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Update on Development of Pressurizer Nozzle Mockups

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ABSTRACT

Dissimilar metal welds associated with the pressurizer include the small-diameter surge, spray, and safety/relief nozzle configurations. The exact configuration of these welds has frequently been found to be quite different than what is represented on design drawings. In addition, the pressurizer water reactors in the United States represent three different manufacturing designs: Westinghouse, Combustion Engineering, and Babcock and Wilcox. As qualified procedures began to be applied, plants found that only a small number of the pressurizer nozzle welds were adequately represented in the original Performance Demonstration Initiative (PDI) test sets. Therefore, the industry faced the need for a larger number of site-specific mockups than was originally anticipated. Ongoing efforts by the owners' groups and the industry have focused on better identifying existing plant configurations. Based on this newly acquired as-built information, recommendations were made in 2004 concerning the need to design and build additional PDI specimens that would represent a wider range of small-diameter pressurizer nozzle configurations. This technical update provides information about the work completed in 2005 to design and fabricate additional dissimilar metal weld mockups to support ASME Code Section XI, Appendix VIII qualification efforts.

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INTRODUCTION

The ASME Code Section XI, Appendix VIII, Supplement 10 requires the use of dissimilar metal weld samples that have minimum and maximum thicknesses and diameters, a distribution of flaw sizes, representative geometric conditions, and specific defect types. The Performance Demonstration Initiative (PDI) developed qualification test sets for procedure and personnel qualifications that include a selection of dissimilar metal weld configurations. The design of the PDI sample sets was intended to be as representative as possible of installed configurations for pressurized water reactors (PWRs) and boiling water reactors (BWRs). However, it was understood that some configurations would not be included, and those configurations would need to be addressed through site-specific demonstrations or alternative examination methods.

Operating experience, both domestic and foreign, has demonstrated that Alloy 82/182/600 materials connected to a PWR's pressurizer can be particularly susceptible to primary water stress corrosion cracking. Dissimilar metal welds associated with the pressurizer include the small-diameter spray, surge, and safety/relief nozzles. The exact configuration of these welds has frequently been found to be quite different from what is shown on design drawings. In addition, the issue is compounded by the fact that PWRs in the United States represent three different manufacturing designs: Westinghouse, Combustion Engineering (CE), and Babcock and Wilcox (B&W).

As Appendix VIII qualified procedures began to be applied, plants found that only a small number of the pressurizer nozzle welds were adequately represented in the original PDI test sets. Therefore, the industry faced the potential need for a larger number of site-specific mockups than was originally anticipated. Ongoing efforts by the different owners' groups and the industry have focused on improving the identification of existing plant configurations. In 2004 and based on this newly acquired as-built information, recommendations concerning the need to design and build additional PDI specimens that would be representative of a wider range of small-diameter pressurizer nozzle configurations were developed. These recommendations are described in the EPRI report *Inspection Methodology for Pressurizer Nozzles* (1009661) [1]. Based on these recommendations, additional dissimilar metal weld mockups were designed and fabricated in 2005.

2
BACKGROUND ON ORIGINAL APPENDIX VIII DISSIMILAR METAL WELD QUALIFICATION SPECIMENS

The ASME Code, Section XI, Appendix VIII, Supplement 10 requires the use of dissimilar metal weld samples that have minimum and maximum thicknesses and diameters, a distribution of flaw sizes, representative geometric conditions, and specific defect types including alternative flaws [2, 3]. When EPRI personnel were designing the PDI qualification specimens, it was quickly realized that it would not be possible to build every configuration that is included in U.S. nuclear BWR and PWR power plants. Therefore, the most representative configurations were selected for inclusion in the performance demonstration test sets [4].

Initial Selection Criteria

The criteria that were used in the selection of sample configurations for inclusion in the original PDI sample set include:

- Occurrence of a particular configuration
- Failure experience
- Perceived degree of difficulty
- Code requirements
- Recognition that site-specific mockups would be required for certain configurations

Design of Original PDI Sample Sets for Dissimilar Metal Weld Qualifications

Two dissimilar metal weld sample sets were designed and are currently available for Appendix VIII procedure and personnel qualifications. The 600-Series specimens are dedicated for examinations performed from the inside surface. The 700-Series specimens are dedicated for examinations performed from the outside surface. Each set is designed to provide similar scan and accessibility limitations as can be typically found with installed configurations. Although the sets were designed to address the majority of installed configurations, it was recognized that there are instances where the joint might not be examinable due to access limitations, and a method other than ultrasonic testing might be required. In other cases, the geometric conditions might exceed those of the demonstration test set, and a site-specific mockup might be required to extend the qualifications to these site-specific applications.

Outside Surface Demonstration Samples (700 Series)

Table 2-1 describes the test samples that were included by PDI to demonstrate procedures and personnel for ultrasonic examinations of dissimilar metal weld configurations from the outside surface [4]. The demonstration specimens are applicable to BWR and PWR plants. Test specimens designed with specific applicability to PWR pressurizers are shown in bold, italicized print.

Table 2-1
Appendix VIII Dissimilar Metal Weld Configurations OD Examination Test Set (November 2004)

Sample #	Description	Thickness/Diameter (in.)	Features	Plant Modeled After
701	Standby liquid control	0.28/2.0 OD	Smallest diameter and thickness	Typical BWR
702	***PWR pressurizer spray***	***1.0/3.82 OD***	***Typical limited scanning surface and tapers***	***Palo Verde***
703	BWR control rod drive return	0.60/4.3 OD	Limited scanning surface	Grand Gulf, River Bend, and Browns Ferry
704	***PWR pressurizer spray***	***1.0/3.26 ID***	***Taper, limited scanning surface***	***Wolf Creek and Comanche Peak***
705	BWR inlet (N2)	1.13/14.25 OD /12.0 ID	BWR standard	Typical
706	BWR (N2) replacement safe end configuration	1.18/12.35 OD /10.0 ID	Multiple layers of butter and weld interfaces	Limerick and Susquehanna
707	BWR 12-in. N4, N5, and N6 nozzles	1.13/12.75 OD /10.5 ID	Multiple weld interfaces, wide weld	Grand Gulf, River Bend, and Nine Mile Point
708	***PWR 18-in. pressurizer surge nozzle***	***1.825/18 OD***	***Typical example***	***Vogtle***
709	BWR N1 outlet	1.06/23 OD	Typical double buttering	Susquehanna, River Bend, and Fitzpatrick
710	28-in. BWR outlet double vee	2.13/30 OD	Double Vee configuration	Susquehanna and Limerick
711	36-in. PWR steam generator nozzle	3.5/27.5 ID	Double weld, limited scanning surface	Fort Calhoun
712	PWR steam generator narrow groove weld	5.20/flat plate	Maximum thickness narrow groove weld	Steam generator replacement reactor coolant system pipe weld
Note: 1 in. = 25.4 mm				

Pressurizer Nozzle Configurations Included in PDI Test Sets

Three pressurizer spray nozzle dissimilar metal weld configurations were included in the design of PDI test sets. Figure 2-1 shows an example of the 702-Series PWR pressurizer spray nozzle configuration from a plant that has a CE design. Figure 2-2 shows an example of the 704-Series PWR pressurizer spray nozzle configuration from a plant that has a Westinghouse design. Figure 2-3 shows an example of the 708-Series PWR pressurizer surge nozzle configuration from a plant that has a Westinghouse design. The samples were selected after an extensive review was performed on design drawings from PWR units supplied by licensees.

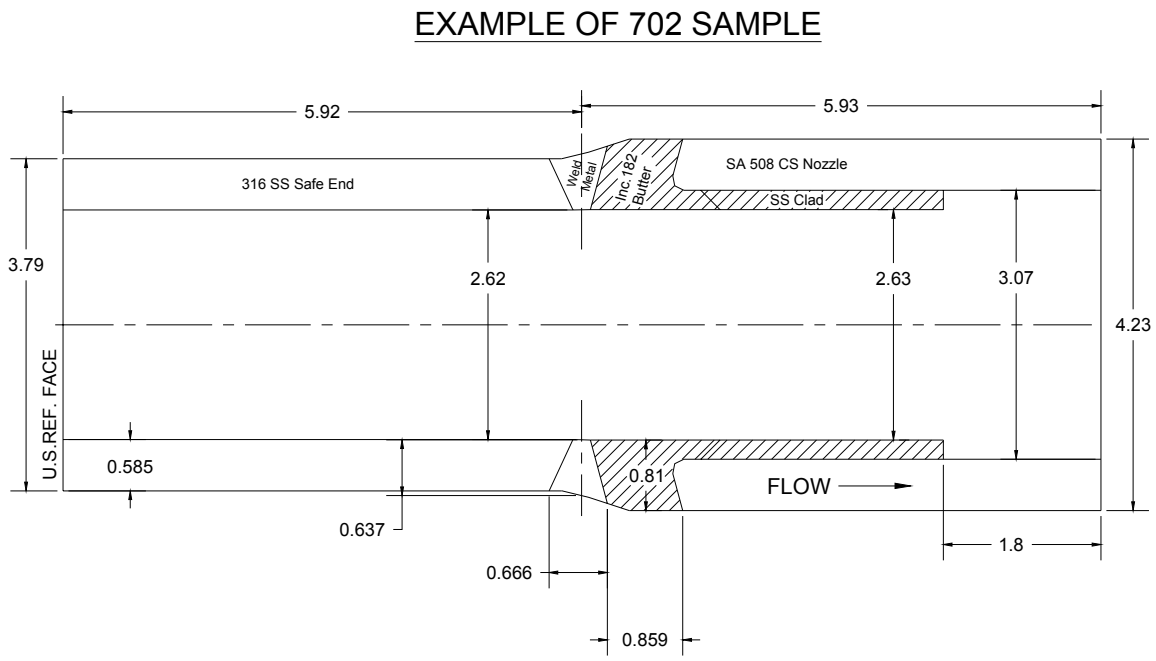


Figure 2-1
Pressurizer Spray Nozzle Configuration: Sample 702

EXAMPLE OF 704 SAMPLE

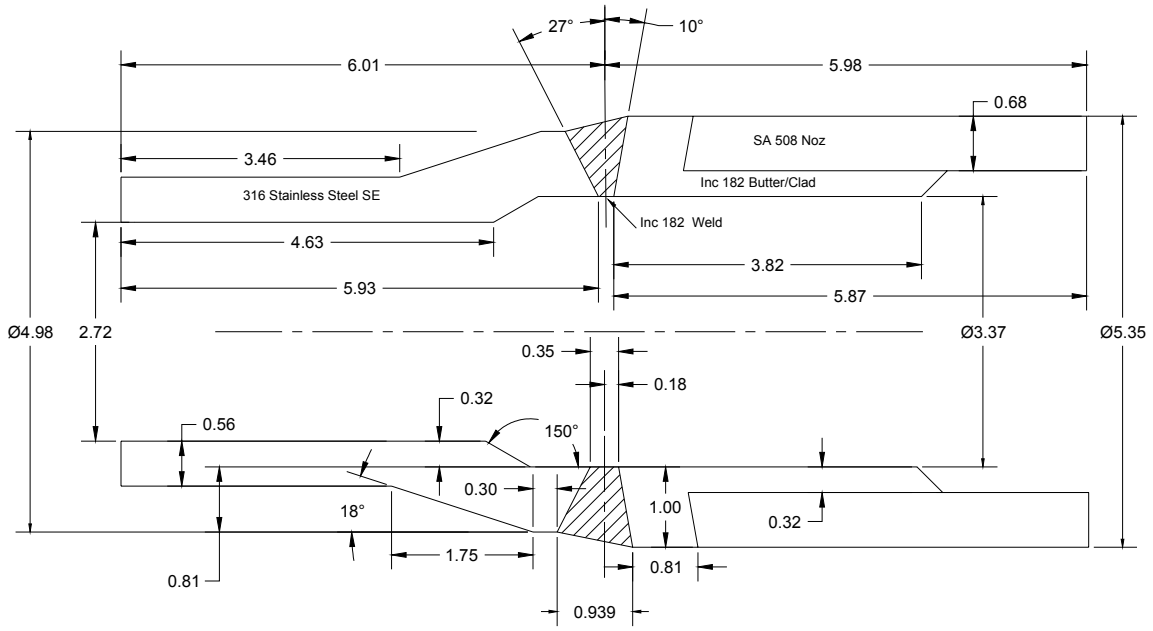


Figure 2-2
Pressurizer Spray Nozzle Configuration: Sample 704

EXAMPLE OF 708 SAMPLE

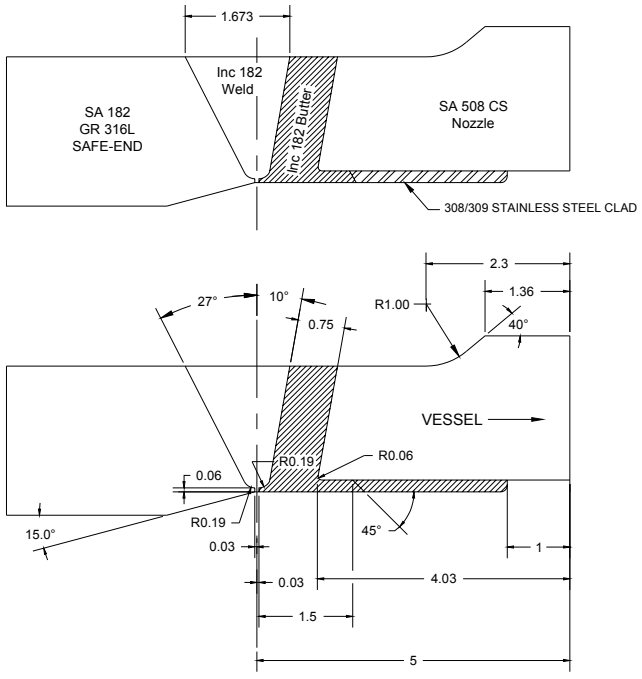


Figure 2-3
Pressurizer Surge Nozzle Configuration: Sample 708

3
REVIEW OF FIELD DATA ON PRESSURIZER NOZZLE CONFIGURATIONS INCLUDING RECOMMENDATIONS TO PDI FOR NEW MOCKUPS

Industry Requests for Field Data

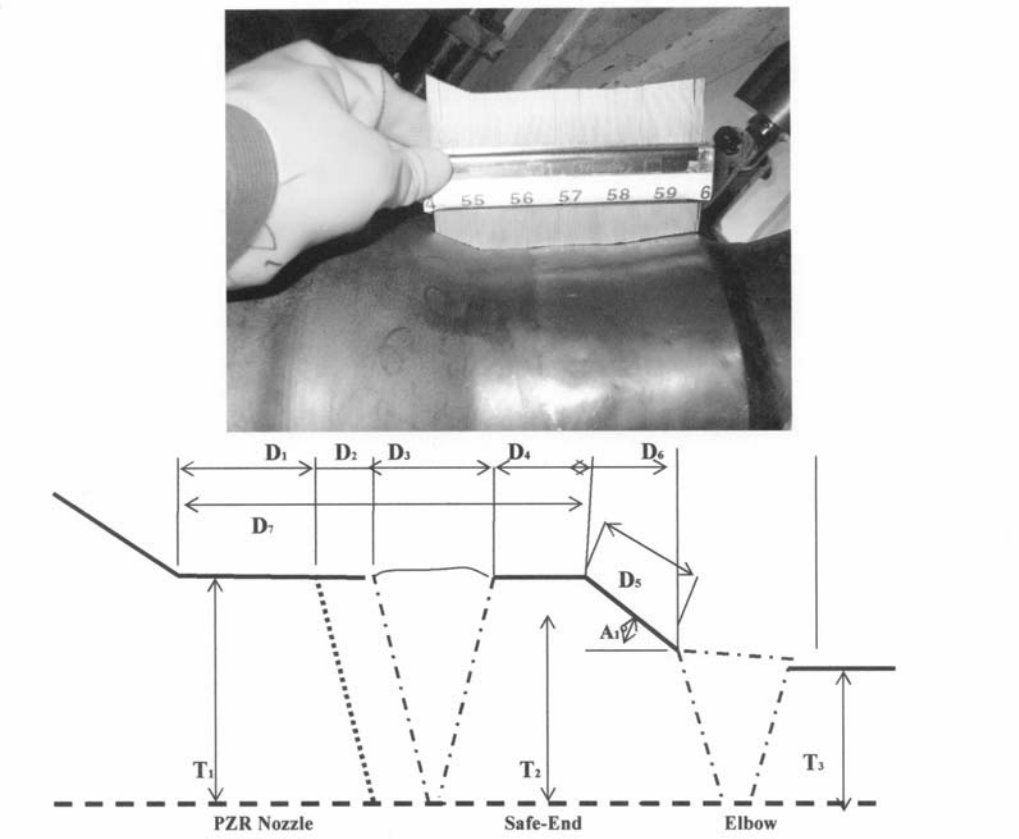
Several letters have been issued by senior representatives of the Materials Reliability Program (MRP) that address recommendations for the inspection of Alloy 82/182 butt welds. In January 2004, the MRP sent out a letter (MRP 2003-039) recommending " . . . that a direct visual inspection of the bare metal or equivalent alternative examination be performed at all Alloy 600/182/82 pressure boundary locations normally operated at greater than or equal to 350°F in the primary system within the next 2 refueling outages at each plant, unless performed during the most recent refueling outage." The letter placed a special emphasis on the importance of using the bare metal examinations as an opportunity to gather useful plant-specific information on joint configurations and access to prepare for future volumetric examinations [5].

In April 2004, a MRP letter (MRP 2004-05) was sent to PWR owners addressing a needed action for the visual inspection of Alloy 82/182 butt welds and good practice recommendations for weld joint configurations [6]. In addition to providing an example of the information that should be collected to better understand the plant-specific joint configurations, the letter recommended that each plant review the PDI mockup library to determine whether its configuration would be qualified for inspection. The importance of collecting good field data was emphasized because existing dissimilar metal weld qualifications to ASME Section XI, Appendix VIII, Supplement 10 have limitations on detection or sizing that depend on joint contour, crown condition, and tapers.

A follow-up letter (MRP 2004-038) was sent out by MRP to PWR owners in October 2004 [7]. This letter is included in Appendix A of this report and states that "MRP Alloy 600 ITG will be consolidating Alloy 82/182 butt weld inspection plans (volumetric and visual), inspection capabilities, and inspection results for the PWR fleet." Again, each plant was requested to collect plant-specific configuration information to determine whether its configurations were qualified for inspection and if additional mockups will be needed to qualify NDE procedures. The letter requests that the plant-specific information be provided to the EPRI NDE Center in Charlotte, North Carolina.

Plant-Specific Information on Pressurizer Nozzle Configurations

EPRI staff has interacted with the various owners' groups regarding available plant-specific information on dissimilar metal weld configurations. In addition, several utilities have provided EPRI with detailed information on pressurizer nozzle configurations at each plant (see Figure 3-1). A review of the information supplied by the owners' groups and the utilities assists in the identification of the broader range of existing nozzle configurations for the pressurizer surge, pressurizer spray, and pressurizer safety/relief nozzles.



#	Description	Dim	#	Description	Dim
D_1	Nozzle to CS Interface	1"	T_1	Nozzle Thickness	1.08"
D_2	CS Interface to weld hump	1"	T_2	Safe-End Thickness	.992"
D_3	Weld hump width	1"	T_3	Elbow Thickness	.941"
D_4	Bottom of hump to weld taper	1.8"			
D_5	Taper length along angle	.7"	Comments:		
D_6	Taper length (axially)	.6"	B-F (DM) Weld Ground "Flush".		
D_7	Nozzle to taper	4.8"	B-J Weld "Flat-Topped". Crown height - 0.05"		
D_8					
D_9					
A_1	Taper Angle	25°			
A_2					

Figure 3-1
Collection of Plant-Specific Data on a Pressurizer Safety Nozzle

Complexity of Pressurizer Nozzle Configurations

As shown in Figure 3-1, the small-diameter pressurizer nozzle configurations typically have tapered surfaces and a range of scanning restrictions caused by adjacent welds or other obstructions. These limitations can have an impact on the ability to achieve the necessary coverage required to detect and size flaws located in the various weld regions. As shown in Figure 3-2, the complexity of these small-diameter nozzle weld configurations varies widely. A review of the different PWR designs shows a wide range of considerations for the mockup design of these small-diameter configurations including the pressurizer surge nozzle, the pressurizer spray nozzle, and the pressurizer safety/relief nozzles.

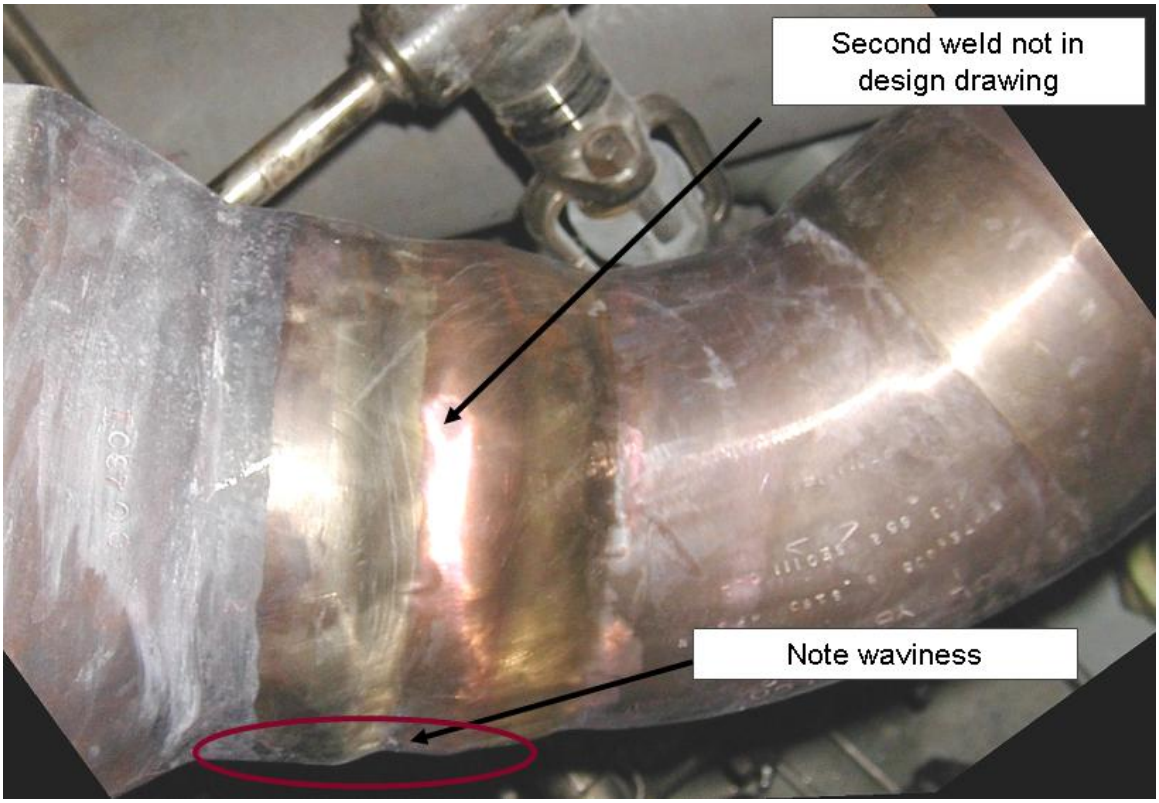


Figure 3-2
Example of a Walkdown Photograph for a Pressurizer Spray Nozzle

Pressurizer Surge, Spray, and Safety/Relief Nozzle Configurations

As previously described, only a select few of the pressurizer surge, spray, and safety/relief nozzle configurations have been included in PDI test sets. In the case of surge nozzles, the PDI set contains a surge nozzle from a Westinghouse design. It contains no tapers or outside geometry. As shown in Figure 3-3, other designs, such as B&W, contain tapers and other geometric considerations.

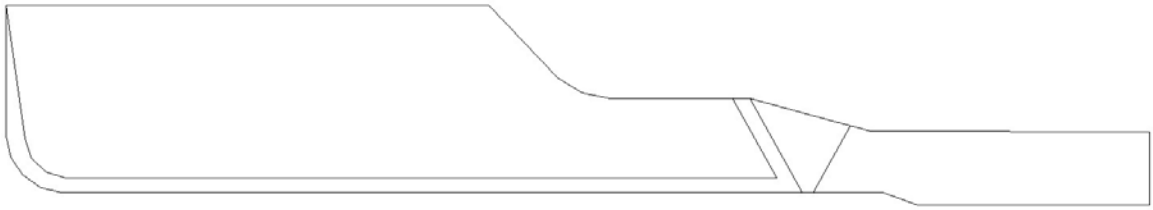


Figure 3-3
Example of a B&W Surge Nozzle with Tapered Weld

In the case of pressurizer spray nozzle configurations, the current PDI test sets include limited examples of the Westinghouse and CE pressurizer spray nozzle configurations. As shown in Figure 3-4, other spray nozzle configurations include adjacent welds. Because coverage of the dissimilar metal weld can be impeded by adjacent welds, representative mockups are needed to evaluate and demonstrate personnel and procedures.

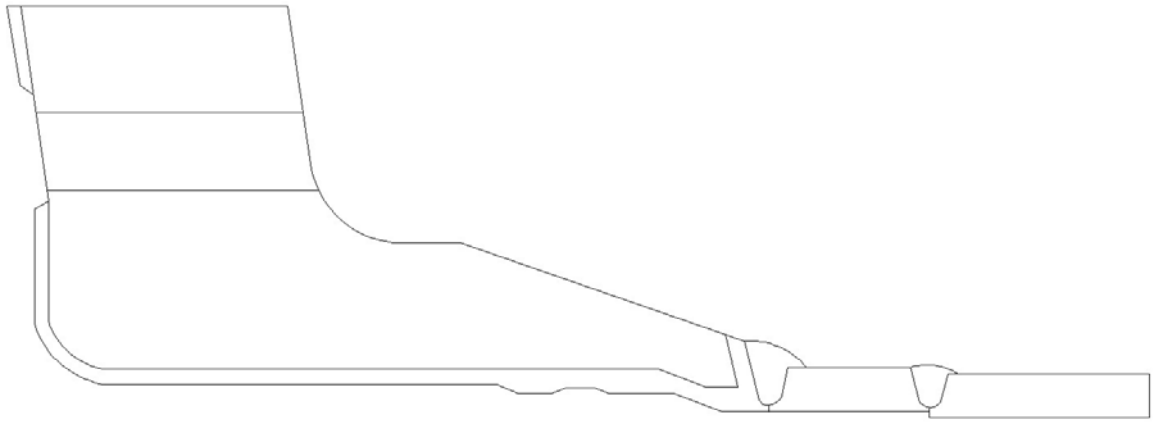


Figure 3-4
Example of a CE Pressurizer Spray Nozzle with a Tapered Weld and an Adjacent Weld

In the case of pressurizer safety/relief nozzle configurations, the current PDI test set did not include specific examples. As shown in Figure 3-5, these small-diameter nozzle configurations can have tapers and geometric conditions that must be considered when planning inspection activities.

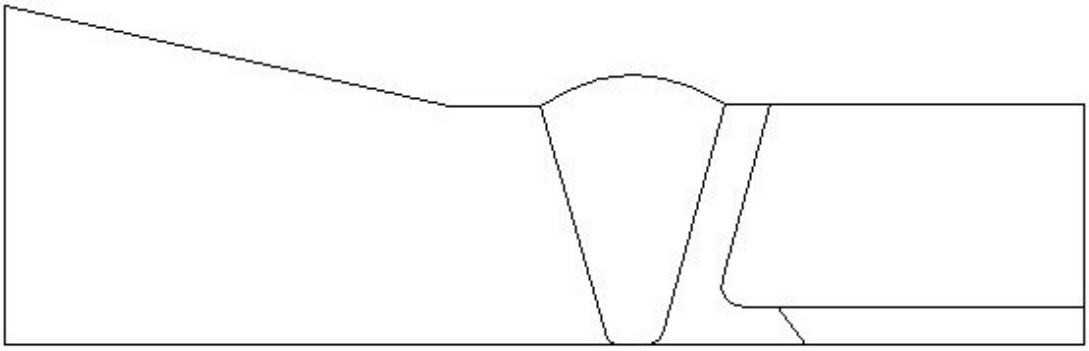


Figure 3-5
Example of a Pressurizer Safety/Relief Nozzle Design from a PWR (CE)

Recommendations to Build Additional Pressurizer Nozzle Mockups

The first objective of the 2004–2005 EPRI project on small-diameter pressurizer nozzles was to make recommendations regarding the need for PDI to build additional pressurizer nozzle mockups. The need for these mockups occurs on a frequent basis as utilities perform walkdown inspections that identify the plant-specific configurations. The purpose of the 2004 work was to make clear recommendations concerning the need to build additional mockups designed to support Appendix VIII qualification of procedures and/or personnel for dissimilar metal weld ultrasonic examinations.

Applicability of Existing PDI Pressurizer Nozzle Mockups

As described in Section 2, "Background on Original Appendix VIII Dissimilar Metal Weld Qualification Specimens," PDI primarily used available design drawings to assist in the fabrication of dissimilar metal weld mockups including the pressurizer nozzle configurations. The design drawings were useful and necessary to assist in this process. However, the actual pressurizer nozzle configurations have been found in many cases to be significantly different from the design drawings. The actual as-built pressurizer nozzle configurations obtained from a surface- and thickness-profile are the most useful. Key criteria for consideration include:

- Location and length of the available examination surfaces
- OD tapers for outside surface examination
- Crown conditions (The PDI demonstrations address conditions only where the weld crown is ground flush with the connecting pipe or forging.)
- Other scanning restrictions including the presence of adjacent welds

As utilities have continued to collect and review more field data from actual pressurizer nozzle configurations, they have identified an obvious need for additional mockups. One proposed approach would be for each utility to embark on designing and building a possibly large number of site-specific mockups for addressing the full range of small-diameter pressurizer nozzles. In some cases, the owners' groups have built some additional mockups and are making them available for site-specific demonstrations. To assist in the effort to qualify the most robust procedures possible and minimize the extent of required site-specific demonstrations, EPRI and PDI have assessed the growing body of field data with the intent of building additional pressurizer mockups that could be added to PDI test sets for expanding the range of procedure qualifications.

Recommendations for PDI

Based on the results of walkdown inspections performed by utilities and owners' groups, the following recommendations were made to PDI at the end of 2004 to build a selection of the following representative small-diameter dissimilar metal weld mockups:

- Surge nozzles: Additional mockups representative of all three PWR designs, that is, Westinghouse, B&W, and CE. Special emphasis should be placed on designs that contain tapered weld configurations with related geometry.
- Spray nozzles: Additional mockups representative of all three PWR designs, that is, Westinghouse, B&W, and CE. Special emphasis should be placed on designs that contain tapered weld configurations with related geometry.
- Safety/Relief nozzles – Additional mockups representative of all three PWR designs, that is, Westinghouse, B&W, and CE. Special emphasis should be placed on designs that contain tapered weld configurations with related geometry.
- Other miscellaneous small-diameter dissimilar metal weld mockups should also be built, for example, appropriate drain lines. This recommendation is based on industry experience with inspection issues associated with these lines.

In addition, where applicable, the presence of adjacent welds should be considered in the fabrication of mockups.

4
NEW DISSIMILAR METAL WELD MOCKUPS

Based on the 2004 recommendations, EPRI and PDI worked to design and fabricate nine additional configurations to the Appendix VIII dissimilar metal weld program. These additional configurations were selected after a review of collected field data, including examples of recent failures. The selected configurations include examples of real world geometry including elbows, adjacent welds, tapers. The final weld crown conditions will be based on results from ongoing EPRI research on examining dissimilar metal welds that have rough or wavy surfaces.

The new dissimilar metal weld mockups that were designed and fabricated for Appendix VIII are listed in Table 4-1 and illustrated in Figures 4-1 through 4-9.

Table 4-1
New Appendix VIII Dissimilar Metal Weld Configurations

Sample #	Description	Plant Design	Reference Figure
702-1-X	PWR pressurizer spray nozzle	Westinghouse	Figure 4-1
702-2-X	PWR pressurizer spray nozzle	CE	Figure 4-2
704-1-X	PWR pressurizer safety/relief nozzle	Westinghouse	Figure 4-3
708-1-X	PWR pressurizer surge nozzle	Westinghouse	Figure 4-4
708-2-X	PWR pressurizer surge nozzle	CE	Figure 4-5
708-3-X	PWR hot leg surge nozzle	B&W	Figure 4-6
708-3-X	PWR pressurizer surge-to-loop nozzle	B&W	Figure 4-7
714-3-X	PWR cold leg drain line	B&W	Figure 4-8
715-3-X	PWR decay heat nozzle	B&W	Figure 4-9

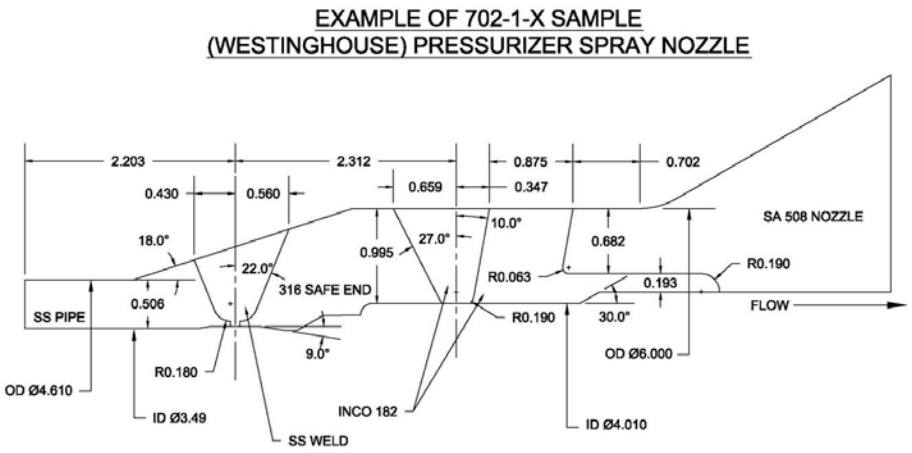


Figure 4-1
Example of 702-1-X Sample (Westinghouse) Pressurizer Spray Nozzle

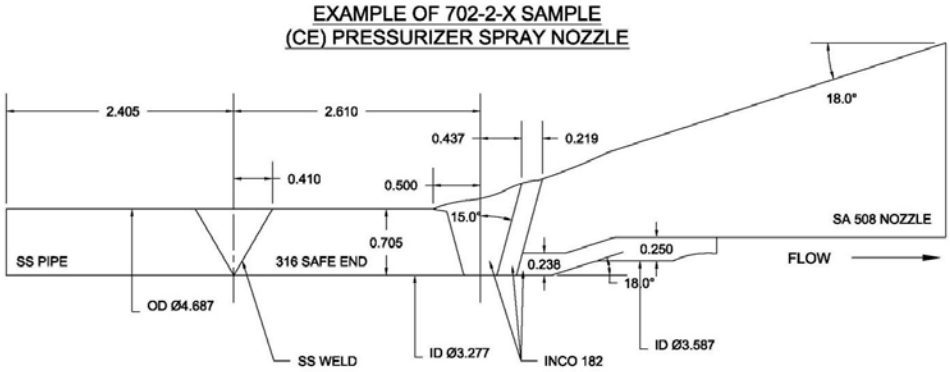


Figure 4-2
Example of 702-2-X Sample (CE) Pressurizer Spray Nozzle

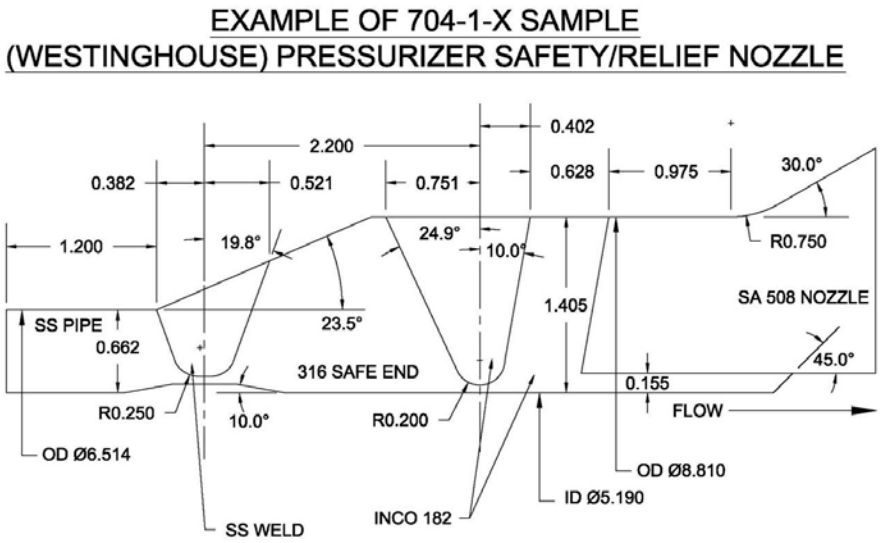


Figure 4-3
Example of 704-1-X Sample (Westinghouse) Pressurizer Safety/Relief Nozzle

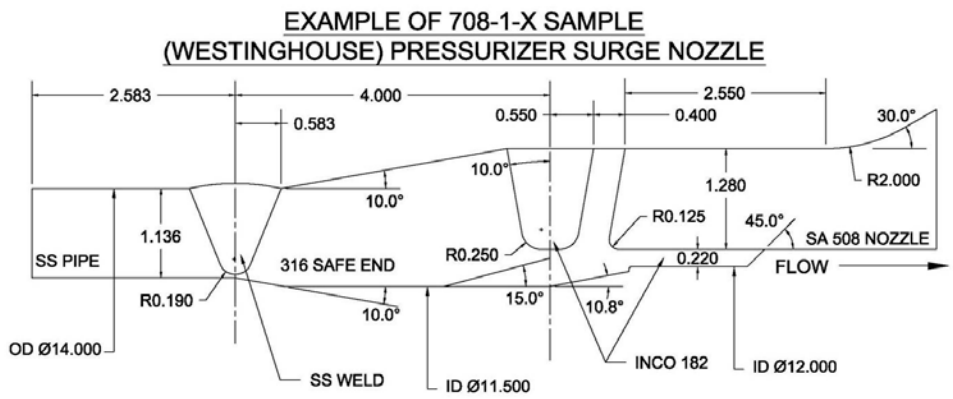


Figure 4-4
Example of 708-1-X Sample (Westinghouse) Pressurizer Surge Nozzle

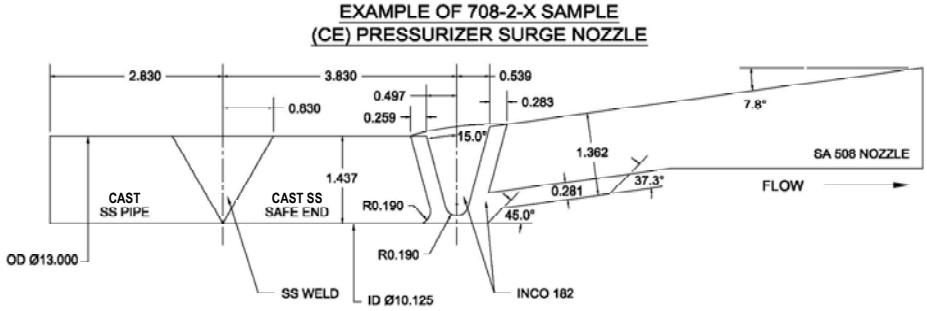


Figure 4-5
Example of 708-2-X Sample (CE) Pressurizer Surge Nozzle

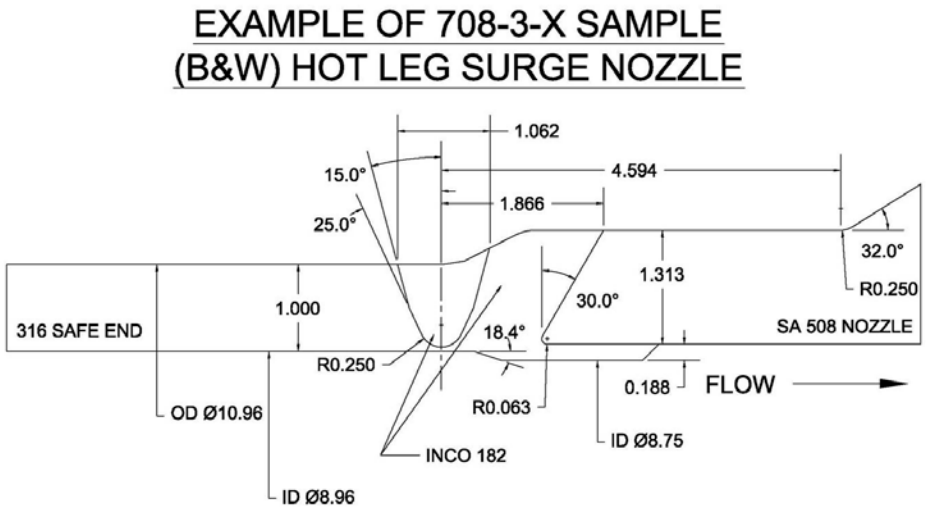


Figure 4-6
Example of 708-3-X Sample (B&W) Hot Leg Surge Nozzle

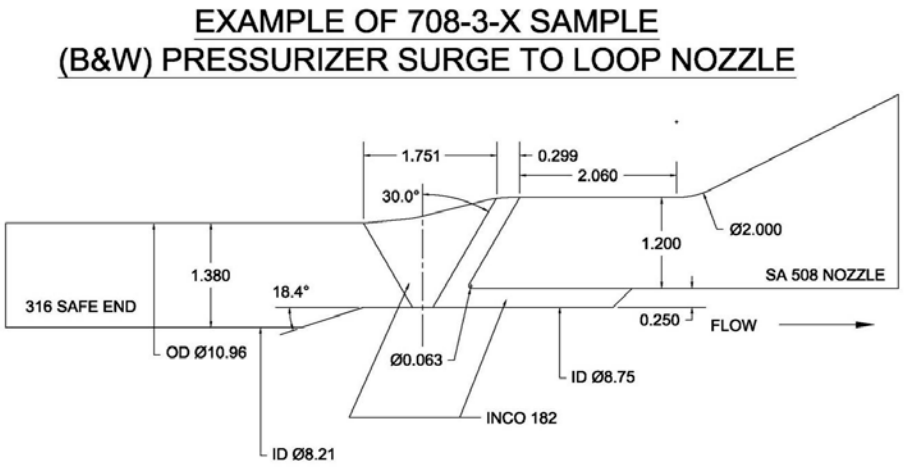


Figure 4-7
Example of 708-3-X Sample (B&W) Pressurizer Surge-to-Loop Nozzle

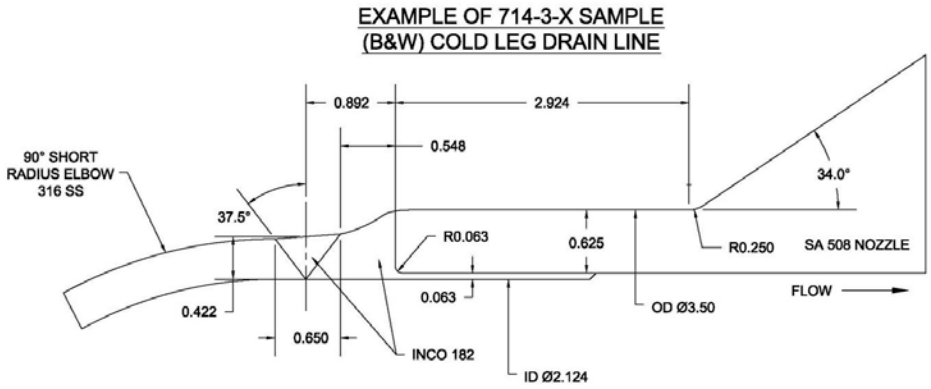


Figure 4-8
Example of 714-3-X Sample (B&W) Cold Leg Drain Line

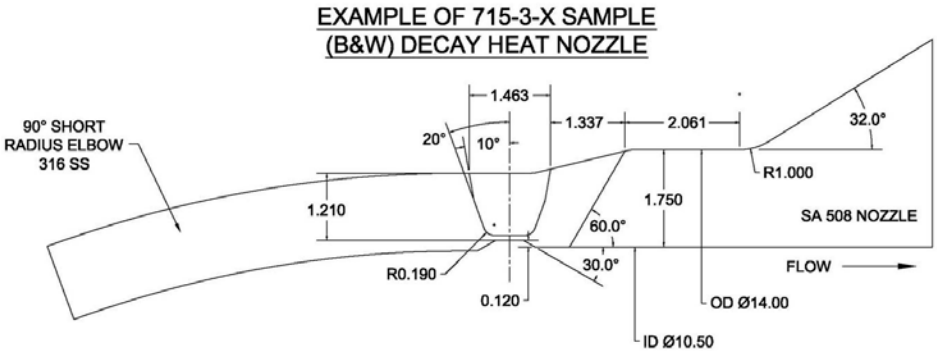


Figure 4-9
Example of 715-3-X Sample (B&W) Decay Heat Nozzle

Use of Additional Appendix VIII Dissimilar Metal Weld Mockups

EPRI research on the development and evaluation of conventional and advanced ultrasonic techniques for examining complex dissimilar metal weld configurations is ongoing. Phased array and electromagnetic acoustic transducer technologies are currently under development. The new pressurizer nozzle mockups will be evaluated using available ultrasonic techniques. To the extent possible, existing procedures will be expanded to include the additional configurations. The samples are scheduled to be received and fingerprinted by PDI before the end of 2005.

5
SUMMARY

During 2004, EPRI, owners' groups, and the industry worked together to gather and review field data on many of the dissimilar metal weld configurations. Special emphasis was placed on the small-diameter pressurizer nozzle configurations because of their complexity and the apparent lack of PDI mockups to support current procedure and personnel qualifications. A detailed review of the field data suggests that PDI should consider building additional mockups. Specific recommendations were made regarding needs for additional pressurizer surge, spray, and safety/relief nozzle mockups. The recommendations requested that new mockup designs include weld tapers and other geometric features such as adjacent welds. New dissimilar metal weld mockups were also recommended to be fabricated for smaller diameter pressurizer dissimilar metal welds such as drain nozzle configurations.

Based on the 2004 recommendations, EPRI staff designed and fabricated nine additional dissimilar metal weld mockups during 2005. The new mockups included complex geometrical considerations such as tapers and adjacent welds. Based on the available ultrasonic capability, the new mockups will be incorporated into the Appendix VIII procedure qualification program.

6
REFERENCES

1. *Inspection Methodology for Pressurizer Nozzles*. EPRI, Palo Alto, CA: 2004. 1009661.
2. ASME Boiler and Pressure Vessel Code, Section XI, Division 1, Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems." American Society of Mechanical Engineers, New York. 1998–2003 Editions and Addenda.
3. Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1, Appendix VIII," May 21, 2003.
4. *Dissimilar Metal Weld Examination-Guidance and Technical Basis for Qualification*. EPRI, Palo Alto, CA: 2003. 1008007.
5. MRP Letter, Leslie Hartz to distribution, MRP 2003-039. "Recommendation for Inspection of Alloy 600/82/182 Pressure Boundary Components." January 20, 2004.
6. MRP Letter, Leslie Hartz to PWR owners, MRP 2004-05. "Needed Action for Visual Inspection of Alloy 82/182 Butt Welds and Good Practice Recommendations for Weld Joint Configurations." April 2, 2004.
7. MRP Letter, Leslie Hartz to PWR owners, MRP 2004-038. "Follow-Up Action on Good Practice Recommendations for Weld Joint Configurations." October 28, 2004.

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APPENDIX

The letter shown in the following pages was sent out by the Materials Reliability Program to pressurized water reactor owners in October 2004.

October 28, 2004

MRP 2004-038

To: PWR Owners

SUBJECT: Follow-up Action on Good Practice Recommendations for Weld Joint Configurations

References

1. Letter, Leslie Hartz to PWR Owners, MRP 2004-05: "Needed Action for Visual Inspection of Alloy 82/182 Butt Welds and Good Practice Recommendations for Weld Joint Configurations", April 2, 2004.
2. Letter, Leslie Hartz to Distribution, MRP 2003-039: "Recommendation for Inspection of Alloy 600/82/182 Pressure Boundary Components," January 20, 2004
3. NEI 03-08, Materials Guidelines Implementation Protocol (Draft F, March 15, 2004), distributed by NEI Letter, "Materials Guidelines Implementation Protocol Revision F," Alex Marion to EPRI SGMP, EPRI MRP, EPRI BWRVIP, EPRI FRP, EPRI Corrosion Research, EPRI Chemistry Control, EPRI NDE Center, WOG Materials Subcommittee, BWOG Materials Subcommittee, March 15, 2004
4. NEI 03-08, Guideline for the Management of Materials Issues, effective January 2, 2004.

Reference 1 above identified a Needed action to be taken at your plants within their next two operational cycles. The letter also identified a Good Practice action. Refer to References 3 and 4 for background on implementation issues and requirements.

This letter requests your input to allow a review of industry progress and success in collecting as-built butt weld geometries. **Please assign the appropriate person within your utility to complete the action requested by this letter.** At the MTAG meeting of August 17-18, 2004 in Toronto, industry progress on collecting butt weld configuration information was discussed. The MRP Alloy 600 ITG will be consolidating Alloy 82/182 butt weld inspection plans (volumetric and visual), inspection capabilities, and inspection results for the PWR fleet. These results will be used to evaluate the inspection capabilities and where new NDE techniques and mock-ups may be needed.

To accomplish the review and evaluation, your utility is requested to provide the following information to the MRP designated contact identified at the end of this letter:

- Schedule for visual inspection of Alloy 82/182 butt welds
    - If you have completed visual inspections per Reference 2, please provide the inspection results and date of inspection.

- Schedule for volumetric inspection of Alloy 82/182 butt welds (currently as required by ASME code)
    - If you have completed volumetric inspections, please provide the inspection method used, inspection results, and date of inspection.
- Current progress and plans for collecting as-built butt weld geometries and determining if those geometries are included in the current PDI mock-up library. If data has been collected using Attachment 3 from Reference 1, please send this information to the MRP designated contact below.

- **Original recommendations from Reference 1 (repeated here for convenience)**
- **"Needed" Action**

1. Each PWR perform a direct visual inspection of the bare metal (either through removal of insulation or remote visual examination inside the insulation) or an equivalent alternative examination at all Alloy 82/182 pressure boundary butt weld locations that normally operate at greater than or equal to 350 degrees in the primary system within the next 2 refueling outages, unless an examination was performed during your most recent refueling outage. Priority should be given to the hottest locations (such as the pressurizer and hot leg weld locations) during the next refueling outage.

"Good Practice" Action

2. The MRP recommends that these bare metal examinations be used to obtain plant-specific information on weld joint configurations and available access to prepare for future volumetric examinations. An example of the information that should be collected to better understand the joint configuration is provided in Attachment 3. Additionally,
    a. each plant needs to verify the configuration of butt welds including candidates for potential inspection sample expansion should cracking be found in any inspected weld, and
    b. with the configuration information collected, review the PDI mockup library to determine if your configuration is qualified for inspection. If not, construct site-specific mockups and qualify your NDE procedure as required by AMSE Section XI Appendix VIII if you feel meaningful ultrasonic examinations can be performed on the as found configuration. If the configuration is too severe to enable successful ultrasonic examination, then alternative examination techniques should be considered.

Guidance presented in item 2 above is provided because weld geometry and inspection access conditions present at some piping locations may limit the applicability of existing qualified UT procedures. In particular, existing dissimilar metal weld qualifications to ASME Section XI, Appendix VIII, Supplement 10 have limitations on detection or sizing that depend upon joint contour, crown condition, tapers, etc. Some of the critical

locations for PWSCC susceptibility are at high temperature locations (e.g. pressurizer spray, relief, and surge lines) that may have to be examined manually, which also has limitations with respect to existing qualified procedures. Thus, it will also be important to determine which welds can be inspected with automated versus manual techniques. Availability of this information will enable utilities to adequately prepare for future volumetric examinations of these 82/182 butt welds.

Contacts

Please submit the above requested information to Bob Bouck at EPRI NDE Center. Bob Bouck can be reached via e-mail rbouck@epri.com.

If you have any questions, please contact any of the following people:

- Dana Covill, Progress Energy, dana.covill@pgnmail.com, 919-546-2631
- Larry Mathews, Southern Nuclear, lkmathew@southernco.com, 205-992-7729
- Mike Robinson, Duke Energy, mrrobins@duke-energy.com, 704-373-3522
- David Steininger, EPRI, dsteinin@epri.com, 650-855-2019

Sincerely,

for

M.R. Robinson
Chairman, MRP Issues and Integration Group
Duke Power Company

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Sincerely,

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M.R. Robinson
Chairman, MRP Issues and Integration Group
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