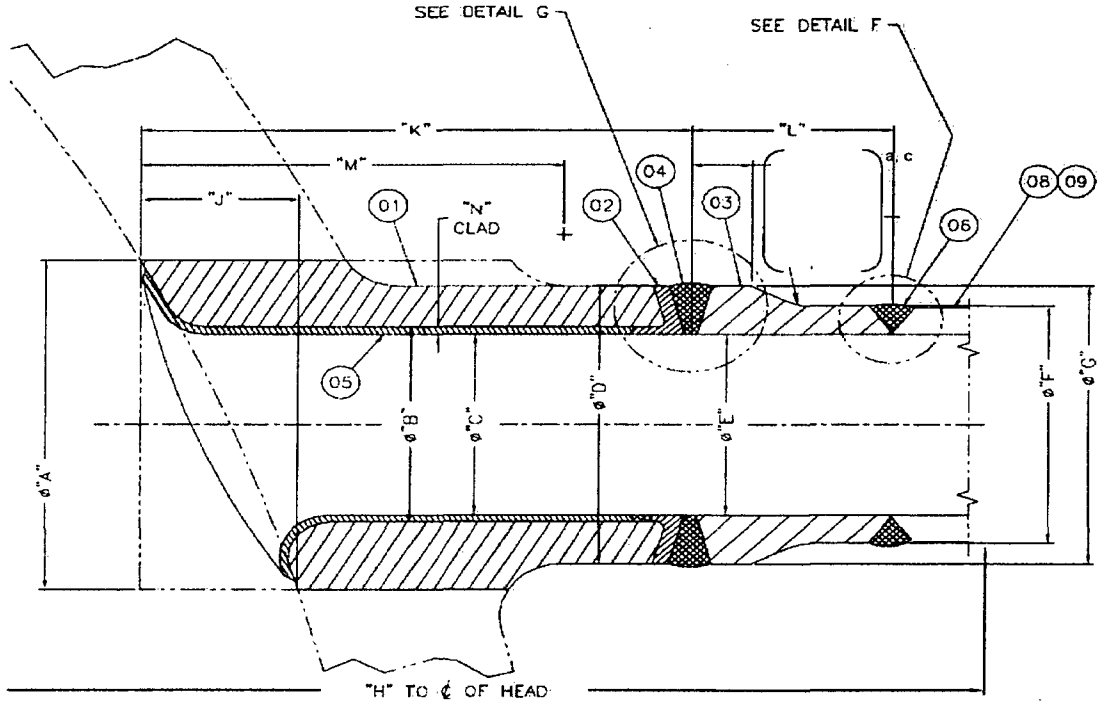
| | Hot Leg | Nozzle | Nozzle End Buttering and Safe end to pipe Weld Material | Safe End | Surge Pipe |
|---|---|---|---|---|---|
| Nominal Diameter | 42" | 12" | 12" | 12" | 12" |
| Material | SA 516<br>Gr. 70 | SA 541<br>Cl. 1 | Alloy 82/182 | SA 182<br>F-316 | SA 376 or<br>SA 312 Gr. TP 304 |

# Material Tables and Non-Proprietary Drawings of Palo Verde Units 1, 2 and 3 Pressurizer and RCS Nozzles

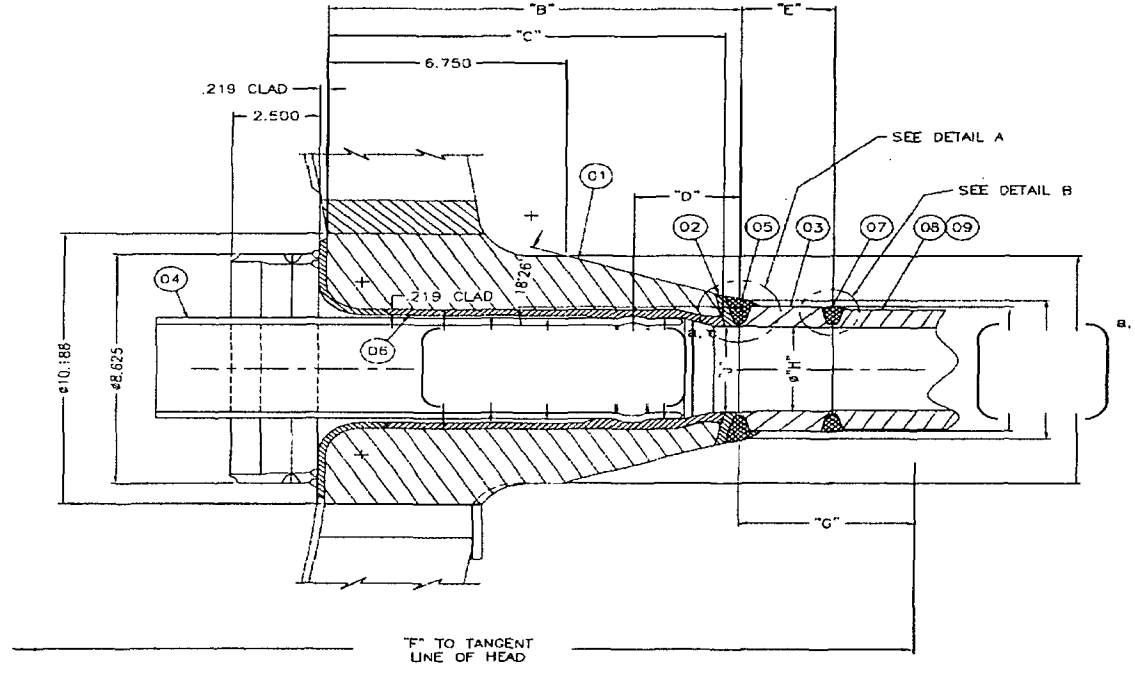
## Shutdown Cooling Outlet Nozzle Materials Unit 1, 2 and 3

| | Hot Leg | Nozzle | Nozzle End Buttering and Safe end to pipe Weld Material | Safe End | Shut down cooling Pipe |
|---|---|---|---|---|---|
| Nominal Diameter | 42" | 16" | 16" | 16" | 16" |
| Material | SA 516 Gr. 70 | SA 541 Cl. 1 | Alloy 82 - 182 | SA 182 F-316 | SA 376 or SA 312 Gr. TP 304 |

**A.1 PRESSURIZER SAFETY NOZZLE**



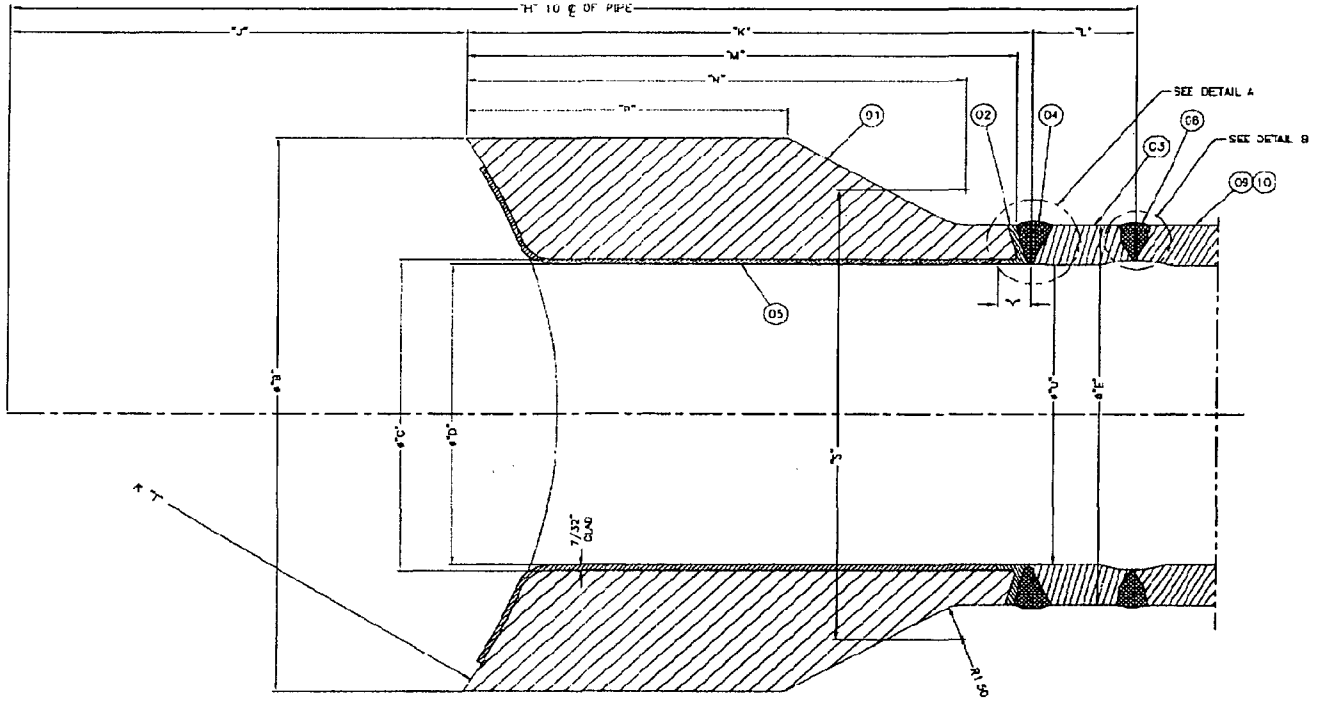
## A.3 PRESSURIZER SPRAY NOZZLE



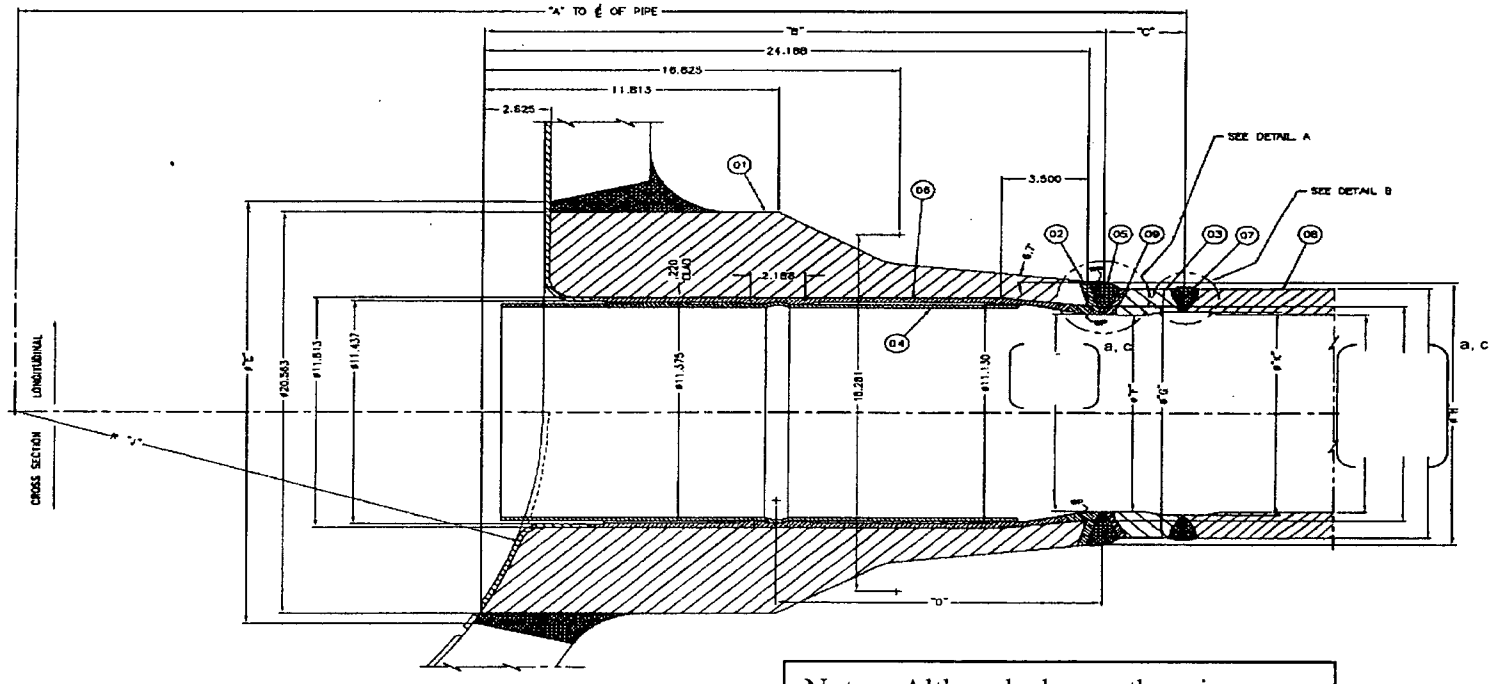
Westinghouse Non-Proprietary Class 3
WESTINGHOUSE ELECTRIC COMPANY LLC



## A.5 RCS SHUTDOWN COOLING NOZZLE

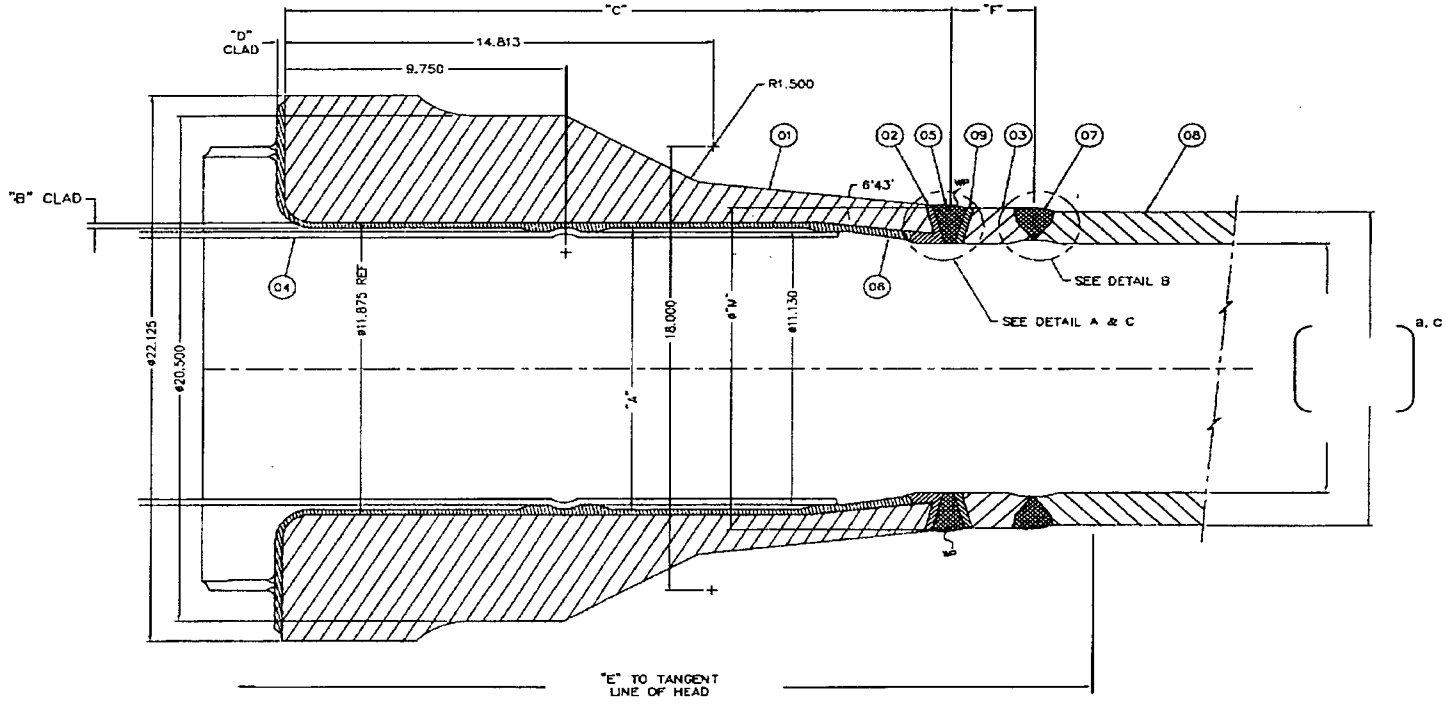


## A.7 RCS SURGE NOZZLE

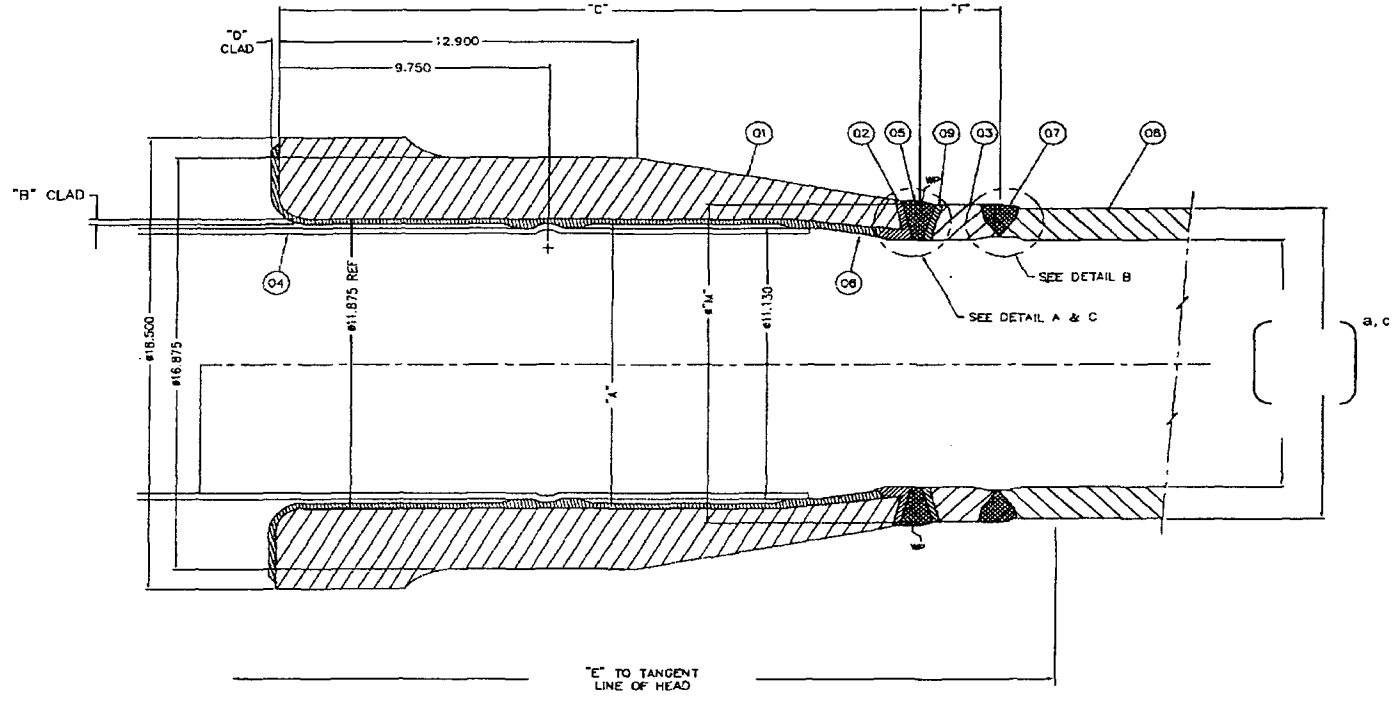



Note: Although shown, there is no thermal sleeve on this nozzle

## A.9 PRESSURIZER SURGE NOZZLE (UNITS 1 AND 2)



**A.10 PRESSURIZER SURGE NOZZLE (UNIT 3)**



# Material Tables and Non-Proprietary Drawings of Palo Verde Units 1, 2 and 3 Pressurizer and RCS Nozzles



## A.12 DIMENSIONS

| Nozzle | A | B | C | D | E | F | G | H | J | K | L | M | N | P | R | S | T | U | V | W | X | Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PZR Safety | | | | | | | | | | | | | | | | | | | | | | |
| PZR Spray | | | | | | | | | | | | | | | | | | | | | | |
| Shutdown Cooling | | | | | | | | | | | | | | | | | | | | | | |
| RCS Surge | | | | | | | | | | | | | | | | | | | | | | |
| PZR Surge (Units 1,2) | | | | | | | | | | | | | | | | | | | | | | |
| PZR Surge (Unit 3) | | | | | | | | | | | | | | | | | | | | | | |

a, c

# Enclosure 3

## APS Response to Questions Asked Regarding Proposed Alternative ISI-GEN-ALT-06-03, Southern Company

## Joseph M. Farley Nuclear Plant
## Vogtle Electric Generating Plant

This enclosure addresses the requests for additional information received by Southern Company

Attachment 1 - September 8, 2006, and September 29, 2006, Questions

Attachment 2 - November 14, 2006, Questions

1. NRC Request

**Page 1. The NOTE under the Contingency Overlay Repairs heading states that the contingency repair would only be used "If evidence of PWSCC [primary water stress corrosion cracking] is observed during volumetric or visual examinations of one of the pressurizer dissimilar metal welds ..." The visual examination cannot detect a PWSCC flaw that is not connected to the outside surface of the weld. Therefore, the result of a visual examination by itself cannot be used as a criterion in determining whether a repair should be made. There are a total of seven dissimilar metal welds and seven similar metal welds at each unit.**

**(a) Clarify that both visual examination and ultrasonic examination will be performed on all pressurizer nozzle dissimilar metal and similar metal welds prior to applying contingency overlay repairs.**
**(b) Clarify whether a weld overlay will be applied to a similar metal weld if an ultrasonic examination will not be performed on that similar metal weld.**
**(c) Discuss the criteria for determining a PWSCC indication and provide the indication size (the threshold) that requires a contingency overlay repair.**
**(d) Discuss whether a contingency overlay repair will be performed on a dissimilar metal weld if the indication detected is not caused by PWSCC.**
**(e) If one of the pressurizer dissimilar metal welds is detected with an indication, clarify whether all the dissimilar metal and similar metal welds in the remaining pressurizers will be repaired.**

APS Comment:

Preemptive full-structural weld overlays for the pressurizer nozzle and hot leg nozzle dissimilar and similar metal welds are planned for all 3 units in the upcoming refueling outages as stated in Section 5.0, Proposed Alternative and Basis for Use, of Relief Request 36. Only visual examination of the welds will be performed prior to the overlay. No UT will be performed prior to the overlay as these are preemptive full-structural weld overlays. If the visual inspection prior to the overlay indicated any leakage, then the overlay will be called a contingency full-structural weld overlay verses a preemptive overlay. However, no additional examinations will be conducted. The similar metal welds will be addressed on a case-by-case bases as discussed in Section 5.0 of the relief request.

APS has committed to completing FSWOL of the Alloy 82/182 pressurizer butt welds in letter 102-05640 dated January 31, 2007. The surge line and shutdown cooling to hot leg dissimilar metal weld for each unit may be completed in subsequent refueling outages.

**APS Response to NRC Items 1(a) through (e)**

(a) Only a visual examination will be performed prior to applying a contingency overlay repair for all pressurizer nozzles and hot leg nozzles.
(b) Similar metal welds may be overlaid on some nozzles as discussed in APS Response 2. Ultrasonic examinations are not planned for the adjacent similar metal welds prior to applying the overlay.
(c) Through-wall leakage during a visual examination will be attributed to PWSCC, and it will be repaired by applying a FSWOL.
(d) Same a (c) above.
(e) Preemptive FSWOLs are scheduled for Palo Verde Unit 1 in the spring of 2007 and Unit 2 in the spring of 2008 and Unit 3 in the fall of 2007. If a through wall leak is detected prior to the planned overlay outage, APS would repair only the nozzle with the leakage.

**2. NRC Request**

**[Discussion removed, does not apply to Palo Verde request]**

**(a) Discuss the criteria for the application of FSWOL to the dissimilar metal and similar metal welds under the preemptive overlay strategy.**
**(b) Clarify whether the ultrasonic examination and visual examination will be conducted on the dissimilar metal and similar metal welds at Vogtle Unit 2 and Farley Unit 1 prior to applying preemptive overlays.**
**(c) Identify the number of welds that will be overlaid under the preemptive overlay strategy.**

**APS Response to NRC Items 2(a) through (c)**

(a) A preemptive FSWOL will be extended over each dissimilar weld and in some cases over adjacent similar metal welds to ensure needed ultrasonic examination coverage of the dissimilar metal weld as well as similar metal weld.
(b) APS plans only to conduct visual examinations on the dissimilar metal welds and adjacent similar metal welds prior to applying the preemptive overlays for all nine nozzle welds.
(c) The number of dissimilar welds planned to be overlaid is 9 per unit. The welds to be overlaid include the dissimilar metal welds listed on page one of the proposed alternative and adjacent similar metal welds (spray, safety, surge and shutdown cooling nozzles) when required to satisfy dissimilar weld overlay design dimensions.

**3. NRC Request**

**Page 2. In the Applicable Code Requirements section, the licensee stated that examinations of pressurizer dissimilar metal and similar metal welds are performed based on the NRC-approved risk-informed program. Confirm that once**

**of the risk information program. The examinations of the overlaid welds will follow the inspection strategy in the proposed alternative.**

**APS Response**

APS confirms that it will use the inspection strategy in the proposed alternative. However, these dissimilar metal welds and similar metal welds will be part of the Risk Informed ISI program since they are subject to other degradation mechanisms such as thermal fatigue. As stated in APS letter 102-05559-CDM/SAB/RJR, dated August 30, 2006, APS is keeping the dissimilar metal weld (DMW) exam scope separate from the RI-ISI exam scope. For example, if a PWSCC-susceptible weld is also selected for RI-ISI, it will receive the appropriate examination based on the EPRI topical report requirements as well as an exam for PWSCC per MRP-139.

**4. NRC Request**

**Page 3. first paragraph. The licensee stated that the proposed alternative will be based on the 2001 edition of the American Society of Mechanical Engineers (ASME), *Boiler* and *Pressure Vessel Code* (Code), Section XI, with Addenda through 2003. As stated in NRC Regulatory Issue Summary 2004-16, licensees need to request the NRC approval for the use of the later edition or addenda of the ASME Code (i.e., later than the edition of the Code of record).**

**(a) Confirm that the proposed Relief Request 36 also contains a request to use the later edition of the Code.**
**(b) Confirm that the 2001 edition with addenda through 2003 of the ASME Code is used for Relief Request 36, because this is the latest edition of the Code that the NRC has approved in 10 CFR 50.55a.**

**APS Response NRC Items 4(a) and (b)**

a) Per 10 CFR 50.55a (g)(4)(iv), as part of this submittal, APS has requested approval to use the 2001 Edition of the American Society of Mechanical Engineers (ASME), *Boiler* and *Pressure Vessel Code* (Code), Section XI, with Addenda through 2003 for units 1 and 3 for the remainder of interval 2 after March 17, 2007. The exception is Appendix VIII which will be of 2001 Edition. This exception is based on 10 CFR 50.55a(b)(2)(xxiv) which states, "The use of Appendix VIII and the supplements to Appendix VIII and Article 1-3000 of Section XI of the ASME BPV Code, 2002 Addenda through the latest edition and addenda incorporated by reference in paragraph (b)(2) of this section, is prohibited."
b) As stated in the proposed alternative, the 2001 edition with addenda through 2003 of the ASME Code is used for proposed alternative. The government website http://ecfr.gpoaccess.gov states that e-CFR Data is current as of January 31, 2007 and contains the following for 10 CFR 50.55a(b)(2) "As used in this section, references to Section XI of the ASME Boiler and Pressure Vessel Code

refer to Section XI, and include the 1970 Edition through the 1976 Winter Addenda, and the 1977 Edition (Division 1) through the 2003 Addenda (Division 1)."

**5. NRC Request**

**On Page 3:**

**(a) To clarify the description in Section 1(a) of the proposed alternative, provide a drawing of a typical nozzle-weld-pipe configuration including the nozzle, dissimilar metal weld, safe end, similar metal weld, pipe, and the overlay. Identify the material of each component. Provide dimensions for relief, safety, spray, and surge nozzles and piping (such as diameters and thickness) in a table. Include the thickness of weld overlays.**

**(b) Clarify when the overlay will be applied and will not be applied to the similar metal welds.**

**APS Response to NRC Items 5(a) and (b)**

(a) Enclosure 2 provides typical sketches of the nozzles and the materials for each nozzle weldment. Specific dimensions and the overlay thickness are being prepared and will be in the design package available for NRC review at the plant site.

(b) Overlay will be applied to similar metal welds when required to satisfy dissimilar metal weld overlay design dimensions.

**6. NRC Request**

**Page 5: Section 2(a) of the proposed alternative states that for a preemptive overlay, a flaw with a depth of 75 percent and a circumference of 360 degrees will be assumed.**

**(a) Confirm that the 75 percent depth flaw is assumed to be located in the original weld and that the flaw originates from the inside surface of the pipe.**

**(b) Provide the technical basis of the assumed flaw depth.**

**APS Response to NRC Items 6(a) and (b)**

(a) As stated in Section 2(a) of the proposed alternative, a flaw in the original weld with a depth of 75% and a circumference of 360 degrees that originates from the inside of the pipe is postulated for crack growth purposes. A flaw in the original weld having a 100% through-wall depth and a circumference of 360 degrees that originates from the inside of the pipe is assumed for determining overlay thicknesses for the preemptive FSWOL. The design requirement is identical to that of a repair.

(b) A 75% through-wall depth flaw is the largest flaw that could remain undetected. A preservice volumetric examination will be performed after application of the overlay using an ASME Section XI, Appendix VIII [as implemented through performance demonstration initiative (PDI)] examination procedure. This examination will verify

there is no cracking in the upper 25% of the original weld and base material, and the assumption of a 75% through-wall crack is conservative. Otherwise, if any crack-like flaws are found during the preservice examination in the upper 25% of the original weld or base materials, the as-found flaw (postulated 75% through wall, plus the portion of the flaw in the upper 25%) would be used for the crack growth analysis.

**7. NRC Request**

**On Pages 5 and 6:**

**(a) Discuss whether the thickness of the full-structural weld overlay will be the same for a specific nozzle weld between the contingency overlay repair design and preemptive overlay design because the flaw assumed in the original nozzle weld between these two designs is different as shown in Section 2(b) of the alternative.**

**(b) Discuss how the thickness of the weld overlay is derived. Use an example to show how an actual overlay thickness is calculated.**

**APS Response to NRC Items 7(a) and (b)**

(a) Overlay thickness may be different for preemptive full-structural overlay and contingency full-structural overlay, the overlay thickness is determined by NB-3200/NB-3600, IWB-3600 rules and crack growth considerations. Thickness is also influenced by the need to produce favorable residual stress improvement and inspectability considerations.

(b) The thickness of the overlay is determined based on the assumption of a through-wall flaw, with a length of 360 degrees in the underlying pipe. The overlay is applied, so that the criteria of IWB-3640 are met after. For example, suppose that the pipe loads in the Alloy 82/182 region are such that an allowable depth of 75% of the pipe wall is determined from IWB-3640. The new thickness of the pipe would have to be such that the postulated flaw would now be 75% of the new total thickness. Simple math results in an overlay thickness of 33% of the original pipe wall thickness in this example.

**8. NRC Request**

**[Other licensees have stated that] the effects of any changes in applied loads, as a result of weld shrinkage from the entire overlay on other items in the piping system shall be evaluated. [Other licensees have] also stated that existing flaws previously accepted by analytical evaluation shall be evaluated in accordance with IWB-3640. Confirm that these evaluation results will be completed and available for staff review prior to plant startup.**

**APS Response**

The weld shrinkage loads will be evaluated and examination results will be available for staff review prior to plant startup.

**9. NRC Request**

**Page 6, The licensee stated that ultrasonic examination procedures and personnel shall be qualified in accordance with Appendix VIII of the ASME Code, Section XI [and that] ultrasonic examinations are implemented through the Performance Demonstration Initiative (PDI) program. In similar relief requests by other licensees, a comparison of the ultrasonic examination qualified by the PDI program to the requirements in Appendix VIII of the Code is included to demonstrate the compliance.**

**(a) Clarify why the proposed alternative did not present such comparison.**

**(b) Clarify whether the ultrasonic examination will be performed on the maximum extent achievable.**

**APS Response to NRC Items 9(a) and (b)**

(a) As stated in response to NRC request 4(a) for proposed alternative' APS intends to use Appendix VIII of the 2001 Edition of Section XI. 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 Section XI as amended and mandated by 10 CFR 50.55a, Final Rule dated October 1, 2004. Therefore, a comparison is not regarded as necessary.

(b) The ultrasonic examination will be performed on the maximum extent achievable.

**10. NRC Request**

**Page 7, Section 3(a)2 of the proposed alternative requires that the weld overlay and the adjacent base material for at least one-half inch from each side of the weld shall be examined using the liquid penetrant method. This requirement is not consistent with Section 4.0(b) of Code Case N-638-1, which requires surface and ultrasonic examination of a band on either side of the overlay with an axial length of at least 1.5 times the component thickness or 5 inches whichever is greater. Discuss why the proposed requirement is sufficient to meet Section 4.0(b) of Code Case N-638-1.**

**APS Response**

The PDI qualified ultrasonic examination procedure in the alternative is designed and qualified to examine the entire volume of the overlay weld as well as the region of the P3 material containing the weld heat affected zone (HAZ) and a volume of unaffected base material beyond the HAZ. In addition to verifying the soundness of the weld, a purpose of these examinations is to assure that delayed cracking that may be caused by hydrogen introduced during the temper bead welding process is not present. In the unlikely event that this type of cracking does occur, it would be initiated on the surface on which the welding is actually performed or in the HAZ immediately adjacent to the weld. The most appropriate technique to detect surface cracking is the surface

examination technique that APS will perform on the weld overlay and the adjacent base material on either side of the overlay. The inspection volume includes 100% of the volume susceptible to weld induced flaws.

While it would be possible to extend the examination volume to a larger extent on either side of the weld overlay, it would not be possible with current technology to ultrasonically inspect 100% of the volume within 1.5 times the thickness of the base material because of geometric considerations. Inspection of an increased volume would result in increased dose to inspection personnel without a compensating increase in safety or quality because there is no plausible mechanism for formation of new flaws or propagation of existing flaws in the region. The overlay volume is small relative to the volume of the underlying pipe and does not present the same concerns as those related to welds in deep cavities contemplated by the requirements of Code Case N-638-1. The examinations required by Code Case N-504-2 and Appendix Q as modified in the alternative are tailored for overlay inspection and provide full-assurance that the weld and adjoining base material are fully capable pf performing their intended function.

Later revision of this Code Case (N-638-2 and N-638-3) approved by ASME Code in 2005 and 2006 respectively, recognize that inspection of the larger volume is not necessary to assure quality and safety. The NRC has previously granted relief on this specific insure for temper bead welding for use at other plants for the reasons mentioned above. Specifically, San Onofre Nuclear Generating Station Unit 2 in the spring of 2006 and the Millstone Power Station Unit 3 in January of 2006 have received approval to use inspection methods essentially identical to those proposed by APS.

**11. NRC Request**

**Page 8. Section 3(a)5(ii) states that any un-inspectible volume in the weld overlay shall be assumed to contain the largest radial planar flaw that could exist within that volume. The assumed flaw shall meet the standards of Table IWB-3514-2 or the requirements of IWB-3640 by evaluation. Confirm that these evaluation results will be completed and available for staff review prior to plant startup.**

**APS Response**

An identification of the examination coverage of each overlay will be developed and available for NRC review prior to plant startup. The evaluation results of postulated flaws in these regions will be completed and will be available for Staff review prior to plant startup. APS Relief Request 36 does not evaluate an assumed flaw in the un-inspectable volume to IWB-3600 requirements.

**12. NRC Request**

**On Page 8:**

**(a) The acceptance examination of Section 3(a) is performed 48 hours after the temperature of the weld overlay reaches the ambient temperature. Discuss**

**when the preservice inspection of Section 3(b) is performed in the sequence of the weld overlay installation.**

**(b) Section 3(a) contains no requirements regarding the disposition of an unacceptable indication in the weld overlay during the acceptance examination. However, Section 3(c)6 requires repair/replacement of the weld overlay if an unacceptable indication is detected in the overlay during inservice inspection. Explain why similar repair/replacement requirements are not discussed in Section 3(a), or clarify the requirements for unacceptable indications in Section 3(a).**

APS Responses NRC Items 12(a) and (b)

(a) The acceptance examination and preservice inspection are performed at the same time.

(b) Section 3(a) now contains the requirements for weld overlay examination. If any volumes with unacceptable indications are identified during the acceptance examinations, the unacceptable indications will be removed and the volume will be re-welded.

**13. NRC Request**

**Page 8. Section 3(c)(3) states that for Class 1, 2,and 3 piping, the acceptance criteria of IWB-3600, IWC-3600, or IWD-3600 shall be met for the weld overlay. However, relief request ISI-GEN-ALT-03 is specifically requested for pressurizer piping which is Class 1. Please clarify.**

APS Response

Only the acceptance criteria of Class 1 piping in accordance with IWB-3600 is referenced in APS' request.

**14. NRC Request**

**On Page 10:**

**(a) Section 3(c)(4) states that the 25 percent of weld overlays in the population will be examined once every ten years. Clarify whether the population of welds to be examined is based on the plant specific number of weld overlays.**

**(b) Justify the adequacy of the proposed successive examinations in Section 3(c)(5), because the proposed successive examinations are not consistent with the requirements of IWB-2420 of the ASME Code, Section XI.**

APS Response to NRC Items 14(a) and (b)

(a) The population of welds to be examined is based on the plant specific number of weld overlays.

(b) The proposed overlays are mitigative structural replacements rather than analytical acceptance of indications for which IWB-2420 rules apply. There are no known indications or flaws present. Instead a flaw is postulated and mitigative overlay is deposited by welding. The successive proposed ISI examination schedule is adequate because even after full-structural replacement re-examination is required within two outages. Any crack growth observed would again require successive examinations within the next two outages.

**15. NRC Request**

**Page 9, The licensee stated that if a flaw is detected in the upper 25 percent of the original material during the preservice examination, the actual flaw size would be used for the crack growth evaluations. The staff thinks that this flaw size is not a conservative assumption for the crack growth calculations. The current ultrasonic examination is qualified only to detect flaws in the upper 25 percent of the pipe base metal after a weld overlay is applied. Therefore, the condition in the lower 75 percent of the pipe base metal would be unknown. The conservative assumption would be to assume existence of a crack of 75 percent through wall depth in the lower 75 percent pipe base metal which should be added to the depth of the crack found in the upper 25 percent of the pipe base metal. This worst case crack should be used to calculate crack growth. Discuss why it is acceptable to assume the actual flaw size as you proposed when the ultrasonic examination is only qualified for the upper 25 percent of the pipe metal.**

**APS Response**

As stated in the response to NRC request 6 (b), the as-found flaw size would be the 75% through-wall flaw postulated, plus any flaws present in the upper 25% of the original weldment. For example, if no flaws were identified in the upper 25% of the weldment, the flaw depth for crack growth purposes would be 75% through-wall. However, if a flaw was found extending 10% of the wall thickness into the upper 25% of the original weldment, the as-found flaw for crack growth purposes would be 85% through-wall. This flaw would then be evaluated for the intended period of operation for growth by PWSCC and fatigue mechanisms.

**16. NRC Request**

**(a) Section 2(g) of Appendix 1 to the submittal is different from the corresponding Section (j) in Code Case N-638-1. Section 2(g) of Appendix 1 provides additional requirements for the case when the average lateral expansion value of the heat affected zone of Charpy V-notch specimens is less than the average value for the unaffected base metal. Discuss the technical basis for the requirements in Section 2(g) of Appendix 1.**
**(b) Section 3.0(c) of Appendix 1 states that the heat input of the first three layers shall not exceed 45,000 J/inch under any conditions. Provide the technical basis for this heat input.**

**(c) Section 3.0(c) of Code Case N-638-1 requires that for similar metal welding, the completed weld shall have at least one layer of weld reinforcement deposited. This reinforcement shall be removed by mechanical means, so that the finished surface is flush with the surface surrounding the weld. Discuss whether this requirement should be included in Section 3.0(c) of Appendix 1.**

**(d) Section 3(d) of Appendix 1 states that the interpass temperature limitation of QW-406.3 does not need to be applied. This condition is not in the corresponding Section 3.0(d) of Code Case N-638-1. Discuss why this condition is included in the proposed alternative.**

**(e) Discuss the technical basis for the requirements in Section 3(e) of Appendix 1, which are not shown in Code Case N-638-1.**

**(f) Section 4.0(c) of Code Case N-638-1 requires that areas from which weld-attached thermocouples have been removed be ground and examined using a surface examination method. Discuss whether this requirement should be included in Appendix 1 to the alternative.**

**(g) In Regulatory Guide 1.147, Revision 14, the staff imposed a condition on Code Case N-638-1 regarding ultrasonic examination and associated acceptance criteria based on NB-5330 of the ASME Code, Section III. Discuss whether this condition will be satisfied.**

**(h) For the case when it is impossible to measure the temperature of the weld overlay during installation, confirm that requirements in Sections 3(e)(2) and 3(e)(3) of Appendix 1 to the proposed alternative will be used in combination to determine the weld overlay temperature.**

APS Response to NRC Items 16(a) through (h)

(a) This question does not apply to APS since APS' submittal Section 2(g) is identical to Code Case N-638-1.

(b) The question does not apply to the APS submittal. APS' proposed alternative is essentially the identical to Code Case N-638-1.

(c) This requirement is not appropriate for inclusion. All weld filler material for this particular application is fully austenitic. This provision is applicable to ferritic filler material. When using a ferritic filler material, it is necessary to remove the last layer since it is not tempered. This is not a concern for the austenitic filler materials.

(d) This question does not apply to the APS submittal. APS' proposed alternative is essentially identical to Code Case N-638-1.

(e) This set of alternative techniques and analytical methods were included to provide a number of ways to determine interpass temperature. This change was included in N-638-2. The basis from the white paper supporting the action is

found in ASME Codes and Standards Connect for the action. The basis is shown at the end of this response.

(f) Welded thermocouples will not be used in this application.

(g) The proposed alterative does not use Code Case N-638-1. The NRC staff imposed condition on Code Case N-638-1 regarding ultrasonic examination and the use of associated acceptance criteria based on NB-5330 of the ASME Code, Section III, will not be satisfied by APS. Code Case N-638-1 was not prepared for weld overlay applications; instead, Code Case N-638-1 (and the temper bead welding techniques in IWA-4600) was written to address repair welds where a defect in piping is excavated and the resulting cavity is filled using a temper bead technique. However, an excavated cavity configuration differs significantly from the weld overlay configuration. APS has concluded that the proposed alternative was written to specifically address weld overlays, and not only does it adequately examine the weld overlays, but it provides more appropriate examinations and acceptance criteria than the NRC staff-imposed position. Conversely, the imposition of ASME Section III acceptance standards to weld overlays is inconsistent with years of NRC precedence and without justification given the evidence of past NRC approvals and operating experience. APS' conclusion is based on the following:

i. Weld overlays have been used for repair and mitigation of cracking in Boiling Water Reactors since the early 1980s. In Generic Letter 88-01, the NRC approved the use of Section XI acceptance standards for determining the acceptability of installed weld overlays.

ii. Weld overlays for repair of cracks in piping are not addressed by ASME Section III. ASME Section III utilizes nondestructive examination procedures and techniques with flaw detection capabilities that are well within the practical limits of workmanship standards for welds. These standards are most applicable to volumetric examinations conducted by radiographic examination. Radiography (RT) of weld overlays is not appropriate because of presence of radioactive material in the Reactor Coolant system and water in the pipes. The acceptance standards are written for a range of fabrication flaws including lack of fusion, incomplete penetration, cracking, slag inclusions, porosity, and concavity. However, experience and fracture mechanics have demonstrated that many of the flaws that are rejected using ASME Section III acceptance standards do not have a significant effect on the structural integrity of the component.

iii. The UT examinations performed in accordance with the proposed alternative are in accordance with ASME Section XI, Appendix VIII, Supplement 11, as implemented through the PDI. These examinations are considered more sensitive for detection of defects, either from fabrication or service-induced, than either ASME Section III RT or UT methods. Further, construction type

flaws have been included in the PDI qualification sample sets for evaluating procedures and personnel.

iv. Per Section 3(a)4 of the proposed alternative, any planar flaws found during either the acceptance or preservice examination are required to meet the requirements of Table IWB-3514-2. This approach was previously found acceptable in the NRC Safety Evaluation Report (SER) dated July 21, 2004 for Three Mile Island, Unit 1. However, within the same SER, the NRC had issues regarding the application of Table IWB-3514-3 to laminar flaws in a weld overlay. The SER stated, "Applying Table IWB-3514-3 to a weld overlay exposes several inherent oversights. For instance, the acceptance of a laminar flaw size is independent of the weld overlay size, and the acceptance criteria is silent on the inaccessible volume beneath the lamination which may hide other flaws beneath the lamination." These issues are addressed in the proposed alternative, as follows:

- Per Section 3(a)5 of the proposed alternative, Table IWB-3514-3 has been restricted so that the total laminar flaw shall not exceed 10% of the weld surface area and no linear dimension of the laminar flaw shall exceed 3.0 inches.
- Per Section 3(a)5i of the proposed alternative, the reduction in coverage due to laminations is limited to less than 10% with the dimensions of the uninspectable area based on the coverage obtained by angle beam examinations.
- Per Section 3(a)5ii of the proposed alternative, any uninspectable volume in the weld overlay shall be assumed to contain the largest planar flaw that could exist within that volume. This assumed planar flaw shall meet the requirements of Table IWB-3514-2, or alternately, the flaw evaluation requirements of IWA-3640.

(h) The alternative allows any one of the methods listed in Section 3(e) of Appendix 1 to the proposed alternative. A discussion of the change to N-638-2 and its basis, as well as a response to the Main Committee negative, is found in the response to NRC request 16(e) above.

**Requirement to Monitor Process Temperatures during the Welding Process (Technical basis for the requirements in Section 3(e) of Appendix 1)**

The present revision of Code Case N-638 does not clearly address the monitoring of process temperatures during the production welding operation. The proposed change adds the following requirement in new paragraph 3.0(e):

*"The interpass temperature shall he controlled by one of the following methods:*

(1) Temperature measurement (e.g. pyrometers, temperature indicating crayons, thermocouples) during welding;
(2) Heat flow calculations using the maximum heat input permitted by the welding procedure;
(3) Mock-up testing using the maximum heat input permitted by the welding procedure."

The proposed change will allow the use of any temperature monitoring or analytical method that ensures that process temperatures are controlled within the interpass temperature limitations of the welding procedure. Because this Code Case is generally used to perform repair welding on Reactor Coolant System (RCS) components where radiological exposure is a significant concern, temperature monitoring has been generally performed remotely using devices such as pyrometers. While thermocouples[1] are certainly allowed under the proposed change, the radiological exposure associated with their installation and removal (which includes NDE) makes them a less attractive option. As an alternative to temperature monitoring methods, analytical evaluations that provide assurance that process temperatures will remain within welding procedure variables can be performed.

[1] Although the use of thermocouples and recording instruments are critical when using traditional temper bead welding procedures that are based on elevated preheat and postweld bake temperatures, their use is not critical to ambient temperature temper bead procedures.

It should be noted that the analytical method included is more specific than that stated above.

**17. NRC Request**

**On Page 3: The code of record for both VEGP units and Farley units is the 1989 editions of the ASME Code, Section XI. On page 1, the licensee stated that the second IS1 interval for both VEGP units started on May 31, 1997. For Farley Unit 1, the third IS1 interval started on December 1, 1997. For Farley Unit 2, the third IS1 interval started on July 30, 2001. Based on the aforementioned starting dates of the IS1 intervals, clarify why the code of record for these units is not based on the edition or addenda later than 1989 edition of the ASME Code.**

**[Question on Code of record does not apply to APS.]**

**18. NRC Request**

**If the pressurizer surge line in any of the Palo Verde units has been approved for leak-before-break and the weld overlay is applied to the surge line, the licensee needs to confirm that the original leak-before-break analyses are still valid and associated acceptance criteria (e.g., the safety margin on crack size and leak rates as specified in Standard Review Plan 3.6.3) are still acceptable.**

**APS Response**

APS will confirm and document that the original leak-before-break analyses, where applicable, are still valid and the associated acceptance criteria will still be met after the weld overlays are applied.

**19. NRC Request**

**By letter dated April 28, 2006, Exelon submitted a relief request for the preemptive weld overlays of the pressurizers lines at Byron and Braidwood. By letter dated September 14,2006, Exelon committed to provide the NRC, within 14 days after the completion of the ultrasonic examination of the weld overlay installations, (1) the examination results of the weld overlays, (2) a discussion of any repairs to the overlay material and/or base metal and the reason for the repair, and (3) commitment to perform the subsequent inservice examination in accordance with Subarticle Q-4300 of Appendix Q to the ASME Code, Section XI. The staff requests that APS submit the same commitments as specified in Exelon's letter dated September 14, 2006, for the contingency and preemptive weld overlay relief requests at Palo Verde Units 1, 2 and 3.**

**APS Response**

APS will inform the Palo Verde Project Manager of the (1) the examination results of the weld overlays, and (2) including any repairs to the overlay material and/or base metal and the reason for the repair within 14 days after the completion of the ultrasonic examination of the weld overlay installations. APS will also provide this information in the 60-day letter committed to in APS letter 102-05640, dated January 31, 2006. APS will also perform the subsequent inservice examination in accordance with Subarticle Q-4300 of Appendix Q to the ASME Code, Section XI Regarding the Inservice Inspection requirements of Subarticle Q-4300 of Appendix Q; the proposed alternative has essentially incorporated these Inservice Inspection requirements.

**20. NRC Request**

**If the preservice inspection (ultrasonic examination) of the installed weld overlay detected indications that are unacceptable per the acceptance criteria of Table IWB-3514-2 of the ASME Code, Section XI, discuss the disposition of the unacceptable indications prior to restart of the plant.**

**APS Response**

For weld overlay examination volumes with unacceptable indications detected during the preservice inspections, the unacceptable indications will be removed and the volume will be re-welded.

1. NRC Request

**In the response to staff's RAI Question 1, the licensee provided a revised schedule for ultrasonic testing (UT) examinations of the pressurizer nozzles and revised weld overlay strategy. For example, the licensee changed from the contingency weld overlay repairs to preemptive weld overlay for Vogtle Unit 1 and Farley Unit 2. The licensee needs to submit a revised ISI-GEN-ALT-06-03 to reflect the changes.**

APS Response

APS Relief Request 36 is for preemptive weld overlay. If visual examinations prior to the overlay indicate through wall leakage, the overlay will be considered a full-structural contingency overlay. APS' submittal clearly states this distinction in the proposed alternative.

2. NRC Request

**In the response to staff's RAI Question 2, the licensee stated that the crack growth calculations in section 2(a) of alternative ISI-GEN-ALT-06-03 are applicable to the preemptive weld overlay. Discuss at what stage of the weld overlay activities will the crack growth calculations be performed. The staff needs to review the crack growth calculations of the preemptive weld overlay.**

APS Response

Crack growth calculations, including both stress corrosion and fatigue crack growth, are performed pre-outage. They are reconciled with respect to actual findings during the outage and as-built overlay conditions. This work is documented as part of the overlay design package and will be available for NRC review prior to plant restart from the outage that the pre-emptive overlays are installed.

3. NRC Request

**In the response to staff's RAI Question 2(b), the licensee stated that it does not plan to conduct UT or visual examination on the similar metal welds which are located adjacent to the dissimilar metal welds. However, the licensee will examine the similar metal welds after the overlay is applied. The staff notes that the UT examination of the weld overlay is qualified to interrogate only the outer 25 percent of the original weld wall thickness (i.e., the outside surface of the original weld penetrating into the 1/4 thickness of the weld). The UT method is not qualified to interrogate the inner 75 percent of the original weld wall thickness. Therefore, the condition of the inner 75 percent of the similar metal weld would not be known. (A) Discuss how the structural integrity can be demonstrated for the inner 75 percent of the wall thickness region of the**

**similar metal weld. (B) The proposed alternative is focused on the requirements for the weld overlay of the dissimilar metal welds and the technical basis and analyses supporting the weld overlay have been based on the material properties of the dissimilar metal welds. Discuss whether the requirements (such as flaw growth calculations) in the proposed alternative are also applicable to the overlaid similar metal welds which have different material properties than the dissimilar metal welds.**

**APS Response – Part A**

Selection and examination of the similar metal welds is currently performed using an NRC approved risk-informed application. The risk-informed application uses failure probability analysis, probabilistic risk assessment, and an expert panel evaluation to identify the piping components that require examination. The piping components selected for examination are only a small portion of the total population of similar metal welds; however, the basic intent of identifying and repairing flaws before piping integrity is challenged is maintained by the risk-informed application. As a final step in the selection process, a statistical model was used to assure that a sufficient number of welds are being examined. By letter dated November 3, 2006, the NRC issued the safety evaluation for the risk-informed program and concluded that, "...the proposed alternative provides an acceptable level of quality and safety." Therefore, these adjacent similar metal welds (including the lower 75% of the weld) do not need to be examined for PWSCC to maintain an acceptable level of quality and safety. After the overlay is applied, these welds will be examined in accordance with the proposed alternative.

The overlay design basis and crack growth calculation for the similar metal welds are identical to those described in the alternative for dissimilar metal welds (even though such welds are not susceptible to PWSCC in the PWR environment). Therefore, the standard weld overlay pre- and inservice inspection volume (the overlay plus the outer 25% of the original weld and HAZ) is adequate to demonstrate the structural integrity of these welds.

**APS Response – Part B**

The requirements (such as flaw growth calculations) in the proposed alternative will be applied to the overlaid similar metal welds using appropriate stress levels and material properties. Fatigue crack growth analysis will be performed, but PWSCC crack growth evaluation will not be performed for the overlaid similar welds because they are not susceptible to stress corrosion cracking in a PWR water environment.

4. **NRC Request**

**In response to staff's RAI Question 5(a), the licensee stated that the specific dimensions and the overlay thickness are proprietary information and will be in the design package available for NRC review at the plant site. The staff**

**would like to review the design package at the NRC headquarters in Rockville Maryland. The staff assume that the design package includes stress analyses associated with the weld overlay design. (See Comment #13)**

**APS Response**

A stress analysis will be performed pre-outage that demonstrates that the pressurizer nozzles and hot leg nozzles will perform their intended design function with the FSWOL installed. This analysis will be documented as part of the overlay design package and will be available for NRC review prior to plant restart from the outage that the pre-emptive overlays are scheduled for installation. The stress analysis report will include results showing that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied. The stress analysis will also include results showing that the requirements of IWB-3000 of the ASME Code, Section XI, are satisfied. The results will show that the postulated crack, including its growth in the nozzles, would not adversely affect the integrity of the overlaid welds.

5. **NRC Request**

**Staff's RAI Question 14(b) is related to the adequacy of the proposed successive inservice inspection (ISI) of the overlaid welds. In the response to Question 14(b), the licensee stated that "...there are no known indications present [in the dissimilar metal welds]..." The staff does not agree with this statement because without conducting an UT examination prior to weld overlay installation as the licensee has proposed for Vogtle Units 1 and 2 and Farley Unit 1, the condition of the original welds would not be known. In addition, the UT examinations performed after weld overlay installation may not detect flaws in the original welds either because (a) the flaws in the original welds, if exist, may be squeezed tightly by the compressive stresses produced by the weld overlay and would not be detected by the UT. (2) The UT examination is qualified to interrogate only the outer 25 percent of the original weld thickness. Therefore, the condition of the remaining 75 percent of the original weld thickness region would not be known.**

**The proposed alterative needs to be revised to address the following scenarios which apply to the condition of the original welds:**

**(A) If the licensee did not perform the UT examination of the original weld prior to weld overlay installation, the licensee needs to assume a worse case indication exists in the original weld and perform ISI of the weld overlay per the successive examination requirements of IWB-2420. The purpose is to ensure that (1) there is no indication in the original weld, and (2) if there is a flaw in the original weld, the flaw will not grow. This scenario applies to Vogtle Units 1 and 2 and Farley Unit 1.**

**(B) If the licensee performed the UT examination of the original weld prior to weld overlay installation and found no unacceptable indication(s) in the original welds, the proposed ISI schedule in alternative ISI-GEN-ALT-06-03 is adequate. However, if the licensee detected unacceptable indications per Table IWB-3514-2 in the original weld, the licensee needs to perform ISI of the weld overlay per the successive examination requirements of IWB-2420. If acceptable indications are detected in the original weld, the proposed ISI inspection schedule is acceptable. This scenario applies to Farley Unit 2.**

APS Response (Part A) -

The proposed alternative, Section 3, has been revised to reflect portions of the following discussion. This discussion replaces the response to Question 14(b) in APS' Response to Request for Additional Information.

The NRC has requested that if a weld is not examined prior to overlay installation that the worst case flaw be assumed and that the overlay be examined per the successive examination requirements of IWB-2420. IWB-2420 requires that if a flaw is detected during inservice examinations and is accepted for continued service by analytical evaluation, the areas containing the flaws shall be re-examined during the next three inspection periods. IWB-2420 is not required for the Acceptance Examination and the Preservice Examination because (1) analytical evaluation was not used to accept any actual flaws in the overlay, and (2) any flaw or postulated flaw in the upper 25% of the original weld is reduced to an acceptable size by increasing the wall thickness by deposition of weld overlay on the outside surface of the piping. Below is a synopsis of APS' proposed examinations:

Palo Verde Units 1, 2, and 3 are scheduled for preemptive overlays during the upcoming refueling outages. APS does not intend to perform ultrasonic examinations of the dissimilar metal welds or similar metal welds on these units prior to the installation of the overlays. Five of the six pressurizer nozzle welds on each unit have coverage less than 90% and for the other weld that is examinable it is estimated about 0.6 Rem per unit would be required to perform the examinations (for a total of 1.8 Rem). Since APS intends to apply full-structural overlays, designed for a worse case, through-wall flaw that is $360^0$ in circumference, APS believes that the dose received from examination of these welds would result in a hardship without a compensating increase in the level of quality and safety.

The new overlay will have ultrasonic acceptance and preservice examinations to determine if there are any indications in the overlay or if there are indications in the upper 25% of the original weld or base material. Pre-existing indications in the outer 25% of the original weld are not expected to be closed by compressive forces imposed by the weld overlay and thus their delectability is not impacted by the overlay. PDI weld overlay qualification samples include flaws in this region, and thus any potential crack closure effects are addressed in the qualification. Within the next two outages the overlay and the upper 25% of the weld and base material will be re-

examined for a second time. If there is no evidence of a new indication or growth of a pre-identified indication during the second ultrasonic examination, then the overlay is functioning as designed and the overlay will be placed into a population to be examined on a sample basis.

In the unlikely event, that at a later time, an indication resumes its growth, the proposed alternative provides sufficient defense-in-depth to ensure structural integrity. First, the overlay material is resistant to PWSCC and if a PWSCC indication grows to the weld overlay interface it would then stop. Second, the proposed alternative design assumes a through-wall flaw that is $360^0$ degrees around the circumference as the design basis for the overlays. Therefore, structural integrity will continue to be maintained by the full-structural overlay regardless of crack growth beneath the overlay. Until final overlays are applied and the final contours are known the actual dose received when examining these welds must be estimated. It is estimated that the dose received by personnel for the examination of 9 overlays on a single unit will average about 1 Rem. Therefore, performing the examinations for a third time per IWB-2420 on 21 welds would require about 3 Rem. APS concludes that performing additional examinations on these 27 weld overlays per IWB-2420 would result in extra dose without a compensating increase in the level of quality and safety. Note: If there is evidence of change in the upper 25% during the second examination the overlay will be examined for a third time within the next two refueling outages. This sequence of examinations would be repeated until there was no growth or until a new repair is applied. This meets the intent of IWB-2420.

**APS Response (Part B) – Farley Unit 2 (6 overlays)**

This question does not apply to APS.

6. **NRC Request**

**Staff's RAI Questions 16(e) and 16(h) are related to the licensee's proposed methods to measure the weld interpass temperature as presented in Section 3.0(e) to Appendix 1. Section 3.0(e) has been incorporated in Code Case N-638-2, but not in N-638-1. The staff has not approved Code Case N-638-2. The staff does not agree with portion of proposed Section 3.0(e). The staff's position is that the licensee should use mainly proposed Section 3.0(e)(1), which is related to use of temperature measurement (e.g., pyrometers, temperature indicating crayons, and thermocouples). However, if it is impossible to measure the weld interpass temperature per Section 3.0(e)(1), Sections 3.0(e)(2) and 3.0(e)(3) shall be used in combination. As it is proposed, any of Sections 3.0(e)1, 3(e)(2), or 3(e)(3) may be used, which the staff finds unacceptable. The licensee needs to revise the proposed Section 3.0(e).**

**APS Response**

Interpass temperature will be directly measured using direct temperature measurement devices. This method of temperature measurement complies with Code Case N-638-2 section 3.0(e)(1). If it is not possible to measure the weld interpass temperature in this manner, sections 3.0(e)(2) and 3.0(e)(3) of Code Case N-638-2 shall be used in combination.

7. **NRC Request**

**In the response to staff's RAI Question 16(g), the licensee stated that due to recent overlay issues at Byron, the licensee proposed to change Section 3(a)3iii in the original proposal. The licensee stated that an uninspectable volume in the weld overlay shall be assumed to contain the largest planar flaw that could exist within that volume. (A) Clarify where is the uninspectable volume in the weld overlay. The staff presumes that there are two regions of the weld overlay that are uninspectable. One uninspectable region would be at the both ends of the weld overlay as shown in Figure 1 of the proposed Request ISI-GEN-ALT-06-06. These are the weld volume outside the examination volume A-B-C-D. The second uninspectable region would be the inner 75 percent of thickness of the original weld. (B) The licensee stated that "...the assumed planar flaw shall meet the requirements of Table IWB-3514-2, or alternatively, the flaw will be repaired...". The statement implies that a repair will be performed on an assumed flaw. The repair should be performed on a real flaw, not an assumed flaw. Please clarify the statement. (C) the licensee needs to submit a revised ISI-GEN-ALT-06-03 to reflect the revised criteria in Section 3(a)3iii.**

**APS Response**

The APS proposed alternative reflects the following discussion and this discussion also replaces the response to Question 16(a) in APS' Response to Request for Additional Information. The new response is:

(A) The only uninspectable volume addressed in this alternative is under detected laminar indications. The presence of laminar indications may limit angle beam examinations by reflecting sound waves. Any uninspectable volume in the weld overlay beneath a laminar flaw shall be assumed to contain the largest radial planar flaw that could exist within that volume. This assumed flaw shall meet the preservice examination standards of Table IWB-3514-2. In applying the acceptance standards, wall thickness "$t_w$" shall be the thickness of the weld overlay. Both axial and circumferential planar flaws shall be assumed.

(B) If the preservice acceptance criteria of Table IWB-3514-2 are not met, the lamination shall be removed or reduced in area such that the assumed flaw is acceptable.

(C) The proposed alternative, Section 3, has been revised.

8. -NRC Request

**In the response to staff's RAI Question 18, the licensee stated that it will confirm that the original leak-before-break (LBB) analyses are still valid and the associated acceptance criteria will still be met after the weld overlays are applied. Discuss why the confirmation of the LBB analysis can not be performed prior to the weld overlay installation.**

APS Response

The confirmation of the LBB analysis cannot be performed prior to the weld overlay installation because weld shrinkage stresses are not available. After the weld overlay is installed, the shrinkage will be measured, and the resulting shrinkage stresses calculated. The shrinkage stresses will be applied to the piping loads and APS will confirm that the existing LBB analysis is still valid. This confirmation will be documented by APS.

9. NRC Request

**(A) In section 3(c)6 of the proposed alternative, it is stated that "...For weld overlay examination volumes with unacceptable indications as described above in Sections 3(c)2 and 3(c)3, the weld overlay shall be removed...". Section 3(c)3 references acceptance standards of Table IWB-3514-2 and acceptance criteria of IWB-3600. Clarify which acceptance criteria (Table IWB-3514-2 or IWB-3600) the indications will have to meet in order to be characterized as "unacceptable" because an indication could be accepted or rejected per Table IWB-3514-2 or per the analysis of IWB-3600.**

APS Response

Section 3(c)6 of the proposed alternative was deleted. Section 3(c) was revised.

10. NRC Request

**Confirm the staff's interpretation of the weld overlay examinations and associated acceptance criteria in the proposed alternative as follows.**

**For the preservice UT examination of the weld overlay, if an indication in the weld overlay is rejected per Table IWB-3514-2, the unacceptable indication will be removed. This criterion will be reflected in the revised**

**section 3(a)3iii of the proposed alternative. If the indication is found acceptable by Table IWB-3514-2, the weld overlay will be placed in service and the ISI schedule and acceptance criteria will follow requirements in Section 3(c) of the proposed alternative.**

**For the inservice UT examination of the weld overlay, if an indication in the weld overlay is accepted per Table IWB 3514-2, the weld overlay will be re-examined in the future refueling outage(s) per section 3(c)5. If the indication is found unacceptable by Table IWB-3514-2, the indication will be evaluated by the analysis of IWB-3600 per section 3(c)3 of the proposed alternative. If the indication is found acceptable by IWB-3600, the ISI schedule will follow Section 3(c)5. If the indication is found unacceptable by IWB-3600, the weld overlay will be removed per section 3(c)6.**

**APS Response**

Preservice UT Examination - The staff's interpretation is confirmed. The APS Section number is 3(b)2.

Inservice UT Examination - The staff's interpretation is confirmed. The APS sections are 3(c)3, 3(c)4 and 3(c)5. The APS request does not contain Section 3(c)6.

**11. NRC Request**

**Section 1.0(a) of Code Case N-638-1 limits the thickness of the weld overlay not to exceed the 50 percent of the ferritic base metal thickness. Discuss why this requirement is not included in Section 1.0 of Appendix 1 to the proposed alternative.**

**APS Response**

Section 1.0(a) of Code Case N-638-1 applies to the excavation of base metal. It states, "...the depth of the weld shall not be greater than one-half of the ferritic base metal." Therefore, an excavation can not be made more than one-half of the base metal thickness. The proposed alternative is for an overlay not an excavation; therefore, the requirement is not applicable.

**12. NRC Request**

**In the August 10, 2006 submittal, the licensee presented a list of welds for the weld overlay. Confirm that weld ALA-4504-2&3 at Farley unit 1 and APR1-4504-2&3 at Farley unit 2 are a single weld at each unit.**

**APS Response**

Not applicable to Palo Verde

13. NRC Request

**Code Case N-504-2(g)2 and N-504-2(g)3 require evaluations of residual stresses and flaw growth of the repaired weldments. The similar evaluations are required in Section 2(b) of the proposed alternative. Recently, the staff reviewed a stress analysis submitted by a licensee after the weld overlays were installed on the pressurizer welds but prior to entry Mode 4 from its nuclear plant's outage. The stress analysis showed that the applied stresses per Subarticle NB-3600 of the ASME Code Section III exceeded the allowable stress. In light of that stress analysis, the staff requests Southern Nuclear to submit a stress analysis demonstrating that the pressurizer nozzles after the weld overlay installation will perform their intended design function. The stress analysis report should include results showing that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied. The stress analysis should also include results showing that the requirements of IWB-3000 of the ASME Code, Section XI, are satisfied. The results should show that the postulated crack including its growth in the nozzles would not adversely affect the integrity of the overlaid welds. The staff requests that the licensee submit the evaluations prior to entry into Mode 4 from the refueling outage. (See Comment # 4).**

APS Response

A stress analysis will be performed pre-outage that demonstrates that the pressurizer nozzles and hot leg nozzles will perform their intended design function with the FSWOL installed. This analysis will be performed as part of the overlay design package and will be available for NRC review prior to entry into Mode 4 following the outage that the pre-emptive overlays are scheduled for installation. The stress analysis report will include results showing that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied. The stress analysis will also include results showing that the requirements of IWB-3000 of the ASME Code, Section XI, are satisfied. The results will show that the postulated crack, including its growth in the nozzles, would not adversely affect the integrity of the overlaid welds.