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SOUTHERN COMPANY
Energy to Serve Your World℠

February 21, 2007

NL-07-0366

Docket Nos.: 50-348 50-424
50-364 50-425

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant
Vogtle Electric Generating Plant
Proposed Alternative for Application of
Pressurizer Nozzle Full-Structural Weld Overlays – Revision 2.0

Ladies and Gentlemen:

Pursuant to 10 CFR 50.55a(a)(3)(i), Southern Nuclear Operating Company (SNC) hereby requests NRC approval of proposed alternative ISI-GEN-ALT-06-03, Revision 2.0 to allow the application of full-structural weld overlays over the pressurizer nozzle dissimilar metal welds for the Farley Nuclear Plant and the Vogtle Electric Generating Plant. (Revision 1.0 of the proposed alternative was submitted to the NRC via letter NL-06-2768, dated January 3, 2007.)

In early February 2007, cracking in welding test coupons containing high levels of sulfur was discovered during weld process development. As a result, it was determined that in order to successfully apply the Vogtle full-structural weld overlay, an initial layer of low carbon austenitic stainless steel and/or an austenitic nickel alloy should be applied over the pressurizer safe ends to provide a buffer between the base metal and the alloy 52/152 overlay. ISI-GEN-06-03 has been revised to reflect the use of a buffer layer. Revisions to ISI-GEN-06-03 can be found in the enclosure on pages 6 and 7.

In order to support the application of the pressurizer weld overlays on Vogtle Unit 2 during the upcoming refueling outage scheduled for early March 2007, SNC requests approval of this alternative by March 5, 2007.

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

L. M. Stinson
Vice President Fleet Operations Support

LMS/LPH/daj

Enclosure: Request for Alternative - ISI-GEN-ALT-06-03, Revision 2.0 – Application of Pressurizer Nozzle Full-Structural Weld Overlays

cc: Southern Nuclear Operating Company
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U. S. Nuclear Regulatory Commission
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Enclosure

Request for Alternative - ISI-GEN-ALT-06-03, Revision 2.0
Application of Pressurizer Nozzle Full-Structural Weld Overlay

Enclosure

SOUTHERN NUCLEAR OPERATING COMPANY
ISI-GEN-ALT-06-03, REVISION 2.0
PROPOSED ALTERNATIVE IN ACCORDANCE WITH 10 CFR 50.55a(a)(3)(i)
APPLICATION OF PRESSURIZER NOZZLE FULL-STRUCTURAL WELD OVERLAYS

Plant Site-Unit: Vogtle Electric Generating Plant (VEGP) Units 1 and 2 and Joseph M. Farley Nuclear Plant (FNP) - Units 1 and 2.

Interval Dates: VEGP-1 & -2 Second ISI Interval from May 31, 1997, through May 30, 2007.

FNP-1 Third ISI Interval from December 1, 1997, through November 30, 2007.

FNP-2 Updated Third ISI Interval from July 30, 2001, through July 29, 2011.

NOTE

As approved by the NRC in SER dated March 20, 1997, FNP-2 updates to the latest Edition of Section XI concurrently with FNP-1 as of December 1, 2007. Therefore, this alternative applies to both FNP units through November 30, 2007 and to both Vogtle units through May 30, 2007.

Requested Date for Approval: Preemptive Overlays

A preemptive full-structural weld overlay (FSWOL) will be applied to each of the VEGP-2 and FNP-1 pressurizer dissimilar metal (DSM) welds as described in the below listed preemptive overlay schedule. The Spring 2007 outage for VEGP-2 is currently scheduled to begin on March 4, 2007, while FNP-1 is currently scheduled to begin on September 29, 2007. The VEGP-1 and FNP-2 DSM welds are scheduled for preemptive overlays in subsequent Intervals and, thus, are not within the scope of this request. Approval is requested to support the Spring 2007 outage for VEGP-2, which is currently scheduled to begin on March 4, 2007.

Preemptive Overlay Schedule

1. Vogtle Unit 2 is scheduled to have preemptive FSWOLs applied during the next refueling outage in Spring 2007. Ultrasonic examinations of the similar or dissimilar metal welds are not planned prior to the installation of the preemptive FSWOLs.

2. Farley Unit 1 is scheduled to have preemptive FSWOLs applied during the next refueling outage in Fall 2007. Ultrasonic examinations of the similar or dissimilar metal welds are not planned prior to the installation of the preemptive FSWOLs.

3. Vogtle Unit 1 is scheduled to have preemptive full-structural weld overlays (FSWOLs) applied during the next refueling outage in Spring 2008. Ultrasonic examinations of the similar or dissimilar metal welds are not planned prior to the

installation of the preemptive FSWOLs. (For information only. These scheduled overlays are to be applied in the Third Interval and are not included in this alternative).

4. Farley Unit 2 is scheduled to have preemptive FSWOLs applied during the Spring 2010 refueling outage. Ultrasonic examinations are scheduled during the next refueling outage in Spring 2007, but they are not planned in 2010, prior the installation of the overlays. (For information only. These scheduled overlays are to be applied during the FNP-2 Updated Fourth ISI Interval and are not included in this alternative.)

Contingency Overlay Repairs

Visual examinations will be performed every refueling outage at each site on all of the dissimilar metal welds until they are mitigated by weld overlay. If a through-wall flaw in any of the FNP or VEGP dissimilar metal welds is detected by a visual examination, the leak will be attributed to Pressurized Water Stress Corrosion Cracking (PWSCC) and an FSWOL will be applied. No ultrasonic examinations are planned prior to applying the contingency overlay repair and only the nozzle with the leak will be repaired.

If a PWSCC flaw is detected during the scheduled Farley Unit 2 ultrasonic examination of the dissimilar metal welds, a contingency overlay will be applied. An ultrasonic indication will be attributed to PWSCC if the indication is observed in the weld metal and the indication is connected to the inside diameter (ID) surface. If unacceptable ultrasonic indications are detected that are not characterized as PWSCC, and the weld is accepted for continued service by Analytical Evaluation, successive examinations will be performed per IWB-2420. A contingency FSWOL will be applied to unacceptable non-PWSCC flaws.

ASME Code Components Affected:

Category R-A Dissimilar metal welds on the pressurizer at VEGP and FNP (Vogtle and Farley have both implemented risk-informed ISI):

VEGP-1	VEGP-2
11201-V6-002-W17 (Relief)	21201-V6-002-W17 (Relief)
11201-V6-002-W18 (Safety)	21201-V6-002-W18 (Safety)
11201-V6-002-W19 (Safety)	21201-V6-002-W19 (Safety)
11201-V6-002-W20 (Safety)	21201-V6-002-W20 (Safety)
11201-V6-002-W21 (Spray)	21201-V6-002-W21 (Spray)
11201-V6-002-W22 (Surge)	21201-V6-002-W22 (Surge)

FNP-1	FNP-2
ALA1-4205-35DM (Spray)	APR1-4205-49DM (Spray)
ALA1-4500-6DM (Surge)	APR1-4500-7DM (Surge)

ALA1-4501-1DM (Safety)	APR1-4501-1DM (Safety)
ALA1-4502-1DM (Safety)	APR1-4502-1DM (Safety)
ALA1-4503-1DM (Safety)	APR1-4503-1DM (Safety)
ALA1-4504-1DM (Relief)	APR1-4504-1DM (Relief)

Category R-A Similar metal welds on the pressurizer at VEGP:

VEGP-1	VEGP-2
11201-030-45 (Spray)	21201-030-49 (Spray)
11201-053-6 (Surge)	21201-053-6 (Surge)
11201-056-1 (Safety)	21201-056-1 (Safety)
11201-057-1 (Safety)	21201-057-1 (Safety)
11201-058-1 (Safety)	21201-058-1 (Safety)
11201-059-1 (Relief)	21201-059-1 (Relief)

Category R-A Similar metal welds on the pressurizer at FNP:

FNP-1	FNP-2
ALA1-4205-34 (Spray)	APR1-4205-48 (Spray)
ALA1-4500-5 (Surge)	APR1-4500-6 (Surge)
ALA1-4501-2 (Safety)	APR1-4501-2 (Safety)
ALA1-4502-2 (Safety)	APR1-4502-2 (Safety)
ALA1-4503-2 (Safety)	APR1-4503-2 (Safety)
ALA1-4504-2&3 (Relief)	APR1-4504-2&3 (Relief)

Applicable Code Edition and Addenda:

The Vogtle and Farley units are in their second and third inspection intervals, respectively. The current Code edition and addenda is ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1989 Edition with no addenda. In addition, as required by 10 CFR 50.55a, ASME Section XI, 1995 Edition through 1996 Addenda, is used for Appendix VIII, "Performance Demonstration for Ultrasonic Examinations."

Per 10 CFR 50.55a (g)(4)(iv), SNC requests approval to use the 2001 Edition of the American Society of Mechanical Engineers (ASME), *Boiler* and *Pressure Vessel Code* (Code), Section III and Section XI, with Addenda through 2003 for this proposed alternative. This is the latest edition and addenda approved by the NRC in 10 CFR 50.55a. The exception is that for ASME Section XI, Appendix VIII, the 2001 Edition of Section XI will be used. 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 I-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."

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PROPOSED ALTERNATIVE IN ACCORDANCE WITH 10 CFR 50.55a(a)(3)(i)
APPLICATION OF PRESSURIZER NOZZLE FULL-STRUCTURAL WELD OVERLAYS

NOTE

Unless identified otherwise, all Code references provided herein are to ASME Section XI.

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.

Currently, pressurizer weld examinations are performed at VEGP and FNP using a Risk-Informed Program (Category R-A) that has been approved by the NRC. The examinations performed are the same as those volumetric examinations specified in Section XI, Table IWB-2500-1, Category B-J and B-F. After the installation of the weld overlays these similar and dissimilar metal welds will no longer be included in the Risk-Informed ISI population, but will be examined in accordance with this proposed alternative.

Reason for Request:

Primary Water Stress Corrosion Cracking has been identified as a degradation mechanism for Alloy 82/182 welds and weld buttering. While no PWSCC flaws have been detected in VEGP or FNP piping, there are geometric limitations such that the required examination volume cannot be met, in all cases, with qualified ultrasonic (UT) techniques. For Farley Unit 1, Vogtle Unit 1, and Vogtle Unit 2 only the surge and spray nozzle dissimilar metal welds on each unit can be examined using a qualified UT technique. For Farley Unit 2, all six of the dissimilar metal welds can be examined. Southern Nuclear Operating Company (SNC) has concluded that the application of a 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 1989 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, SNC proposes the following alternative.

Proposed Alternative and Basis for Use:

Proposed Alternative

A scheduled preemptive FSWOL will be applied to each of the Farley Unit 1 and Vogtle Unit 2 pressurizer Alloy 82/182 safe-end welds as shown in the above schedule. For a preemptive FSWOL, there is no known flaw; therefore, a flaw must be assumed. Section 2(a) defines crack-growth requirements and section 2(b) defines the design requirements.

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

In lieu of performing ultrasonic examinations, the flaw will be assumed to be 100% through the original wall thickness for the entire circumference. Additionally, if a PWSCC indication is detected during the ultrasonic examination of the Farley Unit 2 pressurizer Alloy 82/182 safe-end welds a contingency FSWOL will be applied. Flaw characterization will be based on the as-found flaw size as discussed in section 2(a).

Due to the proximity of the adjacent similar metal piping welds, preemptive or contingency overlay of the safe-end welds may preclude the examination of the adjacent similar metal piping weld(s); therefore, the overlay will be extended over the adjacent similar metal piping welds, as necessary. This is expected to include all adjacent similar metal welds with the possible exception of those on the surge lines, where there may be sufficient separation between the dissimilar metal weld and the similar metal weld to allow examination of the similar metal weld after the dissimilar metal weld is overlaid. Farley Unit 1, similar metal welds ALA1-4504-2 and ALA1-4504-3 are only a few inches apart; therefore, both welds may be overlaid along with the dissimilar metal weld. Farley Unit 2 welds APR1-4504-2 and APR1-4504-3 have a similar configuration and will be treated the same as the Farley Unit 1 welds.

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 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. The welds adjacent to the dissimilar metal welds were not selected for examination in the risk-informed application 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 removed from the risk-informed weld population and examined in accordance with the proposed alternative.

In lieu of using the existing IWA-4000 Repair Procedures in the 1989 Section XI Code, SNC 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 Section III and Section XI Code references in this alternative are to the 2001 Edition of ASME Section III and ASME Section XI with Addenda through 2003 as modified by 10 CFR 50.55a. The methodology is:

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APPLICATION OF PRESSURIZER NOZZLE FULL-STRUCTURAL WELD OVERLAYS

1. **General Requirements:**

(a) An FSWOL will be applied by deposition of weld reinforcement (weld overlay) on the outside surface of the low alloy steel pressurizer nozzles (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 may be extended to include the adjacent wrought stainless steel to stainless steel welds (P-No. 8 to P-No. 8) to improve their inspectability. 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. The weld reinforcement will consist of Alloy 52/152.

When components subject to being overlayed contain levels of trace chemicals (e.g. sulfur) that could cause unacceptable indications in the Alloy 52/152 weld, an initial layer of low carbon (0.035% max.) austenitic stainless steel and/or an austenitic nickel alloy may be applied as a buffer between the base metal and the Alloy 52/152 overlay. This buffer will be considered as a "non-credited" layer and will provide an acceptable chemical composition to apply the FSWOL. Depending on the chemical composition of the base materials where the weld overlay is to be applied, there may be different ways to apply the first layer of weld material. SNC considered the effects of the buffer layer on the requirements previously set forth in this alternative. Significant points are:

- Code Case N-740, from which this alternative is derived, provides a methodology for the application of low carbon austenitic stainless and austenitic nickel alloys.
- This non-credited buffer layer will not be included in calculations required by this alternative.
- Since the FSWOL over the Alloy 82/182 dissimilar metal weld will continue to consist of Alloy 52/152, there will be no effect on the ability of the overlay to stop the progress of PWSCC.
- A review of the geometry by SNC and EPRI NDE personnel indicated that there will be no appreciable effect on the performance of ultrasonic examinations.
- No effects detrimental to the structure will be introduced by addition of the non-credited buffer layer.

Figures 1, 2, and 3 in Appendix 6 provide typical sketches of the Alloy 52/152 overlay and the materials for each component. If the base metal chemical composition requires, a non-credited layer (not shown in the figures) may be applied as a buffer. Specific dimensions and the overlay thickness are proprietary information and will be documented in the design package.

Prior to deposition of the non-credited buffer layer, 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 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.

Since no credit is being taken for the non-credited buffer layer, the non-credited buffer layer will not be further discussed in this proposed alternative.

(b) The Alloy 52/152 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 FSWOL, 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 such as that identified in 1(b) above. The first layer of weld metal deposited may not be credited toward the required thickness. Alternatively, a diluted 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 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 1×10^{17} (E< 0.5 eV) neutrons per cm^2 prior to welding.

2. Crack Growth Considerations and Design

(a) Crack Growth Considerations - Crack growth calculations will be performed as part of a proprietary 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. 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 in both materials is required. This package will be available for NRC review at Westinghouse's Rockville, MD office prior to the outage that the pre-emptive overlays are scheduled for installation.

(b) Design of the FSWOL

The design of the FSWOL weld is the same for preemptive overlays and for

contingency overlays. 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. A slope of not more than 1:3 is recommended.

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 after the overlay is applied. The determination of the thickness shall include the deposit analysis requirements of 1(d).

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 Farley or Vogtle welds to be considered in this evaluation). Included are:

    i. Prior to outage, a stress analysis will be performed that demonstrates that the pressurizer 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 would 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 at Westinghouse's Rockville, MD office prior to the outage that the pre-emptive overlays are scheduled for installation. .

    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. 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 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 and mandated by 10 CFR 50.55a, Final Rule dated October 1, 2004.) Ultrasonic examination will be performed to the maximum extent achievable.

Pre-Overlay Examinations

Farley Unit 1 and Vogtle Unit 2 are scheduled for preemptive overlays during the current ISI inspection intervals. SNC does not plan to perform ultrasonic examinations of the dissimilar metal welds or similar metal welds on these units prior to the installation of the overlays. Four of the six dissimilar welds on each unit have coverage less than 50% and for the other two dissimilar metal welds that are examinable, it is estimated about 0.6 Rem per unit would be required to perform the examinations (for a total of 1.2 Rem). Since SNC intends to apply full-structural overlays, designed for a worse case, through-wall flaw that is 360 degrees in circumference, the dose received from 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 evaluate 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 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) prior to initial acceptance. 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 of the Overlay

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 ½ inch from each side of the weld overlay 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, which is provided in Appendix 2 to this proposed alternative, 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 ultrasonic examination shall be conducted at least 48 hours after the completed overlay has returned to ambient temperature.

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 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.

iii. If the preservice acceptance criteria of Table IWB-3514-2 are not met, the assumed flaw shall be evaluated and shall meet the requirements of IWB-3640. The IWB-3640 evaluation shall be submitted to the NRC within 90 days after plant startup. If the assumed flaw is not acceptable for continued service per IWB-3640, the lamination shall be removed or reduced in area such that the assumed flaw is acceptable per IWB-3640.

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

(b) Preservice Inspection

1. The examination volume A-B-C-D in Figure 2, which is provided in Appendix 3 to this proposed alternative, 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 original wall thickness or into the weld overlay.

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

SNC proposes that the following Inservice Inspection rules be followed.

1. The weld overlay examination volume A-B-C-D in the aforementioned 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 the aforementioned Figure 2 shall be ultrasonically examined to determine if any new or existing cracks have propagated into the upper 25% of original wall thickness. 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. Pressure Testing

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

5. 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 52/152) 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 Performance Demonstration Initiative (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 welds, will provide improved assurance of structural integrity. Further, if no flaws are found in the upper 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 will 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 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).

Duration of Proposed Alternative: The proposed alternative is applicable for the remainder of the Inservice Inspection Interval for VEGP-1 and -2 that ends on May 30, 2007, plus the remainder of the Inservice Inspection Interval for FNP-1 and -2 that ends on November 30, 2007.

Precedents: This alternative is similar to and generally follows the content and statements made by

several utilities, which have pressurized water reactor (PWR) facilities, concerning the addition of FSWOL(s) on DSM piping welds. However, this alternative is not identical to those submitted by other utilities that have used ASME Code Cases, e.g., Code Case N-504-2, already approved by the NRC with a caveat related to the use of Appendix Q in the 2005 Addenda of the 2004 Section XI Edition. These other alternatives included several exceptions to those approved Code Cases because the Code Cases were not specifically developed for the application of FSWOLs on DSM welds. Plants using N-504-2 include, but may not be limited to, Beaver Valley-2 and Calvert Cliffs. A comparison table of the ASME Code Cases N-504-2, N-638-1, both of which have been approved by the NRC for use as documented in NRC Regulatory Guide 1.147, and this proposed alternative has been developed. Code Case N-504-2 versus the proposed alternative is found in Appendix 4, while Code Case N-638-1 versus Appendix 1 of the proposed alternative is found in Appendix 5.

References: None

Status: Awaiting NRC approval.

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PROPOSED ALTERNATIVE IN ACCORDANCE WITH 10 CFR 50.55a(a)(3)(i)

APPENDIX 1
AMBIENT TEMPERATURE TEMPER BEAD WELDING

1.0 GENERAL REQUIREMENTS

(a) This appendix applies to dissimilar austenitic filler metal welds between P-Nos. 1, 3, 12A, 12B, and 12C[1] materials and their associated welds and welds joining P-No. 8 or 43 materials to P-No. 1, 3, 12A, 12B, and 12C[1] materials with the following limitation: This Appendix shall not be used to repair SA-302 Grade B material unless the material has been modified to include from 0.4% to 1.0% nickel, quenching and tempering, and application of a fine grain practice.

(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 above 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 and 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.

[1] P-No. 12C designation refers to specific material classifications originally identified in ASME Section III and subsequently reclassified in a later Edition of ASME Section IX.

(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. If such requirements are not in the Construction Code and Owner's Requirements, the impact properties shall be determined by Charpy V-notch impact tests of the procedure qualification base material at or below the lowest service temperature of the item to be repaired. 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. However, if the average lateral expansion value of the HAZ

Charpy V-notch specimens is less than the average value for the unaffected base metal specimens and the procedure qualification meets all other requirements of this appendix, either of the following shall be performed:

(1) The welding procedure shall be requalified.

(2) An Adjustment Temperature for the procedure qualification shall be determined in accordance with the applicable provisions of NB-4335.2 of Section III, 2001 Edition with 2002 Addenda. The RT_{NDT} or lowest service temperature of the materials for which the welding procedure will be used shall be increased by a temperature equivalent to that of the Adjustment Temperature.

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 A-No. 8 weld metal (ASME Section IX, QW-442) for P-No. 8 to P-No. 1, 3, or 12 (A, B, or C) weld joints or F-No. 43 weld metal (ASME Section IX QW-432) for P-No. 8 or 43 to P-No. 1, 3, or 12 (A, B, or C) 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. The heat input of the first three layers shall not exceed 45,000 J/in. under any conditions. 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. The interpass temperature limitation of QW-406.3 need not be applied.

(e) The interpass temperature shall be determined by (e)(1). If it is not possible to use (e)(1) then (e)(2) and (e)(3) may be used in combination.

(1) temperature measurement (e.g., pyrometers, temperature indicating crayons, thermocouples) during welding.
(2) heat flow calculations using the variables listed below as a minimum:
    (i) welding heat input

APPENDIX 1
AMBIENT TEMPERATURE TEMPER BEAD WELDING (Continued)

(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

(3) 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.

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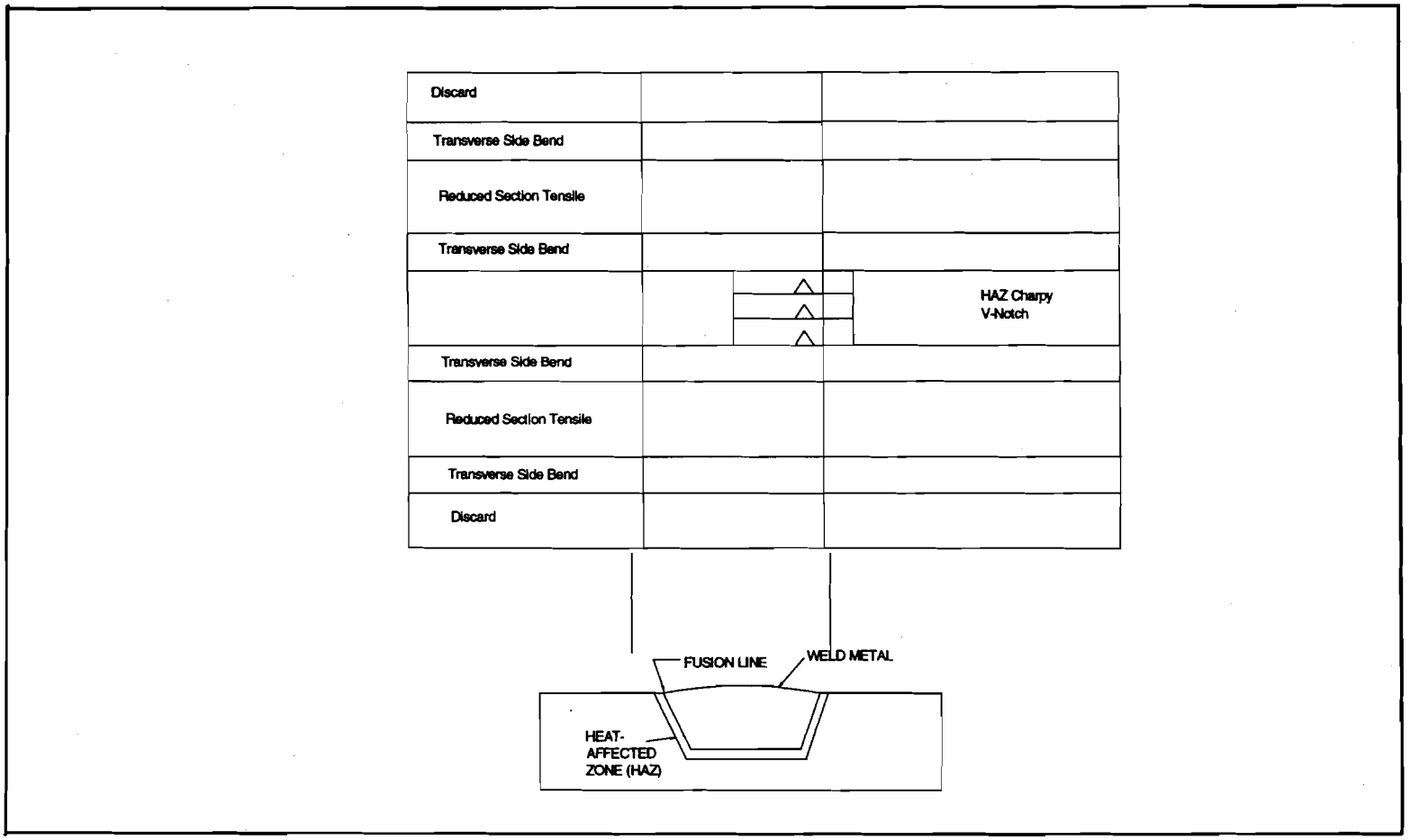
APPENDIX 1
AMBIENT TEMPERATURE TEMPER BEAD WELDING (Continued)



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
UT ACCEPTANCE EXAMINATION VOLUME

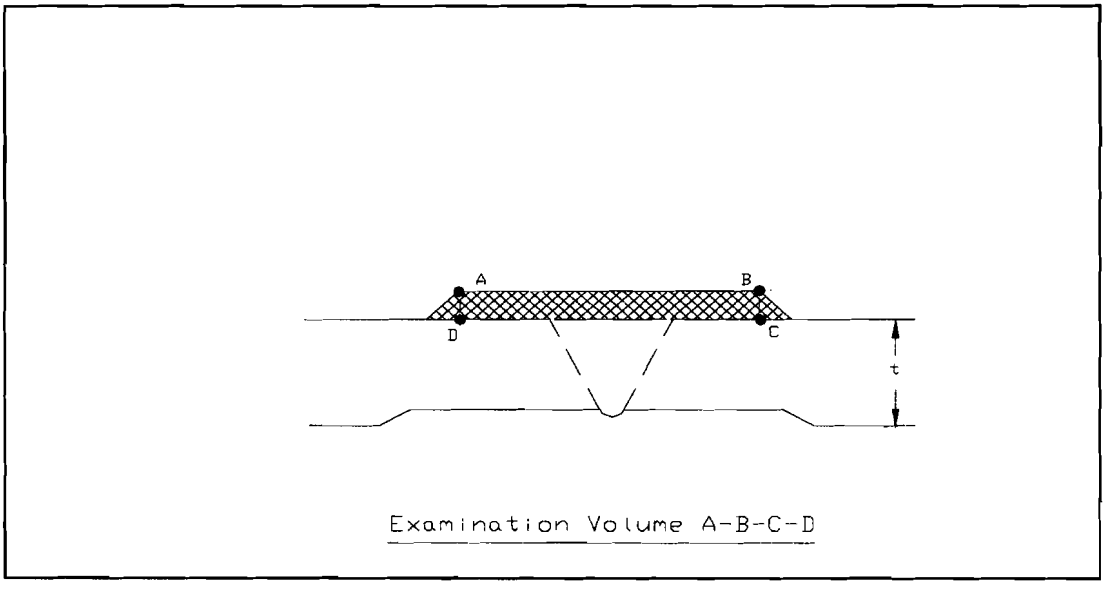


FIGURE 1: ACCEPTANCE EXAMINATION VOLUME

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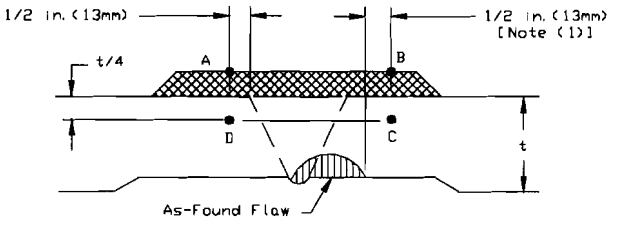
APPENDIX 3
PRESERVICE AND INSERVICE EXAMINATION VOLUME



Examination Volume A-B-C-D

NOTE:
(1) For axial or circumferential flaws, the axial extent of the examination volume shall extend at least 1/2-inch beyond the as-found flaw and at least 1/2-inch beyond the toes of the original weld, including weld end butter, where applied.

FIGURE 2: PRESERVICE AND INSERVICE EXAMINATION VOLUME

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APPENDIX 4
COMPARISON OF SNC-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2

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 or P-43 and P-1, 12A, 2B or 12c or between P-1, 3, 12A, 12B or 12C. 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) Filler Materials – Low C (0.035% max) SS or 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 Min. 2 layers with-7.5 FN. In first austenitic SS layer 5 FN acceptable by evaluation.	(d) Weld Reinforcement (1) Min. 2 layers with-7.5 FN. In first layer 5FN acceptable if deposited weld metal less than 0.02% C. (2) Provides requirements for austenitic nickel alloy weld overlay.
(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 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.

APPENDIX 4
COMPARISON OF SNC-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2
(Continued)

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) 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 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. (a) Acceptance Examinations-Surface finish 250 micro-inch and flatness sufficient to allow adequate examination in accordance with Appendix VIII procedures. PT the overlay and ½-inch on either side of the overlay. Acceptance standards for the PT of the weld overlay, meet weld Construction Code criteria or NB-5300. Base material, meet base material criteria or NB-2500. 48 hour 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. 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. (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.

APPENDIX 4
COMPARISON OF SNC-PROPOSED ALTERNATIVE VERSUS CODE CASE N-504-2
(Continued)

Comparison of Proposed Alternative with N-504-2 (Continued)	
N-504-2	**PROPOSED ALTERNATIVE**
	(c) Inservice Examinations 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. (d) Additional Examinations 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 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 would be met unless an alternative provided
(m) Use of case to be documented on an NIS-2 form	5.0 Documentation Use of case to be documented on an NIS-2 form

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APPENDIX 5
COMPARISON OF SNC-PROPOSED ALTERNATIVE VERSUS CODE CASE N-638-1

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
(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 in Supplement 9. 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 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 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 Sections (a) (d) (e) (f) (g) Section (h) Section (i) Section (j)	2.1 Procedure Qualification Sections (a) (b) (c) (d) (e) same as in N-638-1 for equivalent paragraphs. Equivalent paragraph not in Appendix 1. Section (f) same as (i) from N-638-1. Section (g) changed the first sentence adding "lateral expansion" in front of "value" both at the beginning and end of the sentence. Additional provisions as follow were added:

APPENDIX 5
COMPARISON OF SNC-PROPOSED ALTERNATIVE VERSUS CODE CASE N-638-1

Comparison of Proposed Alternative with N-638-1	
N-638-1	**APPENDIX 1 OF THE PROPOSED ALTERNATIVE**
	However if the average lateral expansion value of the HAZ Charpy V-notch specimens is less than the average value of the unaffected base metal specimen and the procedure qualification meets all other requirements of this appendix, either of the following shall be performed: (1) The welding procedure shall be requalified. (2) An Adjustment Temperature for the procedure qualification shall be determined in accordance with the applicable provisions of NB-4335.3 of Section III, 2001 Edition with 2002 Addenda. RT_{ndt} or lowest service temperature of the materials for which the welding procedure will be used shall be increased by a temperature equivalent to that of the Adjustment Temperature. This is identical wording to N-638-2, which has been approved by ASME.
Section (b) Provisions for welding in a pressurized environment	Not included for overlays in Appendix 1.
Section (c) Provisions to address radiation effects	Not included in Appendix 1. Thermal neutron limitation imposed in the proposed alternative.
1.1 Performance Qualification Welding operators shall be qualified in accordance with Section IX.	2.2 Performance Qualification Welding operators shall be qualified in accordance with Section IX.
3.0 Welding Procedure Requirements	3.0 Welding Procedure Requirements
(a) (b) (c) (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. (d) same as N-638-1 but the following added: The interpass temperature of QW-406.3 need not be applied. This is identical wording to N-638-2, which has been approved by ASME.

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APPENDIX 5
COMPARISON OF SNC-PROPOSED ALTERNATIVE VERSUS CODE CASE N-638-1

Comparison of Proposed Alternative with N-638-1	
N-638-1	**APPENDIX 1 OF THE PROPOSED ALTERNATIVE**
(no corresponding section)	(e) Section 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. Examination and Inspection in the proposed alternative for requirements.
5.0 Documentation	5. Documentation in the proposed alternative.
(no corresponding section)	4. Pressure Testing in the proposed alternative.

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PROPOSED ALTERNATIVE IN ACCORDANCE WITH 10 CFR 50.55a(a)(3)(i)

APPENDIX 6
TYPICAL FIGURES

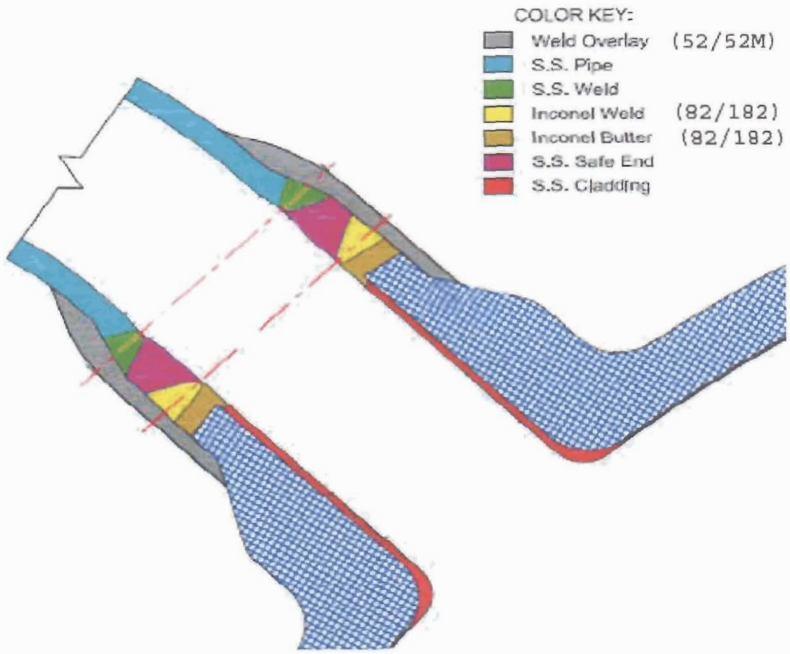

Figure 1 – Typical safety / relief nozzle configuration

APPENDIX 6
TYPICAL FIGURES

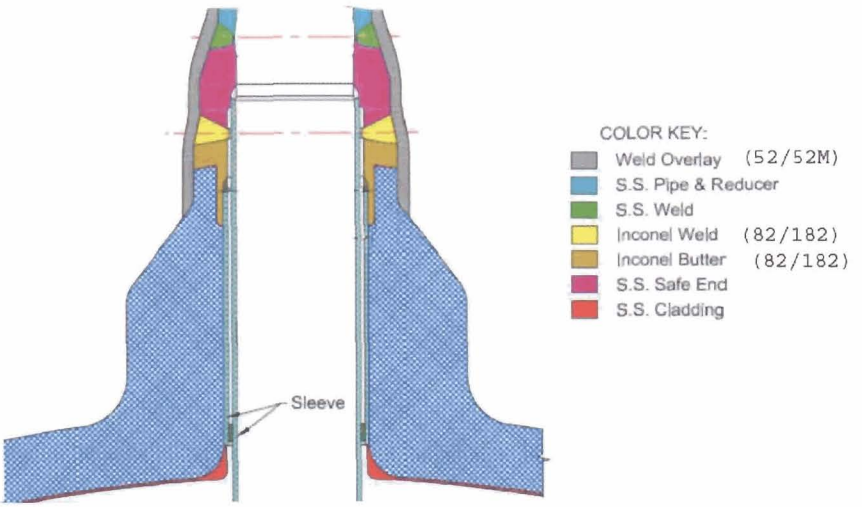

Figure 2 – Typical spray nozzle configuration

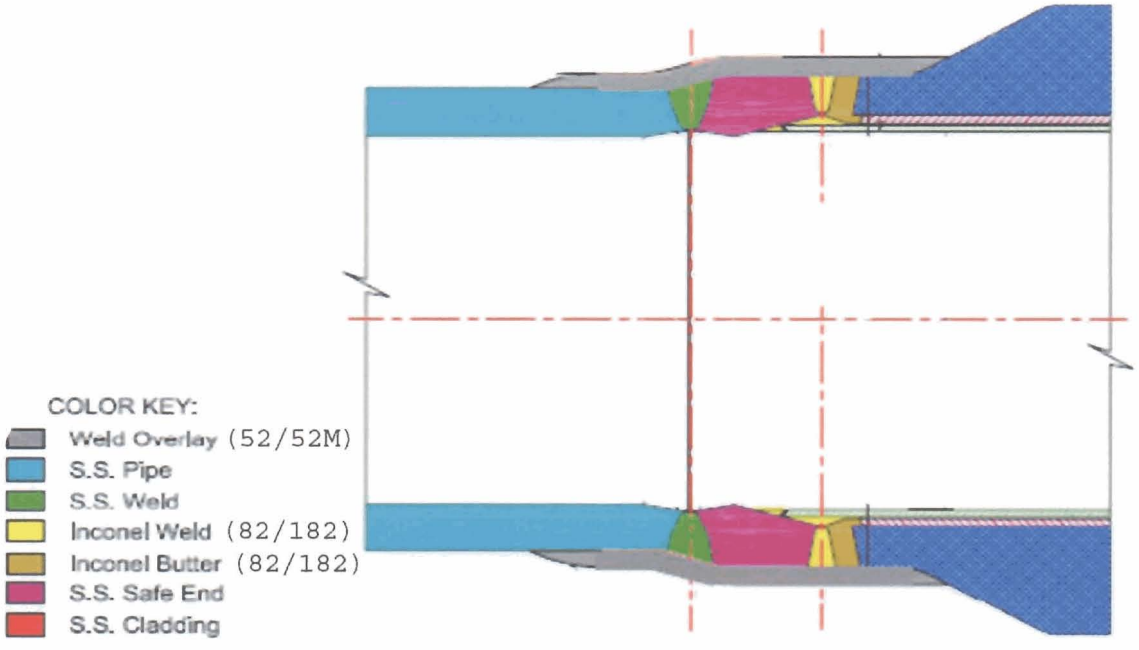

Figure 3 – Typical surge nozzle configuration