Dominion Nuclear Connecticut, Inc.
5000 Dominion Boulevard, Glen Allen, Virginia 23060
Web Address: www.dom.com

Dominion®

April 11, 2008

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Serial No.	07-0555B
NSSL/MAE	R3
Docket No.	50-336
License No.	DPR-65

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON ALTERNATIVE REQUEST RR-89-61, WELD OVERLAYS OF DISSIMILAR METAL WELDS

In a letter dated October 4, 2007 (Serial No. 07-0555), Dominion Nuclear Connecticut, Inc. (DNC) submitted Alternative Request RR-89-61 requesting approval for the use of weld overlays as an alternative repair and mitigation technique for primary water stress corrosion cracking (PWSCC) of susceptible dissimilar metal welds at Millstone Power Station Unit 2 (MPS2). On March 28, 2008, the NRC provided a draft request for additional information (RAI) related to the DNC request. The questions were discussed with the NRC staff in a telephone conference on April 2, 2008, and a response is provided in Attachment 1. A revised Alternative Request RR-89-61, (Revision 1) is provided as Attachment 2. This revision supercedes the request previously provided on October 4, 2007, and is consistent with the DNC response to NRC questions and the discussion held with NRC staff on April 2, 2008.

Should you have further questions, please contact Margaret A. Earle at (804) 273-2768.

Sincerely,

Gerald T. Bischof
Vice President – Nuclear Engineering

Commitments in this letter: None

A047
NRR

Attachments:

Attachment 1: Response to Request for Additional Information on Alternative Request RR-89-61, Weld Overlays of Dissimilar Metal Welds

Attachment 2: Alternative Request RR-89-61, Revision 1, Use of Weld Overlays as an Alternative Repair and Mitigation Technique

cc: U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Mr. J. D. Hughey
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop O-8B3
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON ALTERNATIVE REQUEST RR-89-61, WELD OVERLAYS OF DISSIMILAR METAL WELDS

MILLSTONE POWER STATION UNIT 2
DOMINION NUCLEAR CONNECTICUT, INC.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON ALTERNATIVE REQUEST RR-89-61, WELD OVERLAYS OF DISSIMILAR METAL WELDS

By letter dated October 4, 2007, Dominion Nuclear Connecticut, Inc. proposed an alternative (RR-89-61) to the requirements of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, for mitigating primary water stress corrosion cracking on dissimilar metal welds using full structural weld overlays at Millstone Power Station, Unit 2 (MPS2). To complete its review, the staff is requesting the following additional information.

NRC QUESTION 1:

Will pre-weld overlay ASME Section XI, Appendix VIII Supplement 10 ultrasonic examinations be performed on the welds described in Alternative RR-89-61? If not, it is the staff's understanding that the planned weld overlays are classified as "Repair Weld Overlays" in accordance with Enclosure 1 of Alternative RR-89-61. Is this correct? If the "repair weld overlays" are intended, clarify why the requirements for the mitigative weld overlays are specified in the proposed alternative.

RESPONSE:

No, the pre-weld overlay ASME Section XI, Appendix VIII, Supplement 10 ultrasonic examinations will not be performed. Yes, the preemptive weld overlays (PWOLs) will be treated as "Repair Weld Overlays." The terminology of a PWOL used in RR-89-61 and RR-89-61, Revision 1, is a term that is used to describe a weld overlay that is being applied to mitigate welds that are potentially susceptible to Primary Water Stress Corrosion Cracking (PWSCC). Specifically, PWOLs are being used because no pre-weld overlay Appendix VIII ultrasonic test (UT) examination will be performed and because PWOLs meet the requirements for "Repair Weld Overlays" contained in Attachment 2, Enclosure 1.

NRC QUESTION 2:

Discuss whether the subject nozzles have been ultrasonically examined under the RI-ISI program or MRP-139 in previous refueling outages. If so, discuss whether flaws have been detected in the subject nozzles.

RESPONSE:

Weld BPD-C-1001, 2" Nominal Pipe Size (NPS) Reactor Coolant System (RCS) Hot Leg Drain Line weld was UT examined, consistent with the criteria in MRP-139, during the spring 2005 outage (2R16) with no flaws detected. Weld BSD-C-2001, 12" NPS RCS Hot Leg Shutdown Cooling weld was UT examined in 2R16, during the spring 2005 outage with no flaws detected, but did not meet the criteria in MRP-139 because of the cast stainless steel safe end material. No credit was taken for this examination.

NRC QUESTION 3:

Describe the ISI program plans for the structural weld overlay (SWOL) population. Discuss the frequency, population and examination techniques. Paragraph 4.2 on page 12 of the proposed

alternative appears to conflict with Section 3(c) of Enclosure 1 of Alternative RR-89-61, with regard to ISI of cast stainless steel components.

RESPONSE:

Each weld overlay will be treated as a "Repair Weld Overlay" because no ASME Appendix VIII Supplement 10 ultrasonic examination will be performed prior to the application of the weld overlay. Because these are "Repair Weld Overlays," every weld overlay will be examined at least once within the next two refueling outages and then once every 10 years thereafter for ISI.

NRC QUESTION 4:

Paragraph 2(b)(2) on page 21 of the proposed alternative requires that the slope of the overlay not to exceed 30 degrees. This has been changed from 45 degrees as required in Code Case N-740. Confirm if the 30-degree angle is more conservative than the 45-degree angle.

RESPONSE:

Yes, this is more conservative because the 30-degree angle reduces the stress concentration at the end of the overlay from an abrupt transition and geometry at 45 degrees to one consistent with Section III, NB- 4250.

NRC QUESTION 5:

In Section 3 of Enclosure 1 of Alternative RR-89-61, the licensee stated that "...For cast stainless steel components for which no supplement is available in Appendix VIII, the weld volume shall be examined by Appendix VIII procedures to the maximum extent practicable and the remaining volume may be examined using Appendix III." Clarify the procedural requirements for the examination for the portions of cast stainless steel components not examined by Appendix VIII.

RESPONSE:

In Section 3 of Attachment 2, Enclosure 1, the reference to Appendix III has been deleted and the underlying cast stainless steel base material will be examined to the extent practical using both the Appendix VIII qualified procedure and personnel used to examine the weld overlay. Although the qualified procedure and personnel are not specifically qualified for cast stainless steel materials in accordance with Appendix VIII requirements, the techniques applied are intended to provide a "best effort" examination of the outer 25% of the cast stainless steel base material.

NRC QUESTION 6:

On page 19, paragraph 1(d)(3), of the October 4, 2007 submittal, the licensee stated that it may apply a layer of austenitic stainless steel filler metal across the austenitic stainless steel base metal to reduce the risk of cracks. Paragraph 1(e) requires existence of certain delta ferrite content in the welded metal when austenitic stainless steel weld metal is used, (A) identify the austenitic stainless steel weld filler metal that will be used for the butter layer, (B) confirm that the Certified Material Test Report (CMTR) for the austenitic stainless steel filler wire shows a

minimum delta ferrite of a specified amount. Please provide the maximum and minimum delta ferrite number.

RESPONSE:

Paragraph 1(d)(3) has been changed in Attachment 2, Enclosure 1 of RR-89-61, Revision 1 to clarify that the filler material used shall meet the minimum requirements for delta ferrite. This change is consistent with the latest ASME proposed criteria for weld overlay applications.

(A) In 2R18, the austenitic stainless steel weld filler metal that will be used for the first layer over the stainless steel safe end, weld, pipe, or elbow will be ER 308/308L (dual certified). In 2R19, the austenitic stainless steel weld filler metal that may be used would be selected and qualified by the applicable vendor and approved by DNC. It may be either ER 308/308L or ER 309/309L, depending on the vendor.

(B) In 2R18, the CMTR for the ER 308/308L filler metal (Arcos Lot No. XT8659 Heat No. 734815) has a delta ferrite number of 9FN as determined by chemical composition from WRC 1992 diagram in accordance with ASME Section III Fig. NB2433.1-1: WELD METAL DELTA FERRITE CONTENT. In 2R19, the actual filler metal, if used, will depend on the vendor selected to perform the weld overlays. The filler metal, if used to deposit the first layer of stainless steel weld metal over stainless steel base metal to prevent hot cracking, will be required to have a delta ferrite content of 7.5 FN minimum to 20 FN maximum.

NRC QUESTION 7:

On page 19, paragraph 1(d)(3), of the October 4, 2007 submittal, specifies that the thickness of the austenitic stainless steel filler metal over the austenitic base metal shall not be used in meeting the weld reinforcement design thickness requirements. Paragraph 1(e) provides requirements for the austenitic stainless steel weld metal. Paragraph 1(e) also requires that the austenitic stainless steel weld metal with delta ferrite content of at least 7.5 FN be considered as the first layer of the weld reinforcement. It seems that a potential conflict may exist between the requirements of paragraph 1(d)(3) and 1(e) regarding whether the first layer of the austenitic stainless steel weld metal can be credited for the weld overlay design thickness. Please clarify the intent of paragraphs 1(d)(3) and 1(e).

RESPONSE:

Paragraph 1(d)(3) is written to allow the deposition of a layer or two of stainless steel weld metal over the stainless steel safe end, weld, pipe, or elbow to prevent the occurrence of hot cracking which can result when Alloy 52/52M weld metal is deposited directly over stainless steel base metal with sulfur content exceeding 0.01%. This deposited weld metal is not considered a contributor to the strength of the weld overlay and is not counted as part of the weld overlay reinforcement thickness. Paragraph 1(e) allows options for the type of filler metal that can be used for weld overlays. Paragraph 1(e)(1) applies only when stainless steel weld metal is being used to deposit the weld overlay reinforcement and is not being used for the weld overlays that are going to be applied in 2R18. MPS2 is using paragraph 1(e)(2) which applies when austenitic nickel alloy weld metal is used for the weld overlay. This paragraph specifies that the first layer of weld metal deposited may not be credited toward the required thickness. There is no conflict between the requirements of paragraphs 1(d)(3) and 1(e) regarding whether the first

layer of austenitic stainless steel weld metal can be credited for the overlay design thickness. Both of the applicable paragraphs 1(d)(3) and 1(e)(2) clearly state that the first layer of austenitic stainless steel weld metal may not be used/credited in meeting the required weld reinforcement/design thickness.

NRC QUESTION 8:

Paragraphs 1(c)(1), 1(c)(1)(a), 1(c)(1)(b) of Enclosure 1 of Alternative RR-89-61 provide the alternative to the post weld heat treatment (PWHT) of the Construction Code and Owner's Requirements. The alternative eliminates PWHT for weld overlays when the overlay is applied to P-No.1 base material. As of March 2008, the staff still has concerns with this issue and has not decided the acceptability of the elimination of post weld heat treatment in paragraphs 1(c)(1)(a) and 1(c)(1)(b).

RESPONSE:

MPS2 will not use the alternative paragraphs of 1(c)(1)(a) and 1(c)(1)(b). Reference to these paragraphs have been deleted from Attachment 2, Enclosure 1, of RR-89-61, Revision 1.

NRC QUESTION 9:

As part of the installation of SWOLs at MPS2, the staff requests the following information be provided to the NRC within 14 days following the completion of the UT examination of the SWOL installations:

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

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

(C) Provide a report discussing any repairs to the weld overlay material and/or base metal and the reason for the repairs.

RESPONSE:

Reports for (A), (B), and (C) will be provided and will contain the requested information. (Refer to the required activities in Section 4.3.1 of Attachment 2.)

NRC QUESTION 10:

Paragraphs g(2) and g(3) of Code Case N-504-2 require evaluations of residual stresses and flaw growth of the repaired weldments. The NRC staff believes 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. (A) Confirm that the analysis will be performed to show that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied. (B) Confirm that the analysis includes the crack growth calculations to demonstrate that crack growth in the weld overlay or base metal is acceptable and residual stress distribution in the weld overlay and original weld demonstrate favorable stress distribution. The staff requests that the licensee submit the preliminary results of the evaluations prior to entry into Mode 4 from the refueling outage and the final evaluations within 60 days of the plant restart.

RESPONSE:

A weld qualification report, WCAP-16896-P, Revision 1, "MPS2 RCS Surge, Spray, Shutdown Cooling, Safety Injection Charging Inlet, and Letdown/Drain Nozzles Structural Weld Overlay Qualification," will be provided prior to Mode 4 of 2R18, which contains the requested information for the RCS piping. Analyses for the RCS branch piping that evaluate the impacts of weld shrinkage and stiffness are contained in separate changes to individual piping stress calculations. The impacts from shrinkage and stiffness are acceptable and the individual piping stress calculations will remain available on site for review.

Refer to the required activities in Section 4.3.1 of Attachment 2.

NRC QUESTION 11:

Paragraph I-2.1(h)(2) of Mandatory Appendix I of Enclosure 1 to Alternative RR-89-61 provides a means of determining an Adjustment Temperature for the welding procedure qualification. This Adjustment Temperature was not a part of Code Case N-638-1 and has therefore not been approved by the staff. Explain the technical basis of this requirement.

DNC Response

MPS2 will not use the adjustment temperature for the procedure qualification in I-2.1(h)(2). It has been deleted from Attachment 2, Enclosure 1, Mandatory Appendix I, of RR-89-61, Revision 1.

NRC QUESTION 12:

The staff has determined that a number questions submitted during the review of Alternative Request IR-2-47, Revision 1 dated March 28, 2007 for Millstone Unit 3 are applicable to the review of Alternative RR-89-61. Please confirm that the answers to questions 14 through 21 in your March 28, 2007 letter for Millstone Unit 3 weld overlay Alternative Request IR-2-47, Revision 1 (ADAMS Accession No. ML070880565) remain valid with regard to Alternative RR-89-61.

RESPONSE:

The only difference is in the response to Question 20 where it stated that, as part of the Westinghouse/PCI weld process used, DNC will use contact pyrometers to determine interpass temperatures. For the MPS2 weld overlays contact pyrometers will still be used, however for 2R18, this will be part of the welding process used by Welding Services, Inc., in lieu of Westinghouse/PCI.

NRC QUESTION 13:

Paragraph 3(a)(3)(a) states that "...In applying the acceptance standards to planar indications the thickness t_1, t_2, or t_3 defined in Fig. 1(b) shall be used as the nominal wall thickness in Table IWB-3514-2..." The staff has reservation regarding the definition and concept of t_3 in Figure 1(b) because of the concern on the measurement accuracy and inherent ultrasonic examination uncertainty. Justify the use of the t_3 parameter or eliminate the t_3 definition from paragraph 3(a)(3)(a) and Figure 1(b).

RESPONSE:

The t_3 parameter will not be used. Paragraph 3(a)(3)(a) of RR-89-61, Revision 1, has been reworded to read: Planar flaws detected in the weld overlay acceptance examination shall meet the preservice examination standards of IWB-3514. In applying the acceptance standards to planar indications, the thickness t_1, or t_2 defined in Fig. 1(b), shall be used as the nominal wall thickness in IWB-3514, provided the base metal beneath the flaw (i.e., safe end, nozzle, or piping material) is not susceptible to stress corrosion cracking (SCC). For susceptible material, t_1 shall be used. If a flaw in the overlay crosses the boundary between the two regions, the more conservative of the two dimensions (t_1, or t_2) shall be used. This requirement is consistent with the latest ASME proposed criteria related to weld overlays with cast stainless steel base material. Additionally, Figure 1(b) has been replaced with a new Figure 1(b) that does not use the t_3 parameter.

NRC QUESTION 14:

Paragraph 2(a)(4) states that "For austenitic cast stainless steel components, initial inside-surface-connected planar flaws equal to 75% of the original wall thickness shall be assumed provided 90% of the examination volume, as defined in Fig. 2, is obtained. If 90% coverage is not obtained, a 100% through-wall flaw shall be assumed". The staff has concern regarding use of the criterion of 90% examination coverage in deciding the initial flaw size in crack growth calculations in Paragraph 2(a)(4). The staff has provided 2 options in term of flaw size as shown in the Safety Evaluation for ANO-2 weld overlay relief request dated March 17, 2008 (ADAMS Accession No. ML080660082). In the ANO-2 Safety Evaluation, the staff specified the following options:

> Option (1): The initial flaw depth should be postulated at 100 percent through-wall for the crack-growth calculations.
>
> Option (2): If the 100 percent through-wall flaw is impractical or creates a hardship in the overlay design or installation, an initial flaw with 75 percent through-wall depth may be assumed in the crack-growth calculation. However, the required inspection volume for

Option 2 needs to be examined at a higher frequency. The subject weld shall be UT inspected during the first or second refueling outage following the weld overlay installation. If UT is performed prior to weld overlay installation and after installation without detecting any planar flaws in the original weld and the weld overlay, the first or second refueling outage UT may be eliminated. After the first ISI examination, the required inspection volume shall be UT inspected every 10 years from the date of the installation until such time when UT is qualified to examine the CASS portion of the required inspection volume in accordance with new performance demonstration requirements of ASME Code, Section XI, Appendix VIII. After the subject weld is examined by qualified UT for the CASS material and no planar flaws are detected, the weld may be placed in the 25 percent sample inspection population. The inspection of the overlaid weld shall not be credited to satisfy the requirement of the 25 percent sample inspection every 10 years of overlaid welds with non-CASS materials.

Justify the requirements of Paragraph 2(a)(4) or use one of the above options.

RESPONSE:

Option (1) will be used for all the repair weld overlays at MPS2. A 100% through-wall flaw has been postulated for the required crack growth calculations. The requirements of Paragraph 2(a)(3), (4), (5), and (6) will not be applicable at MPS2 and have been deleted from the requirements in Attachment 2, Enclosure 1, of RR-89-61, Revision 1. Inservice examinations will be added to the inspection plan and each weld overlay will be UT examined at least once within the next two refueling outages and then once every 10 years thereafter and in no case will these examinations exceed the design life of the weld overlay.

NRC QUESTION 15:

On page 18 of the proposed alternative the licensee states that "All ASME Code references are to the 2004 Edition with the 2006 Addenda." The NRC staff has not endorsed the 2004 Edition with the 2006 Addenda code in 10 CFR 50.55a. Therefore, the licensee needs to revise the above statement.

RESPONSE:

DNC understands that the NRC has not endorsed the 2004 Edition and the 2006 Addenda in 10 CFR 50.55a. However, the next sentence refers to Table 1 for use of these alternative requirements with other editions and addenda. The reference to the 2004 Edition and the 2006 Addenda has been deleted from Attachment 2, Enclosure 1, of RR-89-61, Revision 1 and now has been changed to read: "All Section XI references are to the 1998 Edition with No Addenda as shown in Table 1." The 1998 Edition with No Addenda is the Section XI Code edition and addenda that applies to the MPS2 Section XI Repair and Replacement Program and is endorsed in 10 CFR 50.55a.

NRC QUESTION 16:

On page 3 of the proposed alternative, the licensee cited NRC Regulatory Guide 1.147, Revision 14 and Code Case N-504-2. The staff notes that Regulatory Guide 1.147, Revision 15 has been published and is incorporated in the 10 CFR 50.55a. The staff further notes that Code

Case N-504-3 has been approved as shown in Regulatory Guide 1.147, Revision 15. The licensee needs to use Code Case N-504-3 and cite Regulatory Guide 1.147, Revision 15 in the proposed alternative or justify why Code Case N-504-2 is acceptable.

RESPONSE:

The references to Code Case N-504-2 and Regulatory Guide 1.147 Rev. 14 have been revised to N-504-3 and Rev. 15 in Attachment 2 of RR-89-61, Revision 1.

NRC QUESTION 17:

On page 13, Section 4.3 of the proposed alternative, the licensee states, "... the alternatives... will not include any UT examination of the CSS base material because there are no current requirements for UT qualification or performance demonstration requirements that can be consistently met for this material." The staff agrees with the licensee that UT is not qualified to examine cast austenitic stainless steel (CSS). However, this does not preclude the use of "best effort" examinations performed per Appendix III of the ASME Code, Section XI. Please clarify why the proposed alternative will not include UT examination of the CSS base metal.

RESPONSE:

Section 4.3 has been revised in Attachment 2, RR-89-61, Revision 1 to read as follows: "For all PWOLs "Repair Weld Overlays" UT examinations will be performed to meet the alternative requirements of Enclosure 1. The UT examination, after a completed PWOL, will be performed in accordance with ASME Code Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 11 (Reference 7.8) with the alternatives that are used to comply with the Performance Demonstration Initiative (PDI) program, contained in Enclosure 2. The underlying cast stainless steel base material will be examined to the extent practical using the Appendix VIII qualified procedure and personnel used to examine the weld overlay. Although the procedure and personnel are not specifically qualified for cast stainless steel materials in accordance with Appendix VIII requirements, the techniques applied are intended to provide a "best effort" examination of the outer 25% of the cast stainless steel base material."

NRC QUESTION 18:

On page 25, of the proposed alternative, Paragraph 3(b)(1) states, "...For weld overlays with cast austenitic stainless steel base materials only planar flaws that might have propagated into the weld overlay are required to be located and sized." Clarify the intent of the above statement. Why are only planar flaws required to be located and sized?

RESPONSE:

Paragraph 3(b)(1) of Attachment 2, Enclosure 1, RR-889-61, Revision 1 has been changed to read as follows: "The examination volume in Figure 2 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 planar flaws that might have propagated into the outer 25% of the base material or into the weld overlay. For weld overlays with cast austenitic stainless steel base materials, the underlying cast stainless steel material will be examined to locate and size any planar flaws that might have propagated into the outer 25% of

the base material or into the weld overlay. This examination will be performed on a "best effort" basis using the Appendix VIII qualified examination procedure and personnel used to examine the weld overlay. For weld overlays on cast austenitic stainless steel base materials, if a 100% through-wall flaw is used for crack growth, only planar flaws that have propagated into the weld overlay or are in the overlay are required to be located and sized." The basis for only relating these requirements to planar flaws is because these weld overlays on cast stainless steel base materials have already been examined under the requirements of 3(a) for acceptance examination for both planar and laminar type flaws. There would be no benefit in reevaluating any existing laminar flaws as part of a pre-service examination. Any flaws in these weld overlays would have to have already been evaluated and accepted by the criteria provided in 3(a). Thus, only planar flaws that are in the weld overlay and that could potentially propagate further into the weld overlay inservice, and in the future, are required to be located and sized under the requirements of 3(b).

NRC QUESTION 19:

On page 12, Section 4.2, the licensee states, "...DMWs made with CSS base material will be designed for a minimum design life of 10 years..." Clarify whether DMWs made with CSS base material are designed for 10 years or the weld overlays installed on DMWs made with CSS material are designed for minimum of 10 years. In either case, clarify why a weld or a weld overlay is designed for only 10 years.

RESPONSE:

Paragraph 4.2 in Attachment 2 of RR-89-61, Revision 1 has been changed by adding the following words: "The weld overlays with CSS material are designed for a minimum of 10 years. This 10-year minimum is based on postulating a 100% through-wall crack for the original material and then calculating the growth of that crack into the weld overlay material via fatigue crack growth analysis. Fatigue crack growth analysis has been performed for each of the weld overlays to ensure that growth of a crack into the weld overlay material due to fatigue over a ten-year interval will not result in the postulated crack exceeding 75% of the total post-overlay wall thickness. Each weld overlay will be examined at least once within the next two refueling outages and then once every 10 years thereafter for ISI and in no case will these examinations exceed the design life of the weld overlay."

NRC QUESTION 20:

The following typographical errors were identified in the proposed alternative and should be corrected:

a. On page 25, Figure 2 of Enclosure 1 is labeled FIG. 2 PRESERVICE AND INSERVICE EXAMINATION VOLUME E-F-G-H . The E-F-G-H should either be deleted or changed to A-B-C-D as shown in the figure.
b. On page 27, Section I-2 of Mandatory Appendix I states, "...in accordance with Section IX and the requirements of I-1 and I-2." The paragraphs cited should be I-2.1 and I-2.2.
c. On page 28, Section I-2.1(e) of Mandatory Appendix I cites paragraph I-1(f). The correct paragraph is I-2.1(f).
d. On page 28, Section I-2.1(f) of Mandatory Appendix I cites paragraph I-1(e). The correct paragraph is I-2.1(e).

RESPONSE:

All typographical errors have been corrected as identified above.

ATTACHMENT 2

ALTERNATIVE REQUEST RR-89-61, REVISION 1, USE OF WELD OVERLAYS AS AN ALTERNATIVE REPAIR AND MITIGATION TECHNIQUE

MILLSTONE POWER STATION UNIT 2
DOMINION NUCLEAR CONNECTICUT, INC.

ATTACHMENT 2
ALTERNATIVE REQUEST RR-89-61, REVISION 1, USE OF WELD OVERLAYS AS AN ALTERNATIVE REPAIR AND MITIGATION TECHNIQUE

CONTENTS

ENCLOSURE 1 - FIGURES

ENCLOSURE 1 - TABLES

ENCLOSURE 2

ACYRONYMS

ALARA	As Low As Reasonably Achievable
CFR	Code Of Federal Regulations
CE	Combustion Engineering
CS	Carbon Steel
CSS	Cast Stainless Steel
DMW	Dissimilar Metal Weld
DNC	Dominion Nuclear Connecticut, Inc.
FSWOL	Full Structural Weld Overlay
HSS	High Safety Significant
ISI	Inservice Inspection
MPS2	Millstone Power Station Unit 2
NPS	Nominal Pipe Size
NRC	U. S. Nuclear Regulatory Commission
OD	Outside Diameter
PDI	Performance Demonstration Initiative
PWHT	Post Weld Heat Treatment
PWOL	Preemptive Weld Overlay
PWSCC	Primary Water Stress Corrosion Cracking
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RI-ISI	Risk-Informed Inservice Inspection
SS	Stainless Steel
UT	Ultrasonic Test
WOL	Weld Overlay
WPS	Welding Procedure Specification

ATTACHMENT 2
ALTERNATIVE REQUEST RR-89-61, REVISION 1, USE OF WELD OVERLAYS AS AN ALTERNATIVE REPAIR AND MITIGATION TECHNIQUE

Proposed Alternative
In Accordance with 10 CFR 50.55a(a)(3)(i) and 10 CFR 50.55a(a)(3)(ii)

- Alternative Provides Acceptable Level Of Quality And Safety And Compliance With The Specified Requirements Results In A Hardship Without A Compensating Increase In The Level Of Quality And Safety -

1.0 REASON FOR THE REQUEST

The American Society of Mechanical Engineers, Boiler and Pressure Vesesl Code (ASME Code), Section XI, 1998 Edition, No Addenda, IWA-4000 (Reference 7.1), is used for the Millstone Power Station Unit 2 (MPS2) Section XI repair/replacement program.[1] Currently, there is no comprehensive set of Code criteria addressing application of a full structural weld overlay (FSWOL) as a preemptive weld overlay (PWOL) to a dissimilar metal weld (DMW) that is constructed of Alloy 82/182 weld material. Additionally, ultrasonic test (UT) examination performance qualification requirements for DMWs made with austenitic cast stainless steel (CSS) base material are not addressed by the Code. Repair/replacement activities associated with weld overlay (WOL) repairs or PWOL applications are required to address the materials, welding parameters, ALARA concerns, operational constraints, examination techniques, and procedure requirements for conduct of those activities.

The following documents provide a limited set of criteria needed to apply a WOL repair for unacceptable indications and installation of a PWOL for mitigation of PWSCC susceptibility in DMWs with Alloy 82/182 weld material, including the use of temper bead welding without preheat or post weld heat treatment, but they do not contain all the needed criteria.

- ASME approved Code Cases related to this topic that are listed as acceptable for use in NRC Regulatory Guide 1.147, Revision 15 (Reference 7.2). These Code Cases have the following conditions associated with their approval status:

  - N-504-3 (Reference 7.3): The provisions of Section XI, Non-mandatory Appendix Q, "Weld Overlay Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Weldments," must also be met. (This appendix is now published in the 2005 Addenda of ASME Section XI.)

  - N-638-1 (Reference 7.4): UT examinations shall be demonstrated for the repaired volume using representative samples, which contain construction type flaws. The acceptance criteria of NB-5330 of Section III edition and addenda approved in 10 CFR 50.55a apply to all flaws identified within the required volume.

---

(1) NRC letter, "Millstone Power Station, Unit Nos. 2 and 3 RE: Request to Use 1998 Edition, with No Addenda, of ASME Section XI for Repair/Replacement Activities (TAC Nos. MC7347and MC7348),"dated September 13, 2005, (ADAMS Accession No. ML052210033).

- ASME developed and approved Code Cases that are not yet reviewed and approved by the NRC:

  - Code Case N-740, (Reference 7.5), and N-740-1, which includes criteria for WOL repairs using austenitic nickel based materials, and N-740-2, which includes requirements for weld overlays with cast stainless steel base materials.

- ASME Code 1998 Edition, Section XI.

The alternatives in this request have been developed to provide the needed criteria for performance of the weld overlay activities taking into consideration the requirements to address the materials, welding parameters, ALARA concerns, operational constraints, examination techniques, and procedure requirements for conduct of those activities. Dominion Nuclear Connecticut, Inc. (DNC) has determined that with this comprehensive set of criteria this request can be used at MPS2 to provide an acceptable level of quality and safety in the FSWOLs as either a repair WOL or a mitigative PWOL while at the same time addressing the hardship involved with the UT examination of austenitic CSS base material.

2.0 CODE COMPONENTS FOR WHICH THE ALTERNATIVE IS REQUESTED

Code components associated with this request are the high safety significant (HSS) Class 1 piping DMWs with Alloy 82/182 weld metal that are believed to be susceptible to PWSCC and scheduled for examination in accordance with the Risk-Informed Inservice Inspection (RI-ISI) Program and the Guidelines of MRP-139 (Reference 7.6). This request has been written to cover FSWOLs for all the MPS2 Alloy 82/182 DMWs 2-inch nominal pipe size (NPS) and larger with the exception of eight 36-inch outside diameter (OD) reactor coolant system (RCS) cold leg DMWs to the reactor coolant pumps (RCPs). Limited UT examination of all eight of the 36-inch cold leg welds is addressed in a separate alternative request RR-89-64.

For the upcoming Cycle 18 refueling outage (2R18), six nozzles with HSS DMWs described in Table 1 below are currently scheduled to have full structural PWOLs applied. These nozzle welds and adjacent stainless steel safe end to elbow or pipe welds are listed in Table 1 along with any additional welds that would be required to have PWOLs or additional UT examinations added if PWSCC is found during the post WOL UT examination.

Table 1: Cycle 18 Welds Affected By This Alternative (1)

Nozzle to safe end welds	Adjacent SS safe end to elbow or pipe weld	Additional Nozzle to safe end welds	Adjacent SS safe end to elbow or pipe weld
12-inch NPS RCS Hot Leg Surge Line Welds		**2-inch NPS RCS Hot Leg Drain Line Weld** BPD-C-1001, This Weld Would Be UT Examined. Completed UT In Cycle 16 No Indications Of PWSCC	
BPS-C-1001	BPS-C-1003		
12-inch NPS RCS Hot Leg Shutdown Cooling Welds			
BSD-C-2001	BSD-C-2003		
12-inch NPS RCS Cold Leg Safety Injection (SI) Loop 2A and Loop 1B Line Welds		**12-inch NPS RCS Cold Leg Safety Injection (SI) Loops 1A and 2B Line Welds**	
BSI-C-2001 BSI-C-3000	BSI-C-2003 BSI-C-3002	BSI-C-1001 BSI-C-4000	BSI-C-1003 BSI-C-4002
2-inch NPS RCS Cold Leg Charging Line Welds		**2-inch NPS RCS Cold Leg Charging Line Welds**	
BCH-C-1001	BCH-C-1003	BCH-C-2001	BCH-C-2003
3-inch NPS RCS Cold Leg Spray Line Welds		**2-inch RCS Cold Leg Drain Line Welds**	
BPY-C-1001	BPY-C-1003	BPD-C-1017	BPD-C-1019
		BPD-C-3000	BPD-C-3002
		BPD-C-2001, This Weld Would Be UT Examined.	
		3-inch NPS RCS Cold Leg Spray Line Welds	
		BPY-C-3000	BPY-C-3002
		2-inch NPS RCS Cold Leg Letdown Nozzle Weld BPD-C-4000, This Weld Would Be UT Examined. Completed UT In Cycle 16 No Indications Of PWSCC	

NOTE: (1) DMWs may be added from Table 2 if time and resources become available during the 2R18 refueling outage to reduce the scheduled scope of FSWOLs in 2R19.

For the Cycle 19 refueling outage (2R19), the remaining nine nozzles with HSS DMWs, described in Table 2 below, are currently scheduled to have full structural PWOLs applied. These nozzle welds and adjacent stainless steel safe end to elbow or pipe welds are listed in Table 2. No additional welds would be required to be UT examined or have PWOLs addressed if PWSCC was found during the post WOL UT examination.

Table 2: Cycle 19 Welds Affected By This Alternative

Nozzle to safe end welds	Adjacent SS safe end to elbow or pipe weld	Additional Nozzle to safe end welds	Adjacent SS safe end to elbow or pipe weld
12-inch NPS RCS Cold Leg Safety Injection (SI) Loop 1A and Loop 2B Line Welds		None	
BSI-C-1001 BSI-C-4000	BSI-C-1003 BSI-C-4002		
2-inch NPS RCS Hot Leg Drain Line Welds		None	
BPD-C-1001	BPD-C-1003		
2-inch NPS RCS Cold Leg Letdown Line Welds		None	
BPD-C-4000	BPD-C-4002		
2-inch NPS RCS Cold Leg Charging Line Welds		None	
BCH-C-2001	BCH-C-2003		
3-inch NPS RCS Cold Leg Spray Line Welds		None	
BPY-C-3000	BPY-C-3002		
2-inch NPS RCS Cold Leg Drain Line Welds		None	
BPD-C-1017	BPD-C-1019		
BPD-C-3000	BPD-C-3002		
BPD-C-2001	BPD-C-2003		

Twelve of the fifteen MPS2 piping DMWs will not support an ASME Code Section XI, Appendix VIII, Supplement 10 (Reference 7.7), weld UT examination without extensive machining.

The performance of extensive machining to prepare these DMWs for UT examination and performing the examination will be greatly reduced with the application of a full structural PWOL. A full structural PWOL can be applied in a manner that will allow these welds to be examined following the application of the PWOL. This examination can be accomplished using the Performance Demonstration Initiative (PDI) and the alternatives to ASME Code Section XI, Appendix VIII, Supplement 11 (Reference 7.8) that are described in Enclosure 2, Table 1 of this request and supplemented by the alternative requirements in Enclosure 1 that address PWOL design and examination alternatives when CSS base material is present.

2.1 Category and System Details

Code Class:	All listed welds are ASME Code Class 1 welds.
System Welds:	Components are located in the Reactor Coolant System (RCS) pressure boundary.
Code Category:	Examination Category R-A, "Risk-Informed Piping Examinations"
Code Item No.:	R1.15, "Elements subject to PWSCC"

2.2 Component Descriptions and Materials

The materials and configuration descriptions for the 15 nozzles with DMWs that are scheduled for full structural PWOLs in the Cycle 18 and 19 refueling outages are described in Table 3 below.

Table 3: Materials And Configurations For All Welds Affected By This Alternative

Nozzle to safe end weld	Materials	Adjacent SS safe end to elbow or pipe weld	Materials
12-inch NPS RCS Hot Leg Surge Line Welds			
BPS-C-1001	Nozzle is (P-No. 1) Carbon Steel, A 105 GR II, Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) Cast SS, A 351 GR CF8M	BPS-C-1003	Safe End is (P-No. 8) Cast SS, A 351 GR CF8M, Weld is SS, and Elbow is (P-No. 8) Cast SS, A 351 GR CF8M
12-inch NPS RCS Hot Leg Shutdown Cooling Welds			
BSD-C-2001	Nozzle is (P-No. 1) Carbon Steel, A 105 GR II, Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) Cast SS, A 351 GR CF8M	BSD-C-2003	Safe End is (P-No. 8) Cast SS, A 351 GR CF8M, Weld is SS, and Pipe is (P-No. 8) SS A-376 316
12-inch NPS RCS Cold Leg Safety Injection (SI) Loop 1A, 1B, 2A, and Loop 2B Line Welds			
BSI-C-1001 BSI-C-3000 BSI-C-2001 BSI-C-4000	Nozzle is (P-No. 3) Alloy Steel, A 182 F1, Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) Cast SS, A 351 GR CF8M	BSI-C-1003 to (P) BSI-C-3002 to (E) BSI-C-2003 to (P) BSI-C-4002 to (E)	Safe End is (P-No. 8) Cast SS, A 351 GR CF8M, SS Weld, Pipe (P) is (P-No. 8) SS A-376 316, and Elbow (E) is (P-No. 8) SS A-403 WP 316
2-inch NPS RCS Hot Leg Drain And Cold Leg Letdown Line Welds			
BPD-C-1001 BPD-C-4000	Nozzle is (P-No. 1) Carbon Steel, A 105 GR II, Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) SS SA 182 TYPE 316	BPD-C-1003 BPD-C-4002	Safe End is (P-No. 8) SS SA 182 TYPE 316, SS Weld, and Pipe is (P-No. 8) SS A-376 316

Table 3: Materials And Configurations For All Welds Affected By This Alternative

Nozzle to safe end weld	Materials	Adjacent SS safe end to elbow or pipe weld	Materials
3-inch NPS RCS Cold Leg Spray Line Welds			
BPY-C-1001 BPY-C-3000	Nozzle is (P-No. 1) Carbon Steel, A 105 GR II, Weld and Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) SS SA 182 TYPE 316	BPY-C-1003 BPY-C-3002	Safe End is (P-No. 8) SS SA 182 TYPE 316, SS Weld, and Pipe is (P-No. 8) SS A-376 316
2-inch NPS RCS Cold Leg Drain Line Welds			
BPD-C-1017 BPD-C-3000 BPD-C-2001	Nozzle is (P-No. 1) Carbon Steel, A 105 GR II, Weld and Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) SS SA 182 TYPE 316	BPD-C-1019 BPD-C-3002 BPD-C-2003	Safe End is (P-No. 8) SS SA 182 TYPE 316, SS Weld, and Pipe is (P-No. 8) SS A-376 316
2-inch NPS RCS Cold Leg Charging Line Welds			
BCH-C-1001 BCH-C-2001	Nozzle is (P-No. 1) Carbon Steel, A 105 GR II, Weld and Weld and Butter are Alloy 82/182, Safe End is (P-No. 8) SS SA 182 TYPE 316	BCH-C-1003 BCH-C-2003	Safe End is (P-No. 8) SS SA 182 TYPE 316, SS Weld, and Pipe is (P-No. 8) SS A-376 316

3.0 CODE REQUIREMENTS FOR WHICH THE ALTERNATIVE IS REQUESTED

The ASME Code requirements for which the alternative is requested are contained in the following:

- ASME Code, Section XI, 1998 Edition, No Addenda, IWA-4000 (Reference 7.1)
- ASME Code, Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 11 (Reference 7.8)

MPS2 is in its third 10-year ISI interval, which started on April 1, 1999 and has been extended to end on March 31, 2010.[2] The 1995 Edition of Section XI with the 1996 Addenda, Appendix VIII, Supplement 10 (Reference 7.7) is used for UT examination performance demonstration requirements for dissimilar metal welds including the limitations in 10 CFR 50.55a(b), and these requirements are implemented under the industry PDI.

Additionally, the requirements of 10 CFR 50.55a(g)(6)(ii)(C) apply when implementing Appendix VIII of the ASME Code, Section XI, 1995 Edition with the 1996 Addenda, Supplement 11 (Reference 7.8). Appendix VIII of the Code contains UT examination performance qualification requirements for completed FSWOLs, is used for repair WOLs or PWOLs, and does not address UT examination when the base material is made of austenitic CSS.

4.0 PROPOSED ALTERNATIVES AND SUPPORTING INFORMATION

DNC is proposing to use alternative requirements submitted in Enclosure 1 under the provisions of 10 CFR 50.55a(a)(3)(i). These alternative requirements are the result of the industry's operating experience (OE) with WOL repairs for flaws suspected or confirmed to be from PWSCC, and for the PWOLs which are being directly applied to DMWs with both austenitic stainless steel Type 308 or 309 and austenitic nickel based Alloy 52M weld material.

For all the scheduled full structural PWOLs, the potential WOL repairs, and additional PWOLs that may be applied in the case of required additional examinations, the application of this alternative request will include the adjacent stainless steel safe end-to-pipe or safe end-to-elbow welds. The general configuration of a typical WOL is depicted in Figure 1 of this section.

This alternative request will continue to be used to support implementing future phases of the control and remediation plan for the PWSCC susceptible materials at MPS2. The alternative requirements of this request will be applied for the duration of up to and including the last refueling outage of the current third 10-year ISI interval.

4.1 The Structural Weld Overlay Assembly:

The ferritic material of the nozzles is either (P-No. 1) or (P-No. 3). The safe ends and elbows are either wrought SS or CSS (P-No. 8). The pipe is wrought SS (P-No. 8) material. The existing weld filler material for the PWSCC susceptible welds is Alloy 82/182 (F-No. 43 equivalent to P-No. 43).

The FSWOL replaces all the structural design requirements of the pipe as if the pipe were not there. As shown in Figure 1 of this section, this WOL (weld reinforcement) will completely cover the existing Alloy 82/182 weld metal and will extend onto the ferritic and austenitic SS material on each end of the DMW, including the adjacent SS weld. Although the WOL extends the full 360° around the nozzle, only half is shown in Figure 1 for clarity. In all cases under the alternative requirements of this request, a FSWOL (designed for the

---

[2] DNC letter to NRC, Millstone Units 2 & 3, Inservice Testing and Inservice Inspection Programs 10-Year Interval Changes," dated: May 3, 2007, (ADAMS Accession No. ML071350369).

worst case flaw) will be applied in accordance with the alternative requirements in Enclosure 1 with a UT examination following the application of any repair WOL or PWOL.

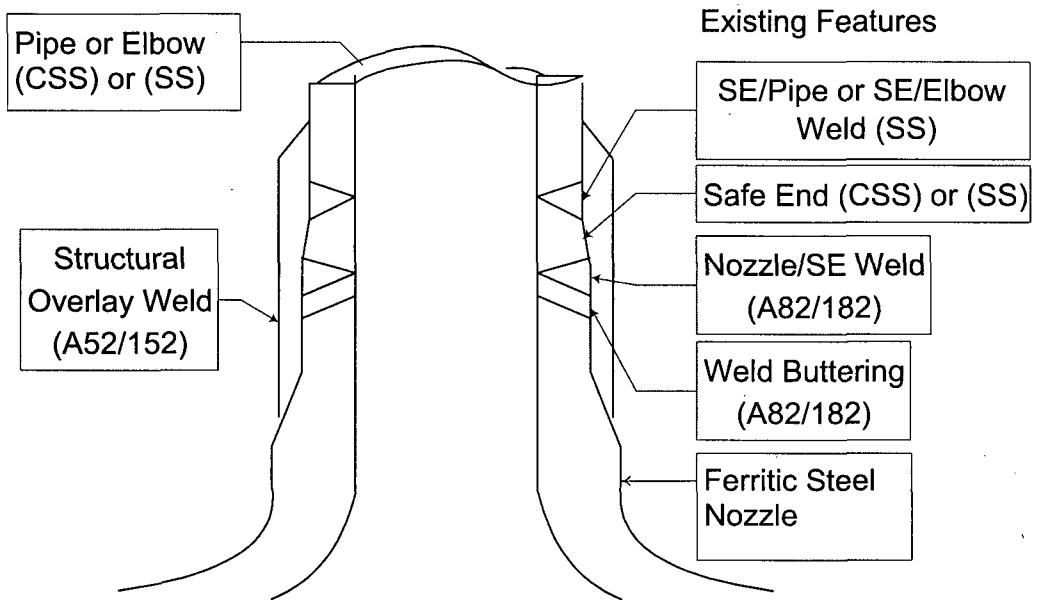


Figure 1 –Typical Weld Overlay Configuration

4.2 Weld Overlay Design:

The PWOLs will be designed as FSWOLs (assumed worst case flaw) in accordance with Section 2.0 of the alternative requirements of Enclosure 1. The details surrounding the design analysis for all the scheduled PWOLs are being developed to support the MPS2 Cycle 18 and Cycle 19 refueling outages and DNC's vendor has committed to supplying this analysis to DNC. As soon as this analysis is available, it will be processed and submitted for NRC review, but no later than prior to entry into Mode 4 in the startup from 2R18. The FSWOLs that will be applied to the DMWs at MPS2 without CSS base material will be designed for the remaining plant life. The weld overlays with CSS material are designed for a minimum of 10 years. This 10-year minimum is based on postulating a 100% through-wall crack for the original material and then calculating the growth of that crack into the weld overlay material via fatigue. Fatigue crack growth analysis has been performed for each of the weld overlays to ensure that growth of a crack into the weld overlay material due to fatigue over a ten-year interval will not result in the postulated crack exceeding 75% of the total post-overlay wall thickness. Each weld overlay will be examined at least once within the next two refueling outages and then once every 10 years thereafter for ISI and in no case will these examinations exceed the design life of the weld overlay.

4.3 Examinations

For all PWOLs "Repair Weld Overlays" UT examinations will be performed to meet the alternative requirements of Enclosure 1. The UT examination, after a completed PWOL, will be performed in accordance with ASME Code Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 11 (Reference 7.8) with the alternatives that are used to comply with the PDI program, contained in Enclosure 2. The underlying CSS base material will be examined to the extent practical using the Appendix VIII qualified procedure and personnel used to examine the weld overlay. Although the procedure and personnel are not specifically qualified for CSS materials in accordance with Appendix VIII requirements, the techniques applied are intended to provide a "best effort" examination of the outer 25% of the CSS base material.

4.3.1 Required Activities

(Refer to response from RAI Questions 9 and 10 in Attachment 1.)

DNC will provide the following information within 14 days following the completion of the UT examination of the SWOL installations:

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

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

(C) A report will be provided discussing any repairs to the weld overlay material and/or base metal and the reason for the repairs.

A preliminary report, prior to entry into Mode 4 from the refueling outage, and a final evaluation within 60 days of the plant restart, will both be submitted. DNC will provide the preliminary results of evaluations that are described in Paragraphs g(2) and g(3) of Code Case N-504-3, which require evaluations of residual stresses and flaw growth of the repaired welds. 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. The analysis will be performed to show that the requirements of Subarticles NB-3200 and NB-3600 of the ASME Code, Section III are satisfied. The analysis includes the crack growth calculations to demonstrate that crack growth in the weld overlay or base metal is acceptable and residual

stress distribution in the weld overlay and original weld demonstrate favorable stress distribution.

4.4 Hot Cracking

OE exists for hot cracking in the first layer of nickel alloy WOL deposits over SS base materials. The major WOL vendors have all decided to alleviate this concern by applying austenitic SS 308 or 309 weld metal over the SS base materials included in the WOL. For MPS2, there is no plan to incorporate this first layer of weld metal into the structural design thickness of the weld overlay. However, Enclosure 1 does provide criteria to allow this first layer to be used as part of the WOL with additional requirements. If this is done, MPS2 will meet those requirements.

4.5 Discussion on Acceptable Level of Quality or Safety or Hardship Without A Compensating Increase in the Level of Quality or Safety

4.5.1 The use of the alternatives described in this request for the design of FSWOLs applied as either a repair WOL or a mitigative PWOL will result in an acceptable level of quality and safety for the following reasons:

- a FSWOL design does not take credit for the original DMW or SS weld and replaces all the structural design requirements of the pipe, as if the pipe were not there;
- the material used in the PWOL or the WOL is Alloy 52M filler material, which is resistant to PWSCC;
- the compressive stress created by the WOL in the underlying base material should prevent or minimize the growth of any existing flaws; and,

4.5.2 The inherent limitations associated with UT examination of CSS base material and the inability to obtain demonstration qualification of CSS as part of the required UT examination volume for PWOLs or WOL repairs is considered a hardship without a compensating increase in the level of quality or safety for the following reasons:

- OE does not indicate PWSCC would initiate in austenitic CSS material;
- the required weld and base material volume that is susceptible to PWSCC and the WOL material itself will be UT examined. This will be per the alternatives provided in Enclosure 1 with performance demonstrated UT examination in accordance with the provisions of the ASME Code Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 11 with the alternatives used to comply with the PDI program as shown in Enclosure 2, Table 1 excluding CSS base material.

5.0 DURATION OF THE PROPOSED REQUEST

This request will be applied for the remainder of the current MPS2 third 10-year ISI interval, which is scheduled to end on March 31, 2010.

6.0 PRECEDENTS

Similar requests have been submitted to address some of the issues that are contained in this request for PWOLs. However, DNC believes that it is the first Combustion Engineering (CE) plant owner to submit an alternative request that will apply over two refueling outages. Enclosures 1 and 2 of this request are similar to Enclosure 1 provided in the MPS3 (IR-2-47, Revision 1) alternative request that was authorized by the NRC for use on May 3, 2007[3], including the PDI modifications of ASME Section XI, Appendix VIII, Supplement 11 referenced in the IR-2-47, Revision 1 submittal. Additionally, a request was submitted by Indiana Michigan Power Company's, D. C. Cook Unit 2 for which NRC verbal approval was provided on March 23, 2006. That request included the application of full structural PWOLs to the pressurizer steam space DMWs. The NRC provided verbal approval on March 23, 2006 for a Southern California Edison, San Onofre Nuclear Generating Station (SONGS) Unit 2 request related to ultrasonic performance examination qualification of CSS under a WOL.

Additionally, the following requests associated with WOL repairs have been approved by the NRC: AmerGen Energy Company, Three Mile Island Nuclear Station, Unit 1, on July 21, 2004;[4] Constellation Energy's Calvert Cliffs Nuclear Power Plant, Unit 2, on July 20, 2005;[5] Millstone Unit 3, on January 20, 2006;[6] and Indiana Michigan Power Company, Donald C. Cook Unit 1, on February 10, 2006.[7]

7.0 REFERENCES

7.1 ASME Code, Section XI, 1998 Edition, No Addenda, IWA-4000

---

(3) NRC Letter, "Safety Evaluation of Request For Approval To Use IR-2-47 For Dissimilar Metal Weld Overlays As An Alternative Repair Technique (TAC NO. MD3379)," dated: May 3, 2007 (ADAMS Accession No. ML071210024).

(4) NRC letter, "Safety Evaluation of Request For Relief From Flaw Removal, Heat Treatment and Nondestructive Examination (NDE) Requirements For The Third 10-Year Inservice Inspection Interval, Three Mile Island Nuclear Station, Unit 1 (TMI-1), (TAC No. MC1201), dated: July 21, 2004, (ADAMS Accession No. ML041670510).

(5) NRC Letter, "Safety Evaluation for Calvert Cliffs Nuclear Power Plant, Unit No. 2, Relief Request for Use Weld Overlay and Associated Alternative Inspection Techniques (TAC Nos. MC6219 and MC6220), dated July 20, 2005, (ADAMS Accession No. ML051930316).

(6) NRC letter, "Safety Evaluation of Relief Request IR-2-39 Pertaining to the Repair and Inspection of Nozzle to Safe End Weld, Weld No. 03-X-5641-E-T at Millstone Power Station Unit No. 3 (MPS3)," (TAC No. MC8609), dated January 20, 2006, (ADAMS Accession No. ML053260012).

(7) NRC letter, Safety Evaluation of Alternative Request Regarding Repair of Safe-End-To-Elbow Weld 1-RC-9-01F at the Donald C. Cook Nuclear Plant Unit 1, (TAC No. MC8807), dated February 10, 2006, (ADAMS Accession No. ML060240355).

7.2 U.S. NRC, Regulatory Guide 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division1, October 2007

7.3 ASME Code Case N-504-3, Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Section XI, Division 1, August 2, 2004

7.4 ASME Code Case N-638-1, Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique Section XI, Division 1, February 13, 2003

7.5 ASME Code Case N-740, Dissimilar Metal Weld Overlay for Repair of Class 1, 2, and 3 Items, Section XI, Division 1, July 14, 2006

7.6 Material Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP 139), EPRI, Palo Alto, CA: 2005. 1010087

7.7 ASME Code, Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 10

7.8 ASME Code, Section XI, 1995 Edition with the 1996 Addenda, Appendix VIII, Supplement 11

8.0 CONCLUSION

The NRC has approved similar alternative requests to support application of WOLs and PWOLs to DMWs made with Alloy 82/182 weld material. The alternatives to existing ASME Code requirements that are provided in this request include consideration of available OE derived from a review of other similar requests.

Consistent with the requirements of 10 CFR 50.55a(a)(3)(i), DNC has demonstrated that the use of the alternatives described in this request for the design of FSWOLs applied as either a repair WOL or a mitigative PWOL will result in an acceptable level of quality and safety.

Consistent with the requirements of 10 CFR 50.55a(a)(3)(ii), DNC has demonstrated that the use of the alternatives described in this request in regards to the examination requirements for CSS base material will provide an acceptable alternative from Code requirements which impose undue hardship or difficulty without a compensating increase in the level of quality or safety.

ATTACHMENT 2
ENCLOSURE 1

ALTERNATIVE REQUIREMENTS FOR DISSIMILAR METAL WELD OVERLAYS FOR THE USE OF ALTERNATIVE REQUEST RR-89-61, REVISION 1

MILLSTONE POWER STATION UNIT 2
DOMINION NUCLEAR CONNECTICUT, INC.

ALTERNATIVE REQUIREMENTS FOR DISSIMILAR METAL WELD OVERLAYS

In lieu of the requirements of the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code) Section XI, IWA-4410 and IWA-4611, a defect in austenitic stainless steel or austenitic nickel alloy piping, components, or associated welds may be reduced to a flaw of acceptable size in accordance with IWB-3640 by addition of a repair weld overlay. The repair weld overlay is in lieu of the requirements of IWA-4410, and a mitigative weld overlay may be applied. All Section XI references are to the 1998 Edition with No Addenda as shown in Table 1. The weld overlay shall be applied by deposition of weld reinforcement (weld overlay) on the outside surface of the piping, component, or associated weld, including ferritic materials when necessary, provided the following requirements are met:

1 GENERAL REQUIREMENTS

Full Structural Weld Overlay – Deposition of weld reinforcement on the outside diameter of the piping, component, or associated weld, such that the weld reinforcement is capable of supporting the design loads, without consideration of the piping, component, or associated weld beneath the weld reinforcement. Full structural weld overlay can either be a mitigative or repair weld overlay as defined below:

Mitigative Weld Overlay – Weld overlay that is applied over material with no inside surface planar defects, prior to the weld overlay being applied.

Repair Weld Overlay – Weld overlay that is applied over material with a defect, or where a pre-weld overlay exam is not performed.

(a) A full-structural weld overlay shall be applied by deposition of weld reinforcement (weld overlay) on the outside surface of circumferential welds between items, inclusive of the UNS N06082 or W86182 welds that join the two items. The design of the overlay may be extended to include the adjacent stainless steel to stainless steel welds (P-No. 8 to P-No. 8).

(b) This alternative applies to dissimilar metal welds between P-No. 8 or 43 and P-Nos. 1, 3, 12A, 12B, or 12C[1] materials. This alternative also applies to dissimilar metal welds between P-No. 8 and P-No. 43 materials joined with austenitic F-No. 43 filler metal, and to welds between P-No. 8 and P-No. 8 materials as described in 1(a).

(c) Weld overlay filler metal shall be austenitic stainless steel meeting the requirements of (e)(1) below or nickel alloy (28% Cr min., ERNiCrFe-7 or ERNiCrFe-7A) meeting the requirements of (e)(2) below applied 360 deg around the circumference of the item and 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 (PWHT) requirements of the Construction Code and Owner's requirements, the following provisions may be applied.
(1) INTENTIONALLY DELETED.
(2) Appendix I may be used for ambient-temperature temper bead welding.

---

(1) P-Nos. 12A, 12B, and 12C designations refer to specific material classifications originally identified in Section III and subsequently reclassified in a later Edition of Section IX. Welds between P-No. 8 or P-No. 43 materials joined with an austenitic filler material.

(d) Prior to deposition of the weld overlay, the surface to be weld overlaid shall be examined using the liquid penetrant method. Indications with major dimensions greater than 1/16 in. (1.5 mm) shall be removed, reduced in size, or weld repaired in accordance with the following requirements:

(1) For weld repair, 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 weld repair of indications identified in 1(d) is required, the area where the weld overlay is to be deposited, including any local weld repairs or initial weld overlay layer, shall be examined using the liquid penetrant method. The area shall contain no indications with major dimensions greater than 1/16 in. (1.5 mm) prior to the application of the structural layers of the weld overlay.

(3) In order to reduce the risk of cracks when applying an austenitic nickel alloy over P-No. 8 base metal, it is permissible to apply a layer of austenitic stainless steel filler material over the austenitic base metal. The thickness of these layers shall not be used in meeting weld reinforcement design thickness requirements. The filler material used shall meet the minimum requirements for delta ferrite.

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

(1) The austenitic stainless steel weld reinforcement shall consist of at least two weld layers having as-deposited delta ferrite content of at least 7.5 Ferrite Number (FN). The first layer of weld metal with delta ferrite content of at least 7.5 FN shall constitute the first layer of the weld reinforcement that may be credited toward the required thickness. Alternatively, first layers of at least 5 FN are acceptable, provided the carbon content of the deposited weld metal is determined by chemical analysis to be less than 0.02%.

(2) The austenitic nickel alloy weld overlay shall consist of at least two weld layers deposited using a filler material with a Cr content of at least 28%. The first layer of weld metal deposited may not be credited toward the required thickness. Alternatively, a first 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 contain at least 24% Cr, and the Cr content of the deposited weld metal is 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.

(f) This alternative is only for welding in applications predicted not to have exceeded thermal neutron ($E < 0.5$ eV) fluence of 1×10^{17} neutrons per cm^2 prior to welding.

(g) A new weld overlay shall not be installed over the top of an existing weld overlay that has been in service.

2 CRACK GROWTH AND DESIGN

(a) *Crack Growth Calculation of Flaws in the Original Weld or Base Metal* - The size of all flaws detected or postulated in the original weld or base metal shall be used to define the life of the overlay. In no case shall the inspection interval be longer than the life of the overlay. The inspection interval shall be as specified in 3(c). Crack growth in the original weld or base metal, due to both stress corrosion and fatigue, shall be evaluated. Flaw characterization and evaluation shall be based on the examination results, as described below. If the flaw is at or near the boundary of two different materials, evaluation of flaw growth in both materials is required.

(1) For repair overlays, the initial flaw size for crack growth shall be based on the as-found flaw or postulated flaw, if no pre-overlay examination is performed.

(2) For postulated flaws, the axial flaw length shall be set at 1.5 in. (38 mm) or the combined width of the weld plus buttering, whichever is greater. The circumferential flaw length shall be assumed to be 360 deg.

(3) INTENTIONALLY DELETED.

(4) INTENTIONALLY DELETED.

(5) INTENTIONALLY DELETED.

(6) INTENTONALLY DELETED.

(b) *Structural Design and Sizing of the Overlay* - The design of the weld overlay shall satisfy the following, using the assumptions and flaw characterization restrictions in 2(a). 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 heat-affected zones on each side of the weld and provide for load redistribution from the item into the weld overlay and back into the item without violating applicable stress limits of NB-3200 or the Construction Code. 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), the end transition slope of the overlay shall not exceed 30 deg. with the nozzle/pipe axis. A taper of not more than 1:3 is recommended.

(3) For determining the combined length of circumferentially oriented flaws in the underlying base material or weld, multiple flaws shall be treated as one flaw of length equal to the sum of the lengths of the individual flaws characterized in accordance with IWA-3300.

(4) For circumferentially oriented flaws, in the underlying base material or weld, the flaws shall be assumed to be 100% through the original wall thickness for the entire circumference.

(5) For axial flaws in the underlying base material or weld, the flaws shall be assumed to be 100% through the original wall thickness of the item for the entire axial length of the flaw or combined flaws, as applicable, for the entire circumference.

(6) For mitigative full structural overlays, the assumed flaw in the underlying base material or weld shall be based on the limiting case of *(a)* or *(b)* below:

(a) 100% through-wall for the entire circumference

(b) 100% through-wall for 1.5 in. (38 mm) or the combined width of the weld plus buttering, whichever is greater, in the axial direction for the entire circumference

(7) The overlay design thickness shall be verified using only the weld overlay thickness conforming to the deposit analysis requirements of 1(e). The combined wall thickness at the weld overlay, or any postulated worst-case planar flaws under the laminar flaws in the weld overlay, and the effects of any discontinuities (e.g., another weld overlay or reinforcement for a branch connection) within a distance of $2.5\sqrt{Rt}$ from the toes of the weld overlay, including the flaw size assumptions defined in 2(b)(4), (5), or (6) above, shall be evaluated and meet the requirements of IWB-3640, IWC-3640, or IWD-3640, as applicable. Ultrasonic examination procedures and personnel used to perform ultrasonic examinations prior to weld overlay application shall be qualified in accordance with Appendix VIII, Supplement 10.

(8) 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, and changes in system flexibility and weight due to the weld overlay) shall be evaluated. Existing flaws previously accepted by analytical evaluation shall be evaluated in accordance with IWB-3640, IWC-3640, or IWD-3640, as applicable.

3 EXAMINATION

In lieu of all other examination requirements, the examination requirements of this alternative 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, Supplement 11.

For cast stainless steel components for which no supplement is available in Appendix VIII, a "best effort" ultrasonic examination shall be performed in accordance with Appendix VIII to the maximum extent practicable.

(a) Acceptance Examination

(1) The weld overlay shall have a surface finish of 250 µin. (6.3 µm) RMS or better and contour that permits ultrasonic examination in accordance with procedures qualified in accordance with Appendix VIII. The weld overlay shall be inspected to verify acceptable configuration.

(2) The weld overlay and the adjacent base material for at least 1/2 in. (13 mm) from each side of the 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 NB-5300. The adjacent base metal shall satisfy the surface examination acceptance criteria for base material of the Construction Code or NB-2500. If ambient-temperature temper bead welding is performed, the liquid penetrant examination of the completed weld overlay shall be conducted no sooner than 48 hrs following completion of the three tempering layers over the ferritic steel.

(3) The acceptance examination volume A-B-C-D in Fig. 1(a) 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 heat affected zone from the overlay. If ambient-temperature temper bead welding is performed, the ultrasonic examination of the completed weld overlay shall be conducted

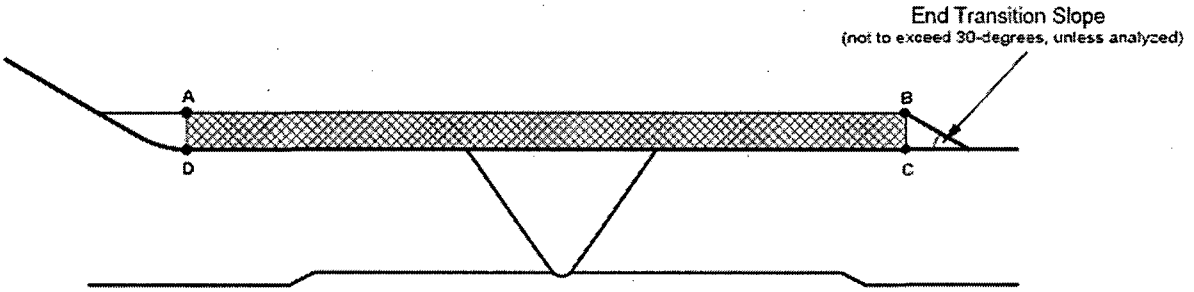
no sooner than 48 hrs after completion of the three tempering layers over the ferritic steel.

(a) Planar flaws detected in the weld overlay acceptance examination shall meet the preservice examination standards of IWB-3514. In applying the acceptance standards to planar indications, the thickness t_1 or t_2 defined in Fig. 1(b), shall be used as the nominal wall thickness in IWB-3514, provided the base metal beneath the flaw (i.e., safe end, nozzle, or piping material) is not susceptible to stress corrosion cracking (SCC). For susceptible material, t_1 shall be used. If a flaw in the overlay crosses the boundary between the two regions, the more conservative of the two dimensions (t_1 or t_2) shall be used.

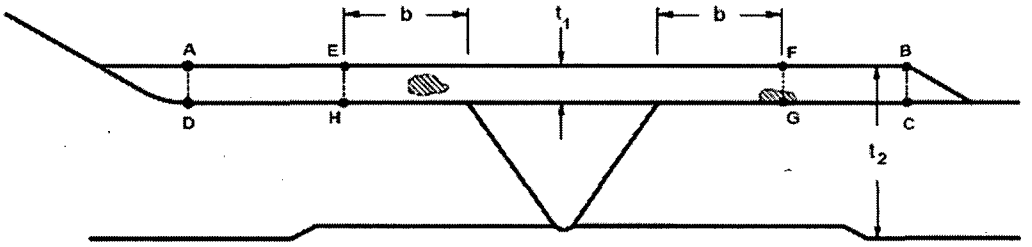
(b) Laminar flaws detected in the weld overlay shall meet the following requirements:

1. The acceptance standards of IWB-3514 shall be met, with the additional limitation that the total laminar flaw area shall not exceed 10% of the weld surface area, and that no linear dimension of the laminar flaw area exceed the greater of 3 in. (76 mm) or 10 % of the nominal pipe circumference.
2. For examination volume A-B-C-D in Fig. 1(a), the reduction in coverage due to laminar flaws shall be less than 10%. The uninspectable volume is the volume in the weld overlay underneath the laminar flaws for which coverage cannot be achieved using the angle beam examination method.
3. 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 preservice examination acceptance standards of IWB-3514, with nominal wall thickness as defined above for planar flaws. Alternatively, the assumed flaw shall be evaluated and shall meet the requirements of IWB-3640, IWC-3640, or IWD-3640, as applicable. Both axial and circumferential planar flaws shall be assumed.

(4) After completion of all welding activities, VT-3 visual examination shall be performed on affected restraints, supports, and snubbers, to verify that their operability and functional adequacy have not been adversely affected.



(a) Examination Volume A-B-C-D



(b) Thickness (t_1 and t_2) for Table IWB-3514-2

FIG. 1 EXAMINATION VOLUME AND THICKNESS DEFINITIONS

GENERAL NOTES:
(1) Dimension "b" is equivalent to the nominal thickness of the nozzle or pipe being overlaid, as appropriate.
(2) The nominal wall thickness is t_1 for flaws in E-F-G-H, and t_2 for flaws in A-E-H-D or F-B-C-G.
(3) For flaws that span two examination volumes (such as illustrated at F-G), the t_1 thickness shall be used.
(4) The weld includes the nozzle or safe end butter, where applied, plus any SCC susceptible base material in the nozzle.

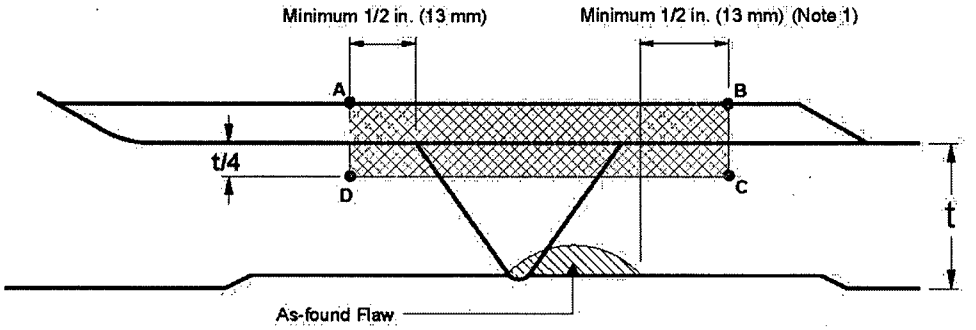
(b) Preservice Inspection

(1) The examination volume in Fig. 2 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 planar flaws that might have propagated into the outer 25% of the base material or into the weld overlay. For weld overlays with cast austenitic stainless steel base materials, the underlying cast stainless steel material will be examined to locate and size any planar flaws that might have propagated into the outer 25% of the base material or into the weld overlay on a "best effort" basis using the Appendix VIII qualified examination procedure and personnel used to examine the weld

overlay. For weld overlays on austenitic stainless steel base materials, if 100% through-wall flaw is used for crack growth, only planar flaws that have propagated into the weld overlay or are in the overlay are required to be located and sized.

(2) The preservice examination acceptance standards of IWB-3514 shall be met for the weld overlay. In applying the acceptance standards to planar indications, the thickness, t_1 or t_2, defined in Fig. 1(b), shall be used as the nominal wall thickness in IWB-3514, provided the base material beneath the flaw (i.e., safe end, nozzle, or piping material) is not susceptible to SCC. For susceptible material, t_1 shall be used. Planar flaws in the outer 25% of the base material thickness shall meet the design analysis requirements of 2(b).

(3) The flaw evaluation requirements of IWB-3640, IWC-3640, or IWD-3640 shall not be applied to planar flaws identified during preservice examination that exceed the preservice examination acceptance standards of IWB-3514.



Examination Volume A-B-C-D

FIG. 2 PRESERVICE AND INSERVICE EXAMINATION VOLUME

NOTE:
(1) For axial or circumferential flaws, the axial extent of the examination volume shall extend at least 1/2 in. (13 mm) beyond the as-found flaw and at least 1/2 in. (13 mm) beyond the toes of the original weld, including weld end butter, where applied.

GENERAL NOTE
The weld includes the nozzle or safe end butter, where applied.

(c) Inservice Inspection

(1) The weld overlay examination shall be added to the inspection plan. The weld overlay inspection interval shall not be greater than the life of the overlay as determined in 2(a) above. All weld overlays shall be examined prior to the end of their design life.

(2) The weld overlay shall be ultrasonically examined during the first or second refueling outage following application. Alternatively, for mitigative weld overlays, in which pre-overlay examinations are performed in accordance with 2(a)(3), post-overlay examinations are performed in accordance with 3(a) and 3(b) and no inside-surface-

connected planar flaws are discovered, the overlay may be placed immediately into the population to be examined in accordance with 3(c)(5).

(3) The weld overlay examination volume in Fig. 2 shall be ultrasonically examined to determine if any new or existing planar flaws have propagated into the outer 25% of the base metal thickness or into the overlay. The angle beam shall be directed perpendicular and parallel to the piping axis, with scanning performed in four directions.

(4) The weld overlay shall meet the inservice examination acceptance standards of IWB-3514. In applying the acceptance standards to planar indications, the thickness, t_1 or t_2, defined in Fig. 1(b), shall be used as the nominal wall thickness in IWB-3514, provided the base material beneath the flaw (i.e., safe end, nozzle, or piping material) is not susceptible to SCC. For susceptible material, t_1 shall be used. If the acceptance standards of IWB-3514 cannot be met, the weld overlay shall meet the acceptance standards of IWB-3600, IWC-3600, or IWD-3600, as applicable. If a planar flaw is detected in the outer 25% of the base metal thickness it shall meet the design analysis requirements of Section 2. Any indication characterized as stress corrosion cracking in the weld overlay material is unacceptable.

(5) Weld overlay examination volumes in Fig. 2 that show no indication of planar flaw growth or new planar flaws shall be placed into a population to be examined on a sample basis, except as required by 3(c)(1). Twenty-five percent of this population shall be examined once during each inspection interval.

(6) If inservice examinations reveal planar flaw crack growth, or new planar flaws that meet the acceptance standards of IWB-3514, IWB-3600, IWC-3600, or IWD-3600, the weld overlay examination volume shall be reexamined during the first or second refueling outage following discovery of the growth or new flaws.

(7) For weld overlay examination volumes with unacceptable indications in accordance with 3(c)(4), the weld overlay and original defective weld shall be removed. A repair/replacement activity shall be performed in accordance with IWA-4000.

(8) If preservice and inservice examinations in accordance with ASME Section XI, Appendix VIII, Supplement 11 cannot be performed for the entire weld overlay examination volume in Fig. 2 because of cast austenitic stainless steel items, and a 100% initial flaw assumption is not used in the crack growth evaluation of 2(a), a 75% through-wall depth may be assumed in the crack growth calculation, provided that the required examination volume is examined at a higher frequency than the requirements in paragraph 3(c). The subject weld shall be ultrasonically examined during the first or second refueling outage following the weld overlay installation. If ultrasonic examination is performed prior to weld overlay installation and after installation without detecting any planar flaws in the original weld or the weld overlay, then the ultrasonic examination during the first or second refueling outage is not required. After the first inservice examination, the required examination volume shall be ultrasonically examined every 10 years from the date of the installation until such time when ultrasonic examination is qualified to examine the cast austenitic stainless steel portion of the required inspection volume in accordance with the performance demonstration requirements of ASME Code, Section XI, Appendix VIII. The inspection of the overlaid weld shall not be credited to satisfy the requirement of the 25% inspection sample every ten years of overlaid welds without cast stainless steel materials. After the required examination volume is examined by qualified ultrasonic examination for the cast austenitic stainless steel material and no planar flaws are detected, the weld may be placed in the 25% inspection sample population in accordance with paragraph 3(c)(5).

(d) Additional Examinations

If inservice examinations reveal a defect, in accordance with 3(c)(4), planar flaw growth into the weld overlay design thickness, or axial flaw 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 defects are found in the second sample, 50% of the total population of weld overlay examination volumes shall be examined prior to return to service. If additional defects 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 alternative shall be documented on Form NIS-2A.

MANDATORY APPENDIX I
AMBIENT TEMPERATURE TEMPER BEAD WELDING

I-1 GENERAL REQUIREMENTS

(a) This appendix applies to dissimilar austenitic filler metal welds between P-No. 1, 3, 12A, 12B, and 12C 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 melting practice.

(b) The maximum area of an individual weld overlay based on the finished surface over the ferritic base material shall be 500 sq. in. (325,000 sq. mm).

(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 in. (3 mm), 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 in. (10mm).

(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 in. (130 mm), whichever is less, shall be at least 50°F (10°C).

(f) Welding materials shall meet the Owner's Requirements and the Construction Code and Cases or NRC approved alternative requests 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.

I-2 WELDING QUALIFICATIONS

The welding procedures and the welding operators shall be qualified in accordance with Section IX and the requirements of I-2.1 and I-2.2.

I-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°F (66°C).

(d) The test assembly cavity depth shall be at least 1 in. (25 mm). 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 in. (150 mm). The qualification test plate shall be prepared in accordance with Fig. I-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 I-2.1(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 I-2.1(e) above. Number, location, and orientation of test specimens shall be as follows:

(1) 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.

(2) 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.

(g) The Charpy V-notch test shall be performed in accordance with SA-370. Specimens shall be in accordance with SA-370, Fig. 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.

(h) 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) INTENTIONALLY DELETED.

I-2.2 Performance Qualification

Welding operators shall be qualified in accordance with Section IX.

I-3 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 (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 (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 in. (3mm) 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 45kJ/in. (1.8 kJ/mm) 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°F (180°C) 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:

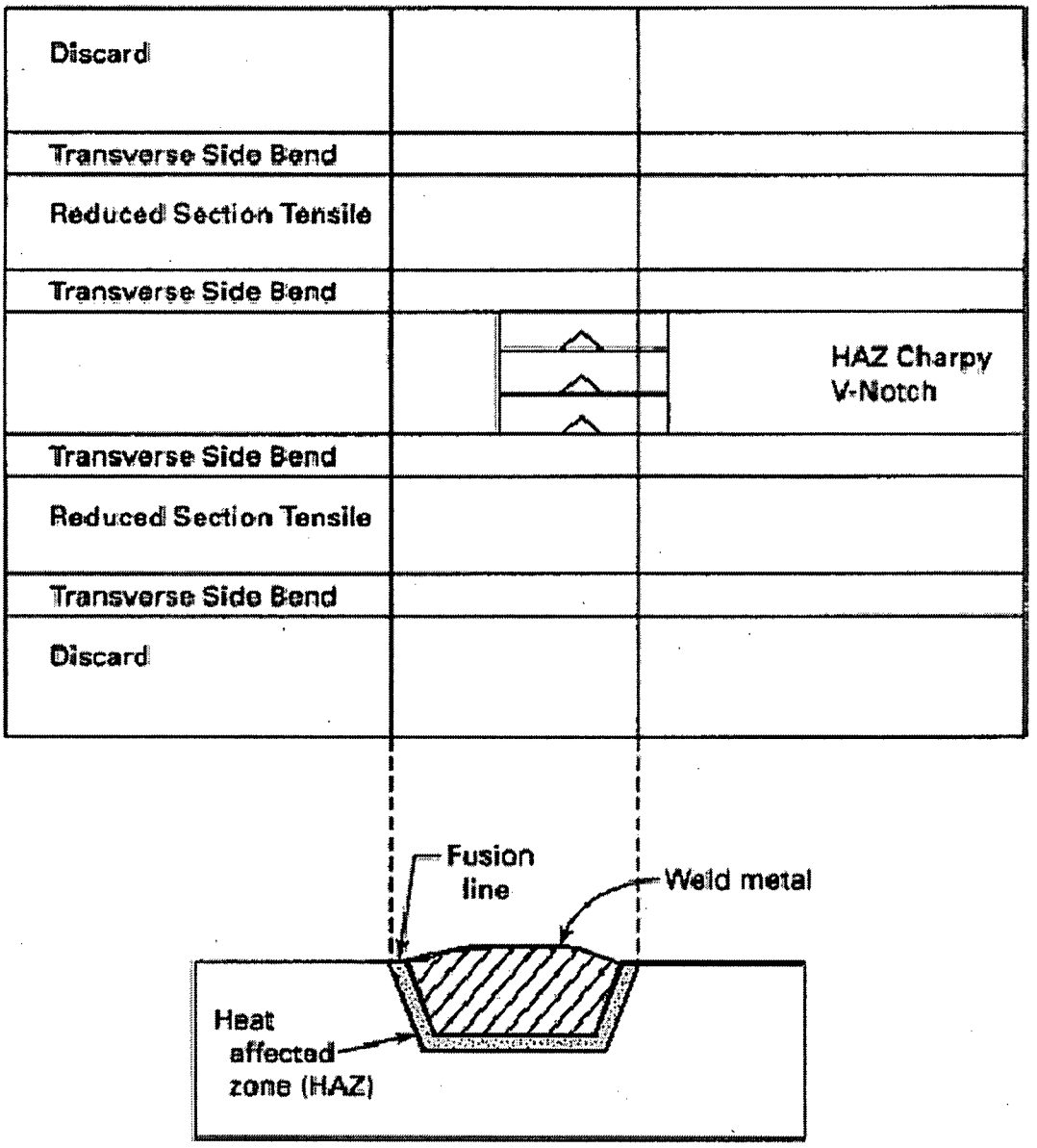
(1) Temperature measurement (e.g. pyrometers, temperature indicating crayons, thermocouples) during welding. When it is impractical to use interpass temperature measurements described in this paragraph due to situations where the weldment area is not accessible, such as internal bore welding or when there are extenuating radiological concerns, either paragraph 3(e)(2) or paragraph 3(e)(3) may be used.

(2) 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

(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.



GENERAL NOTE: Base metal Charpy impact specimens are not shown.

FIG. I-1 QUALIFICATION TEST PLATE

TABLE 1 REFERENCES FOR ALTERNATIVE EDITIONS AND ADDENDA OF SECTION XI

2001 Edition with 2003 Addenda through 2004 Edition with 2006 Addenda	MPS2 1998 EDITION APPLIES 1995 Edition with 1996 Addenda through 2001 Edition with 2002 Addenda	1995 Edition with 1995 Addenda	1989 Edition with 1991 Addenda through 1995 Edition	1986 Edition with 1988 Addenda through 1989 Edition with 1990 Addenda
IWA-4000 Repair/Replacement Activities	IWA-4000	IWA-4000	IWA-4000	IWA-4000 & IWA-7000
IWA-4311 Configuration Changes	IWA-4311	IWA-4311	NA	NA
IWA-4410 Welding, Brazing, Metal Removal, and Installation – General Requirements	IWA-4410	IWA-4410	IWA-4170	IWA-4120
IWA-3300 Flaw Characterization	IWA-3300	IWA-3300	IWA-3300	IWA-3300
IWA-4611 Defect Removal	IWA-4611	IWA-4421 & IWA-4424	IWA-4170(b)	IWA-4120
IWB-3514 Standards for Category B-F	IWB-3514	IWB-3514	IWB-3514	IWB-3514
IWB/C/D –3600 Analytical Evaluation	IWB/C-3600	IWB/C-3600	IWB/C-3600	IWB/C-3600
IWB/C/D-3640 Evaluation Procedures	IWB/C-3640 or IWB/C-3650	IWB/C-3640 or IWB/C-3650	IWB/C-3640 or IWB/C–3650*	IWB/C–3640

*** Starting with the 1989 Edition with the 1989 Addenda**

ATTACHMENT 2
ENCLOSURE 2

TABLE 1 – MODIFICATIONS TO ASME CODE, SECTION XI, APPENDIX VIII, SUPPLEMENT 11 FOR THE USE OF ALTERNATIVE REQUEST RR-89-61, REVISION 1

MILLSTONE POWER STATION UNIT 2
DOMINION NUCLEAR CONNECTICUT, INC.

Appendix VIII of American Society of Mechanical Engineers, Boiler and Pressure Vessel Code (ASME Code), Section XI cannot be used directly for nondestructive examination (NDE) of a structural weld overlay repair. Additionally, the qualification requirements including those in Appendix VIII and with the alternatives provided below do not address austenitic cast stainless steel (CSS) materials, but they do cover the other materials included in the design of the MPS2 dissimilar metal welds. Therefore, this alternative is proposed as part of this request to use the Performance Demonstration Initiative (PDI) program implementation of Appendix VIII with the detailed comparison of Appendix VIII and PDI requirements summarized below.

The alternative requested allows closer spacing of flaws provided they don't interfere with detection or discrimination. The specimens used to date for qualification to the tri-party (NRC/BWROG/EPRI) agreement have a flaw population density greater than allowed by current Code requirements. These samples have been used successfully for all previous qualifications under the tri-party agreement program. To facilitate their use and provide continuity from the tri-party agreement program to Supplement 11, the PDI program has merged the tri-party test specimens into their weld overlay program with the following alternatives.

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
1.0 SPECIMEN REQUIREMENTS	
1.1 General. The specimen set shall conform to the following requirements.	
(b) The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. or larger, the specimen set must include at least one specimen 24 in. or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 in. to +0.25 in. of the maximum nominal overlay thickness for which the procedure is applicable.	**Alternative:** *(b)* The specimen set shall include specimens with overlays not thicker than 0.1 in. more than the minimum thickness, nor thinner than 0.25 in. of the maximum nominal overlay thickness for which the examination procedure is applicable. **Basis:** *To avoid confusion, the overlay thickness tolerance contained in the last sentence was reworded and the phrase "and the remainder shall be alternative flaws" was added to the next to last sentence in paragraph 1.1(d)(1).*

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(d) Flaw Conditions	
(1) Base metal flaws. All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75% through the base metal wall. Flaws may extend 100% through the base metal and into the overlay material; in this case, intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC [intergranular stress corrosion cracking] shall be used when available.	**Alternative:** (1) ...must be in or... intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing intergranular stress corrosion (IGSCC) cracking shall be used when available. At least 70% of the flaws in the detection and sizing tests shall be cracks and the remainder shall be alternative flaws. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following: (a) The use of alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. (b) Flaws shall be semi elliptical with a tip width of less than or equal to 0.002 inches. **Basis:** *This paragraph requires that all base metal flaws be cracks. Implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel through weld material on at least one side, producing an unrealistic flaw response. To resolve this issue, the PDI program revised this paragraph to allow use of alternative flaw mechanisms under controlled conditions. For example, alternative flaws shall be limited to when implantation of cracks precludes obtaining an effective ultrasonic response, flaws shall be semi elliptical with a tip width of less than or equal to 0.002 inches, and at least 70% of the flaws in the detection and sizing test shall be cracks and the remainder shall be alternative flaws.*

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
	To avoid confusion, the overlay thickness tolerance contained in paragraph 1.1(b) last sentence, was reworded and the phrase "and the remainder shall be alternative flaws" was added to the next to last sentence. *Paragraph 1.1(d)(1) includes the statement that intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws.*
(e) Detection Specimens	
(1) At least 20% but less than 40% of the flaws shall be oriented within ±20° of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. The rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.	**Alternative:** (1) At least 20% but less than 40% of the base metal flaws shall be oriented within ±20° of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. **Basis:** *The requirement for axially oriented overlay fabrication flaws was excluded from the PDI Program as an improbable scenario. Weld overlays are typically applied using automated GTAW [gas tungsten arc welding] techniques with the filler metal applied in a circumferential direction. Because resultant fabrication induced discontinuities would also be expected to have major dimensions oriented in the circumferential direction axial overlay fabrication flaws are unrealistic.* *The requirement for using IWA-3300 for proximity flaw evaluation was excluded, instead indications will be sized based on their individual merits*

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(2) Specimens shall be divided into base and overlay grading units. Each specimen shall contain one or both types of grading units.	**Alternative:** (2) Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.
(a)(1) A base grading unit shall include at least 3 in. of the length of the overlaid weld. The base grading unit includes the outer 25% of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75% of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.	**Alternative:** *(a)(1)* A base metal grading unit includes the overlay material and the outer 25% of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 in. and shall start at the weld centerline and be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50" of the adjacent base material. **Basis:** *The phrase* "and base metal on both sides," *was inadvertently included in the description of a base metal grading unit. The PDI program intentionally excludes this requirement because some of the qualification samples include flaws on both sides of the weld. To avoid confusion several instances of the term "cracks" or "cracking" were changed to the term "flaws" because of the use of alternative flaw mechanisms.* *Modified to require that a base metal grading unit include at least 1 in. of the length of the overlaid weld, rather than 3 inches.*
(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 in. of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.	**Alternative:** (a)(2) When base metal flaws penetrate into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(a)(3) When a base grading unit is designed to be unflawed, at least 1 in. of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The segment of weld length used in one base grading unit shall not be used in another base grading unit. Base grading units need not be uniformly spaced around the specimen.	**Alternative:** (a)(3) Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws. *Modified to require sufficient unflawed overlaid weld and base metal to exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws, rather than the 1 inch requirement.*
(b)(l) An overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 in^2. The overlay grading unit shall be rectangular, with minimum dimensions of 2 in.	**Alternative:** *(b)*(l) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 in. *Modified to define an overlay fabrication grading unit as including the overlay material and the base metal-to-overlay interface for a length of at least 1 in, rather than the 6 in^2 requirement*
(b)(2) An overlay grading unit designed to be unflawed shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. around its entire perimeter. The specific area used in one overlay grading unit shall not be used in another overlay grading unit. Overlay grading units need not be spaced uniformly about the specimen	**Alternative:** (b)(2) Overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one overlay fabrication grading unit shall not be used in another overlay fabrication grading unit. Overlay fabrication grading units need not be spaced uniformly about the specimen. **Basis:** *Paragraph 1.1(e)(2)(b)(2) states that overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. at both ends, rather than around its entire perimeter*

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base grading units, ten unflawed base grading units, five flawed overlay grading units, and ten unflawed overlay grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units.	**Alternative:** (b)(3) ...base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(f) Sizing Specimen	
(1) The minimum number of flaws shall be ten. At least 30% of the flaws shall be overlay fabrication flaws. At least 40% of the flaws shall be cracks open to the inside surface.	**Alternative:** (1) The .... least 40% of the flaws shall be open to the inside surface. Sizing sets shall contain a distribution of flaw dimensions to assess sizing capabilities. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially.	**Alternative:** (3) Base metal flaws used ... circumferentially.
(4) Depth sizing specimen sets shall include at least two distinct locations where cracking in the base metal extends into the overlay material by at least 0.1 in. in the through-wall direction.	**Alternative:** (4) Depth sizing specimen sets shall include at least two distinct locations where a base metal flaw extends into the overlay material by at least 0.1 in. in the through-wall direction.

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
2.0 CONDUCT OF PERFORMANCE DEMONSTRATION	
The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.	**Alternative:** The specimen.....prohibited. The overlay fabrication flaw test and the base metal flaw test may be performed separately.
2.1 Detection Test	
Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base or overlay) that are present for each specimen.	**Alternative:** Flawed.... (base metal or overlay fabrication) ... each specimen.
2.2 Length Sizing Test	
(d) For flaws in base grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25% of the base wall thickness.	**Alternative:** *(d)* For ... base metal grading ... base metal wall thickness.
2.3 Depth Sizing Test	
For the depth sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	**Alternative:** (a) The depth sizing test may be conducted separately or in conjunction with the detection test. (b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
	determine the maximum depth of the flaw in each region. (c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.
3.0 ACCEPTANCE CRITERIA	
3.1 Detection Acceptance Criteria	
Examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base grading units and for overlay grading units.	**Alternative:** Examination procedures are qualified for detection when: a. All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls. b. At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (c). c. Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. d. The criteria in (b) and (c) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.

Table 1
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
3.2 Sizing Acceptance Criteria	
(a) The root mean square (RMS) error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch. The length of base metal cracking is measured at the 75% through-base-metal position.	**Alternative:** *(a)* The ... base metal flaws is ... position.
(b) All extensions of base metal cracking into the overlay material by at least 0.1 in. are reported as being intrusions into the overlay material.	**Alternative:** (b) This requirement is omitted. **Basis:** *The requirement for reporting all extensions of cracking into the overlay is omitted from the PDI Program because it is redundant to the RMS calculations performed in paragraph 3.2(c) and its presence adds confusion and ambiguity to depth sizing as required by paragraph 3.2(c). This also makes the weld overlay program consistent with the Supplement 2 depth sizing criteria.*