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A unit of American Electric Power

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10 CFR 50.55a

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50-316

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

Donald C. Cook Nuclear Plant Units 1 and 2
PROPOSED ALTERNATIVE TO THE
AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE, SECTION XI
REQUIREMENTS FOR EXAMINATION OF DISSIMILAR METAL PIPING WELDS

Pursuant to 10 CFR 50.55a(a)(3)(i), Indiana Michigan Power Company (I&M), the licensee for Donald C. Cook Nuclear Plant Units 1 and 2, requests Nuclear Regulatory Commission approval of an alternative to the requirements of the American Society of Mechanical Engineers Code (ASME Code), Section XI requirements for examination of dissimilar metal piping butt welds for the third 10-year inservice inspection program interval.

Attachment 1 to this letter provides a proposed alternative to the qualification requirements of ASME Code, Section XI, Appendix VIII, Supplement 10 for supporting examination of dissimilar metal piping welds. The proposed alternative would allow the use of alternative requirements that have been developed by the industry (to be implemented through the Performance Demonstration Initiative program) and which are contained in a proposed revision to Supplement 10. A summary of the proposed revision to Supplement 10 is included as Attachment 2 to this letter.

I&M requests approval of the proposed alternative by January 31, 2006, to support the Unit 2, Cycle 16 refueling outage scheduled to begin in March 2006. This letter contains no new commitments. Should you have any questions, please contact Mr. John A. Zwolinski, Director of Safety Assurance at (269) 466-2428.

Sincerely,

Daniel P. Fadel
Engineering Vice President

RV/rdw

A047

Attachments:

1. Proposed Alternative to the Requirements of American Society of Mechanical Engineers Code Section XI.
2. Proposed Revision to American Society of Mechanical Engineers (ASME) Code, Section XI Appendix VIII, Supplement 10

c: R. Aben – Department of Labor and Economic Growth
J. L. Caldwell – NRC Region III
K. D. Curry – AEP Ft. Wayne, w/o attachments
J. T. King – MPSC, w/o attachments
MDEQ – WHMD/RPMWS, w/o attachments
NRC Resident Inspector
D. W. Spaulding – NRC Washington DC

PROPOSED ALTERNATIVE TO THE REQUIREMENTS
OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE
SECTION XI

1.0 SYSTEM/COMPONENT (S) FOR WHICH RELIEF IS REQUESTED

Pressure Retaining Piping Welds subject to examination using procedures, personnel, and equipment qualified to American Society of Mechanical Engineers Code (ASME Code) Section XI, Appendix VIII, Supplement 10 criteria. Tables 1 and 2 respectively, identify the Unit 1 and Unit 2 components included in this request.

2.0 APPLICABLE CODE AND ADDENDA

ASME Code, Section XI, Appendix VII, Supplement 10 as required by 10 CFR 50.55a.

3.0 CODE REQUIREMENTS

The following paragraphs or statements are from ASME Code, 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 percent (%) 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.

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.

4.0 RELIEF REQUESTED

Relief is requested to use the following alternative requirements for implementation of the Appendix VIII, Supplement 10 requirements required by 10 CFR 50.55a. They will be implemented through the Performance Demonstration Initiative (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.

5.0 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 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.”

Technical Basis - The change in the minimum pipe diameter tolerance from 0.9 times the diameter to within 1/2 inch of the nominal diameter 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:

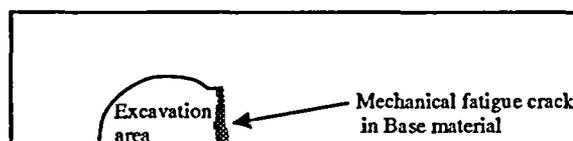
“At least 60% of the flaws shall be cracks, the remainder shall be alternative flaws. Specimens with IGSCC shall be used when available. Alternative flaws, shall meet the following requirements:

(1) Alternative flaws, if used, shall provide crack-like reflective characteristics and shall only be used when implantation of cracks would produce spurious reflectors that are uncharacteristic of service-induced flaws.

(2) Alternative flaw mechanisms shall have a tip width no more than 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 no more than 10% of the flaws shall be in ferritic base material. At least one and no more than 10% of the flaws shall be in austenitic base material.”

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:

“Personnel performance demonstration detection test sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least 1-1/2 times the number of flawed grading units.”

Technical Basis - Table S10-1 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:

“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., pressurized water reactor nozzle to safe end welds) impractical. The proposed alternative differentiates between inside diameter and outside diameter 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 Criteria		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 S10-1 above. It was modified to reflect the reduced number of unflawed grading units and allowable false calls. As a part of ongoing Code activities, Pacific Northwest National Laboratories has reviewed the statistical significance of these revisions and offered the revised Table S10-1.

6.0 ALTERNATIVE EXAMINATION

In lieu of the requirements of ASME Code, Section XI, Appendix VIII, Supplement 10 required by 10 CFR 50.55a, the proposed alternative shall be used. The proposed alternative is described in Attachment 2.

7.0 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 Code, 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.

8.0 DURATION OF THE RELIEF

The relief is requested for the remainder of the third 10-year inservice inspection interval.

9.0 PRECEDENTS

Similar requests have been granted for the Virgil C. Summer Nuclear Station, Reference 1, and the Wolf Creek Generation Station, Reference 2.

10.0 REFERENCES

1. Letter from John A. Nakoski, U. S. Nuclear Regulatory Commission (NRC), to Stephen A. Byrne, Virgil C. Summer Nuclear Station, "Virgil C. Summer Nuclear Station – Second 10-Year Inservice Inspection, Request for Relief RR-II-20, RR-II-20 Addenda, and RR-II-21 (TAC No. MC0108)," Accession Number ML040340450, dated February 3, 2004.
2. Letter from Robert A. Gramm, NRC, to Rick A. Muench, Wolf Creek Nuclear Operating Corporation, "Wolf Creek Generation Station – Relief Requests I2R-29 through I2R-32 Pertaining to Implementation of ASME Code, Section XI Requirements for Examination of Welds (TAC No. MC6478)," Accession Number 051380396, dated May 17, 2005.

TABLE 1
Unit 1 Components

Component Identification	Description	System Description	ASME Item Number
1-RPV-1-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-1-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-2-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-2-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-3-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-3-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-4-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-RPV-4-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
1-PRZ-20	NOZZLE TO SAFE-END	PRESSURIZER	B5.40

TABLE 1
Unit 1 Components

Component Identification	Description	System Description	ASME Item Number
1-PRZ-21	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
1-PRZ-22	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
1-PRZ-24	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
1-PRZ-25	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
STM-11-02R	SAFE-END TO INLET NOZZLE	STEAM GENERATOR NO. 11	B5.70
STM-11-03R	OUTLET NOZZLE TO SAFE-END	STEAM GENERATOR NO. 11	B5.70
STM-12-02R	SAFE-END TO INLET NOZZLE	STEAM GENERATOR NO. 12	B5.70
STM-12-03R	OUTLET NOZZLE TO SAFE-END	STEAM GENERATOR NO. 12	B5.70
STM-13-02R	INLET NOZZLE TO SAFE-END	STEAM GENERATOR NO. 13	B5.70
STM-13-03R	OUTLET NOZZLE TO SAFE-END	STEAM GENERATOR NO. 13	B5.70

TABLE 1
Unit 1 Components

Component Identification	Description	System Description	ASME Item Number
STM-14-02R	SAFE-END TO INLET NOZZLE	STEAM GENERATOR NO. 14	B5.70
STM-14-03R	OUTLET NOZZLE TO SAFE-END	STEAM GENERATOR NO. 14	B5.70
1-FW-11-14F-R	SAFE-END TO NOZZLE	FEEDWATER SYSTEM	C5.51
1-FW-13-14F-R	SAFE-END TO NOZZLE	FEEDWATER SYSTEM	C5.51
1-FW-16-14F-R	SAFE-END TO NOZZLE	FEEDWATER SYSTEM	C5.51
1-FW-18-14F-R	SAFE-END TO NOZZLE	FEEDWATER SYSTEM	C5.51

TABLE 2
Unit 2 Components

Component Identification	Description	System Description	ASME Item Number
2-RPV-1-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-RPV-1-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-RPV-2-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-RPV-2-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-RPV-3-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-RPV-3-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10

TABLE 2
Unit 2 Components

Component Identification	Description	System Description	ASME Item Number
2-RPV-4-01	NOZZLE TO SAFE-END "HOT LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-RPV-4-02	SAFE-END TO NOZZLE "COLD LEG"	REACTOR PRESSURE VESSEL AND CLOSURE HEAD	B5.10
2-PRZ-21	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
2-PRZ-22	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
2-PRZ-23	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
2-PRZ-24	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
2-PRZ-25	NOZZLE TO SAFE-END	PRESSURIZER	B5.40
2-PRZ-26	SAFE-END TO NOZZLE	PRESSURIZER	B5.40
STM-21-02	ELBOW TO INLET NOZZLE	STEAM GENERATOR NO. 21	B5.70

TABLE 2
Unit 2 Components

Component Identification	Description	System Description	ASME Item Number
STM-21-03	OUTLET NOZZLE TO ELBOW	STEAM GENERATOR NO. 21	B5.70
STM-22-02	ELBOW TO INLET NOZZLE	STEAM GENERATOR NO. 22	B5.70
STM-22-03	OUTLET NOZZLE TO ELBOW	STEAM GENERATOR NO. 22	B5.70
STM-23-02	ELBOW TO INLET NOZZLE	STEAM GENERATOR NO. 23	B5.70
STM-23-03	OUTLET NOZZLE TO ELBOW	STEAM GENERATOR NO. 23	B5.70
STM-24-02	ELBOW TO INLET NOZZLE	STEAM GENERATOR NO. 24	B5.70
STM-24-03	OUTLET NOZZLE TO ELBOW	STEAM GENERATOR NO. 24	B5.70

Attachment 2 to AEP:NRC:5055-11

Proposed Revision to American Society of Mechanical Engineers Code (ASME Code) Section XI Appendix VIII, Supplement 10

SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS		
Current Requirement	Proposed Change	Reasoning
	1.0 SCOPE	
	<p>Supplement 10 is applicable to dissimilar metal piping welds examined from either the inside or outside surface.</p> <p>Supplement 10 is not applicable to piping welds containing supplemental corrosion resistant clad (CRC) applied to mitigate Intergranular Stress Corrosion Cracking (IGSCC).</p>	<p>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.</p>
1.0 SPECIMEN REQUIREMENTS	2.0 SPECIMEN REQUIREMENTS	Renumbered
<p>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.</p>	<p>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.</p>	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 specimen 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.

SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS		
Current Requirement	Proposed Change	Reasoning
(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
(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 $\pm 25\%$ 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 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.	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, 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 shall be included as follows: (a) for outside surface examination, weld crowns , diametrical shrink, single-side access due to nozzle and safe end external tapers	Differentiates between inside diameter and outside diameter 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

SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS		
Current Requirement	Proposed Change	Reasoning
	<p>(b) for inside surface examination, internal tapers, exposed weld roots, and cladding conditions for inside surface examinations).</p> <p>(e) Qualification requirements shall be satisfied separately for outside surface and inside surface examinations.</p>	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.
(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.	<p>2.2 Flaw Location.</p> <p>At least 80% of the flaws shall be contained wholly in weld or buttering material. At least one and no more than 10% of the flaws shall be in ferritic base material. At least one and no more than 10% of the flaws shall be in austenitic base material.</p>	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.	<p>2.3 Flaw Type.</p> <p>(a) At least 60% of the flaws shall be cracks, and the remainder shall be alternative flaws. Specimens with IGSCC shall be used when available. Alternative flaws shall meet the following requirements:</p> <p>(1) Alternative flaws, if used, shall provide crack-like reflective characteristics and shall only be used</p>	<p>Renumbered and re-titled. Alternative flaws are required for placing axial flaws in the heat affected zone 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).</p> <p>The 40% limit on alternative flaws is</p>

SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS										
Current Requirement	Proposed Change	Reasoning								
	when implantation of cracks would produce spurious reflectors that are uncharacteristic of service-induced flaws. (2) Alternative flaws shall have a tip width no more than 0.002 in. (.05 mm).	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.								
	<p>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:</p> <table border="1"> <thead> <tr> <th>Flaw Depth (% Wall Thickness)</th> <th>Minimum Number of Flaws</th> </tr> </thead> <tbody> <tr> <td>10-30%</td> <td>20%</td> </tr> <tr> <td>31-60%</td> <td>20%</td> </tr> <tr> <td>61-100%</td> <td>20%</td> </tr> </tbody> </table> <p>At least 75% of the flaws shall be in the range of 10 to 60% of wall thickness.</p>	Flaw Depth (% Wall Thickness)	Minimum Number of Flaws	10-30%	20%	31-60%	20%	61-100%	20%	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))
Flaw Depth (% Wall Thickness)	Minimum Number of Flaws									
10-30%	20%									
31-60%	20%									
61-100%	20%									
1.2 Detection Specimens. The specimen set shall include detection specimens that meet		Renumbered and re-titled and moved to paragraph 3.1(a). No other changes								

SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS		
Current Requirement	Proposed Change	Reasoning
the following requirements.		
(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		Deleted, for consistency in sample sets the depth distribution is the same for detection and sizing.

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Current Requirement	Proposed Change	Reasoning
flaws, rounded to the next whole number, shall have depths greater than 30% of the nominal pipe wall thickness.		
(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) For other than sizing specimens 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		Moved, included in new paragraph 2.4 above after revision for consistency with detection distribution

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Current Requirement	Proposed Change	Reasoning
nominal pipe wall thickness.		
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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Current Requirement	Proposed Change	Reasoning
<p>Flaw Depth Minimum <u>(% Wall Thickness)</u> <u>Number of Flaws</u></p> <p>10-30% 20% 31-60% 20% 61-100% 20%</p> <p>The remaining flaws shall be in any of the above categories.</p>		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) 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 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.	Personnel and procedure performance demonstration tests shall be conducted according to the following requirements. (a) 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	Differentiate between qualifications conducted from the outside and inside surface.

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Current Requirement	Proposed Change	Reasoning
	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.	
2.1 Detection Test. Flawed and unflawed grading units shall be randomly mixed	3.1 Detection Test.	Renumbered, moved text to paragraph 3.1(a)(3)
	(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. (a) Each grading unit shall include at least 3 in. (76 mm) of weld length. (b)The end of each flaw shall be separated from an unflawed grading unit by at least 1 in. (25 mm) of unflawed material. A flaw may be less than 3 in. in length. (c) The segment of weld length used in one grading unit shall not be used in another grading unit. (d) Grading units need not be uniformly spaced around the pipe specimen.	Renumbered, moved from old paragraph 1.2(a). Metricated. No other changes.

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Current Requirement	Proposed Change	Reasoning
	(2) Personnel performance demonstration detection test sets shall be selected from Table VIII-S10-1. The number of unflawed grading units shall be at least 1-1/2 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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Current Requirement	Proposed Change	Reasoning
(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, do not exceed 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	Change made to ensure security of samples, consistent with the recent revision to Supplement 2 (Reference BC 00-755).

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Current Requirement	Proposed Change	Reasoning
	may be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	
(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, do not exceed 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.

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Current Requirement	Proposed Change	Reasoning
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)
	4.0 PROCEDURE QUALIFICATION	New
	<p>Procedure qualifications shall include the following additional requirements.</p> <p>(a) The specimen set shall include the equivalent of at least three personnel performance demonstration test sets. Successful personnel performance demonstrations may be combined to satisfy these requirements.</p> <p>(b) Detectability of all flaws in the procedure qualification test set that are within the scope of the procedure shall be demonstrated. Length and depth sizing shall meet the requirements of paragraph 3.1, 3.2, and 3.3.</p> <p>(c) At least one successful personnel</p>	<p>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</p>

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Current Requirement	Proposed Change	Reasoning
	<p>demonstration shall be performed. (d) To qualify new values of essential variables, at least one personnel qualification set is required. The acceptance criteria of 4.0(b) shall be met.</p>	<p>procedure</p>

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**TABLE VIII-SZ-1
PERFORMANCE DEMONSTRATION DETECTION TEST
ACCEPTANCE CRITERIA**

Detection Test Acceptance Criteria		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