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OPPD
Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

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LIC-02-0142

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference:
1. Docket No. 50-285
2. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 1989 Edition
3. ASME Section XI, Appendix VIII

Subject: **Relief Requests Pertaining to the Fort Calhoun Station (FCS) Inservice Inspection (ISI) of the Reactor Pressure Vessel (RPV) for the Third Ten Year ISI Interval (1993-2003)**

Pursuant to the provision specified in 10 CFR 50.55a(a)(3)(i), the Omaha Public Power District (OPPD) requests relief from certain requirements of the ASME Boiler and Pressure Vessel Code. These relief requests pertain to an alternative ultrasonic examination scan volume for the Reactor Pressure Vessel Nozzle-to-Vessel welds (Category B-D, Item B3.90), ASME Code Case N-662 and ASME Section XI, Appendix VIII, Supplements 4, 10 and 14(proposed). The specifics of the relief requests are detailed in the attachment to this letter and are intended to be applied to the performance of the Reactor Pressure Vessel (RPV) automated ISI examination for the Third Ten Year ISI Interval. This RPV examination is planned to be performed during the 2003 Refueling Outage (RFO) at Fort Calhoun during the Fall of 2003.

If you have any questions or require additional information, please contact Dr. R. L. Jaworski at (402) 533-6833.

Sincerely,

R. T. Ridenoure
Division Manager
Nuclear Operations

RTR/PFH/rrl

A047

Attachment: Fort Calhoun Station Third Interval Relief Requests for 2003 Refueling Outage

c: E. W. Merschoff, NRC Regional Administrator, Region IV
A. B. Wang, NRC Project Manager
J. G. Kramer, NRC Senior Resident Inspector
Winston & Strawn (w/o Attachment)

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ATTACHMENT

Fort Calhoun Station
Third Interval Relief Requests
for
2003 Refueling Outage

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REQUESTS FOR RELIEF FROM ASME SECTION XI REQUIREMENTS

This section contains relief requests written pursuant to the requirements 10 CFR 50.55a for situations applicable ASME Section XI Code requirements cannot be met.

The following NRC guidance was employed to determine the correct 10 CFR 50.55a paragraph citing for Fort Calhoun Station relief requests.

10 CFR 50.55a(a)(3)(i): Cited in relief requests when alternatives to the Section XI requirements, which provide an acceptable level of quality and safety, are proposed. Examples are relief requests, which propose alternative NDE methods and/or examination frequency.

10 CFR 50.55a(a)(3)(ii): Cited in relief requests when compliance with the Section XI requirements is deemed to be a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Examples of hardship and/or unusual difficulty include, but are not limited to, excessive radiation exposure, disassembly of components solely to provide access for examinations, and development of sophisticated tooling that would result in only minimal increases in examination coverage.

10 CFR 50.55a(g)(5)(iii): Cited in relief requests when conformance with Section XI requirements is deemed impractical. Examples of impractical requirements are situations where the component would have to be redesigned, or replaced to enable the required inspection to be performed.

The following relief requests contained in Table 1 are subject to change throughout the inspection interval.

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Table 1
ISI PROGRAM RELIEF REQUEST INDEX

Relief Request	Summary	Revision
RR - 1	Use of Alternative to RPV Nozzle-to-Vessel Welds	0
RR - 2	Use of Alternative to Appendix VIII, Supplement 10	0
RR - 3	Use of Alternative to Appendix VIII, (Proposed) Supplement 14	0
RR - 4	Use of Code Case N-662 only for RPV Nozzle-to-Safe End Welds	0
RR - 5	Alternative to Supplement 4 Length Sizing Criteria	0

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ISI Relief Request RR-1

Use of Alternative to RPV Nozzle-to-Vessel Welds

System: Reactor Vessel **Class 1**
Category: B-D **Item No.: B3.90**

COMPONENT IDENTIFICATION:

ASME Section XI, Class 1, Examination Category B-D, Item B3.90 Reactor Pressure Vessel Pressure retaining Nozzle-to-Vessel welds at Fort Calhoun Station (FCS).

EXAMINATION REQUIREMENTS:

Rules for In-service Inspection of Nuclear Power Plant Components, Section XI, 1989 Edition, Examination Category B-D Full Penetration Welds of Nozzles in Vessels, Code Item B3.90, Figure IWB-2500-7.

ASME Section V, 1989 Edition, Article 4, Paragraphs T-441.3.2.5 Angle Beam Scanning, T-3.2.6 Scanning for Reflectors Oriented Parallel to the Weld, and T-441.3.2.7 Scanning for Reflectors Oriented Transverse to the Weld.

RELIEF REQUESTED:

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested to implement an alternative to the requirements of ASME Section XI Figure IWB-2500-7. These examinations will be performed during the fall 2003 refueling outage.

BASIS FOR RELIEF:

Fort Calhoun Station is currently required to perform In-service Examinations of selected welds in accordance with the requirements of 10 CFR 50.55a, plant technical specifications, and the 1989 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components. This Code edition invokes the examination volume requirements of Figure IWB-2500-7. This Code edition also invokes the examination requirements of Appendix I, Article I-2000 which reference ASME Section V, Article 4 that essentially prescribes twenty (20) year old examination methodology. The Ultrasonic examination techniques utilized for this examination will have been qualified by demonstration for Appendix VIII Supplement 7 of the 1995 Edition 1996 Addenda of ASME by the Performance Demonstration Initiative (PDI) as amended by the September

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1999 revision of 10CFR50.55a. The use of these qualified techniques further assures that the Reactor Vessel welds have remained free of service related flaws thus enhancing quality and ensuring plant safety and reliability.

The examination volume for the Reactor Pressure Vessel nozzle-to-vessel welds extends far beyond the weld into the base metal for a distance of half the metal thickness, and is unnecessarily large. This extends the examination time significantly, and results in no net increase in safety, as the area being examined is a base metal region which is not prone to in-service cracking and has been extensively examined before the vessel was put into service and during the First and Second In-service examination.

FCS proposes reducing the examination volume into the base metal next to the widest part of the weld from half of the vessel wall thickness to one-half (1/2) inch. This removes examination from the base metal that was extensively examined during construction and pre-service inspection and is not in the high residual stress region associated with the weld. These high-stressed areas are contained in the proposed adjacent one-half (1/2) inch volume that are subject to examination.

The implementation of this alternative is also expected to reduce the on-vessel examination time by as much as 5 hours, which translates to a significant reduction in personnel radiation exposure.

ALTERNATIVE EXAMINATIONS:

1. Perform examinations in accordance with the proposed exam volume of the weld plus the adjacent one-half (1/2) inch volume of the base metal.
2. Conduct Mechanized Ultrasonic Examinations of essentially 100% of all welds using Performance Demonstration Initiative (PDI) ASME Section XI, Appendix VIII qualified procedures and personnel. This will be accomplished in accordance with ASME Code, Section XI, Division 1, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 7 as modified by 10CFR50.55a.
3. Periodic System Pressure Tests per Category B-P, Table IWB-2500-1

IMPLEMENTATION SCHEDULE:

The fall 2003 refueling outage.

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ISI Relief Request RR-2

Use of Alternative to Appendix VIII, Supplement 10

System: Various **Class 1 and 2**
Category: Various **Item No.: Various**

SYSTEM/COMPONENT (S) FOR WHICH RELIEF IS REQUESTED

Pressure Retaining Piping Welds subject to examination using procedures, personnel, and equipment qualified to ASME Section XI, Appendix VIII, Supplement 10 criteria.

CODE REQUIREMENTS

The following paragraphs or statements are from ASME Section XI, Appendix VIII, Supplement 10 and identify the specific requirements that are included in this request for relief.

Item 1 - Paragraph 1.1(b) states in part - Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent.

Item 2 - Paragraph 1.1(d) states - All flaws in the specimen set shall be cracks.

Item 3 - Paragraph 1.1(d)(1) states - At least 50% of the cracks shall be in austenitic material. At least 50% of the cracks in austenitic material shall be contained wholly in weld or buttering material. At least 10% of the cracks shall be in ferritic material. The remainder of the cracks may be in either austenitic or ferritic material.

Item 4 - Paragraph 1.2(b) states in part - The number of unflawed grading units shall be at least twice the number of flawed grading units.

Item 5 - Paragraph 1.2(c)(1) and 1.3(c) state in part - At least 1/3 of the flaws, rounded to the next higher whole number, shall have depths between 10% and 30% of the nominal pipe wall thickness. Paragraph 1.4(b) distribution table requires 20% of the flaws to have depths between 10% and 30%.

Item 6 - Paragraph 2.0 first sentence states - The specimen inside surface and identification shall be concealed from the candidate.

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Item 7 - Paragraph 2.2(b) states in part - The regions containing a flaw to be sized shall be identified to the candidate.

Item 8 - Paragraph 2.2(c) states in part - For a separate length-sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate.

Item 9 - Paragraph 2.3(a) states - For the depth sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate.

Item 10 - Paragraph 2.3(b) states - 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.

Item 11 - Table VIII-S2-1 provides the false call criteria when the number of unflawed grading units is at least twice the number of flawed grading units.

RELIEF REQUESTED

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety.

Relief is requested to use the following alternative requirements for implementation of Appendix VIII, Supplement 10 requirements. They will be implemented through the PDI Program.

A copy of the proposed revision to Supplement 10 is attached. It identifies the proposed alternatives and allows them to be viewed in context. It also identifies additional clarifications and enhancements for information. It has been submitted to the ASME Code for consideration and as of September 2002 had been approved by the NDE Subcommittee.

BASIS FOR RELIEF

Item 1 - The proposed alternative to Paragraph 1.1(b) states:

"The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within a range of 1/2 in. (13 mm) of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24 in. (610 mm) shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of $\pm$25% is acceptable."

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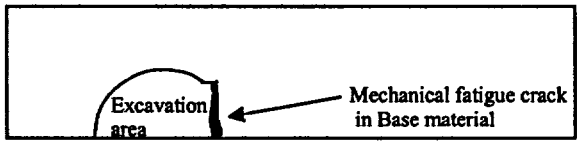
Technical Basis - The change in the minimum pipe diameter tolerance from 0.9 times the diameter to the nominal diameter minus 0.5 inch provides tolerances more in line with industry practice. Though the alternative is less stringent for small pipe diameters they typically have a thinner wall thickness than larger diameter piping. A thinner wall thickness results in shorter sound path distances that reduce the detrimental effects of the curvature. This change maintains consistency between Supplement 10 and the recent revision to Supplement 2.

Item 2 - The proposed alternative to Paragraph 1.1(d) states:

"At least 60% of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with IGSCC shall be used when available. Alternative flaws, if used, shall provide crack-like reflective characteristics and shall be limited to the case where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. Alternative flaw mechanisms shall have a tip width of less than or equal to 0.002 in. (.05 mm). Note, to avoid confusion the proposed alternative modifies instances of the term "cracks" or "cracking" to the term "flaws" because of the use of alternative flaw mechanisms."

Technical Basis - 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. In addition, it is important to preserve the dendritic structure present in field welds that would otherwise be destroyed by the implantation process. To resolve these issues, the proposed alternative allows the use of up to 40% fabricated flaws as an alternative flaw mechanism under controlled conditions. The fabricated flaws are isostatically compressed which produces ultrasonic reflective characteristics similar to tight cracks.



Item 3 - The proposed alternative to Paragraph 1.1(d)(1) states:

"At least 80% of the flaws shall be contained wholly in weld or buttering material. At least one and a maximum of 10% of the flaws shall be in ferritic base material. At least one and a maximum of 10% of the flaws shall be in austenitic base material."

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Technical Basis - Under the current Code, as few as 25% of the flaws are contained in austenitic weld or buttering material. Recent experience has indicated that flaws contained within the weld are the likely scenarios. The metallurgical structure of austenitic weld material is ultrasonically more challenging than either ferritic or austenitic base material. The proposed alternative is therefore more challenging than the current Code.

Item 4 - The proposed alternative to Paragraph 1.2(b) states:

"Detection sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least one and a half times the number of flawed grading units."

Technical Basis - Table S-10-1 provides a statistically based ratio between the number of unflawed grading units and the number of flawed grading units. The proposed alternative reduces the ratio to 1.5 times to reduce the number of test samples to a more reasonable number from the human factors perspective. However, the statistical basis used for screening personnel and procedures is still maintained at the same level with competent personnel being successful and less skilled personnel being unsuccessful. The acceptance criteria for the statistical basis are in Table VIII-S10-1.

Item 5 - The proposed alternative to the flaw distribution requirements of Paragraph 1.2(c)(1) (detection) and 1.3(c) (length) is to use the Paragraph 1.4(b) (depth) distribution table (see below) for all qualifications.

Flaw Depth (% Wall Thickness)	Minimum Number of Flaws
10-30%	20%
31-60%	20%
61-100%	20%

Technical Basis - The proposed alternative uses the depth sizing distribution for both detection and depth sizing because it provides for a better distribution of flaw sizes within the test set. This distribution allows candidates to perform detection, length, and depth sizing demonstrations simultaneously utilizing the same test set. The requirement that at least 75% of the flaws shall be in the range of 10 to 60% of wall thickness provides an overall distribution tolerance yet the distribution uncertainty decreases the possibilities for testmanship that would be inherent to a uniform distribution. It must be noted that it is possible to achieve the same distribution utilizing the present requirements, but it is preferable to make the criteria consistent.

Item 6 - The proposed alternative to Paragraph 2.0 first sentence states:

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"For qualifications from the outside surface, the specimen inside surface and identification shall be concealed from the candidate. When qualifications are performed from the inside surface, the flaw location and specimen identification shall be obscured to maintain a "blind test"."

Technical Basis - The current Code requires that the inside surface be concealed from the candidate. This makes qualifications conducted from the inside of the pipe (e.g., PWR nozzle to safe end welds) impractical. The proposed alternative differentiates between ID and OD scanning surfaces, requires that they be conducted separately, and requires that flaws be concealed from the candidate. This is consistent with the recent revision to Supplement 2.

Items 7 and 8 - The proposed alternatives to Paragraph 2.2(b) and 2.2(c) state:

"... Containing a flaw to be sized may be identified to the candidate."

Technical Basis - The current Code requires that the regions of each specimen containing a flaw to be length sized shall be identified to the candidate. The candidate shall determine the length of the flaw in each region (Note, that length and depth sizing use the term "regions" while detection uses the term "grading units" - the two terms define different concepts and are not intended to be equal or interchangeable). To ensure security of the samples, the proposed alternative modifies the first "shall" to a "may" to allow the test administrator the option of not identifying specifically where a flaw is located. This is consistent with the recent revision to Supplement 2.

Items 9 and 10 - The proposed alternative to Paragraph 2.3(a) and 2.3(b) state:

"... Regions of each specimen containing a flaw to be sized may be identified to the candidate."

Technical Basis - The current Code requires that a large number of flaws be sized at a specific location. The proposed alternative changes the "shall" to a "may" which modifies this from a specific area to a more generalized region to ensure security of samples. This is consistent with the recent revision to Supplement 2. It also incorporates terminology from length sizing for additional clarity.

Item 11 - The proposed alternative modifies the acceptance criteria of Table VIII-S2-1 as follows:

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TABLE VIII-S2-1
PERFORMANCE DEMONSTRATION DETECTION TEST
ACCEPTANCE CRITERIA

Detection Test Acceptance Critera		False Call Test Acceptance Criteria	
No. of Flawed Grading Units	Minimum Detection Criteria	No. of Unflawed Grading Units	Maximum Number of False Calls
~~5~~	~~5~~	~~10~~	~~0~~
~~6~~	~~6~~	~~12~~	~~1~~
~~7~~	~~6~~	~~14~~	~~1~~
~~8~~	~~7~~	~~16~~	~~2~~
~~9~~	~~7~~	~~18~~	~~2~~
10	8	~~20~~ 15	~~3~~ 2
11	9	~~22~~ 17	~~3~~ 3
12	9	~~24~~ 18	~~3~~ 3
13	10	~~26~~ 20	~~4~~ 3
14	10	~~28~~ 21	~~5~~ 3
15	11	~~30~~ 23	~~5~~ 3
16	12	~~32~~ 24	~~6~~ 4
17	12	~~34~~ 26	~~6~~ 4
18	13	~~36~~ 27	~~7~~ 4
19	13	~~38~~ 29	~~7~~ 4
20	14	~~40~~ 30	~~8~~ 5

Technical Basis - The proposed alternative is identified as new Table S-10-1 above. It was modified to reflect the reduced number of unflawed grading units and allowable false calls. As a part of ongoing Code activities, PNNL has reviewed the statistical significance of these revisions and offered the revised Table S-10-1.

ALTERNATIVE EXAMINATION

In lieu of the requirements of ASME Section XI, 1989 Edition, no Addenda, Appendix VIII, Supplement 10, the proposed alternative shall be used. The proposed alternative is described in the enclosure.

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JUSTIFICATION FOR GRANTING RELIEF

Pursuant to 10 CFR 50.55a(a)(3)(i), approval is requested to use the proposed alternatives described above in lieu of the ASME Section XI, Appendix VIII, Supplement 10 requirements. Compliance with the proposed alternatives will provide an adequate level of quality and safety for examination of the affected welds.

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Present wording	Changes (in bold)	Description/Reason
	1.0 SCOPE	Added
	Supplement 10 is applicable to dissimilar metal piping welds examined from either the inside or outside surface. Supplement 10 is not applicable to piping welds containing supplemental corrosion resistant clad (CRC) applied to mitigate Intergranular Stress Corrosion Cracking (IGSCC).	A scope statement provides added clarity regarding the applicable range of each individual Supplement. The exclusion of CRC provides consistency between Supplement 10 and the recent revision to Supplement 2 (Reference BC 00-755). Note, an additional change identifying CRC as "in course of preparation" is being processed separately.
1.0 SPECIMEN REQUIREMENTS	2.0 SPECIMEN REQUIREMENTS	Renumbered
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.	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
1.1 General. The specimen set shall conform to the following requirements.	**2.1** General. The specimen set shall conform to the following requirements.	Renumbered
	(a) The minimum number of flaws in a test set shall be ten.	New, changed minimum number of flaws to 10 so sample set size for detection is consistent with length and depth sizing.
(a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	**(b)** Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	Renumbered

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Present wording	Changes (in bold)	Description/Reason
(b) The specimen set shall include the minimum and maximum pipe diameters and thicknesses 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. Pipe diameters larger than 24 in. shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of ±25% is acceptable.	**(c)** The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within a range of **1/2 in. (13 mm)** of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24 in. **(610 mm)** shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of ±25% is acceptable.	Renumbered, metricated, the change in pipe diameter tolerance provides consistency between Supplement 10 and the recent revision to Supplement 2 (Reference BC 00-755)
(c) The specimen set shall include examples of the following fabrication condition:	**(d)** The specimen set shall include examples of the following fabrication conditions:	Renumbered, changed "condition" to "conditions"
(1) geometric conditions that normally require discrimination from flaws (e.g., counterbore or weld root conditions, cladding, weld buttering, remnants of previous welds, adjacent welds in close proximity);	(1) geometric **and material** conditions that normally require discrimination from flaws (e.g., counterbore or weld root conditions, cladding, weld buttering, remnants of previous welds, adjacent welds in close proximity, **and weld repair areas**);	Clarification, some of the items listed relate to material conditions rather than geometric conditions. Weld repair areas were added as a result of recent field experiences.
(2) typical limited scanning surface conditions (e.g., diametrical shrink, single-side access due to nozzle and safe end external tapers).	(2) typical limited scanning surface conditions (e.g., **weld crowns,** diametrical shrink, single-side access due to nozzle and safe end external tapers **for outside surface examinations; and internal tapers, exposed weld roots, and cladding conditions for inside surface examinations). Qualification requirements shall be satisfied separately for outside surface and inside surface examinations.**	Differentiates between ID and OD scanning surface limitations. Requires that ID and OD qualifications be conducted independently (Note, new paragraph 2.0 (identical to old paragraph 1.0) provides for alternatives when "a set of specimens is designed to accommodate specific limitations stated in the scope of the examination procedure.").
(d) All flaws in the specimen set shall be cracks.		Deleted this requirement, because new paragraph 2.3 below provides for the use of "alternative flaws" in lieu of cracks.

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Present wording	Changes (in bold)	Description/Reason
(1) At least 50% of the cracks shall be in austenitic material. At least 50% of the cracks in austenitic material shall be contained wholly in weld or buttering material. At least 10% of the cracks shall be in ferritic material. The remainder of the cracks may be in either austenitic or ferritic material.	**2.2 Flaw Location. At least 80% of the flaws shall be contained wholly in weld or buttering material. At least one and a maximum of 10% of the flaws shall be in ferritic base material. At least one and a maximum of 10% of the flaws shall be in austenitic base material.**	Renumbered and re-titled. Flaw location percentages redistributed because field experience indicates that flaws contained in weld or buttering material are probable and represent the more stringent ultrasonic detection scenario.
(2) At least 50% of the cracks in austenitic base material shall be either IGSCC or thermal fatigue cracks. At least 50% of the cracks in ferritic material shall be mechanically or thermally induced fatigue cracks.	**2.3 Flaw Type.** **(a) At least 60% of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with IGSCC shall be used when available. Alternative flaws, if used, shall provide crack-like reflective characteristics and shall be limited to the case where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. Alternative flaw mechanisms shall have a tip width of less than or equal to 0.002 in. (.05 mm).**	Renumbered and re-titled. Alternative flaws are required for placing axial flaws in the HAZ of the weld and other areas where implantation of a crack produces metallurgical conditions that result in an unrealistic ultrasonic response. This is consistent with the recent revision to Supplement 2 (Reference BC 00-755). The 40% limit on alternative flaws is needed to support the requirement for up to 70% axial flaws. Metricated
(3) At least 50% of the cracks shall be coincident with areas described in (c) above.	**(b) At least 50% of the flaws shall be coincident with areas described in 2.1(d) above.**	Renumbered. Due to inclusion of "alternative flaws", use of "cracks" is no longer appropriate.
	2.4 Flaw Depth. All flaw depths shall be greater than 10% of the nominal pipe wall thickness. Flaw depths shall exceed the nominal clad thickness when placed in cladding. **Flaws in the sample set shall be distributed as follows:** **Flaw Depth (% Wall Thickness) / Minimum Number of Flaws** **10-30% — 20%** **31-60% — 20%** **61-100% — 20%** **At least 75% of the flaws shall be in the range of 10 to 60% of wall thickness.**	Moved from old paragraph 1.3(c) and 1.4 and re-titled. Consistency between detection and sizing specimen set requirements (e.g., 20% vs. 1/3 flaw depth increments, e.g., original paragraph 1.3(c))

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Present wording	Changes (in bold)	Description/Reason
1.2 Detection Specimens. The specimen set shall include detection specimens that meet the following requirements.		Renumbered and re-titled and moved to paragraph 3.1(a). No other changes
(a) Specimens shall be divided into grading units. Each grading unit shall include at least 3 in. of weld length. If a grading unit is designed to be unflawed, at least 1 in. of unflawed material shall exist on either side of the grading unit. The segment of weld length used in one grading unit shall not be used in another grading unit. Grading units need not be uniformly spaced around the pipe specimen.		Renumbered to paragraph 3.1(a)(1). No other changes.
(b) Detection sets shall be selected from Table VIII-S2-1. The number of unflawed grading units shall be at least twice the number of flawed grading units.		Moved to new paragraph 3.1(a)(2).
(c) Flawed grading units shall meet the following criteria for flaw depth, orientation, and type.		Flaw depth requirements moved to new paragraph 2.4, flaw orientation requirements moved to new paragraph 2.5, flaw type requirements moved to new paragraph 2.3, "Flaw Type".
(1) All flaw depths shall be greater than 10% of the nominal pipe wall thickness. At least 1/3 of the flaws, rounded to the next higher whole number, shall have depths between 10% and 30% of the nominal pipe wall thickness. However, flaw depths shall exceed the nominal clad thickness when placed in cladding. At least 1/3 of the flaws, rounded to the next whole number, shall have depths greater than 30% of the nominal pipe wall thickness.		Deleted, for consistency in sample sets the depth distribution is the same for detection and sizing.

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Present wording	Changes (in bold)	Description/Reason
(2) At least 30% and no more than 70% of the flaws, rounded to the next higher whole number, shall be oriented axially. The remainder of the flaws shall be oriented circumferentially.	**2.5 Flaw Orientation.** **(a)** At least 30% and no more than 70% of the flaws, rounded to the next higher whole number, shall be oriented axially. The remainder of the flaws shall be oriented circumferentially.	Note: this distribution is applicable for detection and depth sizing. Paragraph 2.5(b)(1) requires that all length- sizing flaws be oriented circumferentially.
1.3 Length Sizing Specimens. The specimen set shall include length-sizing specimens that meet the following requirements.		Renumbered and re-titled and moved to new paragraph 3.2
(a) All length sizing flaws shall be oriented circumferentially.		Moved, included in new paragraph 3.2(a)
(b) The minimum number of flaws shall be ten.		Moved, included in new paragraph 2.1 above
(c) All flaw depths shall be greater than 10% of the nominal pipe wall thickness. At least 1/3 of the flaws, rounded to the next higher whole number, shall have depths between 10% and 30% of the nominal pipe wall thickness. However, flaw depth shall exceed the nominal clad thickness when placed in cladding. At least 1/3 of the flaws, rounded to the next whole number, shall have depths greater than 30% of the nominal pipe wall thickness.		Moved, included in new paragraph 2.4 above after revision for consistency with detection distribution
1.4 Depth Sizing Specimens. The specimen set shall include depth-sizing specimens that meet the following requirements.		Moved, included in new paragraphs 2.1, 2.3, 2.4
(a) The minimum number of flaws shall be ten.		Moved, included in new paragraph 2.1
(b) Flaws in the sample set shall not be wholly contained within cladding and shall be distributed as follows:		Moved, potential conflict with old paragraph 1.2(c)(1); "However, flaw depths shall exceed the nominal clad thickness when placed in cladding.". Revised for clarity and included in new paragraph 2.4

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Present wording	Changes (in bold)	Description/Reason
Flaw Depth (% Wall Thickness) / Minimum Number of Flaws 10-30% / 20% 31-60% / 20% 61-100% / 20% The remaining flaws shall be in any of the above categories.		Moved, included in paragraph 2.4 for consistent applicability to detection and sizing samples.
	(b) Sizing Specimen sets shall meet the following requirements.	Added for clarity
	(1) All length-sizing flaws shall be oriented circumferentially.	Moved from old paragraph 1.3(a)
	(2) Depth sizing flaws shall be oriented as in 2.5(a).	Included for clarity. Previously addressed by omission (i.e., length, but not depth had a specific exclusionary statement)
2.0 CONDUCT OF PERFORMANCE DEMONSTRATION	**3.0 CONDUCT OF PERFORMANCE DEMONSTRATION**	Renumbered
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.	**For qualifications from the outside surface, the specimen inside surface and identification shall be concealed from the candidate. When qualifications are performed from the inside surface, the flaw location and specimen identification shall be obscured to maintain a "blind test".** 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.	Differentiate between qualifications conducted from the outside and inside surface.
2.1 Detection Test. Flawed and unflawed grading units shall be randomly mixed	**3.1 Detection Qualification.**	Renumbered, moved text to paragraph 3.1(a)(3)

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Present wording	Changes (in bold)	Description/Reason
	(a) The specimen set shall include detection specimens that meet the following requirements.	Renumbered, moved from old paragraph 1.2.
	(1) Specimens shall be divided into grading units. Each grading unit shall include at least 3 in. **(76 mm)** of weld length. If a grading unit is designed to be unflawed, at least 1 in. **(25 mm)** of unflawed material shall exist on either side of the grading unit. The segment of weld length used in one grading unit shall not be used in another grading unit. Grading units need not be uniformly spaced around the pipe specimen.	Renumbered, moved from old paragraph 1.2(a). Metricated. No other changes.
	(2) Detection sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least **one and a half** times the number of flawed grading units.	Moved from old paragraph 1.2(b). Table revised to reflect a change in the minimum sample set to 10 and the application of equivalent statistical false call parameters to the reduction in unflawed grading units. Human factors due to large sample size.
	(3) flawed and unflawed grading units shall be randomly mixed.	Moved from old paragraph 2.1
	(b) Examination equipment and personnel are qualified for detection when **personnel demonstrations** satisfy the acceptance criteria of Table VIII S10-1 for both detection and false calls.	Moved from old paragraph 3.1. Modified to reflect the 100% detection acceptance criteria of procedures versus personnel and equipment contained in new paragraph 4.0 and the use of 1.5X rather than 2X unflawed grading units contained in new paragraph 3.1(a)(2). Note, the modified table maintains the screening criteria of the original Table VIII-S2-1.
2.2 Length Sizing Test	**3.2 Length Sizing Test**	Renumbered
(a) The length-sizing test may be conducted separately or in conjunction with the detection test.	**(a) Each reported circumferential flaw in the detection test shall be length sized.**	Provides consistency between Supplement 10 and the recent revision to Supplement 2 (Reference BC 00-755).

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Present wording	Changes (in bold)	Description/Reason
(b) When the length-sizing test is conducted in conjunction with the detection test, and less than ten circumferential flaws are detected, additional specimens shall be provided to the candidate such that at least ten flaws are sized. 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.	(b) When the length-sizing test is conducted in conjunction with the detection test, and less than ten circumferential flaws are detected, additional specimens shall be provided to the candidate such that at least ten flaws are sized. The regions containing a flaw to be sized **may** be identified to the candidate. The candidate shall determine the length of the flaw in each region.	Change made to ensure security of samples, consistent with the recent revision to Supplement 2 (Reference BC 00-755). Note, length and depth sizing use the term "regions" while detection uses the term "grading units". The two terms define different concepts and are not intended to be equal or interchangeable.
(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.	(c) For a separate length-sizing test, the regions of each specimen containing a flaw to be sized **may** be identified to the candidate. The candidate shall determine the length of the flaw in each region.	Change made to ensure security of samples, consistent with the recent revision to Supplement 2 (Reference BC 00-755).
	(d) Examination procedures, equipment, and personnel are qualified for length sizing when the RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 in. (19 mm).	Moved from old paragraph 3.2(a) includes inclusion of "when" as an editorial change. Metricated.
2.3 Depth Sizing Test	3.3 Depth Sizing Test	Renumbered
(a) For the depth-sizing test, 80% of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate.	(a) **The depth-sizing test may be conducted separately or in conjunction with the detection test. For a separate depth-sizing test, the regions of each specimen containing a flaw to be sized may be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.**	Change made to ensure security of samples, consistent with the recent revision to Supplement 2 (Reference BC 00-755).

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Present wording	Changes (in bold)	Description/Reason
(b) 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.	**(b) When the depth-sizing test is conducted in conjunction with the detection test, and less than ten flaws are detected, additional specimens shall be provided to the candidate such that at least ten flaws are sized.** The regions of each specimen containing a flaw to be sized may be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	Change made to be consistent with the recent revision to Supplement 2 (Reference BC 00-755). Changes made to ensure security of samples, consistent with the recent revision to Supplement 2 (Reference BC 00-755).
	(c) Examination procedures, equipment, and personnel are qualified for depth sizing when the RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in. **(3 mm).**	Moved from old paragraph 3.2(b). Metricated.
3.0 ACCEPTANCE CRITERIA		Delete as a separate category. Moved to new paragraph detection (3.1) and sizing 3.2 and 3.3
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.		Moved to new paragraph 3.1(b), reference changed to Table S10 from S2 because of the change in the minimum number of flaws and the reduction in unflawed grading units from 2X to 1.5X.
3.2 Sizing Acceptance Criteria		Deleted as a separate category. Moved to new paragraph on length 3.2 and depth 3.3
(a) Examination procedures, equipment, and personnel are qualified for length sizing the RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch.		Moved to new paragraph 3.2(d), included word "when" as an editorial change.
(b) Examination procedures, equipment, and personnel are qualified for depth sizing when the RMS error of the flaw depth measurements, as compared to the true flaw depths, is less than or equal to 0.125 in.		Moved to new paragraph 3.3(c)

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Present wording	Changes (in bold)	Description/Reason
	4.0 PROCEDURE QUALIFICATION	New
	Procedure qualifications shall include the following additional requirements. **(a) The specimen set shall include the equivalent of at least three personnel sets. Successful personnel demonstrations may be combined to satisfy these requirements.** **(b) Detectability of all flaws within the scope of the procedure shall be demonstrated. Length and depth sizing shall meet the requirements of paragraph 3.2 and 3.3.** **(c) At least one successful personnel demonstration has been performed.** **(d) To qualify new values of essential variables, at least one personnel qualification set is required.**	New. Based on experience gained in conducting qualifications, the equivalent of 3 personnel sets (i.e., a minimum of 30 flaws) is required to provide enough flaws to adequately test the capabilities of the procedure. Combining successful demonstrations allows a variety of examiners to be used to qualify the procedure. Detectability of each flaw within the scope of the procedure is required to ensure an acceptable personnel pass rate. The last sentence is equivalent to the previous requirements and is satisfactory for expanding the essential variables of a previously qualified procedure

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TABLE VIII-S2-1
PERFORMANCE DEMONSTRATION DETECTION TEST
ACCEPTANCE CRITERIA

Detection Test Acceptance Critera		False Call Test Acceptance Criteria	
No. of Flawed Grading Units	Minimum Detection Criteria	No. of Unflawed Grading Units	Maximum Number of False Calls
~~5~~	~~5~~	~~10~~	~~0~~
~~6~~	~~6~~	~~12~~	~~1~~
~~7~~	~~6~~	~~14~~	~~1~~
~~8~~	~~7~~	~~16~~	~~2~~
~~9~~	~~7~~	~~18~~	~~2~~
10	8	~~20~~ 15	~~3~~ 2
11	9	~~22~~ 17	~~3~~ 3
12	9	~~24~~ 18	~~3~~ 3
13	10	~~26~~ 20	~~4~~ 3
14	10	~~28~~ 21	~~5~~ 3
15	11	~~30~~ 23	~~5~~ 3
16	12	~~32~~ 24	~~6~~ 4
17	12	~~34~~ 26	~~6~~ 4
18	13	~~36~~ 27	~~7~~ 4
19	13	~~38~~ 29	~~7~~ 4
20	14	~~40~~ 30	~~8~~ 5

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ISI Relief Request RR-3
Use of Alternative to Appendix VIII, (Proposed) Supplement 14

System: Various **Class 1 and 2**
Category: Various **Item No.: Various**

SYSTEM/COMPONENT (S) FOR WHICH RELIEF IS REQUESTED

Class 1 Pressure Retaining Piping Welds examined from the inside surface of Pressurized Water Reactors using procedures, personnel, and equipment qualified to ASME Section XI, Appendix VIII, Supplement 2, 3, or 10 criteria.

CODE REQUIREMENTS

Relief is requested from the qualification requirements for piping welds contained in Table VIII-3110-1 of Appendix VIII to ASME Section XI.

Table VIII-3110-1 identifies Supplement 2 as applicable for Wrought Austenitic Piping Welds.

Table VIII-3110-1 identifies Supplement 3 as applicable for Ferritic Piping Welds.

Table VIII-3110-1 identifies Supplement 10 as applicable for Dissimilar Metal Piping Welds.

RELIEF REQUESTED

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety.

Relief is requested to use the enclosed proposed alternative for implementation of selected aspects of Appendix VIII, Supplement 2 and 3, as coordinated with the proposed alternative for the Supplement 10 implementation program. The Performance Demonstration Initiative (PDI) will administer the alternative program.

BASIS FOR RELIEF

Depending upon the particular design, the nozzle to main coolant piping may be fabricated using ferritic, austenitic, or cast stainless components and assembled using ferritic, austenitic, or dissimilar metal welds. Additionally, differing combinations of these assemblies may be in close proximity, which typically means the same ultrasonic

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essential variables are used for each weld and the most challenging ultrasonic examination process is employed (e.g., the ultrasonic examination process associated with a dissimilar metal weld would be applied to a ferritic or austenitic weld.

Separate qualifications to Supplements 2, 3, and 10 are redundant when done in accordance with the PDI Program. For example, during a personnel qualification to the PDI Program, the candidate would be exposed to a minimum of 10 flawed grading units for each individual supplement. Personnel qualification to Supplements 2, 3, and 10 would therefore require a total of 30 flawed grading units. Test sets this large and tests of this duration are impractical. Additionally, a full procedure qualification (i.e. 3 personnel qualifications) to the PDI Program requirements would require 90 flawed grading units. This is particularly burdensome for a procedure that will use the same essential variables or the same criteria for selecting essential variables for all 3 supplements.

To resolve these issues, the PDI Program recognizes the Supplement 10 qualification as the most stringent and technically challenging ultrasonic application. The essential variables used for the examination of Supplements 2, 3, and 10 are equivalent and a coordinated implementation would be sufficiently stringent to qualify all 3 Supplements if the requirements used to qualify Supplement 10 are satisfied as a prerequisite. The basis for this conclusion is the fact that the majority of the flaws in Supplement 10 are located wholly in austenitic weld material, which is known to be challenging for ultrasonic techniques due to the variable dendritic structure of the weld material. Flaws in Supplements 2 and 3 are located in fine-grained base materials, which are known to be less challenging.

Additionally, the proposed alternative is more stringent than current Code requirements for a detection and length sizing qualification. For example, the current Code would allow a detection procedure, personnel, and equipment to be qualified to Supplement 10 with 5 flaws, Supplement 2 with 5 flaws, and Supplement 3 with 5 flaws, a total of only 15 flaws. The proposed alternative of qualifying Supplement 10 using 10 flaws and adding on Supplement 2 with 5 flaws and Supplement 3 with 3 flaws results in a total of 18 flaws which will be multiplied by a factor of 3 for the procedure qualification.

Based on the above, the use of a limited number of Supplement 2 or 3 flaws is sufficient to access the capabilities of procedures and personnel who have already satisfied Supplement 10 requirements. The statistical basis used for screening personnel and procedures is still maintained at the same level with competent personnel being successful and less skilled personnel being unsuccessful. The proposed alternative is consistent with other coordinated qualifications currently contained in Appendix VIII.

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The proposed alternate program is attached and is identified as Supplement 14. It has been submitted to the ASME Code for consideration as new Supplement 14 to Appendix VIII and as of September 2002 had been approved by the NDE Subcommittee.

ALTERNATIVE EXAMINATION

In lieu of the requirements of ASME Section XI, 1989 Edition, no Addenda, Appendix VIII, Table VIII-3110-1, the Performance Demonstration Initiative (PDI) Program for implementation of selected aspects of Appendix VIII, Supplement 2, and 3, as coordinated with the alternative PDI Supplement 10 implementation program shall be used and as modified in FCS RR-2. The PDI Program alternative is described in the enclosure.

JUSTIFICATION FOR GRANTING RELIEF

Pursuant to 10 CFR 50.55a(a)(3)(i), approval is requested to use the proposed alternatives described above in lieu of the ASME Section XI, Appendix VIII, Supplement 10 requirements. Compliance with the proposed alternatives will provide an adequate level of quality and safety for examination of the affected welds.

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PDI Program Alterative	Reasoning
1.0 SCOPE	
This Supplement provides requirements for expansion of Supplement 10 procedure, equipment, and personnel inside surface qualifications with add-ons of Supplements 2 and 3 qualifications. The same ultrasonic essential variables values, or, when appropriate, the same criteria for selecting values as demonstrated in Supplement 10 shall be used. This Supplement is applicable to examinations conducted from the inside surface.	There is currently no available Code action allowing for a coordinated implementation of the fundamental qualifications required for the typical examinations performed from the ID of PWR nozzles. Without this Code Case/Change, qualifications would require an excessive amount of flawed and unflawed grading units. This proposed supplement uses the more technically stringent Supplement 10 qualification as a base and then incorporates a limited number of Supplement 2 and Supplement 3 samples. This proposal is consistent with the philosophy of Supplement 12, the proposed changes to Supplement 10, and the approved changes to Supplement 2 and 11.
2.0 SPECIMEN REQUIREMENTS	
2.1General 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, access limitations). The same specimens may be used to demonstrate both detection and sizing qualification. The specimen sets shall conform to the following requirements.	
(a) Specimens shall have sufficient volume to minimize spurious reflections that may interfere with the interpretation process.	
(b) The specimen set shall include the minimum and maximum pipe diameters and thicknesses for which the examination procedure is applicable. Pipe diameters within 1/2 in. (13 mm) of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24 in. (610 mm) shall be considered to be flat. When a range of thicknesses is to be examined, a thickness tolerance of $\pm$ 25% is acceptable.	This criteria is consistent with Supplement 10.
(c) The specimen set shall include examples of the following fabrication conditions: (1) geometric and material conditions that normally require discrimination from flaws (e.g., counterbore or weld root conditions, cladding, weld buttering, remnants of previous welds, adjacent welds in close proximity, and weld repair areas); (2) typical limited scanning surface conditions (e.g., internal tapers, exposed weld roots, and cladding conditions).	
2.2 At least 70% of the Supplement 2 flaws shall be cracks, the remainder shall be	

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PDI Program Alterative	Reasoning
alternative flaws. Specimens with IGSCC shall be used when available Alternative flaws, if used, shall provide crack-like reflective characteristics and shall be limited to the case where implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. Alternative flaw mechanisms shall have a tip width of less than or equal to 0.002 in. (0.05 mm).	
2.3 Supplement 3 flaws shall be mechanical or thermal fatigue cracks.	
2.4 The specimen set shall contain a representative distribution of flaws. Flawed and unflawed grading units shall be randomly mixed.	Since the number of flaws will be limited words such as "uniform distribution" could lead to testmanship and are considered inappropriate.
3.0 CONDUCT OF PERFORMANCE DEMONSTRATION	
The flaw location and specimen identification shall be obscured to maintain a "blind test". 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.	
4.0 DETECTION QUALIFICATION	
The coordinated implementation shall include the following requirements for personnel detection qualification.	
4.1 The specimen set for Supplement 2 qualification shall include at least five flawed grading units and ten unflawed grading units in austenitic piping. A maximum of one flaw shall be oriented axially.	
4.2 The specimen set for Supplement 3 qualification shall include at least three flawed grading units and six unflawed grading units in ferritic piping. A maximum of one flaw shall be oriented axially.	
4.3 Specimens shall be divided into grading units. Each grading unit shall include at least 3 in. (76 mm) of weld length. If a grading unit is designed to be unflawed, at least 1 in. (25 mm) of unflawed material shall exist on either side of the grading unit. The segment of weld length used in one grading unit shall not be used in another grading unit. Grading units need not be uniformly spaced around the pipe specimen.	
4.4 All grading units shall be correctly identified as being either flawed or unflawed.	
5.0 LENGTH SIZING QUALIFICATION	
The coordinated implementation shall include the following requirements for	

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PDI Program Alterative	Reasoning
personnel length sizing qualification.	
5.1 The specimen set for Supplement 2 qualification shall include at least four flaws in austenitic material.	Axial flaws are not length sized in Supplement 2.
5.2 The specimen set for Supplement 3 qualification shall include at least three flaws in ferritic material.	
5.3 Each reported circumferential flaw in the detection test shall be length sized. When only length sizing is being tested, the regions of each specimen containing a flaw to be sized may be identified to the candidate. The candidate shall determine the length of the flaw in each region.	
5.4 Supplement 2 examination procedures, equipment, and personnel are qualified for length sizing when the flaw lengths estimated by ultrasonics, as compared with the true lengths, does not exceed 0.75 in. (19 mm) RMS when they are combined with a successful Supplement 10 qualification.	
5.5 Supplement 3 examination procedures, equipment, and personnel are qualified for length sizing when the flaw lengths estimated by ultrasonics, as compared with the true lengths, does not exceed 0.75 in. (19 mm) RMS when they are combined with a successful Supplement 10 qualification.	
6.0 DEPTH SIZING QUALIFICATION	
The coordinated implementation shall include the following requirements for personnel depth sizing qualification.	
6.1 The specimen set for Supplement 2 qualification shall include at least four circumferentially oriented flaws in austenitic material.	Axial flaws are not depth sized in Supplement 2.
6.2 The specimen set for Supplement 3 qualification shall include at least three flaws in ferritic material.	
6.3 For a separate depth sizing test, the regions of each specimen containing a flaw to be sized may be identified to the candidate. The candidate shall determine the depth of the flaw in each region.	
6.4 Supplement 2 examination procedures, equipment, and personnel are qualified for depth sizing when the flaw depths estimated by ultrasonics, as compared with the true depths, does not exceed 0.125 in. (3 mm) RMS when they are combined with a	

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PDI Program Alterative	Reasoning
successful Supplement 10 qualification.	
6.5 Supplement 3 examination procedures, equipment, and personnel are qualified for depth sizing when the flaw depths estimated by ultrasonics, as compared with the true depths, does not exceed 0.125 in. (3 mm) RMS when they are combined with a successful Supplement 10 qualification.	
7.0 PROCEDURE QUALIFICATION	
Procedure qualifications shall include the following additional requirements. (a) The specimen set shall include the equivalent of at least three personnel sets. Successful personnel demonstrations may be combined to satisfy these requirements. (b) Detectability of all flaws within the scope of the procedure shall be demonstrated. Length and depth sizing shall meet the requirements of paragraph 5.0 and 6.0. (c) At least one successful personnel demonstration has been performed. (d) To qualify new values of essential variables, at least one personnel qualification set is required.	

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ISI Relief Request RR-4

Use of Code Case N-662 only for RPV Nozzle-to-Safe End Welds

System: Reactor Vessel **Class 1**
Category: B-F **Item No.: B5.10**

ALTERNATIVE EXAMINATION REQUIREMENTS:

In accordance with 10 CFR 50.55a(a)(3)(i), FCS is requesting relief from inservice inspection requirements of the 1989 Edition no Addenda, Section XI of the ASME Boiler and Pressure Vessel Code for the surface examination of Class 1, reactor pressure vessel (RPV) nozzle-to-safe end welds. The examination requirement is for a surface and volumetric examination of ASME Section XI, Examination Category B-F, "Pressure Retaining Dissimilar Metal Welds"," Item No. B5.10, "Reactor Vessel NPS 4 or larger".

FCS proposes to implement the requirements consistent with ASME Code Case N-662, "Alternative Requirements for Class 1 and 2 Surface Examinations Section XI, Division 1." FCS plans to implement the Code Case N-662 only for the surface examinations scheduled for the six (6) Reactor Pressure Vessel nozzle-to-safe end dissimilar metal welds, category B-F, item B5.10. These six (6) welds have no history of being susceptible to any probable leak paths which would cause external chloride stress corrosion cracking or other outside surface initiated mechanisms for outside surface cracking. By implementing Code Case N-662 for these six (6) welds, FCS would eliminate the need for a surface examination. FCS would still perform the required volumetric examinations of these six (6) nozzle-to-safe end welds under the rules of ASME Section XI 1989 Edition with no Addenda, category B-F, item number B5.10.

JUSTIFICATION FOR GRANTING RELIEF

The Ultrasonic examination techniques utilized for this examination will have been qualified by demonstration for Appendix VIII of the 1995 Edition 1996 Addenda of ASME by the Performance Demonstration Initiative (PDI) as amended by 10CFR50.55a. The use of these qualified techniques further assures that the dissimilar metal welds have remained free of service related flaws thus enhancing quality and ensuring plant safety and reliability.

The work required to support these surface examinations includes labor to remove/replace the cover plates over the six (6) reactor nozzles, and labor to remove/replace the sand surrounding the nozzles. The surface inspections of the outside weld surfaces are then limited due to the tight space and no access to the very bottom of

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the welds. The area dose rate is estimated to be about 120 mr/hr with the head on however, the dose in the cavity surrounding the nozzles is unknown. An ex-core detector was pulled out of one of the nozzle boxes last outage and was reading 40,000 mr/hr. The surface dose rate near the welds would be very close to these detectors. The implementation of this Code Case is expected to reduce the radiation exposure by several man-rem while providing an acceptable level of quality and safety.

The ultrasonic examinations will be performed during the fall 2003 refueling outage.

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ISI Relief Request RR-5

Alternative to Supplement 4 Length Sizing Criteria

System: Reactor Vessel **Class 1**
Category: B-A **Item No.: B1.10**

COMPONENT IDENTIFICATION:

ASME Section XI, Class 1, Examination category B-A, Item B1.10 longitudinal and circumferential shell welds and B1.20 Head welds subject to Appendix VIII, Supplement 4, examination.

Pressure retaining welds in Reactor Pressure Vessels examined Fort Calhoun Station.

EXAMINATION REQUIREMENTS:

10 CFR 50.55a(b)(2) was amended to reference Section XI of the Code through the 1995 Edition with the 1996 Addenda (64 FR 51370). ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 4, Subparagraph 3.2(b), length sizing qualification criteria requires that flaw lengths estimated by ultrasonics be the true length –1/4 inch +1 inch. As amended, 10 CFR 50.55a(b)(2)(xv)(C)(1) requires a depth sizing acceptance criteria of 0.15 inch root mean square (RMS) be used in lieu of the requirements of Subparagraphs 3.2(b) Supplement 4 to Appendix VIII of Section XI of the 1996 Addenda of the Code. Subparagraph 3.2(c) contains additional requirements for statistical parameters.

RELIEF REQUESTED:

Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested to use an alternative length sizing qualification criteria of 0.75 inch Root Mean Square Error (RMSE) in lieu of subparagraph 3.2(b) and to use the RMSE calculations of 3.2(a) and 3.2(b) in lieu of the statistical parameters of 3.2(c). These examinations will be performed at Fort Calhoun station during the 2003 fall refueling outage..

BASIS FOR RELIEF:

On January 12, 2000, NRC staff, representatives from the Electric Power Research Institute (EPRI) Nondestructive Examination Center, and representatives from the Performance Demonstration Initiative (PDI) participated in a conference call. The discussion during the conference call included the difference between Supplement 4,

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"Qualification Requirements for the Clad/Basemetal Interface of Reactor Vessel," to Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) in the rule (Federal Register, 64 FR 51370), and the implementation of Supplement 4 by the PDI Program. Supplement 4, Subparagraph 3.2(b) imposed a flaw sizing tolerance of –1/4 inch, +1.0 inch of the true length to the performance demonstration qualification criteria. The rule changed Subparagraph 3.2(a) to a depth sizing requirement of 0.15 inch RMS, and the PDI program uses a length sizing tolerance of 0.75 inch RMS for paragraph 3.2(b). The NRC staff acknowledged that Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) in the rule was an error and should actually be a length sizing tolerance of 0.75 inch RMS, the same tolerance that was being implemented by the PDI program.

In a public meeting on October 11, 2000 at NRC offices in White Flint, MD, the PDI identified the discrepancy between the Subparagraph 3.2(c) and the PDI program. The NRC agrees that Paragraph 10 CFR 50.55a(b)(2)(xv)(C)(1) should have excluded Subparagraph 3.2(c) as a requirement.

The U.S. nuclear utilities created the PDI to implement demonstration requirements contained in Appendix VIII. PDI developed a performance demonstration program for qualifying UT techniques. In 1995, the NRC staff performed an assessment of the PDI program and reported that PDI was using a length sizing tolerance of 0.75 inch RMS for reactor pressure vessel performance demonstrations. This criterion was introduced to reduce testmanship (passing the test based on manipulation of results rather than skill). The staff noted in the assessment report dated, March 6, 1996, that the length sizing tolerance was not according to Appendix VIII but did not take exception to PDI's implementation of the 0.75 inch RMS length sizing tolerance. The staff requested that the length sizing difference between PDI and the Code be resolved.

The solution for resolving the differences between the PDI and the Code for PDI to participate in development of a Code case that reflected PDI's program. The Code case was presented to ASME for discussion and consensus building. NRC representatives participated in this process. ASME approved the Code case and published it as Code Case N-622, "Ultrasonic Examination of RPV and Piping, Bolts and Studs, Section XI, Division 1."

Operating in parallel with the actions of PDI, the staff incorporated most of Code Case N-622 criteria in the rule published in the Federal Register, 64 FR 51370. Supplement 4 to Code Case N-622 contains the proposed alternative sizing criteria, which has been authorized by the staff. The staff agrees that the omission of the length sizing tolerance 0.75 inch RMS in the rule and the inclusion of statistical parameters of Paragraph 3.2(c) of Supplement 4 to Appendix VIII was an oversight.

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ALTERNATIVE EXAMINATIONS:

In lieu of the length sizing requirements of the ASME Section XI, 1995 Edition, 1996 addenda, Appendix VIII, Supplement 4, Subparagraph 3.2(b), a length sizing qualification criteria of 0.75 inch RMSE will be used. The RMSE calculation will be used in lieu of Subparagraph 3.2(c).

Periodic System Pressure Tests per Category B-P, Table IWB-2500-1

IMPLEMENTATION SCHEDULE:

Fall 2003 refueling outage.