



Palo Verde Nuclear  
Generating Station

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**10 CFR 50.55a**  
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102-05079-CDM/SAB/RJR  
April 5, 2004

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

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2, and 3  
Docket Nos. STN 50-528, 50-529 and 50-530  
License Nos. NPF-41, NPF-51 and NPF-74  
Second Ten-Year Interval Inservice Inspection Program  
Relief Request No. 26 – Relief from ASME Code, Section XI,  
Appendix VIII, Supplement 10**

Supplement 10 to ASME Section XI, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," contains qualification requirements for procedures, equipment, and personnel involved with examining dissimilar metal welds using ultrasonic techniques. Pursuant to 10 CFR 50.55a( a)( 3)( i), Arizona Public Service Co. (APS) requests NRC approval to use an alternative in lieu of certain of these requirements.

Approval is requested to use a technical alternative developed by the Performance Demonstration Initiative (PDI) for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3. Use of the proposed alternative will provide an acceptable level of quality and safety, as described in attached Relief Request No. 26.

By letter dated February 26, 2004, the NRC Staff authorized the use of a similar alternative for Duane Arnold Energy Center, Monticello Nuclear Generating Plant, Prairie Island Nuclear Generating Plants, Units 1 and 2, Kewaunee Nuclear Power Plant, Point Beach Nuclear Plant, Units 1 and 2, and Palisades Nuclear Plant (TAC Nos. MC0814, MC0816, MC0820, MC0821, MC0815, MC0818, MC0819 and MC0817)

APS requests review of this relief by July 05, 2004, to support the 2004 spring refueling outage for PVNGS Unit 1 scheduled to end on May 6, 2004. Approval by this date would allow APS to take credit for welds examined during the Unit 1 spring outage using the alternate qualification requirements identified in RR No. 26 to be reported in the Inservice Inspection Summary Report issued 90 days after the completion of the outage.

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U. S. Nuclear Regulatory Commission  
Second Ten-Year Interval Inservice Inspection Program  
Relief Request No. 26 – Relief from ASME Code, Section XI, Appendix VIII,  
Supplement 10

Inservice Inspection Summary Report issued 90 days after the completion of the  
outage.

No new commitments are being made to the NRC by this letter. If you have any  
questions concerning this matter, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,



GRO/SAB/RJR/kg

Enclosure: Relief Request No. 26 – Relief from ASME Code, Section XI,  
Appendix VIII, Supplement 10

cc:

B. S. Mallett	(w/Enclosure)
M. B. Fields	(w/Enclosure)
N. L. Salgado	(w/Enclosure)

## **Relief Request No. 26**

### **I. ASME Code Component(s) Affected**

Pressure retaining piping welds subject to examination using procedures, personnel, and equipment qualified to ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 10 criteria.

### **II. Applicable Code Addition and Addenda**

Second 10-year inservice inspection interval code for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3: The American Society of Mechanical Engineers (ASME) Code, Section XI, 1992 Edition, 1992 Addenda.

Construction code for PVNGS Units 1, 2, and 3: ASME Section III, 1971 Edition, 1973 Winter Addenda.

Installation code for PVNGS Units 1, 2, and 3: ASME Section III, 1974 Edition, 1975 Winter Addenda.

### **III. Applicable Requirements**

The following paragraphs or statements are from ASME Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 10, Qualification Requirements for Dissimilar Metal Piping Welds, 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%.

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- 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.

### **IV. Relief Requested**

Relief is requested to use alternative requirements for implementation of Appendix VII, Supplement 10 requirements. The alternative requirements will be implemented through the PDI Program. A copy of the proposed revision to Supplement 10 is included in the attachment to this request. 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 Committee for consideration.

### **V. 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 one-half inch (13 mm) of the nominal diameter shall be considered equivalent. Pipe diameters larger than 24-inches (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.

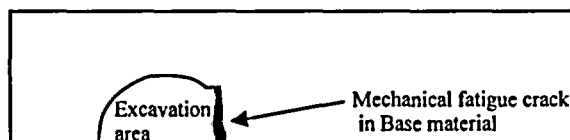
**Item 2** - The proposed alternative to Paragraph 1.1(d) states:

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.



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**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."

### 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 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.

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

In addition, the proposed alternative includes the following: "At least 75% of the flaws shall be in the range of 10 to 60% of wall thickness."

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### 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., 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."

## Relief Request 26

### 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
<del>5</del>	<del>5</del>	<del>10</del>	<del>0</del>
<del>6</del>	<del>6</del>	<del>12</del>	<del>1</del>
<del>7</del>	<del>6</del>	<del>14</del>	<del>1</del>
<del>8</del>	<del>7</del>	<del>16</del>	<del>2</del>
<del>9</del>	<del>7</del>	<del>18</del>	<del>2</del>
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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### 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 Laboratory (PNNL) has reviewed the statistical significance of these revisions and offered the revised Table S10-1.

### VI. Alternative Examination

In lieu of the requirements of ASME Section XI, 1995 Edition, 1996 Addenda, Appendix VIII, Supplement 10, the proposed alternative shall be used. The proposed alternative is described in the attachment to this enclosure.

### VII. 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, 1995 Edition, 1996 Addenda, 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.

### VIII. Implementation Schedule

APS requests review of this relief by July 05, 2004, to support the 2004 spring refueling outage for PVNGS Unit 1 scheduled to end on May 6, 2004. Approval by this date would allow APS to take credit for welds examined during the Unit 1 spring outage using the alternate qualification requirements identified in RR No. 26 and reported in the Inservice Inspection Summary Report issued 90 days after the completion of the outage.

### IX. Precedence

Nine Mile Point Nuclear Stations 1 and 2  
November 21, 2003  
ML033240060

San Onofre Nuclear Generating Station Unit 3  
August 27, 2003  
ML032390449

Three Mile Island Nuclear Station Unit 1  
September 5, 2003  
ML032320548

**Attachment to Relief Request No. 26**

# SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS

Current Requirement	PDI Proposed Change	Reasoning
	<b>1.0 SCOPE</b>	
	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.
<b>1.0 SPECIMEN REQUIREMENTS</b>	<b>2.0 SPECIMEN REQUIREMENTS</b>	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
<b>1.1 General.</b> The specimen set shall conform to the following requirements.	<b>2.1 General.</b> The specimen set shall conform to the following requirements.	Renumbered
	<b>(a) The minimum number of flaws in a specimen set shall be ten.</b>	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

# SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS

Current Requirement	PDI Proposed Change	Reasoning
(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, 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 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 (b) for inside surface examination, internal tapers, exposed weld roots, and cladding conditions for inside surface examinations). (e) Qualification requirements shall be satisfied separately for outside surface	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.").

# SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS

Current Requirement	PDI Proposed Change	Reasoning
	and inside surface examinations.	
(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.	<b>2.2 Flaw Location.</b> 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.	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.	<b>2.3 Flaw Type.</b> <b>(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:</b> <b>(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.</b> <b>(2) Alternative flaws shall have a tip width no more than 0.002-in. (.05 mm).</b>	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>(b) At least 50% of the flaws shall be coincident with areas described in 2.1(d) above.</b>	Renumbered. Due to inclusion of “alternative flaws”, use of “cracks” is no longer appropriate.

**SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS**

Current Requirement	PDI Proposed Change	Reasoning								
	<p><b>2.4 Flaw Depth.</b> 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. <b>Flaws in the sample set shall be distributed as follows:</b></p> <table><tr><th>Flaw Depth (% Wall Thickness)</th><th>Minimum Number of Flaws</th></tr><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></table> <p><b>At least 75% of the flaws shall be in the range of 10 to 60% of wall thickness.</b></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%									
<b>1.2 Detection Specimens.</b> 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.								

# SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS

Current Requirement	PDI Proposed Change	Reasoning
(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.
(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.	<b>2.5 Flaw Orientation.</b> (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.
<b>1.3 Length Sizing Specimens.</b> The specimen set shall include length		Renumbered and re-titled and moved to new paragraph 3.2

# SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS

Current Requirement	PDI Proposed Change	Reasoning
sizing specimens that meet the following requirements.		
(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
<b>1.4 Depth Sizing Specimens.</b> 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



# **SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS**

<b>Current Requirement</b>	<b>PDI Proposed Change</b>	<b>Reasoning</b>
<p>Flaw Depth Minimum (% Wall Thickness) Number of Flaws</p> <p>10-30% 20%</p> <p>31-60% 20%</p> <p>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>(b) Sizing Specimen sets shall meet the following requirements.</b>	Added for clarity
	<b>(1) Length-sizing flaws shall be oriented circumferentially.</b>	Moved from old paragraph 1.3(a)
	<b>(2) Depth sizing flaws shall be oriented as in 2.5(a).</b>	Included for clarity. Previously addressed by omission (i.e., length, but not depth had a specific exclusionary statement)
<b>2.0 CONDUCT OF PERFORMANCE DEMONSTRATION</b>	<b>3.0 PERFORMANCE DEMONSTRATION</b>	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.	<p><b>Personnel and procedure performance demonstration tests shall be conducted according to the following requirements.</b></p> <p><b>(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 test”. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular</b></p>	Differentiate between qualifications conducted from the outside and inside surface.

**SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS**

<b>Current Requirement</b>	<b>PDI Proposed Change</b>	<b>Reasoning</b>
	specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.	
<b>2.1 Detection Test.</b> Flawed and unflawed grading units shall be randomly mixed	<b>3.1 Detection Test.</b>	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.
	(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

# **SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS**

<b>Current Requirement</b>	<b>PDI Proposed Change</b>	<b>Reasoning</b>
	<b>(b)</b> Examination equipment and personnel are qualified for detection when <b>personnel demonstrations</b> 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.
<b>2.2 Length Sizing Test</b>	<b>3.2 Length Sizing Test</b>	Renumbered
<b>(a)</b> The length sizing test may be conducted separately or in conjunction with the detection test.	<b>(a)</b> 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).
<b>(b)</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>(b)</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.
<b>(c)</b> 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.	<b>(c)</b> 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).

# SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS

Current Requirement	PDI Proposed Change	Reasoning
	(d) Examination procedures, equipment, and personnel are qualified for length-sizing <b>when</b> 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.
<b>2.3 Depth Sizing Test</b>	<b>3.3 Depth Sizing Test</b>	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 <b>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.</b>	Change made to ensure security of samples, consistent with the recent revision to Supplement 2 (Reference BC 00-755).
(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) <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.</b>	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 <b>when</b> 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.

# **SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS**

<b>Current Requirement</b>	<b>PDI Proposed Change</b>	<b>Reasoning</b>
<b>3.0 ACCEPTANCE CRITERIA</b>		Delete as a separate category. Moved to new paragraph detection (3.1) and sizing 3.2 and 3.3
<b>3.1 Detection Acceptance Criteria.</b> 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.
<b>3.2 Sizing Acceptance Criteria</b>		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)
	<b>4.0 PROCEDURE QUALIFICATION</b>	New
	<b>Procedure qualifications shall include the following additional requirements.</b> <b>(a) The specimen set shall include the equivalent of at least three personnel performance demonstration test sets.</b> <b>Successful personnel performance</b>	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.

**SUPPLEMENT 10 – QUALIFICATION REQUIREMENTS FOR DISSIMILAR METAL PIPING WELDS**

<b>Current Requirement</b>	<b>PDI Proposed Change</b>	<b>Reasoning</b>
	<p>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 demonstration shall be performed.</p> <p>(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>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</p>

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
<del>5</del>	5	<del>10</del>	<del>0</del>
<del>6</del>	6	<del>12</del>	<del>1</del>
<del>7</del>	6	<del>14</del>	<del>1</del>
<del>8</del>	7	<del>16</del>	<del>2</del>
<del>9</del>	7	<del>18</del>	<del>2</del>
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