

June 30, 2003

10 CFR 50.55a(a)(3)(i)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop: OWFN P1-35
Washington, D.C. 20555-0001

Gentlemen:

| | | |
|----------------------------|---|--------------------|
| In the Matter of |) | Docket Nos. 50-260 |
| Tennessee Valley Authority |) | 50-296 |

BROWNS FERRY NUCLEAR PLANT (BFN) - UNITS 2, AND 3 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM - REQUESTS FOR RELIEF 2-ISI-21, AND 3-ISI-17 FOR EXAMINATION OF PIPING WELD OVERLAYS

In accordance with 10 CFR 50.55a(a)(3)(i), TVA is requesting relief from certain inservice inspection (ISI) requirements in Section XI of the ASME Section XI, Appendix VIII, Supplement 11 for BFN Units 2 and 3. The specific requirements for which relief is requested relate to the qualification requirements for inspecting piping weld overlays using ultrasonic testing (UT). The enclosure to this letter contains BFN Units 2, and 3 requests for relief 2-ISI-21, and 3-ISI-17 for NRC review and approval.

ASME Section XI, Appendix VIII requirements are mandated and supplemented by 10 CFR 50.55a(b)(2)(xiv), (xv), and (xvi). Appendix VIII of ASME Section XI, 1995 Edition with 1996 Addenda is specified in the CFR. The BFN Units 2 and 3 Inservice Inspection (ISI) Programs for nondestructive

examination complies with the 1995 Edition, 1996 Addenda of ASME Section XI, and supplemented as required to incorporate ASME Section XI, Appendix VIII.

TVA recently was advised by the Electric Power Institute (EPRI), staff that prior to performing ultrasonic examination of Class 1 Reactor Coolant System (RCS) weld overlays (reference NRC GL 88-01, and Boiling Water Reactor Vessel and Internals Project (BWRVIP)-75), relief from ASME Section XI, Appendix VIII, Supplement 11 requirements is necessary. TVA was also informed that two options exist: (1) adopt ASME Code Case N-653, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds, Section XI, Division 1," with some modifications, or, (2) use the EPRI Performance Demonstration Initiative (PDI) Program in lieu of the ASME Code Section XI, Appendix VIII, Supplement 11 requirements. EPRI has worked with the NRC staff to develop a sample request for relief, using option 2 above, to ensure sufficient information is submitted for NRC review.

Enclosure 1 of this letter contains BFN Unit 2 request for relief 2-ISI-21 for NRC review and approval. Enclosure 2 of this letter provides BFN Unit 3 request for relief 3-ISI-17. The technical content each of the requests for relief is consistent with the EPRI sponsored PDI model including updates resulting from requests for additional information issued to other utilities (i.e., Southern Nuclear Operating Company (SNC), for Plant Hatch and Carolina Power and Light, for Brunswick Steam Electric Plant).

TVA requests approval of these requests for relief by January 16, 2004, to support resource planning for the Unit 3, Cycle 11 (Spring 2004) refueling outage.

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There are no new regulatory commitments in this letter. If you have any questions, please contact me at (256) 729-2636.

Sincerely,

Original signed by:

T. E. Abney
Manager of Licensing
and Industry Affairs

Enclosures

cc (Enclosures):

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Enclosures

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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 2
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI,
INSERVICE INSPECTION (ISI) PROGRAM
(THIRD TEN-YEAR INSPECTION INTERVAL)

REQUEST FOR RELIEF 2-ISI-21

(See Attached)

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 2
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI,
INSERVICE INSPECTION (ISI) PROGRAM
(THIRD TEN-YEAR INSPECTION INTERVAL)

REQUEST FOR RELIEF 2-ISI-21

Executive Summary: In accordance with 10 CFR 50.55a(a)(3)(i), TVA is requesting relief from inservice inspection requirements of the 1995 Edition through 1996 Addenda of ASME Section XI, Appendix VIII, Supplement 11, "Qualification Requirements For Full Structural Overlaid Wrought Austenitic Piping Welds," of the ASME Boiler and Pressure Vessel Code. The Performance Demonstration Initiative (PDI) Program for implementing the Supplement 11 qualification program for overlay welds is not in strict compliance with the requirements of Supplement 11 of the 1995 Edition through the 1996 Addenda. TVA proposes to use the PDI Program for implementation of Appendix VIII, Supplement 11 as amended in the attachment to this request for relief. The amendments to Supplement 11 as shown in the attachment were coordinated with PDI, NRC, and Pacific Northwest National Laboratory (PNNL).

Unit: Two (2)

System(s): Recirculation (RECIRC), Core Spray (CS), and Reactor Water Clean Up (RWCU) Systems

Components: Piping Welds with Structural Weld Overlay

ASME Code Class: ASME Code Class 1

ASME Section XI Edition: 1995 Edition, 1996 Addenda

Code Table: Westinghouse Owners Group (WOG)
topical Report WCAP-14572, Revision 1-NP-A, Table 4.1-1

Examination Category: R-A, Risk-Informed Piping Examinations

Examination Item Number: R1.16, Elements Subject To Intergranular Stress Corrosion Cracking (IGSCC)

Code Requirement: The 1995 Edition of ASME Section XI, with addenda through 1996, WCAP-14572, Revision 1-NP-A, Table 4.1-1, Examination Category R-A, Item No. R1.16, requires a volumetric (UT) examination of the pipe weld including the overlay. The UT examination must be performed using personnel, procedures, and equipment qualified in accordance with Appendix VIII, Supplement 11.

Code Requirements From Which Relief Is Requested: Relief is requested from the requirement to qualify personnel, procedures, and equipment in accordance with Appendix VIII, Supplement 11 as stated in the 1995 Edition through the 1996 Addenda of the ASME Section XI Code.

List Of Items Associated With The Relief Request: BFN Unit 2 Weld Overlays in the Risk-Informed ISI Program that require examination:

| <u>WELD #</u> | <u>SYSTEM</u> | <u>PIPE SIZE</u> | <u>CATEGORY</u> |
|---------------|---------------|------------------|-----------------|
| GR-2-15 | RECIRC | 12.0" | E |
| DSRWC-2-03 | RWCU | 6.0" | E |
| DSRWC-2-04 | RWCU | 6.0" | E |
| DSRWC-2-05 | RWCU | 6.0" | E |

Weld Overlays in the BFN Unit 2 Risk-Informed ISI Program that currently do not require examination:

| <u>WELD #</u> | <u>SYSTEM</u> | <u>PIPE SIZE</u> | <u>CATEGORY</u> |
|---------------|---------------|------------------|-----------------|
| TCS-2-421 | CS | 12.0" | E |
| GR-2-45 | RECIRC | 12.0" | E |
| GR-2-59 | RECIRC | 28.0" | E |
| GR-2-61 | RECIRC | 28.0" | E |
| GR-2-64 | RECIRC | 28.0" | E |

Basis For Relief Request:

The requirements of ASME Section XI, Appendix VIII, Supplement 11, as stated in the 1995 Edition through the 1996 Addenda are not practical to implement. The requirements were amended to improve the implementation process. The amended requirements are contained in the attachment to this relief request. The EPRI sponsored PDI amendments to Supplement 11, as shown in the attachment, were coordinated with PDI, NRC, and PNNL.

The proposed amended requirements of Supplement 11 for the qualification of personnel, procedures, and equipment will provide an alternative with an acceptable level of quality and safety.

Alternate Requirement:

TVA proposes to utilize personnel, procedures, and equipment qualified in accordance with ASME section XI, Appendix VIII, Supplement 11, as amended by the attachment, which is the EPRI administered PDI Program.

Justification For The Granting Of

Relief:

The proposed amended criteria (as shown in the attachment) to the requirements of the ASME Section XI, 1995 Edition with addenda through 1996, Appendix VIII, Supplement 11, which were coordinated through PDI, NRC, and PNNL, provides an alternative with an acceptable level of quality and safety.

NOTE: This request for relief (RFR) is consistent with one submitted by Brunswick Steam Electric Plant to the NRC by letters dated July 16, 2002, and February 11, 2003. The NRC approved the request for relief by letter dated March 26, 2003.

Implementation
Schedule:

This request for relief is applicable to the BFN Unit 2, ASME Section XI Third Ten-Year ISI inspection interval which expires on May 24, 2011.

Attachment:

Table - Comparison of ASME Section XI, Appendix VIII, Supplement 11, Code Case N-653, and PDI Alternative

ATTACHMENT

2-ISI-21

Comparison of ASME Section XI,
Appendix VIII, Supplement 11,
Code Case N-653, and PDI Alternative

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
|--|--|--|
| 1.0 SPECIMEN REQUIREMENTS | | |
| Qualification test specimens shall meet the requirements listed herein, unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification. | No Change | No Change |
| 1.1 General. The specimen set shall conform to the following requirements. | No Change | No Change |
| (a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process. | No Change | No Change |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(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 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 inches to +0.25 inches of the maximum nominal overlay thickness for which the procedure is applicable.</p> | <p>No Change</p> | <p>(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 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter.</p> <p>The specimen set shall include specimens with overlays not thicker than 0.1 inches more than the minimum thickness, nor thinner than 0.25 inches of the maximum nominal overlay thickness for which the examination procedure is applicable.</p> |
| <p>(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.</p> | <p>No Change</p> | <p>No Change</p> |

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| <p align="center">SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS</p> | <p align="center">CODE CASE N-653 (Provided for Information Only)</p> | <p align="center">PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements</p> |
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| <p><i>(d) Flaw Conditions</i></p> | | |
| <p><i>(1) Base metal flaws.</i> All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Flaws may extend 100 percent 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 shall be used when available.</p> | <p>(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC shall be used when available.</p> <p>(a) At least 70 percent of the flaws in the detection and sizing tests shall be cracks. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following:</p> <p>(1) Flaws shall be limited to when implantation of cracks precludes obtaining a realistic ultrasonic response.</p> <p>(2) Flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches.</p> | <p>(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing IGSCC shall be used when available. At least 70 percent 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:</p> <p>(a) The use of Alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws.</p> <p>(b) Flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches.</p> |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(2) <i>Overlay fabrication flaws.</i> At least 40 percent of the flaws shall be non-crack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20 percent of the flaws shall be cracks. The balance of the flaws shall be of either type.</p> | <p>No Change</p> | <p>No Change</p> |
| <p>(e) <i>Detection Specimens</i></p> | | |
| <p>(1) At least 20 percent but less than 40 percent of the flaws shall be oriented within ± 20 degrees 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.</p> | <p>(1) At least 20 percent but less than 40 percent of the base metal flaws shall be oriented within ± 20 degrees 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.</p> | <p>(1) At least 20 percent but less than 40 percent of the base metal flaws shall be oriented within ± 20 degrees 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.</p> |
| <p>(2) Specimens shall be divided into base and over-lay grading units. Each specimen shall contain one or both types of grading units.</p> | <p>(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.</p> | <p>(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.</p> |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(a)(1) A base grading unit shall include at least 3 inches of the length of the overlaid weld. The base grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.</p> | <p>(a)(1) A base metal grading unit shall include at least 1 inch of the length of the overlaid weld. The base metal grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base metal grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.</p> | <p>(a)(1) A base metal grading unit includes the overlay material and the outer 25 percent of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 inch 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 inches of the adjacent base material.</p> |
| <p>(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 inch of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.</p> | <p>(a)(2) When base metal cracking penetrates into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.</p> | <p>(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.</p> |
| <p>(a)(3) When a base grading unit is designed to be unflawed, at least 1 inch 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.</p> | <p>(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.</p> | <p>(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.</p> |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(b)(1) An overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2 inches.</p> | <p>(b)(1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch.</p> | <p>(b)(1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch.</p> |
| <p>(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 inch 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.</p> | <p>(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 inch 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.</p> | <p>(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 inch 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.</p> |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(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.</p> | <p>(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed 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.</p> | <p>(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed 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.</p> |

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| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <i>(f) Sizing Specimen</i> | | |
| (1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface. | (1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface. 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. | (1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent 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. |
| (2) At least 20 percent but less than 40 percent of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. | No Change | No Change |
| (3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially. | No Change | (3) Base metal flaws used for length sizing demonstrations shall be oriented circumferentially. |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(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 inch in the through-wall direction.</p> | <p>No Change</p> | <p>(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 inch in the through-wall direction.</p> |
| <p>2.0 CONDUCT OF PERFORMANCE DEMONSTRATION</p> | | |
| <p>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.</p> | <p>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. The overlay fabrication flaw test and the base metal flaw test may be performed separately.</p> | <p>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. The overlay fabrication flaw test and the base metal flaw test may be performed separately.</p> |

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| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| 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. | 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 metal or overlay fabrication) that are present for each specimen. | 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 metal or overlay fabrication) that are present for each specimen. |
| 2.2 Length Sizing Test | | |
| (a) The length sizing test may be conducted separately or in conjunction with the detection test. | No Change | No Change |
| (b) When the length 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 determine the length of the flaw in each region. | No Change | No Change |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(c) For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.</p> | <p>No Change</p> | <p>No Change</p> |
| <p>(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 percent of the base wall thickness.</p> | <p>(d) For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base metal wall thickness.</p> | <p>(d) For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base metal wall thickness.</p> |
| <p>2.3 Depth Sizing Test.</p> | | |
| <p>For the depth sizing test, 80 percent 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.</p> | <p>The candidate shall determine the depth of the flaw in each region.</p> | <p>(a) The depth sizing test may be conducted separately or in conjunction with the detection test.</p> |

| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| | | <p>(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 determine the maximum depth of the flaw in each region.</p> |
| | | <p>(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.</p> |

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| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| 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. | Examination procedures are qualified for detection when 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. 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. The criteria shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units. | (a) Examination procedures are qualified for detection when: |
| | | (1) 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. |
| | | (2) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b). |

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| | | (b) 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. |
| | | (c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units. |
| 3.2 Sizing Acceptance Criteria. | | |
| Examination procedures, equipment, and personnel are qualified for sizing when the results of the performance demonstration satisfy the following criteria. | No Change | No Change |
| <i>(a)</i> The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inches. The length of base metal cracking is measured at the 75 percent through-base-metal position. | No Change | <i>(a)</i> The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inches. The length of base metal flaws is measured at the 75 percent through-base-metal position. |

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| <i>(b)</i> All extensions of base metal cracking into the overlay material by at least 0.1 inches are reported as being intrusions into the overlay material. | This requirement is omitted. | This requirement is omitted. |
| <i>(c)</i> The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches. | <i>(b)</i> The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches. | <i>(b)</i> The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inch. |

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI,
INSERVICE INSPECTION (ISI) PROGRAM
(SECOND TEN-YEAR INSPECTION INTERVAL)

REQUEST FOR RELIEF 3-ISI-17

(See Attached)

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI,
INSERVICE INSPECTION (ISI) PROGRAM
(SECOND TEN-YEAR INSPECTION INTERVAL)

REQUEST FOR RELIEF 3-ISI-17

Executive Summary: In accordance with 10 CFR 50.55a(a)(3)(i), TVA is requesting relief from inservice inspection requirements of the 1995 Edition through 1996 Addenda of Section XI, Appendix VIII, Supplement 11, "Qualification Requirements For Full Structural Overlaid Wrought Austenitic Piping Welds", of the ASME Boiler and Pressure Vessel Code. The Performance Demonstration Initiative (PDI) Program for implementation of the Supplement 11 qualification program for overlay welds is not in strict compliance with the requirements of Supplement 11 of the 1995 Edition through the 1996 Addenda. TVA proposes to use the PDI Program for implementation of Appendix VIII, Supplement 11 as amended in attachment to this request for relief. The amendments to Supplement 11 as shown in attachment were coordinated with PDI, NRC, and Pacific Northwest National Laboratory (PNNL).

Units: Three (3)

System(s): Recirculation (RECIRC), and Residual Heat Removal (RHR) Systems

Components: Piping Welds with Structural Weld Overlay

ASME Code Class: ASME Code Class 1

Section XI

Edition: 1995 Edition, 1996 Addenda

Note: The ASME Section XI Code of record (component selection) for BFN Unit 3 is the 1989 Edition, No addenda. However, TVA has adopted the 1995 Edition, 1996 Addenda for nondestructive examination at all of its nuclear plants. Reference TVA letter to NRC dated August 10, 2001. The NRC approved TVA's request by letter dated May 24, 2002.

Code Table: Westinghouse Owners Group (WOG) Topical Report WCAP-14572, Revision 1-NP-A, Table 4.1-1

Examination Category: R-A, Risk-Informed Piping Examinations

Examination Item Number: R1.16, Elements Subject To Intergranular Stress Corrosion Cracking (IGSCC)

Code Requirement: The 1995 Edition of ASME Section XI, with addenda through 1996, WCAP-14572, Revision 1-NP-A, Table 4.1-1, Examination Category R-A, Item No. R1.16, requires a volumetric (UT) examination of the pipe weld including the overlay. The UT examination must be performed using personnel, procedures, and equipment qualified in accordance with Appendix VIII, Supplement 11.

Code Requirements From Which Relief Is Requested: Relief is requested from the requirement to qualify personnel, procedures, and equipment in accordance with Appendix VIII, Supplement 11 as stated in the 1995 Edition through the 1996 Addenda of the ASME Section XI Code.

List Of Items Associated With The Relief Request: Weld Overlays that currently require examination in the Unit 3 Risk-Informed ISI Program

| <u>WELD #</u> | <u>SYSTEM</u> | <u>PIPE SIZE</u> | <u>CATEGORY</u> |
|---------------|---------------|------------------|-----------------|
|---------------|---------------|------------------|-----------------|

| | | | |
|------------|--------|-------|---|
| GR-3-53 | RECIRC | 28.0" | E |
| DSRHR-3-11 | RHR | 20.0" | E |

Weld Overlays in the BFN Unit 3 Risk-Informed ISI Program that currently do not require examination:

| <u>WELD #</u> | <u>SYSTEM</u> | <u>PIPE SIZE</u> | <u>CATEGORY</u> |
|---------------|---------------|------------------|-----------------|
| GR-3-03 | RECIRC | 28.0" | E |
| GR-3-27 | RECIRC | 28.0" | E |
| GR-3-54 | RECIRC | 28.0" | E |
| GR-3-57 | RECIRC | 28.0" | E |
| GR-3-59 | RECIRC | 28.0" | E |
| GR-3-60 | RECIRC | 28.0" | E |
| GR-3-64 | RECIRC | 28.0" | E |

Basis For Relief:

The requirements of ASME Section XI, Appendix VIII, Supplement 11, as stated in the 1995 Edition through the 1996 Addenda are not practical to implement. The requirements were amended to improve the implementation process. The amended requirements are contained in the attachment to this relief request. The EPRI sponsored PDI amendments to Supplement 11, as shown in the attachment, were coordinated with PDI, NRC, and PNNL.

The proposed amended requirements of Supplement 11 for the qualification of personnel, procedures, and equipment will provide an alternative with an acceptable level of quality and safety.

Alternate Requirement:

TVA proposes to utilize personnel, procedures, and equipment qualified in accordance with ASME section XI, Appendix VIII, Supplement 11 as amended by the Attachment, which is the EPRI administered PDI Program.

Justification For

**The Granting Of
Relief:**

The proposed amended criteria (as shown in the attachment) to the requirements of the ASME Section XI, 1995 Edition with addenda through 1996, Appendix VIII, Supplement 11, which were coordinated through PDI, NRC, and PNNL, provides an alternative with an acceptable level of quality and safety.

NOTE: This request for relief (RFR) is consistent with one submitted by Brunswick Steam Electric Plant to the NRC by letters dated July 16, 2002 and February 11, 2003. The NRC approved the request for relief by letter dated March 26, 2003.

Implementation
Schedule:

This request for relief is applicable to the Unit 3 second Ten-Year ISI inspection interval which expires on November 18, 2005.

Attachment:

Table - Comparison of ASME Section XI, Appendix VIII, Supplement 11, Code Case N-653, and PDI Alternative

ATTACHMENT

3-ISI-17

**Comparison of ASME Section XI,
Appendix VIII, Supplement 11,
Code Case N-653, and PDI Alternative**

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| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| 1.0 SPECIMEN REQUIREMENTS | | |
| Qualification test specimens shall meet the requirements listed herein, unless a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure (e.g., pipe size, weld joint configuration, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification. | No Change | No Change |
| 1.1 General. The specimen set shall conform to the following requirements. | No Change | No Change |
| (a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process. | No Change | No Change |

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| <p>(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 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 inches to +0.25 inches of the maximum nominal overlay thickness for which the procedure is applicable.</p> | <p>No Change</p> | <p>(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 inches or larger, the specimen set must include at least one specimen 24 inches or larger but need not include the maximum diameter.</p> <p>The specimen set shall include specimens with overlays not thicker than 0.1 inches more than the minimum thickness, nor thinner than 0.25 inches of the maximum nominal overlay thickness for which the examination procedure is applicable.</p> <p>.</p> |
| <p>(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.</p> | <p>No Change</p> | <p>No Change</p> |

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| <i>(d) Flaw Conditions</i> | | |
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| SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS | CODE CASE N-653 (Provided for Information Only) | PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements |
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| <p>(1) <i>Base metal flaws.</i> All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Flaws may extend 100 percent 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 shall be used when available.</p> | <p>(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC shall be used when available. At least 70 percent of the flaws in the detection and sizing tests shall be cracks. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following:</p> <p>(1) Flaws shall be limited to when implantation of cracks precludes obtaining a realistic ultrasonic response.</p> <p>(2) Flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches.</p> | <p>(1) Base metal flaws. All flaws must be in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing IGSCC shall be used when available. At least 70 percent 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:</p> <p>(a) The use of Alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws.</p> <p>(b) Flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches.</p> |

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| <p><i>(2) Overlay fabrication flaws.</i> At least 40 percent of the flaws shall be non-crack fabrication flaws (e.g., sidewall lack of fusion or laminar lack of bond) in the overlay or the pipe-to-overlay interface. At least 20 percent of the flaws shall be cracks. The balance of the flaws shall be of either type.</p> | <p>No Change</p> | <p>No Change</p> |
| <p><i>(e) Detection Specimens</i></p> | | |
| <p>(1) At least 20 percent but less than 40 percent of the flaws shall be oriented within ± 20 degrees 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.</p> | <p>(1) At least 20 percent but less than 40 percent of the base metal flaws shall be oriented within ± 20 degrees 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.</p> | <p>(1) At least 20 percent but less than 40 percent of the base metal flaws shall be oriented within ± 20 degrees 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.</p> |

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| <p>(2) Specimens shall be divided into base and over-lay grading units. Each specimen shall contain one or both types of grading units.</p> | <p>(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.</p> | <p>(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.</p> |
| <p>(a)(1) A base grading unit shall include at least 3 inches of the length of the overlaid weld. The base grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.</p> | <p>(a)(1) A base metal grading unit shall include at least 1 inch of the length of the overlaid weld. The base metal grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base metal grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.</p> | <p>(a)(1) The base metal grading unit includes the overlay material and the outer 25 percent of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 inch 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.</p> |
| <p>(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 inch of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.</p> | <p>(a)(2) When base metal cracking penetrates into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.</p> | <p>(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.</p> |

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| <p>(a)(3) When a base grading unit is designed to be unflawed, at least 1 inch 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.</p> | <p>(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.</p> | <p>(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.</p> |
| <p>(b)(1) An overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 square inches. The overlay grading unit shall be rectangular, with minimum dimensions of 2 inches.</p> | <p>(b)(1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch.</p> | <p>(b)(1) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch.</p> |

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| <p>(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 inch 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.</p> | <p>(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 inch 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.</p> | <p>(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 inch 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.</p> |

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| <p>(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.</p> | <p>(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed 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.</p> | <p>(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed 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.</p> |

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| <i>(f) Sizing Specimen</i> | | |
| (1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface. | (1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface. 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. | (1) The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent 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. |
| (2) At least 20 percent but less than 40 percent of the flaws shall be oriented axially. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. | No Change | No Change |

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| (3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially. | No Change | (3) Base metal flaws used for length sizing demonstrations shall be oriented 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 inches in the through-wall direction. | No Change | (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 inches in the through-wall direction. |
| 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. | 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. The overlay fabrication flaw test and the base metal flaw test may be performed separately | 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. The overlay fabrication flaw test and the base metal flaw test may be performed separately. |

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| 2.1 Detection Test. | | |
| <p>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.</p> | <p>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 metal or overlay fabrication) that are present for each specimen.</p> | <p>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 metal or overlay fabrication) that are present for each specimen.</p> |
| 2.2 Length Sizing Test | | |
| <p>(a) The length sizing test may be conducted separately or in conjunction with the detection test.</p> | <p>No Change</p> | <p>No Change</p> |
| <p>(b) When the length 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 determine the length of the flaw in each region.</p> | <p>No Change</p> | <p>No Change</p> |

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| <p>(c) For a separate length sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region.</p> | <p>No Change</p> | <p>No Change</p> |
| <p>(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 percent of the base wall thickness.</p> | <p>(d) For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base metal wall thickness.</p> | <p>(d) For flaws in base metal grading units, the candidate shall estimate the length of that part of the flaw that is in the outer 25 percent of the base metal wall thickness.</p> |
| <p>2.3 Depth Sizing Test.</p> | | |
| <p>For the depth sizing test, 80 percent 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.</p> | <p>The candidate shall determine the depth of the flaw in each region.</p> | <p>(a) The depth sizing test may be conducted separately or in conjunction with the detection test.</p> |

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| | | <p>(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 determine the maximum depth of the flaw in each region.</p> |
| | | <p>(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.</p> |

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| 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. | Examination procedures are qualified for detection when 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. 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. The criteria shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units. | (a) Examination procedures are qualified for detection when: |
| | | 1) 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. |

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| | | (2) At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (b). |
| | | (b) 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. |
| | | (c) The criteria in (a), (b) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units. |
| 3.2 Sizing Acceptance Criteria. | | |
| Examination procedures, equipment, and personnel are qualified for sizing when the results of the performance demonstration satisfy the following criteria. | No Change | No Change |

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| <p>(a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inches. The length of base metal cracking is measured at the 75 percent through-base-metal position.</p> | <p>No Change</p> | <p>(a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inches. The length of base metal flaws is measured at the 75 percent through-base-metal position.</p> |
| <p>(b) All extensions of base metal cracking into the overlay material by at least 0.1 inches are reported as being intrusions into the overlay material.</p> | <p>This requirement is omitted.</p> | <p>This requirement is omitted.</p> |
| <p>(c) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches.</p> | <p>(b) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches.</p> | <p>(b) The RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 inches.</p> |