November 26, 2008

10 CFR 50.55a

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

In the Matter of	)	Docket No. 50-259
Tennessee Valley Authority	)	

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 1 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION PROGRAM FOR THE SECOND TEN-YEAR INSPECTION INTERVAL - REQUEST FOR RELIEF 1-ISI-21 - RESUBMITTAL

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 Unit 1. 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 Unit 1, request for relief 1-ISI-21, 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, 2001 Edition with 2003 Addenda is specified in the CFR. The BFN Unit 1 Inservice Inspection (ISI) Program for nondestructive examination complies with the 2001 Edition, 2003 Addenda of ASME Section XI, and supplemented as required to incorporate ASME Section XI, Appendix VIII.

TVA proposes to use the EPRI Performance Demonstration Initiative (PDI) Program in lieu of the ASME Code Section XI, Appendix VIII, Supplement 11 requirements. This request for relief is consistent with the one approved for BFN Unit 3 by NRC letter dated August 22, 2006.

TVA requests approval of this request for relief by 0900 CST on November 27, 2008, in order to support transition to Mode 2 (i.e. startup) for Cycle 8 operation.

This request supersedes TVA's request dated November 25, 2008, to address comments received from the NRC staff.

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

Michael K. Brandon
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Enclosure
cc: See Page 3

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TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 1
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION XI, INSERVICE INSPECTION (ISI) PROGRAM
(SECOND TEN YEAR INSPECTION INTERVAL)
REQUEST FOR RELIEF 1-ISI-21

Executive Summary: In accordance with 10 CFR 50.55a(a)(3)(i), TVA is requesting relief from inservice inspection requirements of the 2001 Edition through 2003 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 2001 Edition through the 2003 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 the attachment were coordinated with PDI, NRC, and Pacific Northwest National Laboratory (PNNL).

Unit: One (1)

System(s): Reactor Feedwater (FW)

Components: Piping Welds with Structural Weld Overlay

ASME Code Class: ASME Code Class 1

Section XI Edition: 2001 Edition, 2003 Addenda, as required by 10 CFR 50.55a(b)(2)(xxiv)

Code Table: N/A

Examination Category: N/A

Examination Item Number: N/A

Code Requirement: The 2001 Edition of ASME Section XI, as required by 10 CFR 50.55a(b)(2)(xxiv). 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: Pursuant to 10 CFR 50.55a(a)(3)(i) relief is requested to use the enclosed Performance Demonstration Initiative (PDI) Program for implementation of Appendix VIII, Supplement 11 requirements.

Relief is requested from the requirement to qualify personnel, procedures, and equipment in accordance with Appendix VIII, Supplement 11 as stated in the 2001 Edition of ASME Section XI, as required by 10 CFR 50.55a(b)(2)(xxiv). The Code requirements for which relief is requested are all contained within Appendix VIII, Supplement 11. For example, paragraph 1.1(d)(1), requires that all base metal flaws be cracks. Paragraph 1.1(e)(1) requires that at least 20% but less than 40% of the flaws shall be oriented within plus or minus 20 degrees of the pipe axial direction. Paragraph 1.1(e)(1) also requires that the rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws. Paragraph 1.1(e)(2)(a)(1) requires that a base grading unit shall include at least 3 inches of the length of the overlaid weld. Paragraph 1.1(e)(2)(b)(1) requires that a overlay grading unit shall include the overlay material and the base metal-to-overlay interface of at least 6 sq. in. The overlay grading unit shall be rectangular, with minimum dimensions of 2 in. Paragraph 3.2(b) requires that 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.

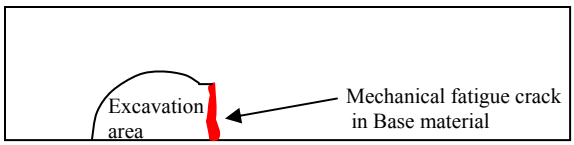
List Of Items Associated With The Relief Request: Weld Overlays that currently require examination in the Unit 1 ISI Program as required by Code Case N-504-3 and Appendix Q.

WELD #	SYSTEM	PIPE SIZE	CATEGORY
N-11B-1 OL	FW	2 inches	N/A

Note 1: Safe End: 0.206 inches min wall thickness as specified on drawing 122868E. Overlay: 0.13 inches minimum design thickness as specified for structural integrity in DCN 69535.

Basis For Relief: The requirements of ASME Section XI, Appendix VIII, Supplement 11, as stated in the 2001 Edition, as required by 10 CFR 50.55a(b)(2)(xxiv), 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.

Paragraph 1.1(d)(1), requires that all base metal flaws be cracks. As illustrated below, 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 semielliptical with a tip width of less than or equal to 0.002 inches, and at least 70 percent of the flaws in the detection and sizing test shall be cracks and the remainder shall be alternative flaws.



Relief is requested to allow closer spacing of flaws provided they didn't interfere with detection or discrimination. The existing specimens used to date for qualification to the Tri-party (NRC/BWROG/EPRI) agreement have a flaw population density greater than allowed by the 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. For example: the requirement for using IWA-3300 for proximity flaw evaluation in paragraph 1.1(e)(1) was excluded, instead indications will be sized based on their individual merits; 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; paragraph 1.1(e)(2)(a)(1) was 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; paragraph 1.1(e)(2)(a)(3) was 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 of Supplement 11; paragraph 1.1(e)(2)(b)(1) was 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 sq. in. requirement of Supplement 11; and 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.

Additionally, the requirement for axially oriented overlay fabrication flaws in paragraph 1.1(e)(1) was excluded from the PDI Program as an improbable scenario. Weld overlays are typically applied using automated gas tungsten arc welding techniques with the filler metal being 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 PDI Program revised paragraph 2.0 allowing the overlay fabrication and base metal flaw tests to be performed separately. The requirement in paragraph 3.2(b) 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.

A comparison between the ASME Section XI 2001 Edition of Supplement 11, Code Case N-653 (for information only), and the PDI Program is enclosed as an attachment.

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. Additionally, 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 in paragraph 1.1(d)(1).

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: In lieu of the requirements of ASME Section XI, 2001 Edition, Appendix VIII, Supplement 11, the PDI Program shall be used. 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 U.S. nuclear utilities created the PDI to implement performance demonstration requirements contained in Appendix VIII of Section XI of the Code. To this end, PDI has developed a program for qualifying equipment, procedures, equipment, and personnel in accordance with the ultrasonic testing criteria of Appendix VIII, Supplement 11. Prior to the Supplement 11 program, EPRI was maintaining a performance demonstration program for weld overlay qualification under the Tri-party Agreement (Reference 1). Instead of having two programs with similar objectives, the NRC staff recognized the PDI program for weld overlay qualifications as an acceptable alternative to the Tri-party Agreement

(Reference 2). The PDI program does not fully comport with the existing requirements of Supplement 11. The differences are discussed below.

Paragraph 1.1(b):
States limitations to the maximum thickness for which a procedure may be qualified. The Code states that "The specimen set must include at least one specimen with overlay thickness within minus 0.10 inch to plus 0.25 inch of the maximum nominal overlay thickness for which the procedure is applicable." The Code requirement addresses the specimen thickness tolerance for a single specimen set, but is confusing when multiple specimen sets are used. The PDI proposed alternative states that "the specimen set shall include specimens with overlay not thicker than 0.10-inch more than the minimum thickness, nor thinner than 0.25 inch of the maximum nominal overlay thickness for which the examination procedure is applicable." The proposed alternative provides clarification on the application of the tolerance. The tolerance is unchanged for a single specimen set, however, it clarifies the tolerance for multiple specimen sets by providing tolerances for both the minimum and maximum thicknesses. The proposed wording eliminates confusion while maintaining the intent of the overlay thickness tolerance.

Paragraph 1.1(d)(1):
The PDI program determined that certain Supplement 11 requirements pertaining to location and size of cracks would be extremely difficult to achieve. In an effort to satisfy the requirements, the PDI program developed a process for fabricating flaws that exhibited crack-like reflective characteristics. Instead of all flaws being cracks, as required by Paragraph 1.1(d)(1), the PDI program weld overlay performance demonstrations contain at least 70-percent cracks with the remainder being fabricated flaws exhibiting crack-like reflective characteristics. The application of alternative flaws are limited with a flaw tip dimension of 0.002 inches. Throughout the PDI proposal, the ASME Code term 'crack' is replaced with the term 'flaw' in order to substitute fabricated flaws for cracks.

Paragraph 1.1(e)(1):
The ASME Code requires that at least 20-percent but not less than 40-percent of the flaws shall be oriented within plus or minus 20-degrees of the axial direction. In the proposed PDI program, the flaws satisfy the requirement and specifies that the flaws must be in the base metal. The PDI program is confining flaw placement to ensure that candidates do not have visual or physical access to the flaws. This is a tightening of the requirements.

The ASME Code also requires that the requirements of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws. The proposed PDI program treats each flaw as an individual flaw and not as part of a system of closely spaced flaws. The proposed program controls the flaws going into a test specimen set such that the flaws are free of interfering reflections

from adjacent flaws. In some cases, this would permit flaws to be closer together than what is allowed by IWA-3300, thus making the performance demonstration more challenging.

Paragraph 1.1(e)(2)
The ASME Code requires that specimens be divided into base metal and overlay grading units. The PDI program adds clarification with the addition of the word "fabrication" to denote the overlay process and ensures flaw identification by ensuring all flaws will not be masked by other flaws with the addition of, "Flaws shall not interfere with ultrasonic detection or characterization of other flaws." PDI's alternative provides clarification and assurance that the flaws are identified and associated with the appropriate material.

Paragraph 1.1(e)(2)(a)(1):
The ASME Code requires that a base grading unit shall include at least 3 inches of the length of the overlaid weld, and the base grading unit includes the outer 25-percent of the overlaid weld and base metal on both sides. The PDI program reduced the criteria to 1 inch of the length of the overlaid weld and eliminated from the grading unit the need to include both sides of the weld. The test specimens from the existing weld overlay program have flaws on both sides of the welds, which prevents them from satisfying the base grading unit requirements. These test specimens have been used successfully for testing the proficiency of personnel for over 16 years. This is a more challenging test because the individual must locate the flaw on the correct side of the weld.

Paragraph 1.1(e)(2)(a)(2):
The ASME Code requires when base metal cracks penetrate into the weld overlay, the weld overlay within 1 inch of the crack becomes part of the base metal grading unit. The PDI program makes the base metal part of the weld overlay grading unit for cracks ending in the weld overlay. The object of the performance demonstration is to detect the crack tip that is in the weld overlay. The change redefines the grading unit to be representative of the intent of the performance demonstration.

Paragraph 1.1(e)(2)(a)(3):
The ASME Code requires that for unflawed base grading units, at least 1 inch of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. This is to minimize the number of false identifications of extraneous reflectors. The PDI program stipulates that unflawed overlaid weld and base metal exist on all sides of the grading unit and be free of interfering reflections from adjacent flaws, which addresses the same concerns as the Code.

Paragraph 1.1(e)(2)(b)(1):
The ASME Code requires that 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. The PDI program reduces the base metal-to-overlay interface to at least 1 inch (in lieu of a minimum of 2 inches) and eliminates the minimum rectangular dimension. This criterion is more challenging than the ASME Code because of the variability associated with the shape of the grading unit.

Paragraph 1.1(e)(2)(b)(2):
ASME Code requires 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 inch around its entire perimeter. The PDI program changes the requirement of 1 inch around its perimeter to 1 inch at both ends with sufficient unflawed overlaid weld and base metal on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The PDI proposal accommodates test specimens that have been successfully used for previous weld overlay qualifications under the Tri-party (NRC/Boiling-Water Reactor Owners Group/EPRI) agreement program.

Paragraph 1.1(e)(2)(b)(3):
The ASME Code identifies the minimum number of flawed and unflawed grading units in the test set. The PDI proposal stipulates that for detection, the procedure test set must consist of at least three personnel test sets. The PDI proposal is more conservative than the ASME Code.

Paragraph 1.1(f)(1):
The ASME Code identifies the minimum number of flaws and flaw locations in the test set. The PDI proposal stipulates that for sizing, the procedure test set must consist of at least three personnel test sets. The PDI proposal is more conservative than ASME Code.

Paragraphs 1.1(f)(3) and 1.1(f)(4):
The ASME Code requirements are clarified by the PDI program by replacing the term “cracking” with “flaws” because the use of alternative flaws would provide representative responses that are not achievable with implanted cracks.

Paragraph 1.1(f)(4):
The ASME Code stipulates base metal cracks extending in the overlay. The PDI proposal uses base metal flaws extending into the overlay. The flaws are fabricated alternatives to cracks that were determined to be acceptable in Paragraph 1.1(d)(1).

Paragraph 2.0:
The ASME Code requirements are retained in the PDI program alternative. In addition, the PDI program provides clarification that the overlay fabrication flaw test and the base metal flaw test may be performed separately. The ASME Code is

nonspecific on this issue. Since flaw specific criteria exist for the overlay fabrication process, separating the base metal test should produce the same results as the combined test.

Paragraph 2.1 and 2.2(d):
The ASME Code requirements are clarified by the PDI program by the addition of the terms “metal” and “fabrication.” The change provides consistency with the terms normally used for these applications in the manufacturing sector. The change is editorial in nature.

Paragraph 2.3:
The ASME Code requires 80-percent of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. This requires detection and sizing performance demonstration to be performed separately. The PDI proposal permits detection and sizing performance demonstration to be performed together, when necessary, and permits identifying flawed regions instead of specific locations. The PDI proposal is more challenging for sizing because the candidate has no prior knowledge of specific flaw locations.

Paragraph 3.1:
The ASME Code requires examination procedures, equipment, and personnel (as a complete ultrasonic system) to be qualified for detection or sizing of flaws, as applicable, when certain criteria are met. The PDI program allows procedure qualification to be performed separately from personnel and equipment qualification. Historical data indicate that, if ultrasonic detection or sizing procedures are thoroughly tested, personnel and equipment using those procedures have a higher probability of successfully passing a qualification test. In an effort to increase this passing rate, PDI has elected to perform procedure demonstration separately in order to assess and modify essential variables that may affect overall system capabilities. For a procedure to be qualified, the PDI program requires three times as many flaws to be detected (or sized) than required by Supplement 11. Personnel and equipment are still required to meet the Supplement 11 requirement; therefore, the PDI program criteria exceed the ASME Code requirements for personnel, procedures, and equipment qualification.

Paragraph 3.2(a):
The ASME Code requirements are clarified by the PDI program by replacing the term “cracking” with “flaws” because of the use of alternative flaw mechanisms. This clarification in the PDI program maintains the intent of the ASME Code requirement and is acceptable.

Paragraph 3.2(b):
The ASME Code requires that all extensions of base metal cracking into the overlay material by at least 0.1 inch be reported as intrusions into the overlay material. The PDI program omits this criterion. The PDI program requires that cracks be sized to the tolerance specified in the Code, which is 0.125 inches. Since the Code tolerance is close to the 0.1 inch value of Paragraph 3.2(b), any crack extending beyond 0.1

inch into the overlay material would be identified from its dimensions. The reporting of an extension in the overlay material is redundant for performance demonstration testing.

Based on the above evaluation, the proposed alternative to use the EPRI-PDI program requirements in lieu of selected paragraphs of Supplement 11 to Appendix VIII of Section XI of the ASME Code will provide an acceptable level of quality and safety.

Implementation Schedule: This request for relief is applicable to the Unit 1 Second Ten-Year ISI inspection interval which expires on June 1, 2017. Preservice and Inservice inspection of weld overlay N-11B-1 (OL) will be conducted in accordance with Code Case N-504-3 and Nonmandatory Appendix Q.

Attachment: Table - 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 AUSTENETIC 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

(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.	No Change	(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 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.
(c) The surface condition of at least two specimens shall approximate the roughest surface condition for which the examination procedure is applicable.	No Change	No Change

(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 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.	(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: (1) Flaws shall be limited to when implantation of cracks precludes obtaining a realistic ultrasonic response. (2) Flaws shall be semi-elliptical with a tip width of less than or equal to 0.002 inches.	(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: (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.

(2) Overlay fabrication flaws. 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.	No Change	No Change
(e) Detection Specimens		
(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.	(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.	(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.
(2) Specimens shall be divided into base and over-lay grading units. Each specimen shall contain one or both types of grading units.	(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.	(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 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.	(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.	(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.
(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.	(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.	(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.
(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.	(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.	(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.

(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.	(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 inch.	(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 inch.
(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.	(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.	(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.

(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.	(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.	(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.
(f) Sizing Specimen		
(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.
(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.
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
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.	No Change	No Change
(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.	(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.	(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.

2.3 Depth Sizing Test.		
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.	The candidate shall determine the depth of the flaw in each region.	(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 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.	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).

		(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
(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.	No Change	(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.
(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.	This requirement is omitted.	This requirement is omitted.

(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.	(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.	(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.