THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

SUBCOMMITTEE REPAIRS and ALTERATIONS

MINUTES

Meeting of July 18, 2012
Columbus, Ohio

These minutes are subject to approval and are for committee use only.
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The National Board of Boiler & Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, Ohio 43229-1183
Phone: (614)888-8320
FAX: (614)847-1828

1. Call to Order

The meeting was called to order at 8:00 a.m. by Subcommittee Chairman George Galanes.

2. Announcements

Wednesday's evening outing will leave from the Crowne Plaza Hotel at 5:30 p.m.
Lunch will be served each day at 12 noon and breakfast will be served at 7 a.m.
on Thursday.

3. Adoption of the Agenda

There was a motion to approve the Agenda. The motion was unanimously approved.

4. Approval of Minutes of January 18, 2012

There was a motion to approve the Minutes of January 17, 2012. The motion was unanimously approved.

5. Review of the Roster (Attachment 1)

Mr. Frank Johnson (User) would like to become a member of the subgroups Repair and Alteration General and Specific. Mr. Johnson is a current member of the Subgroup on Historical Boilers.

There was a motion to appoint Mr. Johnson to become a member of the subgroups Repair and Alteration General and Specific pending the approval of the Chairman of the Board of Trustees. The motion was unanimously approved.

Mr. Ray Miletti (Manufacturer) would like to become a member of the Subgroup on Repair and Alteration Specific.

There was a motion to appoint Mr. Ray Miletti (Manufacturer) to as a member of the subgroups Repair and Alteration Specific, pending the approval of the Chairman of the Board of Trustees. The motion was unanimously approved.

Mr. Chad Bryan (Jurisdictional Authority) would like to become a member of the Subgroup Repair and Alteration Specific.

There was a motion to appoint Mr. Chad Bryan (Jurisdictional Authority) as a member of the subgroups Repair and Alteration Specific, pending the approval of the Chairman of the Board of Trustees. The motion was unanimously approved.

Messrs. Mike Webb, Paul Edwards, Jim Larson and Bryan Schulte are all eligible for reappointment to the SG on Repair and Alteration General.

There was a motion to reappoint Mike Webb, Paul Edwards, Jim Larson and Bryan Schulte as members of the subgroups Repair and Alteration Genera, pending the approval of the Chairman of the Board of Trustees.. The motion was unanimously approved.

Messrs. George Galanes, Jim Pillow and Jim Sekely are eligible for reappointment to the SG on Repair and Alteration Specific.

There was a motion to reappoint George Galanes, Jim Pillow and Jim Sekely as members of the subgroups Repair and Alteration Specific, pending the approval of the Chairman of the Board of Trustees. The motion was unanimously approved.

6. Interpretations (Attachment 2)

IN11-0903 ***Part 3, 4.4.4 SC Repairs and Alterations-*** Question: If the installation of the new nozzles is considered an alteration(s) (in accordance with NBIC NB23, 2007 Edition, para. 3.4.4) is the R Certificate Holder required to prepare a detailed alteration plan covering the scope of the repair (3.4.4.1) prior to commencement of any work?

There was a motion made to close this item as the Committee viewed this item as consulting. A letter will be sent to the inquirer by the NBIC Committee Secretary. The motion was unanimously approved.

IN11-0904 ***Part 3, 4.4.4.1 a) SC Repairs and Alterations***-Question: Does the R Certificate Holder have to have the detailed alteration plan and R-2 form reviewed and certified by an Engineer meeting the criteria of ASME VIII Div. 2 or 3 prior to commencement of the work?

There was a motion made to close this item as the Committee viewed this item as consulting. A letter will be sent to the inquirer by the NBIC Committee Secretary. The motion was unanimously approved.

IN12-0401 ***Part 3, 4.4.2 SC Repairs and Alterations*** Question 1: In Part 3, 4.4.2 a) is it the purpose of the rule to require a liquid pressure test at a pressure less than 150% of the maximum allowable working pressure (MAWP) stamped on the pressure-retaining item, as adjusted for temperature?

Question 2: In Part 3, 4.4.2 a) is it allowable to perform a liquid pressure test at a pressure less than 150% of the MAWP stamped on the pressure-retaining item to verify the leak tightness of the alteration?

Mr. Brian Schulte presented proposed revisions. There was a motion made to approve the proposed revisions. The motion was unanimously approved. (Attachment 2, pp. 1-2)

7. Action Items (Attachment 3)

NB08-0322 ***Part 3 3.2 SG R/A General*** Add a new paragraph to 3.2 General Requirements for Repairs and Alterations to address change of service for a pressure vessel. These requirements should caution inspectors, owners, repair organizations and jurisdictional authorities of the inherent dangers involved when changing service. A new supplement should be added to address the specific requirements for repairs and alterations of pressure vessels that have been converted from one service to another. A task group representing all three parts of the NBIC has been formed underthe leadership of Bob Wielgoszinski. Task group members from R & A are P. Edwards and B. Schulte. (No Attachment)

A progress report was provided by Mr. Paul Edwards.

NB10-0103 ***Part 3 Part 3 S2.13.9.2 SG Historical Boilers-*** Resolve conflict of text and figure. S2.13.9.2.

Mr. Bob Reetz presented proposed revisions. There was a motion to approve the proposed revisions. The motion was unanimously approved. (Attachment 3, pp. 1-3)

NB10-0110 ***Part 3 S6.19.1 TG DOT-*** Combine and clarify requirements within S6.15 for TR Forms, S6.18 Preparation of TR-Forms and S6.19 for Reports of Repairs, Alterations and Modifications. (No Attachment)

Mr. Staniszewski sent a progress report to the NBIC Committee Secretary.

NB10-1004 ***Part 3 S2 Fig. S2.13.13.1 SG Historical Boilers-*** Figure and title are incorrect. Figure should show caulking of seam and rivet heads. The title should reflect caulking of seam and rivet heads also. (Attachment 3, pp. 4-6)

Mr. Bob Reetz presented proposed revisions. There was a motion made to approve the proposed revisions. The motion was unanimously approved.

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NB11-0401 *SC PRD* The development of a possible fourth part of the NBIC. (No Attachment)

A progress report was provided by Mr. Terry Parks. A new survey will be sent to all owners and users that have purchased the NBIC.

NB11-0701 ***Part 3, S3 5.4 SG Graphite-*** Address Graphite Tube replacement. (No Attachment)

A progress report was provided by Mr. Francis Brown.

NB11-1001 ***Part 3, 3.3.4.9 SG R/A Specific-*** Tube plugging for fire tube boilers. (No Attachment)

A progress report was provided by Mr. Jim Pillow.

NB11-1201 ***Part 3, 1.8, SG R/A General-*** Revise Part 3, 1.8 "NR" Accreditation requirements to include repairs to ASME Section III stamped components. (No Attachment)

A progress report was provided by Mr. Ben Schaefer.

NB12-0501 ***Part 3, 3.2.2 c) SG R/A General-*** Hydrostatic testing of pressure parts. (No Attachment)

A progress report was provided by Mr. George Galanes.

NB12-0603 ***Part 3, 1.5.1, 1.7.1, 1.8.1, SG R/A General*** - Removal of administrative requirements from Part 3. (Attachment 3, pp. 7-64)

A progress report was provided by Mr. Terry Parks. There was a motion made to approve letter balloting the proposed revisions. The motion was unanimously approved.

NB12-0801 ***Part 3, SG R/A Specific*** Repair and Alteration of Gasketed PHE's in the field. (No Attachment)

A progress report was provided by Mr. Jim Pillow.

NB12-1101 ***Part 3, 5.13.1 SG R/A General*** - Revision of R forms. A task group consisting of M. Webb (Chair), G. Galanes, R. Pulliam, Nikki Estep (NB Staff), Deanna Mazik (NB Staff) and Donna Radcliff (NB Staff) will work on this action item. (Attachment 3,pp. 65-68)

Mr. Mike Webb presented proposed revisions. There was a motion to approve the proposed revisions. The motion was unanimously approved.

NB12-1901 ***All three parts SC on Inspection*** This action item was opened as a result of NB11-1501 to address the usage of the words "metal" and "material". The task group of Venus Newton (Chair), Brian Moore and Jim Pillow has been assigned to examine their respective parts. (No Attachment)

A progress report was provided by Mr. Jim Pillow. There was a motion to not change the usage of the words "metal" and "material. The motion was unanimously approved.

NB12-2001 Part 3, 5.13.4.1 SG R/A General- Revise text in this section to address the inconsistent interpretations of item 12 of the R Form. This item will be handled by the same TG handling NB12-1101.

Mr. Ron Pulliam presented proposed revisions. There was a motion made to approve the proposed revisions. The motion was unanimously approved. (Attachment 3, pp. 69-70)

NB12-2101 ***Part 3, 4.2 SG R/A Specific*** – A recommendation to change the reference in this section from 2001 to 2006. (Attachment 3, pp. 69-76)

Mr. Jim Pillow presented proposed revisions. There was a motion to approve the proposed revisions. The motion was unanimously approved.

NB12-0403 Part 3 Specific CSEF Weld Repair Options using temper bead.

Mr. George Galanes gave a presentation on NB12-0403 to the Subcommittee. This item was taken as a progress report. (Attachment 3, pp. 77 - 120)

9. New Business

NB11-0203- ***Part 2 S213.9.1SG Historical Boilers*** Revise text and figure to incorporate the correct percentage of wasting allowed. Task group of M. Wahl and T. Dillon has been assigned. (Attachment 3, pp. 121-123.

Mr. Reetz presented proposed wording and a revised figure. There was a motion to approve the new items. The motion was unanimously approved.

NB13-0201- ***Part 3, S2.13.10.1, 10.2, 13.14..2,4 SG Historical Boilers*** Correct errors and omissions to these documents. (Attachment 3, pp. 124-133)

Mr. Reetz presented revised wording. There was a motion to approve the wording. The motion was unanimously approved.

10. Future Meetings

January 14-18, 2013, Mobile, Alabama
July 15-19, 2013, Columbus, Ohio

11. Adjournment

The meeting was adjourned at 11:20 a.m.

Respectfully Submitted,

James McGimpsey, Secretary
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Attendance List Subcommittee Repairs Alterations

Meeting Date: July 18, 2012

Paul Edwards Director, ASME Programs Stone & Webster, Inc. 100 Technology Center Drive Stoughton, MA 02072 Ph: 617-589-5690 Fax: 617-589-1792 E-mail: paul.edwards@shawgrp.com	Attended: Yes ☑ No ☐ *Initial*	**Jim McGimpsey** The National Board 1055 Crupper Ave. Columbus, OH 43229 Ph: 614-431-3233 Fax: 614-847-1828 E-mail: jmcgimp@nationalboard.org	Attended: Yes ☒ No ☐ *Initial*
Mike Webb Xcel Energy 9500 Interstate 76 Henderson, CO 80640 Ph:303-628-2840 Fax: 303-628-2928 E-mail: mike.webb@xcelenergy.com	Attended: Yes ☑ No ☐ *Initial*	**George W. Galanes, PE** Manager, Metallurgy and QA Edison Mission Group/Midwest Generation 235 Remington Blvd. Boilingbrook, IL 60440 Ph: 630-771-7927 Fax: 312-788-5218 E-mail: ggalanes@MWGen.com	Attended: Yes ☒ No ☐ *Initial*
Bryan Schulte NRG Energy Services 12307 Kurland Drive Houston, TX 77034 Ph: 713-795-1456 Fax: 713-795-1451 E-mail: bryan. schulte@nrgenergy.com	Attended: Yes ☑ No ☐ *Initial*	**Jim Larson** One Beacon Insurance Company 2540 180th Street, East Port Lake, MN 55372 Ph: 952-226-2956 Fax: 952-226-2957 E-mail: jmloghome@earthlink.net	Attended: Yes ☐ No ☒ *Initial*
James T. Pillow Common Arc Corporation 67 Wyndemere Lane Windsor, CT 06035 Ph: 860-688-2531 Fax: 860-688-2531 E-mail: Jpillow@commonarc.com	Attended: Yes ☒ No ☐ *Initial*	**Edward Ortman** Alstom Power 175 Addison Road Windsor, CT 06095 Ph: 860-285-2437 Fax: 860-285-3436. E-mail: Edward.m.ortman@power.alstom.com	Attended: Yes ☐ No ☒ Represented by Angelo Bonnucci *Initial*

Attendance List Subcommittee Repairs Alterations

Meeting Date: **July 18, 2012**

Stuart Cameron Resigned Doosan Babcock Porterfield Road Renfrew PA 4 8DJ United Kingdom Ph: +44-1389 381919 Fax: Fax: +44 (0) 141 885 3338 Email: scameron@doosanbabcock.com	Attended: Yes ☐ No ☒ *Initial*	**James Sekely** Welding Services Inc. 716 Vanderbilt Drive Monroeville, PA 15146 Ph: 412-389-5567 Fax: 724-327-7381 E-mail: jsekely@comcast.net	Attended: Yes ☐ No ☒ *Initial*
Wayne Jones Arise Boiler Inspection and Insurance Company 705 East 4th Street Bay Minette, AL 36507 Ph: 251-937-6225 Fax: E-mail: wayne.jones@ariseinc.com	Attended: Yes ☒ No ☐ *Initial*	**Larry McManoman** Great Lakes Apprenticeship Program 566 W. 95th Street Oak Lawn, IL 60453 cell 708.267.9850 Ph: 708.636.6656 Fax: E-mail: Lmac@gLabap.com	Attended: Yes ☑ No ☐ *Initial*
Name: Angelo Bramucci Company: Alstom Power Inc. Address: 175 Addison Road City/State/Zip: Windsor, CT 06095 Ph: 860-285-9176 Ext. Fax: E-mail: angelo.c.bramucci@power.alstom.com		Name: William Vallance W Company: STATE OF MICHIGAN Address: PO Box 30254 ~~EAST~~ City/State/Zip: LANSING MI 48909 Ph: 517 241 9359 Ext. Fax: 517 241 6301 E-mail: VALLANCEW@MICHIGAN.GOV	

Attendance List Subcommittee Repairs Alterations

Meeting Date: **July 18, 2012**

Name: Marla Minnick Company: ONACIS Address: 450 Duff Rd City/State/Zip: Beaver Falls PA 15143 Ph: 412-741-4408 Ext. Fax: same E-mail: bmminick@comcast.net	Name: Ray Miletti Company: B & W Const. Co. Address: 74 Robinson Ave. City/State/Zip: Akron, Ohio 44203 Ph: 330-860-2589 Ext. — Fax: — E-mail: RLMILETTI@BABCOCK.com
Name: Brian Boseo Company: Grayor Services Address: Two Mid America Plaza City/State/Zip: Oakbrook Terrace, IL Ph: 630-684-7300 Ext. Fax: 630-684-7116 E-mail: brian_boseo@grayor.com	Name: Rick Valdez Company: ARB, INC Address: 3500 Pegasus Drive City/State/Zip: Bakersfield., Ca. 93308 Ph: (661) 331-6024 Ext. Fax: (661) 833-4409 E-mail: rvaldez@arbinc.com
Name: Ron Pulliam Company: Babcock & Wilcox PGG Address: City/State/Zip: Ph: Ext. Fax: E-mail: RLPULLIAM@BABCOCK.COM	Name: Terry Parks Company: NBBI Address: City/State/Zip: Ph: Ext. Fax: E-mail:
Name: David Martinez Company: FM GLOBAL Address: 2100 Reston Parkway City/State/Zip: Reston, Ohio Ph: 703-262-6311 Ext. Fax: 703-860-3187 E-mail: david.martinez@fmglobal.com	Name: Nikki Esop Company: NBBI Address: City/State/Zip: Ph: Ext. Fax: E-mail:

Attendance List Subcommittee Repairs Alterations

Meeting Date: **July 18, 2012**

Name: Benjamin Schaefer Company: American Electric Power Address: 1 Riverside Plaza City/State/Zip: Cols, Oh. 43215 Ph: 614-716-1843 Ext. NA Fax: 614-716-1744 E-mail: bschaefer@aep.com	Name: Marty Toth Company: Boiler Supply Co. Address: 2450 Foster Creighton City/State/Zip: Nashville, TN 37204 Ph: 615-915-5687 Ext. Fax: E-mail: mtoth@boisco.com
Name: BRIAN MORELOCK Company: EASTMAN CHEMICAL CO. Address: P.O. Box 511, B540 City/State/Zip: KINGSPORT, TN 37660 Ph: (423) 229-1205 Ext. Fax: (423) 229-[redacted]6099 E-mail: morelock@eastman.com	Name: Company: Address: City/State/Zip: Ph: Ext. Fax: E-mail:
Name: RANDY CAUTHON Company: APCOMPOWER INC. Address: 200 GREAT POND DR City/State/Zip: WINDSOR, CT 06095 Ph: 860-285-3481 Ext. Fax: 860-285-4377 E-mail: randal.t.cauthon@power.alstom.com	Name: Company: Address: City/State/Zip: Ph: Ext. Fax: E-mail:

ATTACHMENT 2

Proposed Interpretation

Inquiry:	IN12-0401
Source:	Tony Hardin
Subject:	Part 3, 4.4.2. a) Liquid Pressure Test
Edition:	2011
Question:	(1) In Part 3, 4.4.2 a), is it the purpose of the rule to require a liquid pressure test at 150% of the maximum allowable working pressure (MAWP) stamped on the pressure retaining item, adjusted for temperature ?
Reply:	No
Committee's Question:	(1) In Part 3, 4.4.2 a) is a liquid pressure test not exceeding 150% of MAWP stamped on the pressure retaining item required for an alteration?
Committee's Reply:	No. In accordance with Part 3, 4.4.2 a) 2), liquid pressure testing of connecting welds not exceeding 150% of MAWP may be tested or examined in accordance with rules for repairs.
Rationale:	Part 3, 4.4.2 a) 2) references either testing or examination methods used in repairs for connecting welds, in lieu of liquid pressure testing at 150% of MAWP.
SC Vote	
NBIC Vote	

Inquiry:	IN12-0401
Source:	Tony Hardin
Subject:	Part 3, 4.4.2. a) Liquid Pressure Test
Edition:	2011
Question:	(2) In Article 3, 4.4.2. a) is it allowable to perform a liquid pressure test at less than 150% of the MAWP stamped on the pressure retaining item to verify the leak tightness of the alteration?
Reply:	Yes.
Committee's Question:	(2) In Part 3, 4.4.2. a) 2) may a liquid pressure test of connecting welds for a pressure retaining item be performed below 150% of the MAWP for an alteration?
Committee's Reply:	Yes. See NBIC Part 3, 4.4.1 rules for repairs.
Rationale:	Part 3, 4.4.2. a) 2) provides an alternative to a code required pressure test by liquid pressure testing of connecting welds to be performed at less than 150% of MAWP.
SC Vote	
NBIC Vote	

Attachment 3

Subject: 2007 Edition, Part 3, Supplement 2, S2.13.9.2 – Welded Repair of Cracks in Unstayed Area

File Number: NB10-0103

Prop. Page: 156 & 157

Proposal: Update figure S2.13.9.2 to show crack in non-riveted area, update text to fix a typo, move “See figure S.2.13.9.2” and change girth to circumferential.

Explanation This area currently is confusing and can be updated and corrected to fix these issues. There are six issues to address.

1. Remove “See figure S.2.13.9.2” from a).
2. Correct Typo in b) should say Cracks in unstayed not Cracks in stayed
3. Change 8” requirement to insure that the repair is at least 2” from last row of rivets and that preheat is used. Text should be changed to “within 2in. (50mm) from the center line of the outer most row of rivets. Minimum 175 degree preheat shall be used.”
4. Add a reference to figure S2.13.9.2-a in c).
5. Add a reference to figure S2.13.9.2 –b in d).
6. Change girth to circumferential in d)
7. Use new figure S.2.13.9.2-a and S.13.9.2-b

Update text and diagram can be found on page 3

Item # 2

Change to UNSTAYED

Item # 1

Remove text from here

Item # 3

Change text for 8" rule and preheat

Item # 4

Add Reference to Figure

Item # 5

Add Reference to Figure

Item # 6

Change girth to Circumferential

S2.13.9.2 WELDED REPAIR OF CRACKS IN UNSTAYED AREAS

a) Prior to repairing cracks, the plate shall be NDE examined for other defects. All affected sections shall be repaired. ~~(See NBIC Part 3, Figure S2.13.9.2).~~

b) Cracks in ~~stayed~~ areas may be repaired by welding. Before cracks are repaired, however, the inner surface of the plate should be examined for possible excessive corrosion or grooving.

c) Cracks in unstayed areas may be repaired by welding, providing the cracks do not extend between rivet holes in a longitudinal seam or parallel to a longitudinal seam within ~~8 in. (200 mm)~~. The completed repair must be radiographed and stress relieved. Alternative methods in lieu of Postweld Heat Treatment identified in NBIC Part 3, 2.5.3 may be used. (See Figure S2.13.9.2.-a)

d) Cracks radiating from a common point (star cracking) shall not be repaired; installation of a flush patch is required. Cracks radiating from a rivet hole in a girth seam may be repaired if the plate is not seriously damaged. (See Figure S2.13.9.2-b)

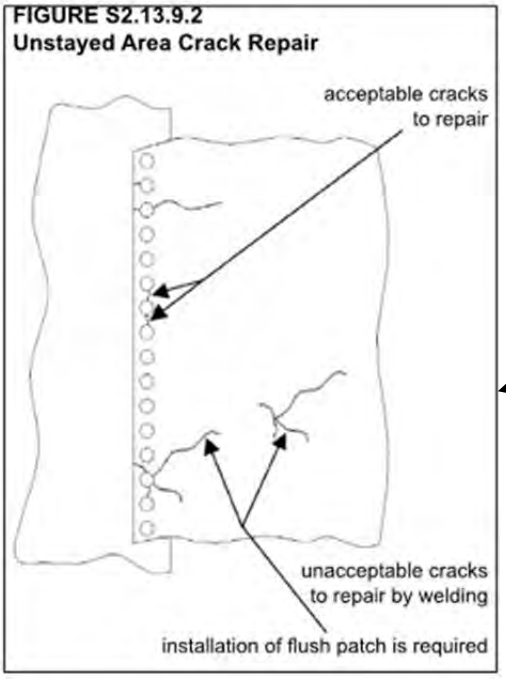
e) Prior to welding, the rivets into which cracks extend and the rivets on each side of them shall be removed.

f) In riveted joints, tack bolts should be placed in alternating holes to hold the plate laps firmly.

g) Rivets holes should be reamed after welding.

h) Welding shall not cover rivet heads.

FIGURE S2.13.9.2
Unstayed Area Crack Repair



Item # 7 Replace this with the Figure S2.13.9.2-a and Figure S2.13.9.2-b on page 3

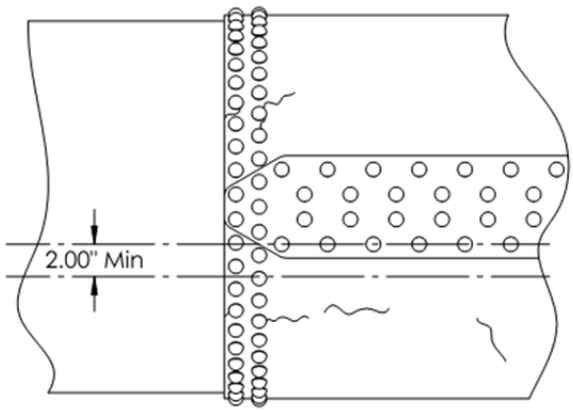
[2]

Updated text and Diagram

S.2.13.9.2 WELDED REPAIR OF CRACKS IN UNSTAYED AREAS

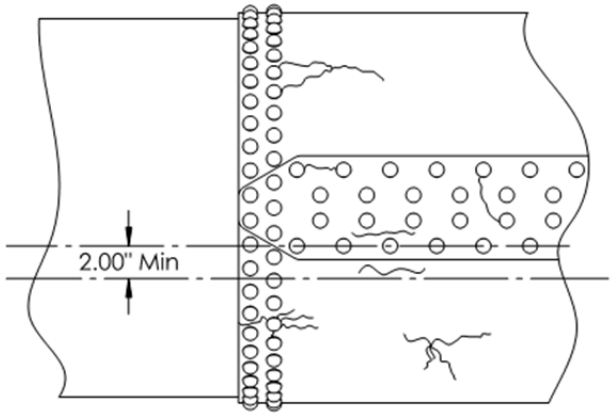
a) Prior to repairing cracks, the plate shall be NDE examined for other defects. All affected sections shall be repaired.
b) Cracks in unstayed areas may be repaired by welding. Before cracks are repaired, however, the inner surface of the plate should be examined for possible excessive corrosion or grooving.
c) Cracks in unstayed areas may be repaired by welding, providing the cracks do not extend between rivet holes in a longitudinal seam or parallel to a longitudinal seam within 2in. (50mm) from the center line of the outer most row of rivets. Minimum 175^0 F. (65^0 C.) preheat shall be used. The complete repair must be radiographed and stress relieved. Alternative methods in lieu of Postweld Heat Treatment identified in NBIC Part 3, 2.5.3 may be used. (See NBIC Part 3, Figure S.2.13.9.2-a)
d) Cracks radiating from a common point (star cracking) shall not be repaired; installation of a flush patch is required. Cracks radiating from a rivet hole in a circumferential seam may be repaired if the plate is not seriously damaged. (See NBIC Part 3, Figure S.2.13.9.2-b)
e) Prior to welding, the rivets into which cracks intend and the rivets on each side of them shall be removed.
f) In riveted joints, tack bolts should be placed in alternating holes to hold plate laps firmly.
g) Rivets holes should be reamed after welding.
h) Welding shall not cover rivet heads.

Figure S2.13.9.2-a
Unstayed Area Crack Repair



Cracks Acceptable to
Repair by Welding

Figure S2.13.9.2-b
Unstayed Area Crack Repair



Cracks Unacceptable
to Repair by Welding

Subject: 2007 Edition, Part 3, Supplement 2, S2.13.13.1 – Caulking Rivet Seams and Rivet Heads

File Number: NB10-1004

Prop. Page: 166 & 167

Proposal: Update figure S2.13.13.1 with proper title and update figure to show caulking rivet seams.

Explanation:

1. Update a) to say caulking tool instead of impact tool.
2. Current title calls out Rivet heads; however, figure shows caulking rivet seam. Figure title should be caulking rivet seams and show caulking rivet seams.

Update Text & figure can be found on page 3

[4]

S2.13.13.1 CAULKING RIVETED SEAMS AND RIVET HEADS (SEE NBIC PART 3, FIGURE S2.13.13.1)

a) Caulking refers to the sealing of plate seams and rivet heads by driving the edge of one surface onto the other by use of an ~~impact tool~~.

b) The plate edges should be beveled to an angle not sharper than 70 degrees to the plane of the plate and as near thereto as practicable.

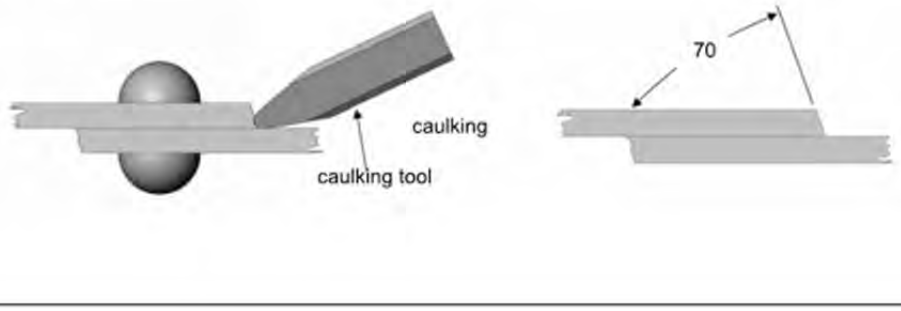
c) Caulking shall be done with a tool of such form that there is no danger of scoring or damaging the plate underneath the caulking edge, or splitting the caulked sheet.

d) Riveted seams and rivet heads may be re-caulked after repairs to tighten joint.

Item #1

Change to caulking tool

FIGURE S2.13.13.1
Rivet Heads



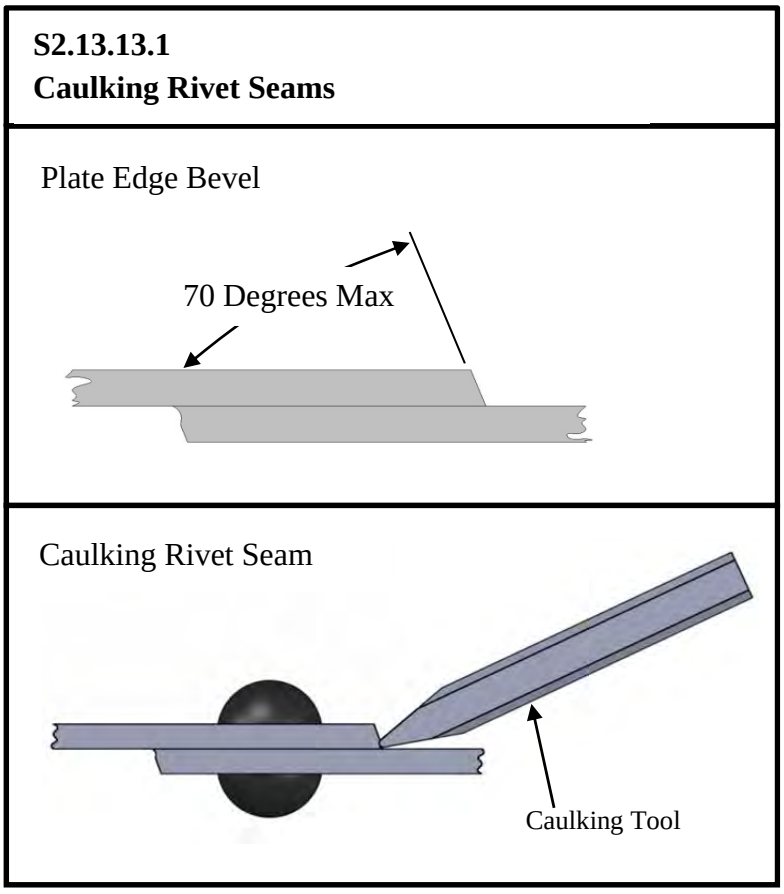
Item #2

Replace this figure with the one update one on page 3

[5]

S.2.13.13.1 Caulking Riveted Seams and Rivet Heads

a) Caulking refers to the sealing of plate seams and rivet heads by driving the edge of one surface onto the other by use of a caulking tool.



[6]

1.5.1 ACCREDITATION PROCESS

a) The National Board administers accreditation programs for authorization of organizations performing repairs and alterations to pressure-retaining items and/or pressure relief valves.

b) Any organization may apply to the National Board to obtain a Certificate of Authorization for the requested scope of activities. A review shall be conducted to evaluate the organization's quality system. The individual assigned to conduct the evaluation shall meet the qualification requirements prescribed by the National Board. Upon completion of the evaluation, any deficiencies within the organization's quality system will be documented and a recommendation will be made to the National Board regarding issuance of a Certificate of Authorization.

c) As part of the accreditation process, an applicant's quality system is subject to a review. National Board procedures provide for the confidential review resulting in recommendations to issue or not issue a Certificate of Authorization.

~~d) When the quality system requirements of this Section have been met, a Certificate of Authorization and appropriate National Board symbol stamp shall be issued.~~

d) ~~e)~~ The accreditation programs provide requirements for organizations performing repairs and alterations to pressure-retaining items. Depending upon the expected scope of activities at the time of review, organizations may be authorized to perform design only, metallic or non-metallic repairs, and/or alterations either in the shop only, field only, or shop and field. Repairs and/or alterations to metallic and non-metallic pressure-retaining items are made by welding, bonding and/or mechanical assembly.

~~**1.5.2 SCOPE ISSUANCE AND REVISION TO A QUALITY SYSTEM**~~

~~a) Any scope revision shall require authorized inspection agency acceptance of quality system changes. These changes shall be submitted to the National Board for acceptance. A program review may be required by the National Board or the Jurisdiction to ensure quality system requirements are met for scope changes. Upon acceptance of the changes, the National Board will issue a Certificate of Authorization with a revised scope.~~

~~b) The "VR" accreditation program provides requirements for organizations performing repairs to pressure relief valves. For scope issuance and revisions, refer to 1.7.~~

~~**1.6 ACCREDITATION OF "R" REPAIR ORGANIZATIONS**~~

~~**1.6.1 SCOPE**~~

~~a) This section provides requirements that must be met by organizations in order to obtain a National Board Certificate of Authorization to use the "R" Symbol Stamp for the~~

repair or alteration of pressure-retaining items. Organizations may be authorized to perform repairs only, or repairs and alterations.

b) The issuance of the "R" Stamp is not restricted to organizations whose primary business is to repair and alter pressure-retaining items, nor to manufacturers of pressure-retaining items. Owners and Users of pressure-retaining items and other organizations that qualify in accordance with these rules may also obtain the "R" Stamp.

c) Owners or users may be accredited for both a repair and inspection program provided the owner or user complies with the requirements of the "R" program and the National Board requirements of NB 371 for an Owner-User Inspection Organization. The requirements of 1.6.2(a) do not apply if the owner or user chooses to use the Owner-User Inspection Organization to accept the repair quality system when:

1) There is no conflict with jurisdictional requirements.

2) The line of authority for the Owner-User Inspection Organization shall be independent of the organization responsible for execution of "R" program work.

3) The process and Inspector limitations are described in the written Owner-User Inspection Organization's quality system manual.

1.6.2 PREREQUISITES FOR ISSUING A NATIONAL BOARD CERTIFICATE OF AUTHORIZATION

Before an organization can obtain a National Board "R" Certificate of Authorization, the organization shall:

a) Have and maintain an Inspection Agreement with an Authorized Inspection Agency;

b) Have, in the English language, a written Quality System that complies with the requirements of this section and includes the expected scope of activities;

c) Have the current edition and addendum of the National Board Inspection Code, all parts; and

d) Have available a copy of the code of construction appropriate to the intended scope of work.

1.6.3 PROCEDURE FOR OBTAINING OR RENEWING A NATIONAL BOARD CERTIFICATE OF AUTHORIZATION

a) Prior to issuance or renewal of a National Board "R" Certificate of Authorization, the organization and its facilities are subject to a review of its Quality System. The implementation of the Quality System shall be satisfactorily demonstrated by the

~~organization. The National Board reserves the absolute right to cancel, refuse to issue, or renew such authorization.~~

e) ~~b)~~ Organizations desiring to renew or obtain a National Board Certificate of Authorization shall apply to the National Board using forms obtained from the National Board. Application for renewal shall be made prior to the expiration date of the Certificate of Authorization.

f) ~~c)~~ When an organization has plants or shops in more than one location, the organization shall submit separate applications for each plant or shop. The organization may perform repairs or alterations in its plants, shops, or in the field, provided such operations are described in the organization's Quality System.

~~d) Upon notification of the review dates from the National Board, it is the responsibility of the organization to make arrangements for the review.~~

~~e) The Review Team, as a minimum, shall consist of one representative each from the Authorized Inspection Agency and the Jurisdiction.[2]~~

~~f) The Review Team shall conduct an evaluation of the organization's Quality System. The organization shall demonstrate sufficient implementation of the Quality System to provide evidence of the organization's knowledge of welding, nondestructive examination, postweld heat treatment, and other repair or alteration activities performed appropriate for the requested scope of work. The demonstration may be performed using current work, a demonstration mock-up, or a combination of both.~~

~~g) A recommendation to issue, renew, or withhold the National Board Certificate of Authorization shall be included in a Review Report prepared by the Review Team. The completed Review Report shall be forwarded to the National Board.~~

~~h) If proper administrative fees are paid and all other requirements are met, a Certificate of Authorization will be issued evidencing permission to use the "R" Symbol Stamp. The certificate shall expire on the triennial anniversary date.~~

~~i) When an organization holding a National Board Certificate of Authorization changes ownership, name, location, or address, the National Board shall be notified. The Certificate of Authorization may be revised by submitting an application for National Board "R" Certificate of Authorization; however, a re-review may be required.~~

~~j) The holder of an ASME Code Symbol Stamp, whose facilities were reviewed (with the exception of "V," "UV," "HV," "NV," and "H" [cast iron]) may obtain National Board authorization without a review of its facilities, provided:~~

~~1) The organization has a Quality System to cover the scope of the repairs or alterations to be made, subject to review by the Jurisdiction; and~~

~~2) The application for the "R" Certificate of Authorization is submitted within 12 months from the issuance of the ASME Certificate of Authorization. The initial Certificate of Authorization shall be issued to expire concurrent with the ASME Certificate of Authorization. Subsequent certificates shall be renewed upon a successful review and implementation of its Quality System by a National Board Representative.~~

g) ~~k)~~ The Jurisdiction[2] may audit the Quality System and activities of an organization upon a valid request from an owner, user, inspection agency, or the National Board.

h) ~~l)~~ The NBIC Committee may at any time change the rules for the issuance of Certificates of Authorization and use of the "R" Symbol Stamp. These rules shall become binding on all certificate holders.

1.6.4 NATIONAL BOARD "R" SYMBOL STAMP

a) All "R" Symbol Stamps shall be obtained from the National Board of Boiler and Pressure Vessel Inspectors. Authorization to use the "R" Symbol Stamp may be granted by the National Board at its absolute discretion to the certificate holder.

b) The "R" Symbol Stamp is furnished on loan by the National Board for a nominal fee. Each organization shall agree if authorization to use the "R" Symbol Stamp is granted, that the "R" Symbol Stamp is at all times the property of the National Board and will be promptly returned upon demand. If the organization discontinues the use of the "R" Symbol Stamp, inspection agreement with an Authorized Inspection Agency, or if the Certificate of Authorization has expired and no new certificate has been issued, the "R" Symbol Stamp shall be returned to the National Board.

c) The organization's Quality System shall provide for adequate control of the "R" Symbol Stamp. Provisions may be made for the issuance of the "R" Symbol Stamp for use at various field locations.

d) The holder of a Certificate of Authorization may obtain more than one "R" Symbol Stamp provided the organization's Quality System describes how the use of such stamps is controlled from the location shown on the certificate.

e) An organization shall not permit others to use the "R" Symbol Stamp loaned to it by the National Board.

[2] Jurisdiction: The National Board member jurisdiction where the organization is located. Alternatively, where the Jurisdiction elects not to perform the review or where there is no Jurisdiction or where the Jurisdiction is the organization's Authorized Inspection Agency, the National Board of Boiler and Pressure Vessel Inspectors will represent the Jurisdiction. At the Jurisdiction's discretion, the Jurisdiction may choose to be a member of the review team if the Jurisdiction chooses not to be the team leader.

1.6.~~5~~ QUALITY SYSTEM

A holder of a National Board Certificate of Authorization shall have and maintain a written Quality System. The System shall satisfactorily meet the requirements of the NBIC and shall be available for review. The Quality System may be brief or voluminous, depending on the projected scope of work. It shall be treated confidentially by the National Board.

1.6.~~5~~.1 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM FOR QUALIFICATION FOR THE NATIONAL BOARD "R" CERTIFICATE OF AUTHORIZATION

The following is a guide for required features of a Quality System which shall be included in the organization's Quality System Manual. As a minimum, each organization shall address the required features relative to the scope of work to be performed. Organizations shall explain their intent, capability and applicability for each required feature outlined in this section. Work may be subcontracted provided controls are clearly defined for maintaining full responsibility for code compliance by the National Board repair organization certifying the work.

a) **Title Page**

The name and complete address of the company to which the National Board Certificate of Authorization is issued shall be included on the Title Page of the Quality System Manual.

b) **Contents Page**

The manual should contain a page listing the contents of the manual by subject, number (if applicable), and revision number of each document.

c) **Scope of Work**

The manual shall clearly indicate the scope and type of repairs or alterations the organization is capable of and intends to carry out.

d) **Statement of Authority and Responsibility**

A dated Statement of Authority, signed by an officer of the organization, shall be included in the manual. Further, the Statement of Authority shall include:

1) A statement that all repairs or alterations carried out by the organization shall meet the requirements of the NBIC and the Jurisdiction, as applicable.

2) A statement that if there is a disagreement in the implementation of the Quality

System, the matter is to be referred for resolution to a higher authority in the company.

3) The title of the individual who will be responsible to ensure that (1) above is followed and has the freedom and authority to carry out the responsibility.

e) Manual Control

The manual shall include the necessary provisions for revising and issuing documents to maintain the manual current. The title of the individual authorized to approve revisions shall be included in the manual. Revisions must be accepted by the Authorized Inspection Agency prior to issuance of the manual and implementation.

f) **Organization**

An organizational chart shall be included in the manual. It shall include the title of the heads of all departments or divisions that perform functions that can affect the quality of the repair or alteration, and it shall show the relationship between each department or division. The manual shall identify the title of those individuals responsible for preparation, implementation, or verification of the Quality System. The responsibilities shall be clearly defined and the individuals shall have the organizational freedom and authority to fulfill those responsibilities.

g) **Drawings, Design and Specifications**

The manual shall contain controls to ensure that all design information, applicable drawings, design calculations, specifications, and instructions are prepared or obtained, controlled, and interpreted in accordance with the original code of construction.

h) **Repair and Alteration Methods**

The manual shall include controls for repairs and alterations, including, mechanical assembly procedures, materials, nondestructive examination methods, pre-heat, and postweld heat treatment, as applicable. Special requirements such as nonmetallic repairs and alterations to graphite and fiber-reinforced thermosetting plastic pressure-retaining items including bonding or mechanical assembly procedures shall be addressed, if applicable.

i) **Materials**

The manual shall describe the method used to assure that only acceptable materials (including welding material) are used for repairs and alterations. The manual shall include a description of how existing material is identified and new material is ordered, verified, and identified. The manual shall identify the title of the individual(s) responsible for each function and a brief description of how the function is to be performed.

j) **Method of Performing Work**

The manual shall describe the methods for performing and documenting repairs and alterations in sufficient detail to permit the Inspector to determine at what stages specific inspections are to be performed. The method of repair or alteration must have prior acceptance of the Inspector.

k) **Welding, NDE and Heat Treatment**

The manual shall describe controls for welding, nondestructive examination, and heat treatment. The manual is to indicate the title of the individual(s) responsible for the welding procedure specification and its qualification, and the qualification of welders and welding operators. It is essential that only welding procedure specifications and welders or welding operators qualified, as required by the NBIC, be used in the repair or alteration of pressure-retaining items. It is also essential that welders and welding operators maintain their proficiency as required by the NBIC, while engaged in the repair or alteration of pressure-retaining items. The manual shall also describe controls for assuring that the required WPS or SWPS is available to the welder or welding operator prior to welding. Similar responsibility for nondestructive examination and heat treatment shall be described in the manual.

l) **Examinations and Tests**

Reference shall be made in the manual for examinations and tests upon completion of the repair or alteration.

m) **Calibration**

The manual shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs and alterations.

n) **Acceptance and Inspection of Repair or Alteration**

The manual shall specifically indicate that before the work is started, acceptance of the repair/alteration shall be obtained from an Inspector who will make the required inspections and confirm NBIC compliance by signing and dating the applicable NBIC Report Form[3] upon completion of the work.

[3] NBIC Report Form: National Board Form R-1 for Repairs, Form R-2 for Alterations, or Form R-3 for Fabricated Parts or altered component can be considered in compliance with the NBIC.

o) **Inspections**

The manual shall make provisions for the Inspector to have access to all drawings, design calculations, specifications, procedures, process sheets, repair or alteration procedures, test results, and other documents as necessary to ensure compliance with the NBIC. A copy of the current manual shall be available to the inspector.

p) **Report of Repair or Alteration Form**

The manual shall indicate the title of the individuals responsible for preparing, signing, and presenting the NBIC Report Forms to the Inspector. The distribution of the NBIC Report Forms shall be described in the manual.

q) **Exhibits**

Any forms referenced in the manual shall be included. The form may be a part of the referencing document or included as an appendix. For clarity, the forms may be completed and identified as examples. The name and accepted abbreviations of the "R" Certificate Holder shall be included in the manual.

r) **Construction Code**

The manual shall include provisions for addressing the requirements that pertain to the specific construction code for the equipment being repaired or altered.

s) **Nonconforming Items**

There shall be a system acceptable to the Inspector for the correction of nonconformities. A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system. Nonconformance must be corrected or eliminated before the repaired

1.5.1 ACCREDITATION PROCESS

a) The National Board administers accreditation programs for authorization of organizations performing repairs and alterations to pressure-retaining items and/or pressure relief valves.

b) Any organization may apply to the National Board to obtain a Certificate of Authorization for the requested scope of activities. A review shall be conducted to evaluate the organization's quality system. The individual assigned to conduct the evaluation shall meet the qualification requirements prescribed by the National Board. Upon completion of the evaluation, any deficiencies within the organization's quality system will be documented and a recommendation will be made to the National Board regarding issuance of a Certificate of Authorization.

c) As part of the accreditation process, an applicant's quality system is subject to a review. National Board procedures provide for the confidential review resulting in recommendations to issue or not issue a Certificate of Authorization.

d) The accreditation programs provide requirements for organizations performing repairs and alterations to pressure-retaining items. Depending upon the expected scope of activities at the time of review, organizations may be authorized to perform design only, metallic or non-metallic repairs, and/or alterations either in the shop only, field only, or shop and field. Repairs and/or alterations to metallic and non-metallic pressure-retaining items are made by welding, bonding and/or mechanical assembly.

e) Organizations desiring to renew or obtain a National Board Certificate of Authorization shall apply to the National Board using forms obtained from the National Board. Application for renewal shall be made prior to the expiration date of the Certificate of Authorization.

f) When an organization has plants or shops in more than one location, the organization shall submit separate applications for each plant or shop. The organization may perform repairs or alterations in its plants, shops, or in the field, provided such operations are described in the organization's Quality System.

g) The Jurisdiction may audit the Quality System and activities of an organization upon a valid request from an owner, user, inspection agency, or the National Board.

h) The NBIC Committee may at any time change the rules for the issuance of Certificates of Authorization and use of the "R" Symbol Stamp. These rules shall become binding on all certificate holders.

1.5.2 NATIONAL BOARD "R" SYMBOL STAMP

a) All "R" Symbol Stamps shall be obtained from the National Board of Boiler and Pressure Vessel Inspectors. Authorization to use the "R" Symbol Stamp may be granted by the National Board at its absolute discretion.

b) The "R" Symbol Stamp is furnished on loan by the National Board for a nominal fee. Each organization shall agree if authorization to use the "R" Symbol Stamp is granted, that the "R" Symbol Stamp is at all times the property of the National Board and will be promptly returned upon demand. If the organization discontinues the use of the "R" Symbol Stamp, inspection agreement with an Authorized Inspection Agency, or if the Certificate of Authorization has expired and no new certificate has been issued, the "R" Symbol Stamp shall be returned to the National Board.

c) The organization's Quality System shall provide for adequate control of the "R" Symbol Stamp. Provisions may be made for the issuance of the "R" Symbol Stamp for use at various field locations.

d) The holder of a Certificate of Authorization may obtain more than one "R" Symbol Stamp provided the organization's Quality System describes how the use of such stamps is controlled from the location shown on the certificate.

e) An organization shall not permit others to use the "R" Symbol Stamp loaned to it by the National Board.

[2] Jurisdiction: The National Board member jurisdiction where the organization is located. Alternatively, where the Jurisdiction elects not to perform the review or where there is no Jurisdiction or where the Jurisdiction is the organization's Authorized Inspection Agency, the National Board of Boiler and Pressure Vessel Inspectors will represent the Jurisdiction. At the Jurisdiction's discretion, the Jurisdiction may choose to be a member of the review team if the Jurisdiction chooses not to be the team leader.

1.6 QUALITY SYSTEM

A holder of a National Board Certificate of Authorization shall have and maintain a written Quality System. The System shall satisfactorily meet the requirements of the NBIC and shall be available for review. The Quality System may be brief or voluminous, depending on the projected scope of work. It shall be treated confidentially by the National Board.

1.6.1 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM FOR QUALIFICATION FOR THE NATIONAL BOARD "R" CERTIFICATE OF AUTHORIZATION

The following is a guide for required features of a Quality System which shall be included in the organization's Quality System Manual. As a minimum, each organization

shall address the required features relative to the scope of work to be performed. Organizations shall explain their intent, capability and applicability for each required feature outlined in this section. Work may be subcontracted provided controls are clearly defined for maintaining full responsibility for code compliance by the National Board repair organization certifying the work.

a) **Title Page**

The name and complete address of the company to which the National Board Certificate of Authorization is issued shall be included on the Title Page of the Quality System Manual.

b) **Contents Page**

The manual should contain a page listing the contents of the manual by subject, number (if applicable), and revision number of each document.

c) **Scope of Work**

The manual shall clearly indicate the scope and type of repairs or alterations the organization is capable of and intends to carry out.

d) **Statement of Authority and Responsibility**

A dated Statement of Authority, signed by an officer of the organization, shall be included in the manual. Further, the Statement of Authority shall include:

1) A statement that all repairs or alterations carried out by the organization shall meet the requirements of the NBIC and the Jurisdiction, as applicable.

2) A statement that if there is a disagreement in the implementation of the Quality System, the matter is to be referred for resolution to a higher authority in the company.

3) The title of the individual who will be responsible to ensure that (1) above is followed and has the freedom and authority to carry out the responsibility.

e) Manual Control

The manual shall include the necessary provisions for revising and issuing documents to maintain the manual current. The title of the individual authorized to approve revisions shall be included in the manual. Revisions must be accepted by the Authorized Inspection Agency prior to issuance of the manual and implementation.

f) **Organization**

An organizational chart shall be included in the manual. It shall include the title of the heads of all departments or divisions that perform functions that can affect the quality of the repair or alteration, and it shall show the relationship between each department or division. The manual shall identify the title of those individuals responsible for preparation, implementation, or verification of the Quality System. The responsibilities shall be clearly defined and the individuals shall have the organizational freedom and authority to fulfill those responsibilities.

g) **Drawings, Design and Specifications**

The manual shall contain controls to ensure that all design information, applicable drawings, design calculations, specifications, and instructions are prepared or obtained, controlled, and interpreted in accordance with the original code of construction.

h) **Repair and Alteration Methods**

The manual shall include controls for repairs and alterations, including, mechanical assembly procedures, materials, nondestructive examination methods, pre-heat, and postweld heat treatment, as applicable. Special requirements such as nonmetallic repairs and alterations to graphite and fiber-reinforced thermosetting plastic pressure-retaining items including bonding or mechanical assembly procedures shall be addressed, if applicable.

i) **Materials**

The manual shall describe the method used to assure that only acceptable materials (including welding material) are used for repairs and alterations. The manual shall include a description of how existing material is identified and new material is ordered, verified, and identified. The manual shall identify the title of the individual(s) responsible for each function and a brief description of how the function is to be performed.

j) **Method of Performing Work**

The manual shall describe the methods for performing and documenting repairs and alterations in sufficient detail to permit the Inspector to determine at what stages specific inspections are to be performed. The method of repair or alteration must have prior acceptance of the Inspector.

k) **Welding, NDE and Heat Treatment**

The manual shall describe controls for welding, nondestructive examination, and heat treatment. The manual is to indicate the title of the individual(s) responsible for the welding procedure specification and its qualification, and the qualification of welders and welding operators. It is essential that only welding procedure specifications and welders

or welding operators qualified, as required by the NBIC, be used in the repair or alteration of pressure-retaining items. It is also essential that welders and welding operators maintain their proficiency as required by the NBIC, while engaged in the repair or alteration of pressure-retaining items. The manual shall also describe controls for assuring that the required WPS or SWPS is available to the welder or welding operator prior to welding. Similar responsibility for nondestructive examination and heat treatment shall be described in the manual.

l) **Examinations and Tests**

Reference shall be made in the manual for examinations and tests upon completion of the repair or alteration.

m) **Calibration**

The manual shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs and alterations.

n) **Acceptance and Inspection of Repair or Alteration**

The manual shall specifically indicate that before the work is started, acceptance of the repair/alteration shall be obtained from an Inspector who will make the required inspections and confirm NBIC compliance by signing and dating the applicable NBIC Report Form[3] upon completion of the work.

o) **Inspections**

The manual shall make provisions for the Inspector to have access to all drawings, design calculations, specifications, procedures, process sheets, repair or alteration procedures, test results, and other documents as necessary to ensure compliance with the NBIC. A copy of the current manual shall be available to the inspector.

p) **Report of Repair or Alteration Form**

The manual shall indicate the title of the individuals responsible for preparing, signing, and presenting the NBIC Report Forms to the Inspector. The distribution of the NBIC Report Forms shall be described in the manual.

[3] NBIC Report Form: National Board Form R-1 for Repairs, Form R-2 for Alterations, or Form R-3 for Fabricated Parts or altered component can be considered in compliance with the NBIC.

q) **Exhibits**

Any forms referenced in the manual shall be included. The form may be a part of the referencing document or included as an appendix. For clarity, the forms may be completed and identified as examples. The name and accepted abbreviations of the "R" Certificate Holder shall be included in the manual.

r) **Construction Code**

The manual shall include provisions for addressing the requirements that pertain to the specific construction code for the equipment being repaired or altered.

s) **Nonconforming Items**

There shall be a system acceptable to the Inspector for the correction of nonconformities. A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system. Nonconformance must be corrected or eliminated before the repaired

1.7 ACCREDITATION OF "VR" REPAIR ORGANIZATIONS

1.7.1 SCOPE

a) These administrative rules and procedures are provided by the National Board for those who wish to obtain a National Board Certificate of Authorization for use of the "VR" (Repair of Pressure Relief Valves) symbol stamp. It should be noted that the issuance of the "VR" stamp is not restricted to companies whose primary business is the repair of pressure relief valves, nor to manufacturers or assemblers that hold an ASME "V," "HV," "UV," or "NV" Code symbol stamp. Owners and users of boilers and pressure vessels and other organizations that qualify in accordance with the National Board Rules and Regulations may also obtain the "VR" Certificate and stamp.

~~b) In order to provide due process in the issuance, renewal, and revocation of "VR" symbol stamps and certificates of authorization, the National Board Appeals Committee procedures provide an affected "VR" Certificate of Authorization applicant the right of appeal, or to provide additional information that may affect the Committee's decision.~~

1.7.2 JURISDICTIONAL PARTICIPATION

The National Board member jurisdiction in which the "VR" organization is located is encouraged to participate in the review and demonstration of the applicant's quality system. The Jurisdiction may require participation in the review of the repair organization and the demonstration and acceptance of the repair organization's quality system manual.

~~1.7.3 GENERAL RULES~~

~~The general rules of the National Board "VR" certification program apply only to the repair of National Board capacity certified ASME Code Section I "V" stamped, Section IV "HV" marked, and Section VIII "UV" stamped pressure relief valves that:~~

~~a) Have been in service or have been exposed to environmental or other conditions such that there is reason to question their ability to perform equivalent to the standards for new valves; or~~

~~b) Any or all of the valve's external adjustment seals have been broken, opened, or otherwise disturbed, regardless of the valve's age or service status.~~

~~1.7.4 REPAIR OF NUCLEAR VALVES~~

~~Provided that the requirements of Supplement 9 and applicable requirements of these rules are met, the "VR" certificate may be extended to apply to the repair of any ASME Code Section III, Class 1, 2, or 3, pressure relief devices that have been capacity certified by the National Board and have been in service, regardless of their intended function, in a nuclear system.~~

1.7.3 ~~1.7.5~~ ISSUANCE AND RENEWAL OF THE "VR" CERTIFICATE OF AUTHORIZATION

1.7.3.1 ~~1.7.5.1~~ GENERAL

Authorization to use the stamp bearing the official National Board "VR" symbol as shown in Section 5 of this Part, will be granted by the National Board pursuant to the provisions of the following administrative rules and procedures. ~~Supplement 9 of this Part, provides rules for the repair of ASME Section III "NV" stamped pressure relief devices.~~

1.7.3.2 ~~1.7.5.2~~ ISSUANCE OF CERTIFICATE

a) Repair organizations, manufacturers, assemblers, or users that make repairs to the American Society of Mechanical Engineers (ASME) Code symbol, stamped or marked (as applicable), and The National Board of Boiler and Pressure Vessel Inspectors (National Board) capacity certified pressure relief valves may apply to the National Board for a Certificate of Authorization to use the "VR" symbol. ~~The National Board may at any time, through the NBIC Committee, modify the regulations concerning the issuance and use of such valve repair symbol. All such modified regulations shall become binding upon holders of valid Valve Repair Certificates of Authorization.~~

~~b) Authorization to use the "VR" stamp may be granted or withheld by the National Board in its absolute discretion. If authorization is granted and proper administrative fees paid, a Certificate of Authorization will be issued evidencing permission to use such a symbol, expiring on the triennial anniversary date. The certificate will be signed by the National Board Chairman of the National Board of Trustees, the Executive Director, or any other duly authorized officer.~~

~~c) The certificate shall list the physical, permanent address of record for the certificate holder's shop/plant. For field-only scopes, this address of record shown on the Certificate of Authorization is where administrative, technical, and quality aspects of the business are controlled.~~

~~1.7.5.3 RENEWAL OF CERTIFICATE~~

~~The Certificate of Authorization is renewable every three (3) years subject to a review of the Quality System by a representative of the National Board, review and acceptance of the representative's report by the National Board, and successful completion of capacity verification tests. See 1.7.8 for exceptions. The applicant should apply to the National Board for renewal of authorization and re-issuance of the certificate prior to the date of expiration. The National Board reserves the absolute right to cancel, refuse to issue, or renew such authorization.~~

1.7.5.4 REVIEW OF APPLICANT'S FACILITY

a) Before issuance or renewal of pressure relief "VR" Certificates of Authorization, the repair organization, its written quality system, and its facilities are subject to a review and verification of implementation of its quality system by a representative of the National Board. The implementation demonstration shall include, as a minimum, disassembly, inspection, repair, application of special processes, reassembly, setting, and testing of valves within the scope of the applicant's quality system.

b) The applicant shall repair and submit for verification testing one (1) valve for each Code section (except Section III) and test fluid (steam, air/gas, liquid) which will appear on the Certificate of Authorization. A minimum of two (2) valves are required regardless of Code sections or test fluid. The valves shall be within the capabilities of the National Board accepted laboratory. When an applicant is using the provisions of 4.5.2, the applicant shall submit one additional Section VIII steam valve set on air for verification testing on steam.

c) The applicant shall have a copy of the National Board Pressure Relief Device Certifications publication, NB-18, dated within one year (available from the National Board Web page), the latest edition and addenda of the National Board Inspection Code (NBIC), all parts; and the ASME Code section(s) that the organization is including in its scope.

d) It is the responsibility of the valve repair organization to make arrangements for this review. Certificates cannot be issued or renewed until the National Board is in receipt of approval of this review. Wherever possible, National Board reviews of valve repair organizations shall be coordinated with ASME reviews, when applicable.

e) For field-only repair scopes, the review shall encompass both the applicant's address of record and field repair demonstration site. The demonstration site shall be representative of that typically encountered by the applicant (see 1.7.5.6).

1.7.5.5 VERIFICATION TESTING

a) Before the "VR" Certificate of Authorization and stamps may be issued or renewed, the demonstration valves must successfully complete capacity and operational verification tests at a National Board accepted testing laboratory. See 1.7.5.6 and 1.7.8 for exceptions. The valves shall be typical of those repaired by the organization and within the capabilities of the testing laboratory.

b) Tests conducted at the accepted testing laboratory shall be witnessed by a representative of the National Board. The purpose of the tests is to ensure that the repairs have been satisfactorily carried out and the function and operation of the valves meet the requirements of the section of the ASME Code to which they were manufactured.

c) Valves not meeting the function or operational requirements of the section of the ASME Code to which they were manufactured shall be considered to have failed. Replacement valves shall be repaired and selected for testing as stated above, at a rate of two (2) valves for each one (1) that failed.

1) If either or both of these replacement valves fail to meet the above criteria, the applicant shall document the cause of the noted deficiencies and actions taken to guard against future occurrence. Upon acceptance of this information by the National Board, one (1) additional valve for each replacement valve that failed shall be repaired and tested. The valve(s) shall be of the same ASME Code Section, fluid and set pressure scope, as the valve previously failing to meet the test requirement.
2) Failure of this valve(s) to meet the ASME Code to which the valve was manufactured shall be cause for consideration by the National Board of revocation of the "VR" Certificate of Authorization or acceptance of alternative corrective action.

1.7.5.6 VERIFICATION TESTING ALTERNATIVES

a) In such cases where all valves repaired by the applicant for a specified ASME Code Section or test fluid exceed the capabilities of the accepted testing laboratory, valves for that ASME Code Section or test fluid shall be selected as specified in 1.7.5.4, and a demonstration test shall be successfully performed in lieu of verification testing specified in 1.7.5.5 above. The demonstration tests shall be conducted at a facility mutually agreeable to the National Board representative, the facility owner, and the applicant. The purpose of these tests is to demonstrate, in the presence of a National Board representative, that the repaired valves shall have adequate seat tightness at the maximum expected operating pressure prior to lifting, shall open within the required set pressure tolerance, operate consistently without chatter, and reclose within the required blowdown.

b) If a valve lift-assist device is used by the applicant to establish set pressure after repairs, this device must also be used to set the demonstration valves.

c) If either of these valves fail to meet the above criteria, then replacement valves shall be repaired and tested at a rate of two valves for each one that failed.

1) If either or both of these replacement valves fail to meet the above criteria, the applicant shall document the cause of the noted deficiencies and actions taken to guard against future occurrence. Upon acceptance of this information by the National Board, one (1) additional valve for each replacement valve that failed shall be repaired and tested. The valve(s) shall be of the same ASME Code section, fluid, and set pressure scope as the valve previously failing to meet the test requirement.

~~2) Failure of this valve(s) to meet the ASME Code to which the valve was manufactured shall be cause for consideration by the National Board of revocation of the "VR" Certificate of Authorization or acceptance of alternative corrective action.~~

1.7.4 ~~1.7.6~~ USE OF THE "VR" AUTHORIZATION

1.7.4.1 ~~1.7.6.1~~ TECHNICAL REQUIREMENTS

The administrative requirements of ~~1.7~~ for use of the "VR" stamp shall be used in conjunction with the technical requirements for valve repair as described in Supplement 7 of the NBIC. Those requirements shall be mandatory when a "VR" repair is performed.

~~1.7.6.2~~ STAMP USE

Each "VR" symbol stamp shall be used only by the repair firm within the scope, limitations, and restrictions under which it was issued.

1.7.4.2 ~~1.7.6.3 RETURN OF STAMP~~

~~Each applicant shall agree, if authorization to use the stamp is granted, that the stamp is at all times the property of the National Board and will be promptly returned upon demand. If the applicant discontinues the repair of such valves or if the "VR" Certificate of Authorization issued to such applicant has expired and no new certificate has been issued, the stamp will be returned to the National Board.~~

~~1.7.6.4 MULTIPLE LOCATIONS~~

~~A holder of a National Board "VR" stamp shall not permit any others to use the "VR" symbol stamp loaned to it by the National Board. When a repair organization, manufacturer, or user has a repair department and/or equipment in fixed plants or shops located in more than one geographical area, it must submit separate applications for each plant or shop with the addresses of all such repair locations.~~

~~1.7.6.5 CERTIFICATE OF AUTHORIZATION CONTENTS~~

~~Qualification for repair location (shop, shop and field, or field only), code section (Section I, III, IV, and/or VIII valves), special processes, and test media shall be specified on the repair organization's "VR" Certificate of Authorization.~~

~~1.7.6.6 CHANGES TO CERTIFICATES OF AUTHORIZATION~~

~~a) When a "VR" Certificate Holder intends to change the address of record (location), the certificate holder shall notify the National Board in writing prior to relocating. The new facilities and related quality system for the new location shall be reviewed in~~

~~accordance with 1.7.5.4. Issuance of a new Certificate of Authorization is subject to the procedures herein.~~

~~b) When a "VR" Certificate Holder intends to change ownership or scope, the certificate holder shall notify the National Board in writing prior to the change. A review, in accordance with 1.7.5.4, may be required depending upon the nature and extent of the change to the quality system manual, repair procedures, or facilities. Issuance of a new Certificate of Authorization is subject to the procedures herein.~~

~~**1.7.6.7 ISSUANCE OF MORE THAN ONE "VR" SYMBOL STAMP TO A CERTIFICATE OF AUTHORIZATION HOLDER**~~

~~The holder of a Certificate of Authorization may obtain more than one "VR" symbol stamp provided its quality system manual controls the use of such stamps from the address of record shown on the Certificate of Authorization.~~

1.7.5 ~~1.7.7~~ QUALITY SYSTEM

1.7.5.1 ~~1.7.7.1~~ GENERAL

Each applicant for a new or renewed "VR" Certificate of Authorization shall have and maintain a quality system which shall establish that all of these rules and administrative procedures and applicable ASME Code requirements, including material control, fabrication, machining, welding, examination, setting, testing, inspection, sealing, and stamping will be met.

1.7.5.2 ~~1.7.7.2~~ WRITTEN DESCRIPTION

A written description, in the English language, of the system the applicant will use shall be available for review and shall contain, as a minimum, the features set forth in 1.7.7.5. This description may be brief or voluminous, depending upon the projected scope of work, and shall be treated confidentially. In general, the quality system shall describe and explain what documents and procedures the repair firm will use to validate a valve repair.

~~**1.7.7.3 REVIEW**~~

~~A review of the applicant's quality system will be performed by a representative of the National Board. The review will include a demonstration of the implementation of the provisions of the applicant's quality system.~~

1.7.5.3 ~~1.7.7.4~~ MAINTENANCE OF CONTROLLED COPY

Each applicant to whom a "VR" Certificate of Authorization is issued shall maintain thereafter a controlled copy of the accepted quality system manual with the National Board. Except for changes that do not affect the quality system, revisions to the quality system manual shall not be implemented until such revisions are accepted by the National Board.

1.7.5.4 ~~1.7.7.5~~ OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM

The following establishes the minimum requirements of the written description of the quality system. It is required that each valve repair organization develop its own quality system that meets the requirements of its organization. For this reason it is not possible to develop one quality system that could apply to more than one organization. The written description shall include, as a minimum, the following features:

a) **Title Page**
The title page shall include the name and address of the company to which the National Board Certificate of Authorization is to be issued.

b) **Revision Log**
A revision log is required to assure revision control of the quality system manual. The log should contain sufficient space for date, description and section of revision, company approval, and National Board acceptance.

c) **Contents Page**

The contents page should list and reference, by paragraph and page number, the subjects and exhibits contained therein.

d) **Statement of Authority and Responsibility**

A statement of authority and responsibility shall be dated and signed by an officer of the company. It shall include:

1) A statement that the "VR" stamp shall be applied only to pressure relief valves that meet both of the following conditions:

a. Are stamped with an ASME "V", "UV", or "NV" Code symbol or marked with an ASME "HV" symbol and have been capacity certified by the National Board; and

b. Have been disassembled, inspected, and repaired by the Certificate Holder such that the valves' condition and performance are equivalent to the standards for new valves.

2) The title of the individual responsible to ensure that the quality system is followed and who has authority and freedom to effect the responsibility;

3) A statement that if there is a disagreement in the implementation of the written quality system, the matter is to be referred to a higher authority in the company for resolution; and

4) The title of the individual authorized to approve revisions to the written quality system and the method by which such revisions are to be submitted to the National Board for acceptance before implementation.

e) **Organization Chart**

A chart showing the relationship between management, purchasing, repairing, inspection, and quality control personnel is required and shall reflect the actual organization in place.

f) **Scope of Work**

1) The scope of work section shall indicate the scope and type of valve repairs, including conversions the organization is capable of and intends to perform. The location of repairs (shop, shop and field, or field only), ASME Code Section(s) to which the repairs apply, the test medium (air, gas, liquid, or steam, or combinations thereof), and special processes (machining, welding, postweld heat treatment, or nondestructive examination, or combinations thereof) shall be specifically addressed.

2) The types and sizes of valves to be repaired, pressure ranges and other limitations, such as engineering and test facilities, should also be addressed.

g) **Drawings and Specification Control**

The drawings and specification control system shall provide procedures assuring that the latest applicable drawings, specifications, and instructions required are used for valve repair, including conversions, inspection, and testing.

h) **Material and Part Control**

The material and part control section shall describe purchasing, receiving, storage, and issuing of parts.

1) State the title of the individual responsible for the purchasing of all
material.

2) State the title of the individual responsible for certification and other records as required.

3) All incoming material and parts shall be checked for conformance with the purchase order and, where applicable, the material specifications or drawings. Indicate how material or part is identified and how identity is maintained by the quality system.

i) **Repair and Inspection Program**

The repair and inspection program section shall include reference to a document (such as a report, traveler, or checklist) that outlines the specific repair and inspection procedures used in the repair of pressure relief valves. Repair procedures shall require verification that the critical parts meet the valve manufacturer's specification. Supplement S7.14 outlines recommended procedures covering some specific items. Provisions shall be made to retain this document for a period of at least five years.

1) Each valve or group of valves shall be accompanied by the document referred to above for processing through the plant. Each valve shall have a unique identifier (i.e., repair serial number, shop order number, etc.) appearing on the repair documentation and repair nameplate such that traceability is established.

2) The document referred to above shall describe the original nameplate information, including the ASME Code symbol stamping and the repair nameplate information, if applicable. In addition, it shall include material checks, replacement parts, conversion parts (or both), reference to items such as the welding procedure specifications (WPS), fitup, NDE technique, heat treatment, and pressure test methods to be used. Application of the "VR" stamp to the repair nameplate shall be recorded in this document. Specific conversions performed with the new Type/Model number shall be recorded on the document. There shall be a space for "signoffs" at each operation to verify that each step has been properly performed.

3) The system shall include a method of controlling the repair or replacement of critical valve parts. The method of identifying each spring shall be indicated.

4) The system shall also describe the controls used to ensure that any personnel engaged in the repair of pressure relief valves are trained and qualified in accordance with Supplement S7.

j) **Welding, NDE, and Heat Treatment** (when applicable)

The quality system manual shall indicate the title of the person(s) responsible for and describe the system used in the selection, development, approval, and qualification of welding procedure specifications, and the qualification of welders and welding operators in accordance with the provisions of S7.

1) The quality system manual may include controls for the "VR" Certificate Holder to have the pressure relief valve part repaired by a National Board "R" Certificate Holder, per Supplement S7.

2) The completed Form R-1 shall be noted on and attached to the "VR" Certificate Holder's document required in 1.7.7.5(i). Similarly, NDE and heat treatment techniques must be covered in the quality system manual. When outside services are used for NDE and heat treatment, the quality system manual shall describe the system whereby the use of such services meet the requirements of the applicable section of the ASME Code.

k) **Valve Testing, Setting, and Sealing**

The system shall include provisions that each valve shall be tested, set, and all external adjustments sealed according to the requirements of the applicable ASME Code Section and the National Board. The seal shall identify the "VR" Certificate Holder making the repair. Abbreviations or initials shall be permitted, provided such identification is acceptable to the National Board.

l) **Valve Repair Nameplates**

An effective valve stamping system shall be established to ensure proper stamping of each valve as required by 5.9.2. The manual shall include a description of the nameplate or a drawing.

m) **Calibration**

1) The manual shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs. Documentation of these calibrations shall include the standard used and the results.

2) All calibration standards shall be calibrated against certified equipment having known valid relationships to nationally recognized standards.

n) **Manual Control**

The quality system shall include:

1) Measures to control the issuance of and revisions to the quality system manual;

2) Provisions for a review of the system in order to maintain the manual current with these rules and the applicable sections of the ASME Code;
3) The title(s) of the individual(s) responsible for control, revisions, and review of the manual;

4) Provision of a controlled copy of the written quality system manual to be submitted to the National Board; and
5) Revisions shall be submitted for acceptance by the National Board prior to being implemented.

o) **Nonconformities**

The system shall establish measures for the identification, documentation, evaluation, segregation, and disposition of nonconformities. A nonconformity is a condition of any material, item, product, or process in which one or more characteristics do not conform to the established requirements. These may include, but are not limited to, data discrepancies, procedural and/or documentation deficiencies, or material defects. Also, the title(s) of the individual(s) involved in this process shall be included.

p) **Exhibits**

Forms used in the quality system shall be included in the manual with a written description. Forms exhibited should be marked SAMPLE and completed in a manner typical of actual valve repair procedures.

q) **Testing Equipment (See Supplement 8)**

The system shall include a means to control the development, addition, or modification of testing equipment to ensure the requirements of 4.5.1(b) are met.

r) Field Repairs (See Supplement S7.7)

If field repairs are included in the scope of work, the system shall address any differences or additions to the quality system required to properly control this activity, including the following:

1) Provisions for annual audits of field activities shall be included;

2) Provisions for receipt and inspection of replacement parts, including parts received from the owner-user, shall be addressed;

3) If owner-user personnel will assist with repairs, provisions for the use of owner-user personnel shall be included; and

4) Provisions for use of owner-user measurement and test equipment, if applicable, shall be addressed.

~~**1.7.8 ASME "V," "HV," OR "UV" CERTIFICATE HOLDERS**~~

~~a) A manufacturer holding a valid ASME Certificate of Authorization for use of an ASME "V", "HV", or "UV" Code symbol stamp may obtain the "VR" Certificate of Authorization for the repair of pressure relief valves covered by the ASME Certificate of Authorization and that meet the requirements of 1.7.3. This can be accomplished without a review of the facilities provided there is a written quality system to cover the scope of the repairs to be made and the repairs are carried out at the same location where the ASME valves are manufactured. Unless the repaired valves are tested on the same facilities and to the same procedures as new valves, two (2) repaired valves shall be selected by a National Board representative for verification tests.~~

~~b) The initial Certificate of Authorization shall be issued to expire concurrent with the ASME Certificate of Authorization. Subsequent certificates shall be renewed upon a successful review and verification of implementation of its quality system by a National Board representative. This review shall be performed concurrently with the ASME Certificate renewal review.~~

~~c) A manufacturer may also perform field repairs of pressure relief valves covered by the ASME Certificate of Authorization provided the provisions of Supplement S7.7 are met.~~

~~d) Assemblers holding ASME Certificates of Authorization shall qualify for the "VR" Certificate of Authorization as required elsewhere in these rules.~~
~~e) The quality system manual shall be submitted for review and acceptance by the National Board.~~

f) In order for an ASME Code symbol stamp holder to qualify for the National Board "VR" stamp, the following areas to the written quality system usually require attention.

1) Statement of Authority and Responsibility

This should clearly indicate that valve repairs are carried out in accordance with the requirements and the rules of the National Board and the quality system manual. In addition, the scope and type of valve repairs covered by the manual should be indicated.

2) Organization

Unless the functions which affect the quality of valve repairs are carried out by individuals other than those responsible for manufacturing or assembly, it should not be necessary to revise the organization chart.

3) General Quality Functions

Usually quality system requirements regarding valve repairs may be controlled in the same manner as for ASME manufacturing or assembly provided applicable shop and/or field activities are covered. If this is the case, the applicant for the "VR" stamp should include in its quality system manual a separate section covering valve repairs that references the applicable section of the manual. For a more explicit explanation see 1.7.7.5, Outline of Requirements for a Quality System.

1.7 ACCREDITATION OF "VR" REPAIR ORGANIZATIONS

1.7.1 SCOPE

a) The administrative rules and procedures are provided by the National Board for those who wish to obtain a National Board Certificate of Authorization for use of the "VR" (Repair of Pressure Relief Valves) symbol stamp. It should be noted that the issuance of the "VR" stamp is not restricted to companies whose primary business is the repair of pressure relief valves, nor to manufacturers or assemblers that hold an ASME "V," "HV," "UV," or "NV" Code symbol stamp. Owners and users of boilers and pressure vessels and other organizations that qualify in accordance with the National Board Rules and Regulations may also obtain the "VR" Certificate and stamp.

1.7.2 JURISDICTIONAL PARTICIPATION

The National Board member jurisdiction in which the "VR" organization is located is encouraged to participate in the review and demonstration of the applicant's quality system. The Jurisdiction may require participation in the review of the repair organization and the demonstration and acceptance of the repair organization's quality system manual.

1.7.2 ISSUANCE AND RENEWAL OF THE "VR" CERTIFICATE OF AUTHORIZATION

1.7.2.1 GENERAL

Authorization to use the stamp bearing the official National Board "VR" symbol as shown in Section 5 of this Part, will be granted by the National Board pursuant to the provisions of the following administrative rules and procedures

1.7.2.2 ISSUANCE OF CERTIFICATE

a) Repair organizations, manufacturers, assemblers, or users that make repairs to the American Society of Mechanical Engineers (ASME) Code symbol, stamped or marked (as applicable), and The National Board of Boiler and Pressure Vessel Inspectors (National Board) capacity certified pressure relief valves may apply to the National Board for a Certificate of Authorization to use the "VR" symbol.

1.7.3USE OF THE "VR" AUTHORIZATION

1.7.3.1 TECHNICAL REQUIREMENTS

The administrative requirements of ~~1.7~~ for use of the "VR" stamp shall be used in conjunction with the technical requirements for valve repair as described in Supplement 7 of the NBIC. Those requirements shall be mandatory when a "VR" repair is performed.

1.7.3.2 STAMP USE

Each "VR" symbol stamp shall be used only by the repair firm within the scope, limitations, and restrictions under which it was issued.

1.7.4 QUALITY SYSTEM

1.7.4.1 GENERAL

Each applicant for a new or renewed "VR" Certificate of Authorization shall have and maintain a quality system which shall establish that all of these rules and administrative procedures and applicable ASME Code requirements, including material control, fabrication, machining, welding, examination, setting, testing, inspection, sealing, and stamping will be met.

1.7.4.2 WRITTEN DESCRIPTION

A written description, in the English language, of the system the applicant will use shall be available for review and shall contain, as a minimum, the features set forth in 1.7.4.5. This description may be brief or voluminous, depending upon the projected scope of work, and shall be treated confidentially. In general, the quality system shall describe and explain what documents and procedures the repair firm will use to validate a valve repair.

1.7.4.3 MAINTENANCE OF CONTROLLED COPY

Each applicant to whom a "VR" Certificate of Authorization is issued shall maintain thereafter a controlled copy of the accepted quality system manual with the National Board. Except for changes that do not affect the quality system, revisions to the quality system manual shall not be implemented until such revisions are accepted by the National Board.

1.7.4.4 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM

The following establishes the minimum requirements of the written description of the quality system. It is required that each valve repair organization develop its own quality system that meets the requirements of its organization. For this reason it is not possible to develop one quality system that could apply to more than one organization. The written description shall include, as a minimum, the following features:

a) **Title Page**
The title page shall include the name and address of the company to which the National Board Certificate of Authorization is to be issued.

b) **Revision Log**

A revision log is required to assure revision control of the quality system manual. The log should contain sufficient space for date, description and section of revision, company approval, and National Board acceptance.

c) **Contents Page**

The contents page should list and reference, by paragraph and page number, the subjects and exhibits contained therein.

d) **Statement of Authority and Responsibility**

A statement of authority and responsibility shall be dated and signed by an officer of the company. It shall include:

1) A statement that the "VR" stamp shall be applied only to pressure relief valves that meet both of the following conditions:

a. Are stamped with an ASME "V", "UV", or "NV" Code symbol or marked with an ASME "HV" symbol and have been capacity certified by the National Board; and

b. Have been disassembled, inspected, and repaired by the Certificate Holder such that the valves' condition and performance are equivalent to the standards for new valves.

2) The title of the individual responsible to ensure that the quality system is followed and who has authority and freedom to effect the responsibility;

3) A statement that if there is a disagreement in the implementation of the written quality system, the matter is to be referred to a higher authority in the company for resolution; and

4) The title of the individual authorized to approve revisions to the written quality system and the method by which such revisions are to be submitted to the National Board for acceptance before implementation.

e) **Organization Chart**

A chart showing the relationship between management, purchasing, repairing, inspection, and quality control personnel is required and shall reflect the actual organization in place.

f) **Scope of Work**

1) The scope of work section shall indicate the scope and type of valve repairs, including conversions the organization is capable of

and intends to perform. The location of repairs (shop, shop and field, or field only), ASME Code Section(s) to which the repairs apply, the test medium (air, gas, liquid, or steam, or combinations thereof), and special processes (machining, welding, postweld heat treatment, or nondestructive examination, or combinations thereof) shall be specifically addressed.

2) The types and sizes of valves to be repaired, pressure ranges and other limitations, such as engineering and test facilities, should also be addressed.

g) **Drawings and Specification Control**

The drawings and specification control system shall provide procedures assuring that the latest applicable drawings, specifications, and instructions required are used for valve repair, including conversions, inspection, and testing.

h) **Material and Part Control**

The material and part control section shall describe purchasing, receiving, storage, and issuing of parts.

1) State the title of the individual responsible for the purchasing of all
material.

2) State the title of the individual responsible for certification and other records as required.

3) All incoming material and parts shall be checked for conformance with the purchase order and, where applicable, the material specifications or drawings. Indicate how material or part is identified and how identity is maintained by the quality system.

i) **Repair and Inspection Program**

The repair and inspection program section shall include reference to a document (such as a report, traveler, or checklist) that outlines the specific repair and inspection procedures used in the repair of pressure relief valves. Repair procedures shall require verification that the critical parts meet the valve manufacturer's specification. Supplement S7.14 outlines recommended procedures covering some specific items. Provisions shall be made to retain this document for a period of at least five years.

1) Each valve or group of valves shall be accompanied by the document referred to above for processing through the plant. Each valve shall have a unique identifier (i.e., repair serial number, shop order number, etc.) appearing on the repair documentation and repair nameplate such that traceability is established.

2) The document referred to above shall describe the original nameplate information, including the ASME Code symbol stamping and the repair nameplate information, if applicable. In addition, it shall include material checks, replacement parts, conversion parts (or both), reference to items such as the welding procedure specifications (WPS), fitup, NDE technique, heat treatment, and pressure test methods to be used. Application of the "VR" stamp to the repair nameplate shall be recorded in this document. Specific conversions performed with the new Type/Model number shall be recorded on the document. There shall be a space for "signoffs" at each operation to verify that each step has been properly performed.

3) The system shall include a method of controlling the repair or replacement of critical valve parts. The method of identifying each spring shall be indicated.

4) The system shall also describe the controls used to ensure that any personnel engaged in the repair of pressure relief valves are trained and qualified in accordance with Supplement S7.

j) **Welding, NDE, and Heat Treatment** (when applicable)

The quality system manual shall indicate the title of the person(s) responsible for and describe the system used in the selection, development, approval, and qualification of welding procedure specifications, and the qualification of welders and welding operators in accordance with the provisions of S7.

1) The quality system manual may include controls for the "VR" Certificate Holder to have the pressure relief valve part repaired by a National Board "R" Certificate Holder, per Supplement S7.

2) The completed Form R-1 shall be noted on and attached to the "VR" Certificate Holder's document required in 1.7.4.5(i). Similarly, NDE and heat treatment techniques must be covered in the quality system manual. When outside services are used for NDE and heat treatment, the quality system manual shall describe the system whereby the use of such services meet the requirements of the applicable section of the ASME Code.

k) **Valve Testing, Setting, and Sealing**

The system shall include provisions that each valve shall be tested, set, and all external adjustments sealed according to the requirements of the applicable ASME Code Section and the National Board. The seal shall identify the "VR" Certificate Holder making the repair. Abbreviations or initials shall be permitted, provided such identification is acceptable to the National Board.

l) **Valve Repair Nameplates**

An effective valve stamping system shall be established to ensure proper stamping of each valve as required by 5.9.2. The manual shall include a description of the nameplate or a drawing.

m) **Calibration**

1) The manual shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs. Documentation of these calibrations shall include the standard used and the results.

2) All calibration standards shall be calibrated against certified equipment having known valid relationships to nationally recognized standards.

n) **Manual Control**

The quality system shall include:

1) Measures to control the issuance of and revisions to the quality system manual;

2) Provisions for a review of the system in order to maintain the manual current with these rules and the applicable sections of the ASME Code;
3) The title(s) of the individual(s) responsible for control, revisions, and review of the manual;

4) Provision of a controlled copy of the written quality system manual to be submitted to the National Board; and
5) Revisions shall be submitted for acceptance by the National Board prior to being implemented.

o) **Nonconformities**

The system shall establish measures for the identification, documentation, evaluation, segregation, and disposition of nonconformities. A nonconformity is a condition of any material, item, product, or process in which one or more characteristics do not conform to the established requirements. These may include, but are not limited to, data discrepancies, procedural and/or documentation deficiencies, or material defects. Also, the title(s) of the individual(s) involved in this process shall be included.

p) **Exhibits**

Forms used in the quality system shall be included in the manual with a written description. Forms exhibited should be marked SAMPLE and completed in a manner typical of actual valve repair procedures.

q) **Testing Equipment (See Supplement 8)**

The system shall include a means to control the development, addition, or modification of testing equipment to ensure the requirements of 4.5.1(b) are met.

r) Field Repairs (See Supplement S7.7)

If field repairs are included in the scope of work, the system shall address any differences or additions to the quality system required to properly control this activity, including the following:

1) Provisions for annual audits of field activities shall be included;

2) Provisions for receipt and inspection of replacement parts, including parts received from the owner-user, shall be addressed;

3) If owner-user personnel will assist with repairs, provisions for the use of owner-user personnel shall be included; and

4) Provisions for use of owner-user measurement and test equipment, if applicable, shall be addressed.

1.8 "NR" ACCREDITATION REQUIREMENTS

1.8.1 SCOPE

a) ~~This section provides~~ The requirements ~~that must~~ to be met for an organization to obtain a National Board Certificate of Authorization to use the "NR" Symbol Stamp for the Repair/Replacement activities performed in accordance with this Part and ASME Section XI requirements.

b) The issuance of the "NR" stamp is not restricted to organizations whose primary business is to perform repair/replacement activities or to manufacturers or assemblers that hold an ASME "N"-type Code symbol stamp. Owners and users of nuclear components and other organizations that qualify in accordance with these rules may also obtain the "NR" stamp may be obtained from the National Board.

~~1.8.2 PREREQUISITES FOR ISSUING A NATIONAL BOARD "NR" CERTIFICATE OF AUTHORIZATION~~

~~Before an organization can obtain a National Board "NR" Certificate of Authorization, the organization shall:~~

~~a) Have and maintain an inspection agreement with an accredited Nuclear Inspection Agency in accordance with NB-360[4], NB-369[5], and ASME Section XI;~~

~~b) Have in the English language a written Quality System Program that complies with the requirements of this Section and addresses controls for the intended scope of activities;~~

~~c) Have a current edition and addenda of the NBIC, all parts; and~~
~~d) Have available copies of the original code of construction appropriate to the intended scope of work and the applicable edition and addenda of ASME Section XI, as required by the regulatory authority.[6]~~

~~1.8.3 PROCEDURES FOR OBTAINING OR RENEWING A NATIONAL BOARD "NR" CERTIFICATE OF AUTHORIZATION~~

~~a) Prior to issuance or renewal of a National Board "NR" Certificate of Authorization, the organization and its facilities are subject to a review of its Quality System Program. The implementation of the Quality System Program shall be satisfactorily demonstrated by the organization. Demonstration of implementation shall meet the most stringent code requirements for the scope of work to be performed by the organization. The National Board reserves the absolute right to cancel, refuse to issue,~~

1.8.2 ~~1.8.4~~ NATIONAL BOARD "NR" SYMBOL STAMP

a) All "NR" Symbol Stamps shall be obtained from the National Board of Boiler and Pressure Vessel Inspectors. Authorization to use the "NR" Symbol Stamp may be granted by the National Board at its absolute discretion.

~~b) The National Board, for a nominal fee, furnishes the "NR" Symbol Stamp. Each organization shall agree, if authorized to use the "NR" Symbol Stamp, that the "NR" Symbol Stamp is at all times the property of the National Board and will be promptly returned upon demand. If the organization discontinues the use of the "NR" Symbol Stamp or if the Certificate of Authorization has expired and no new Certificate of Authorization has been issued, the "NR" Symbol Stamp shall be returned to the National Board.~~

~~c) The organization's Quality System Program shall provide for adequate control of the "NR" Symbol Stamp.~~

~~d) The organization authorized to use the "NR" Symbol Stamp may obtain more than one "NR" Symbol Stamp provided the organization's Quality System Program describes how the use of such stamps are controlled from the location shown on the "NR" Certificate of Authorization.~~

b) ~~e)~~ The organization shall not permit other organizations to use the "NR" Symbol Stamp loaned to it by the National Board.

1.8.3 ~~1.8.5~~ QUALITY SYSTEM PROGRAM

A holder of a National Board Certificate of
Authorization shall have and maintain a written Quality System Program. The system shall satisfactorily meet the requirements of the NBIC, jurisdictional requirements, and shall be available for review. The Quality System Program may be brief or voluminous, depending on the circumstances. It shall be treated confidentially by the National Board.

1.8.3.1 ~~1.8.5.1~~ OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM PROGRAM FOR QUALIFICATION FOR THE NATIONAL BOARD "NR" SYMBOL STAMP

These rules set forth the requirements for planning, managing, and implementing the organization's Quality System Programs for controlling the quality of activities performed during repair/replacement activities of components and systems in nuclear power plants within the scope of the applicable edition and addenda of Section XI of the ASME Code. These

rules are to be the basis for evaluating such programs prior to the issuance of the National Board "NR" Certificate of Authorization.

a) **Organization**

1) The authority and responsibility of those in charge of the Quality System Program and activities affecting quality shall be clearly established and documented. The person and organization performing Quality System functions shall have sufficient and well-defined responsibility, authority, and organizational freedom to:

a. Identify quality problems;

b. Initiate action which results in solutions;

c. Verify implementation of solutions to those problems; and

d. Control further processing, delivery or installation of a nonconforming item, deficiency or unsatisfactory condition until proper disposition has been made.

2) The person and organization responsible for defining and for measuring the overall effectiveness of the Quality System Program shall be designated sufficiently independent from the pressure of production, have direct access to responsible management at a level where appropriate action can be required and report regularly on the effectiveness of the program. Assurance of quality requires management measures which provide that the individual or group assigned the responsibility of inspection, testing, checking, or otherwise verifying that an activity has been correctly performed, is independent of the individual or group directly responsible for performing the specific activity. The specific responsibilities of the Quality Assurance organization of the "NR" Certificate Holder shall include the review of written procedures and monitoring of all activities concerned with the Quality System Program as covered in these rules.

b) **Quality System Program**

1) Before becoming a holder of an "NR" Certificate of Authorization, the applicant shall establish a Quality System Program for the control of the quality of work to be performed. The program shall define the organizational structure within which the Quality System Program is to be implemented and shall clearly delineate the responsibilities, levels of authority, and lines of communication for the various individuals involved. The program shall be documented in detail in a Quality System Manual that shall be a major basis for

demonstration of compliance with the NBIC. The applicant's Quality System Program shall be documented by written policies, procedures, and instructions and shall be based on the organization's scope of work to be performed.

2) The applicant's program need not be in the same format or sequential arrangement as the requirements in these rules as long as all applicable program requirements have been covered. The program shall provide for the accomplishment of activities affecting quality under suitably controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity and assurance that prerequisites for the activity have been satisfied. The program shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality and need for the verification of quality by inspection and test. The program shall provide for ready detection of nonconforming material and items and for timely and positive corrective actions.

3) The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained. It shall be the responsibility of the "NR" Certificate Holder to ensure that all personnel performing quality functions within the scope of these rules, including personnel of subcontracted services, are qualified as specified in these rules. The assignment of qualified personnel shall be at the discretion of the "NR" certificate holder.

4) The "NR" Certificate Holder shall be responsible for advising his Authorized Nuclear Inspection Agency of any proposed changes to the Quality System Manual and shall have acceptance of the Authorized Nuclear Inspection Agency's Authorized Nuclear Inspector Supervisor before putting such changes into effect. The "NR" Certificate Holder shall make a current copy of the Quality System Manual available to the Authorized Nuclear Inspector. The "NR" Certificate Holder shall be responsible for promptly notifying the Authorized Nuclear Inspector of such accepted changes, including evidence of acceptance by the Authorized Nuclear Inspection Agency.

5) The quality of all repair/replacement activities shall be controlled at all points necessary to ensure conformance with the requirements of these rules and the "NR" Certificate Holder's Quality System Manual.

6) The Certificate Holder shall make available to the Authorized Nuclear Inspector such drawings and process sheets as are necessary to make the Quality System Program intelligible.

c) **Design Control**

1) ASME Section XI establishes that the owner is responsible for design in connection with repair/replacement activities. The "NR" Certificate Holder must ensure that the design specification, drawings, or other specifications or instructions furnished by the owner satisfy the code edition and addenda of the owner's design specification. To satisfy this requirement, the "NR" Certificate Holder shall establish requirements that correctly incorporate the owner's design specification requirements into their specifications, drawings, procedures, and instructions, which may be necessary to carry out the work. The "NR" Certificate Holder's system shall include provisions to ensure that the appropriate quality standards are specified and included in all quality records. These records shall be reviewed for compliance with the owner's design specification and the requirements of Section XI of the ASME Boiler and Pressure Vessel Code.

2) If the "NR" Certificate Holder's specifications, drawings, procedures, and instructions conflict with the owner's design specification, a system must be implemented that will resolve or eliminate the deficiency. This system must be reconciled with the owner and the "NR" Certificate Holder in accordance with IWA-4000 of Section XI of the ASME Code.

d) **Procurement Document Control**

Documents for procurement of materials, items, and subcontracted services shall include requirements to the extent necessary to ensure their compliance with the owner's design specifications and IWA-4000 of Section XI of the ASME Code. To the extent necessary, procurement documents shall require suppliers to maintain a Quality System Program consistent with the applicable requirements of the edition and addenda of the code of construction to which the items are constructed. Measures shall be established

to ensure that all purchased material, items, and services conform to these requirements.

e) **Instructions, Procedures and Drawings**

Activities affecting quality shall be prescribed by documented instructions, procedures or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative and qualitative criteria for determining that activities affecting quality have been satisfactorily accomplished. The "NR" Certificate Holder shall maintain a written description of procedures, instructions, or drawings used by his organization for control of quality and examination requirements detailing the implementation of the Quality System requirements. Copies of these procedures shall be readily available to the Authorized Nuclear Inspector.

f) **Document Control**

The program shall include measures to control the issuance, use, and disposition of documents, such as specifications, instructions, procedures, and drawings, including changes thereto. These measures shall ensure that the latest applicable documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and distributed for use at the location where the prescribed activity is performed.

g) **Control of Purchased Material, Items, and Services**

Measures shall be established to ensure that all purchased material, items, and services conform to the requirements of the owner's design specifications and applicable edition and addenda of the code of construction and Section XI of the ASME Code. These measures shall include identification for material traceability. Provisions shall be identified for source evaluation and objective evidence shall be provided evidencing quality standards for material examination upon receipt.

h) **Identification and Control of Material and Items**

1) Measures shall be established for identification and control of material and items, including partially fabricated assemblies. These measures shall ensure that identification is maintained and traceable, either on the material or component, or on records throughout the repair/replacement activity. These measures shall be designed to prevent the

use of incorrect or defective items and those which have not received the required examinations, tests, or inspections.
2) Permanent or temporary unit identification marks shall be applied using methods and materials that are legible and not detrimental to the component or system involved. Such identification shall be located in areas that will not interfere with the function or quality aspects of the item.

3) Certified Material Test Reports shall be identified as required by the applicable material specification in Section II of the ASME Code and shall satisfy any additional requirements specified in the original code of construction. The Certified Material Test Report or Certificate of Compliance need not be duplicated for submission with compliance documents when a record of compliance and satisfactory reviews of the Certified Material Test Report and Certificates of Compliance is provided. Documents shall provide a record that the Certified Material Test Report and Certificates of Compliance have been received, reviewed, and found acceptable. When the "NR" Certificate Holder Scope authorizes the organization to perform examinations and tests in accordance with the original code of construction, the "NR" Certificate Holder shall certify compliance either on a Certified Material Test Report or Certificate of Conformance that the material satisfies the original code of construction requirements.

i) **Control of Processes**

1) The "NR" Certificate Holder shall operate under a controlled system such as process sheets, checklists, travelers, or equivalent procedures. Measures shall be established to assure that processes such as welding, nondestructive examination, and heat treating are controlled in accordance with the rules of the applicable section of the ASME Code and are accomplished by qualified personnel using qualified procedures.

2) Process sheets, checklists, travelers, or equivalent documentation shall be prepared, including the document numbers and revisions to which the process conforms with space provided for reporting results of completion of specific operations at checkpoints of repair/replacement activities.

j) **Examinations, Tests and Inspections**

1) In-process and final examinations and tests shall be established to assure conformance with specifications, drawings, instructions, and procedures which incorporate or reference the requirements and acceptance limits contained in applicable design documents. Examination activities to verify the quality of work shall be performed by persons other than those who performed the activity being examined. Such persons shall not report directly to the immediate supervisors responsible for the work being examined.

2) Process sheets, travelers, or checklists shall be prepared, including the document numbers and revision to which the examination or test is to be performed, with space provided for recording results.

3) Mandatory hold/inspection points at which witnessing is required by the "NR" Certificate Holder's representative or the Authorized Nuclear Inspector shall be indicated in the controlling documents. Work shall not proceed beyond mandatory hold/inspection points without the consent of the "NR" Certificate Holder's representative or the Authorized Nuclear Inspector, as appropriate.

k) **Test Control**

1) Testing shall be performed in accordance with the owner's written test procedures that incorporate or reference the requirements and acceptance limits contained in applicable design documents.

2) Test procedures shall include provisions for assuring that prerequisites for the given test have been met, that adequate instrumentation is available and used, and that necessary monitoring is performed. Prerequisites may include calibrated instrumentation, appropriate equipment, trained personnel, condition of test equipment and the item to be tested, suitable environmental conditions, and provisions for data acquisition.

3) Test results shall be documented and evaluated to assure that test requirements have been satisfied.

l) **Control of Measuring and Test Equipment**

Measures shall be established and documented to assure that tools, gages,

instruments, and other measuring and testing equipment and devices used in activities affecting quality are of the proper range, type, and accuracy to verify conformance to established requirements. A procedure shall be in effect to assure that they are calibrated and properly adjusted at specified periods or use intervals to maintain accuracy within specified limits. Calibration shall be traceable to known national standards, where these standards exist, or with the device manufacturer's recommendation.
m) Quality Records

1) The owner is responsible for designating records to be maintained. Measures shall be established for the "NR" Certificate Holder to maintain these records [See 1.8.5.1(m)(2)] required for Quality Assurance of repair/replacement activities. These shall include documents such as records of materials, manufacturing, examination, and test data taken before and during repair/replacement activity. Procedures, specifications, and drawings used shall be fully identified by pertinent material or item identification numbers, revision numbers, and issue dates. The records shall also include related data such as qualification of personnel, procedures, equipment, and related repairs. The "NR" Certificate Holder shall take such steps as may be required to provide suitable protection from deterioration and damage for all records while in his care. Also, it is required that the "NR" Certificate Holder have a system for correction or amending records that satisfies the owner's requirements. These records may be either the original or a reproduced, legible copy and shall be transferred to the owner at his request.

2) Records to be maintained as required in 1.8.5.1(m)(1) above may include the following:

a. An index that details the location and who is responsible for maintaining the records;

b. Data reports, properly executed, for each replacement component, part, appurtenance, piping system, and piping
assembly, when required by the design specification or the owner;

c. The required as-constructed drawings certified as to correctness;

d. Copies of applicable Certified Material Test Reports and Certificates of Compliance;

e. As-built sketch(es) including tabulations of materials repair/replacement procedures, and instructions to achieve compliance with Section XI of the ASME Code;

f. Nondestructive examination reports including results of examinations shall identify the ASNT, SNT-TC-1A, CP-189, or ACCP level of personnel interpreting the examination results. The ASNT Central Certification Program (ACCP) may be used to fulfill the examination and demonstration requirement of the employer's written practice. Final radiographs shall be included where radiography has been performed;

g. Records of all heat treatments may be either the heat treatment charts or a summary description of heat treatment time and temperature data certified by the "NR" Certificate Holder. Heat treatments performed by the material manufacturer to satisfy requirements of the material specifications may be reported on the Certified Material Test Report; or

h. Any and all nonconformance reports shall satisfy IWA-4000 of Section XI of the ASME Code and shall be reconciled by the owner
prior to certification of the Form NR-1 or NVR-1, as applicable.

3) After a repair/replacement activity, all records including audit reports required to verify compliance with the applicable engineering documents and the "NR" Certificate Holder's Quality System Program, except those required by the owner or listed in 1.8.5.1(m)(2)(a) thru (g) above, shall be maintained at a place mutually agreed upon by the owner and the "NR" Certificate Holder. These records shall be maintained for a period of five years after completion of the repair/replacement activity.

4) The original of the completed Form NR-1 or Form NVR-1, as applicable, shall be registered with the National Board and, if required, a copy forwarded to the Jurisdiction where the nuclear power plant is located.

n) **Examination or Test Status**

Measures shall be established to indicate examination and test status of parts, items, or components during the repair/replacement activity. The system used shall provide positive identification of the part, item, or component by means of stamps, labels, routing cards, or other acceptable methods. The system shall include any procedures or instructions to achieve compliance. Also, measures shall be provided for the identification of acceptable and unacceptable items. They shall also include procedures for control of status indicators, including the authority for application and removal of status indicators.

o) **Nonconforming Materials or Items**

Measures shall be established to control materials or items that do not conform to requirements in order to prevent their inadvertent use, including measures to identify and control the proper installation of items and to preclude nonconformance with the requirements of these rules. These measures shall include procedures for identification, documentation, segregation, and disposition. Nonconforming items shall be reviewed for acceptance, rejection, or repair in accordance with documented procedures. The responsibility and authority for the disposition of nonconforming items shall be defined. Repaired or modified items shall be re-examined in accordance with the applicable procedures. Measures that control further processing of a nonconforming or defective item, pending a decision on its disposition, shall be established and maintained. Ultimate disposition of nonconforming items shall be documented.

p) **Corrective Action**

1) Measures shall be established to ensure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and other nonconformances are promptly identified and corrected.

2) In the case of significant conditions adverse to quality, the measures shall also ensure that the cause of these conditions be determined and corrected to preclude repetition. The identification of significant conditions adverse to quality, the cause, and condition and the corrective action taken shall be documented and reported to the appropriate levels of management.

3) The requirements shall also extend to the performance of subcontractors' corrective action measures.

q) **Audits**

A comprehensive system of planned and periodic audits shall be carried out by the "NR" Certificate Holder's organization to ensure compliance with the Quality System Program and to determine its effectiveness. Audits shall be performed in accordance with written procedures or checklists by personnel not having direct responsibilities in the areas being audited. Audit results shall be documented by the auditing personnel for review by management having responsibility in that area. Follow-up action, including re-audit of deficient areas, shall be taken where indicated. Audit results shall be made available to the Authorized Nuclear Inspector.

r) **Authorized Nuclear Inspector**

Measures shall be taken to reference the commissioned Rules for National Board Authorized Nuclear Inspector, qualified in accordance with the Rules for National Board Inservice and New Construction Commisioned Inspectors, to ensure that the latest documents including the Quality System Program will be made available to the inspector. The Authorized Nuclear Inspector shall be consulted prior to the issuance of a repair/replacement program in order that the Inspector may select any inspection or hold points in the program. The Authorized Nuclear Inspector shall not sign Form NR-1 or Form NVR-1, as applicable, unless satisfied that all work carried out is in accordance with the NBIC, ASME Section XI, and any jurisdictional requirements.

s) **Exhibits**

Forms referenced in the Quality System Manual shall be explained in the text and included as part of the referencing document or as an appendix. Forms shall be controlled and identified to show the latest approved revision, exhibit name, and other corresponding references as stated in the Quality System manual.

1.8.6 INTERFACE WITH THE OWNER'S REPAIR/REPLACEMENT ~~PROGRAM~~

~~Interface with the owner's repair/replacement program shall meet the following:~~

~~a) The repair/replacement plan shall be subject to the acceptance of the Jurisdiction and the owner's Authorized Nuclear In-service Inspector (ANII).~~

b) Repair/replacement activities of nuclear components shall meet the requirements of Section XI of the ASME Boiler and Pressure Vessel Code and the Jurisdiction where the nuclear power plant is located.

c) Documentation of the repair/replacement activities of nuclear components shall be recorded on the National Board Report of Nuclear Repair/Modification or Replacement activities, Form NR-1, or Form NVR-1, as applicable. The completed forms shall be signed by a representative of the authorized nuclear repair organization and the Authorized Nuclear Inspector if the repair/replacement activity meets the requirements of ASME Section XI. For repair/replacement activities that involve design changes as specified in 1.8.5.1(c), Form NR-1, or Form NVR-1, as applicable, shall indicate the responsible organization satisfying the owner's design specification requirements.

d) The authorized nuclear repair organization shall provide a copy of the signed Form NR-1 or Form NVR-1, as applicable, to the owner, if required, the Jurisdiction, and the Authorized Nuclear Inspection Agency. The original Form NR-1 or Form NVR-1, as applicable, shall be registered with the National Board by the authorized nuclear repair organization.

e) The authorized nuclear repair organization shall provide a nameplate/stamping for repair/replacement activities for each nuclear component unless otherwise required by the Owner's Quality System Program. The required information and format shall be as shown in Section 5 of this Part.

1.8 "NR" ACCREDITATION REQUIREMENTS

1.8.1 SCOPE

a) The requirements to be met for an organization to obtain a National Board Certificate of Authorization to use the "NR" Symbol Stamp for the Repair/Replacement activities performed in accordance with this Part and ASME Section XI requirements.

b) The issuance of the "NR" stamp is not restricted to organizations whose primary business is to perform repair/replacement activities or to manufacturers or assemblers that hold an ASME "N"-type Code symbol stamp. Owners and users of nuclear components and other organizations that qualify in accordance with these rules may also obtain the "NR" stamp may be obtained from the National Board.

1.8.2 NATIONAL BOARD "NR" SYMBOL STAMP

a) All "NR" Symbol Stamps shall be obtained from the National Board of Boiler and Pressure Vessel Inspectors. Authorization to use the "NR" Symbol Stamp may be granted by the National Board at its absolute discretion.

b) The organization shall not permit other organizations to use the "NR" Symbol Stamp loaned to it by the National Board.

1.8.3 QUALITY SYSTEM PROGRAM

A holder of a National Board Certificate of Authorization shall have and maintain a written Quality System Program. The system shall satisfactorily meet the requirements of the NBIC, jurisdictional requirements, and shall be available for review. The Quality System Program may be brief or voluminous, depending on the circumstances. It shall be treated confidentially by the National Board.

1.8.3.1 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM PROGRAM FOR QUALIFICATION FOR THE NATIONAL BOARD "NR" SYMBOL STAMP

These rules set forth the requirements for planning, managing, and implementing the organization's Quality System Programs for controlling the quality of activities performed during repair/replacement activities of components and systems in nuclear power plants within the scope of the applicable edition and addenda of Section XI of the ASME Code. These rules are to be the basis for evaluating such programs prior to the issuance of the National Board "NR" Certificate of Authorization.

a) **Organization**

1) The authority and responsibility of those in charge of the Quality System Program and activities affecting quality shall be clearly established and documented. The person and organization performing Quality System functions shall have sufficient and well-defined responsibility, authority, and organizational freedom to:

a. Identify quality problems;

b. Initiate action which results in solutions;

c. Verify implementation of solutions to those problems; and

d. Control further processing, delivery or installation of a nonconforming item, deficiency or unsatisfactory condition until proper disposition has been made.

2) The person and organization responsible for defining and for measuring the overall effectiveness of the Quality System Program shall be designated sufficiently independent from the pressure of production, have direct access to responsible management at a level where appropriate action can be required and report regularly on the effectiveness of the program. Assurance of quality requires management measures which provide that the individual or group assigned the responsibility of inspection, testing, checking, or otherwise verifying that an activity has been correctly performed, is independent of the individual or group directly responsible for performing the specific activity. The specific responsibilities of the Quality Assurance organization of the "NR" Certificate Holder shall include the review of written procedures and monitoring of all activities concerned with the Quality System Program as covered in these rules.

b) **Quality System Program**

1) Before becoming a holder of an "NR" Certificate of Authorization, the applicant shall establish a Quality System Program for the control of the quality of work to be performed. The program shall define the organizational structure within which the Quality System Program is to be implemented and shall clearly delineate the responsibilities, levels of authority, and lines of communication for the various individuals involved. The program shall be documented in detail in a Quality System Manual that shall be a major basis for demonstration of compliance with the NBIC. The applicant's Quality System Program shall be documented by written policies,

procedures, and instructions and shall be based on the organization's scope of work to be performed.

2) The applicant's program need not be in the same format or sequential arrangement as the requirements in these rules as long as all applicable program requirements have been covered. The program shall provide for the accomplishment of activities affecting quality under suitably controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity and assurance that prerequisites for the activity have been satisfied. The program shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality and need for the verification of quality by inspection and test. The program shall provide for ready detection of nonconforming material and items and for timely and positive corrective actions.

3) The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained. It shall be the responsibility of the "NR" Certificate Holder to ensure that all personnel performing quality functions within the scope of these rules, including personnel of subcontracted services, are qualified as specified in these rules. The assignment of qualified personnel shall be at the discretion of the "NR" certificate holder.

4) The "NR" Certificate Holder shall be responsible for advising his Authorized Nuclear Inspection Agency of any proposed changes to the Quality System Manual and shall have acceptance of the Authorized Nuclear Inspection Agency's Authorized Nuclear Inspector Supervisor before putting such changes into effect. The "NR" Certificate Holder shall make a current copy of the Quality System Manual available to the Authorized Nuclear Inspector. The "NR" Certificate Holder shall be responsible for promptly notifying the Authorized Nuclear Inspector of such accepted changes, including evidence of acceptance by the Authorized Nuclear Inspection Agency.

5) The quality of all repair/replacement activities shall be controlled at all points necessary to ensure conformance

with the requirements of these rules and the "NR" Certificate Holder's Quality System Manual.

6) The Certificate Holder shall make available to the Authorized Nuclear Inspector such drawings and process sheets as are necessary to make the Quality System Program intelligible.

c) **Design Control**

1) ASME Section XI establishes that the owner is responsible for design in connection with repair/replacement activities. The "NR" Certificate Holder must ensure that the design specification, drawings, or other specifications or instructions furnished by the owner satisfy the code edition and addenda of the owner's design specification. To satisfy this requirement, the "NR" Certificate Holder shall establish requirements that correctly incorporate the owner's design specification requirements into their specifications, drawings, procedures, and instructions, which may be necessary to carry out the work. The "NR" Certificate Holder's system shall include provisions to ensure that the appropriate quality standards are specified and included in all quality records. These records shall be reviewed for compliance with the owner's design specification and the requirements of Section XI of the ASME Boiler and Pressure Vessel Code.

2) If the "NR" Certificate Holder's specifications, drawings, procedures, and instructions conflict with the owner's design specification, a system must be implemented that will resolve or eliminate the deficiency. This system must be reconciled with the owner and the "NR" Certificate Holder in accordance with IWA-4000 of Section XI of the ASME Code.

d) **Procurement Document Control**

Documents for procurement of materials, items, and subcontracted services shall include requirements to the extent necessary to ensure their compliance with the owner's design specifications and IWA-4000 of Section XI of the ASME Code. To the extent necessary, procurement documents shall require suppliers to maintain a Quality System Program consistent with the applicable requirements of the edition and addenda of the code of construction to which the items are constructed. Measures shall be established to ensure that all purchased material, items, and services conform to these requirements.

e) **Instructions, Procedures and Drawings**

Activities affecting quality shall be prescribed by documented instructions, procedures or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative and qualitative criteria for determining that activities affecting quality have been satisfactorily accomplished. The "NR" Certificate Holder shall maintain a written description of procedures, instructions, or drawings used by his organization for control of quality and examination requirements detailing the implementation of the Quality System requirements. Copies of these procedures shall be readily available to the Authorized Nuclear Inspector.

f) **Document Control**

The program shall include measures to control the issuance, use, and disposition of documents, such as specifications, instructions, procedures, and drawings, including changes thereto. These measures shall ensure that the latest applicable documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and distributed for use at the location where the prescribed activity is performed.

g) **Control of Purchased Material, Items, and Services**

Measures shall be established to ensure that all purchased material, items, and services conform to the requirements of the owner's design specifications and applicable edition and addenda of the code of construction and Section XI of the ASME Code. These measures shall include identification for material traceability. Provisions shall be identified for source evaluation and objective evidence shall be provided evidencing quality standards for material examination upon receipt.

h) **Identification and Control of Material and Items**

1) Measures shall be established for identification and control of material and items, including partially fabricated assemblies. These measures shall ensure that identification is maintained and traceable, either on the material or component, or on records throughout the repair/replacement activity. These measures shall be designed to prevent the use of incorrect or defective items and those which have not received the required examinations, tests, or inspections.

2) Permanent or temporary unit identification marks shall be applied using methods and materials that are legible and not detrimental to the component or system involved. Such identification shall be located in areas that will not interfere with the function or quality aspects of the item.

3) Certified Material Test Reports shall be identified as required by the applicable material specification in Section II of the ASME Code and shall satisfy any additional requirements specified in the original code of construction. The Certified Material Test Report or Certificate of Compliance need not be duplicated for submission with compliance documents when a record of compliance and satisfactory reviews of the Certified Material Test Report and Certificates of Compliance is provided. Documents shall provide a record that the Certified Material Test Report and Certificates of Compliance have been received, reviewed, and found acceptable. When the "NR" Certificate Holder Scope authorizes the organization to perform examinations and tests in accordance with the original code of construction, the "NR" Certificate Holder shall certify compliance either on a Certified Material Test Report or Certificate of Conformance that the material satisfies the original code of construction requirements.

i) **Control of Processes**

1) The "NR" Certificate Holder shall operate under a controlled system such as process sheets, checklists, travelers, or equivalent procedures. Measures shall be established to assure that processes such as welding, nondestructive examination, and heat treating are controlled in accordance with the rules of the applicable section of the ASME Code and are accomplished by qualified personnel using qualified procedures.

2) Process sheets, checklists, travelers, or equivalent documentation shall be prepared, including the document numbers and revisions to which the process conforms with space provided for reporting results of completion of specific operations at checkpoints of repair/replacement activities.

j) **Examinations, Tests and Inspections**

1) In-process and final examinations and tests shall be established to assure conformance with specifications,

drawings, instructions, and procedures which incorporate or reference the requirements and acceptance limits contained in applicable design documents. Examination activities to verify the quality of work shall be performed by persons other than those who performed the activity being examined. Such persons shall not report directly to the immediate supervisors responsible for the work being examined.

2) Process sheets, travelers, or checklists shall be prepared, including the document numbers and revision to which the examination or test is to be performed, with space provided for recording results.

3) Mandatory hold/inspection points at which witnessing is required by the "NR" Certificate Holder's representative or the Authorized Nuclear Inspector shall be indicated in the controlling documents. Work shall not proceed beyond mandatory hold/inspection points without the consent of the "NR" Certificate Holder's representative or the Authorized Nuclear Inspector, as appropriate.

k) **Test Control**

1) Testing shall be performed in accordance with the owner's written test procedures that incorporate or reference the requirements and acceptance limits contained in applicable design documents.

2) Test procedures shall include provisions for assuring that prerequisites for the given test have been met, that adequate instrumentation is available and used, and that necessary monitoring is performed. Prerequisites may include calibrated instrumentation, appropriate equipment, trained personnel, condition of test equipment and the item to be tested, suitable environmental conditions, and provisions for data acquisition.

3) Test results shall be documented and evaluated to assure that test requirements have been satisfied.

l) **Control of Measuring and Test Equipment**

Measures shall be established and documented to assure that tools, gages,
instruments, and other measuring and testing equipment and devices used in activities affecting quality are of the proper range,

type, and accuracy to verify conformance to established requirements. A procedure shall be in effect to assure that they are calibrated and properly adjusted at specified periods or use intervals to maintain accuracy within specified limits. Calibration shall be traceable to known national standards, where these standards exist, or with the device manufacturer's recommendation.
m) Quality Records

1) The owner is responsible for designating records to be maintained. Measures shall be established for the "NR" Certificate Holder to maintain these records [See 1.8.5.1(m)(2)] required for Quality Assurance of repair/replacement activities. These shall include documents such as records of materials, manufacturing, examination, and test data taken before and during repair/replacement activity. Procedures, specifications, and drawings used shall be fully identified by pertinent material or item identification numbers, revision numbers, and issue dates. The records shall also include related data such as qualification of personnel, procedures, equipment, and related repairs. The "NR" Certificate Holder shall take such steps as may be required to provide suitable protection from deterioration and damage for all records while in his care. Also, it is required that the "NR" Certificate Holder have a system for correction or amending records that satisfies the owner's requirements. These records may be either the original or a reproduced, legible copy and shall be transferred to the owner at his request.

2) Records to be maintained as required in 1.8.5.1(m)(1) above may include the following:

a. An index that details the location and who is responsible for maintaining the records;

b. Data reports, properly executed, for each replacement component, part, appurtenance, piping system, and piping
assembly, when required by the design specification or the owner;

c. The required as-constructed drawings certified as to correctness;

d. Copies of applicable Certified Material Test Reports and Certificates of Compliance;

e. As-built sketch(es) including tabulations of materials repair/replacement procedures, and instructions to achieve compliance with Section XI of the ASME Code;

f. Nondestructive examination reports including results of examinations shall identify the ASNT, SNT-TC-1A, CP-189, or ACCP level of personnel interpreting the examination results. The ASNT Central Certification Program (ACCP) may be used to fulfill the examination and demonstration requirement of the employer's written practice. Final radiographs shall be included where radiography has been performed;

g. Records of all heat treatments may be either the heat treatment charts or a summary description of heat treatment time and temperature data certified by the "NR" Certificate Holder. Heat treatments performed by the material manufacturer to satisfy requirements of the material specifications may be reported on the Certified Material Test Report; or

h. Any and all nonconformance reports shall satisfy IWA-4000 of Section XI of the ASME Code and shall be reconciled by the owner
prior to certification of the Form NR-1 or NVR-1, as applicable.

3) After a repair/replacement activity, all records including audit reports required to verify compliance with the applicable engineering documents and the "NR" Certificate Holder's Quality System Program, except those required by the owner or listed in 1.8.5.1(m)(2)(a) thru (g) above, shall be maintained at a place mutually agreed upon by the owner and the "NR" Certificate Holder. These records shall be maintained for a period of five years after completion of the repair/replacement activity.

4) The original of the completed Form NR-1 or Form NVR-1, as applicable, shall be registered with the National Board and, if required, a copy forwarded to the Jurisdiction where the nuclear power plant is located.

n) **Examination or Test Status**

Measures shall be established to indicate examination and test status of parts, items, or components during the repair/replacement activity. The system used shall provide positive identification of the part, item, or component by means of stamps, labels, routing cards, or other acceptable methods. The system shall include any procedures or instructions to achieve compliance. Also, measures shall be provided for the identification of acceptable and unacceptable items. They shall also include procedures for control of status indicators, including the authority for application and removal of status indicators.

o) **Nonconforming Materials or Items**

Measures shall be established to control materials or items that do not conform to requirements in order to prevent their inadvertent use, including measures to identify and control the proper installation of items and to preclude nonconformance with the requirements of these rules. These measures shall include procedures for identification, documentation, segregation, and disposition. Nonconforming items shall be reviewed for acceptance, rejection, or repair in accordance with documented procedures. The responsibility and authority for the disposition of nonconforming items shall be defined. Repaired or modified items shall be re-examined in accordance with the applicable procedures. Measures that control further processing of a nonconforming or defective item, pending a decision on its disposition, shall be established and maintained. Ultimate disposition of nonconforming items shall be documented.

p) **Corrective Action**

1) Measures shall be established to ensure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and other nonconformances are promptly identified and corrected.

2) In the case of significant conditions adverse to quality, the measures shall also ensure that the cause of these conditions be determined and corrected to preclude repetition. The identification of significant conditions adverse to quality, the cause, and condition and the corrective action taken shall be documented and reported to the appropriate levels of management.

3) The requirements shall also extend to the performance of subcontractors' corrective action measures.

q) **Audits**

A comprehensive system of planned and periodic audits shall be carried out by the "NR" Certificate Holder's organization to ensure compliance with the Quality System Program and to determine its effectiveness. Audits shall be performed in accordance with written procedures or checklists by personnel not having direct responsibilities in the areas being audited. Audit results shall be documented by the auditing personnel for review by management having responsibility in that area. Follow-up action, including re-audit of deficient areas, shall be taken where indicated. Audit results shall be made available to the Authorized Nuclear Inspector.

r) **Authorized Nuclear Inspector**

Measures shall be taken to reference the commissioned Rules for National Board Authorized Nuclear Inspector, qualified in accordance with the Rules for National Board Inservice and New Construction Commisioned Inspectors, to ensure that the latest documents including the Quality System Program will be made available to the inspector. The Authorized Nuclear Inspector shall be consulted prior to the issuance of a repair/replacement program in order that the Inspector may select any inspection or hold points in the program. The Authorized Nuclear Inspector shall not sign Form NR-1 or Form NVR-1, as applicable, unless satisfied that all work carried out is in accordance with the NBIC, ASME Section XI, and any jurisdictional requirements.

s) **Exhibits**

Forms referenced in the Quality System Manual shall be explained in the text and included as part of the referencing document or as an appendix. Forms shall be controlled and identified to show the latest approved revision, exhibit name, and other corresponding references as stated in the Quality System manual.

NBIC Sub-Group Repairs & Alterations

Subject:	Review Form R-2 and Instructions accepted by Main Committee Letter Ballot September 2010

NB-Item number:	Initiated by NB-staff ➡**NB12-1101**

Explanation of assignment needed:	Mr. Terry Parks initiated this item to revisit the configuration of the "as-published" Form R-2 after receiving numerous comments as to how the Form was to work within the industry as well as within the National Board. To that end, Mr. Parks proposed a TG-approach with N-BD staff to clarify the objectives of the Form R-2 and best use the time between January 2012 and January 2013 to develop or introduce any other changes prior to issuing the 2013-Edition. This assignment represents: ✓ • Affirm the direction of the Committee to portray the natural continuity of work flow, and as described in the book at 5.2.2 when preparing a Form R-2, emphasizing the need to complete the design certification and review PRIOR to the start of construction. ✓ • Enhance the scope of work description fields to better afford the completion of the Form R-2 outside of an electronic format. ***No betterment Ø*** • Affirm the perception of betterment in separating the form as sheet 1 and sheet 2 for the purpose of expediting communication & registration. ✓ • Interact with N-BD staff as a TG to understand the fallout of the noted tasks and to recognize any obstacles to overcome within the Natl. -BD's EDT-system. ✓ • Review the Instruction sheet developed by N-BD staff for inclusion into the Instructions for completing N-BD Forms @ 5.13.4.1.

Assigned to:	M. Webb, Ron Pulliam, Wayne Jones, Nikki Estep and Donna Radcliff (N-BD staff), Ben Schaefer, Bob Wielgoszinski

Background:	The Form R-2 as published in the 2011-Edition of NB-23 was published in error and does not reflect the accepted Form by MC-Letter Ballot in September 2010. See Ballot Archives, NB08-0304. The N-BD will use the "as-published" Form R-2 until the correction or other action is adopted for the 2013 code Edition.

Existing Text in '11-Edition **5.13.4.1 INSTRUCTIONS FOR COMPLETING NATIONAL BOARD FORM "R" REPORTS**	**Proposed Change #1** (Proposed changes are double-underlined) **5.13.4.1 INSTRUCTIONS: ITEM 2**	Rationale
5.13.4.1 INSTRUCTIONS FOR COMPLETING NATIONAL BOARD FORM "R" REPORTS 2. When registering a Form "R"-Report with the National Board, this line is solely designated for a unique sequential number assigned by the "R" Certificate Holder. When the "R"-Form is not to be registered, indicate so by "N/A". As described in 5.6, a log shall be maintained identifying sequentially, any "R"-forms registered with the National Board. For re-rating only, the Design Organization registers the R-2. Where physical work is also performed, the Construction Organization registers the R-2. →	2. When registering a Form "R"-Report with the National Board, this line is solely designated for a unique sequential number assigned by the "R" Certificate Holder. When the "R"-Form is not to be registered, indicate so by "N/A". As described in 5.6, a log shall be maintained identifying sequentially, any "R"-forms registered with the National Board. The requirements for registration can be found at Part 3, 5.5. Information is relocated to: ***5.5.2 b) REGISTRATION OF ALTERATIONS*** →	As instructions for line 2, the language specifically identifying registration requirements may be better profiled as a reference to the applicable section of the Code; Part 3, 5.5.2 a) - c). ***RELOCATED TO 5.5.2 b)- PROPOSED CHANGE 2*** -For re-rating only, the Design Organization registers the R-2. Where physical work is also performed, the Construction Organization registers the R-2.

Accepted Text NB-item: NB10-0701 **5.5.2 REGISTRATION FOR ALTERATIONS**	**Proposed Change #2** (Proposed changes are double-underlined) **5.5.2 REGISTRATION FOR ALTERATIONS**	Rationale
a) If the pressure retaining item is originally registered with the National Board, an original Form R-2, together with attachments, shall be registered with the National Board. *b)* If the item was not *originally* registered with the National Board, one original Form R-2 *meeting the requirements of the Code*, together with attachments *when the exact scope of work is not described,* may be registered with the National board or retained as required by *The Quality Manual System.* As shown the ***italicized script*** represents item NB10-0701 accepted by Main Committee **"b" is relocated as "d".**	a) No Change b) For re-rating or design-only where no physical work is performed, the Design Organization assigns a unique sequential number shown on the Form R-2; front and back, as instructed at 5.13.4.1 item 2 and when required, is responsible for registering the Form R-2 Report with the National Board. c) Where physical work is also performed, the Construction Organization assigns a unique sequential number shown on the Form R-2; front and back, as instructed at 5.13.4.1 item 2 and when required, is responsible for registering the Form R-2 Report with the National Board. d) If the item was not *originally* registered with the National Board, one original Form R-2 *meeting the requirements of the Code*, together with attachments *when the exact scope of work is not described,* may be registered with the National board or retained as required by *The Quality Manual System.*	The proposed relocation of information shown as "b" and "c" is from Instruction item #2. The subject matter @ 5.5.2 "REGISTRATION FOR ALTERATIONS" goes beyond an Instruction item for line 2 and describes Code-responsibilities of the Design and Construction organizations. The Task Group suggests it may be better suited as Code-text rather than as an instruction item.

Existing Text in '11-Edition **5.2.2 PREPARATION OF FORM R-2**	**Proposed Change #3** (Proposed changes are double-underlined)	Rationale
c) …The construction organization shall complete the Form R-2 provided by the design organization, including the "Construction Certification" section of the form. When no construction work is performed (e.g., a re-rating with no physical changes), the "R" Certificate Holder responsible for the design shall prepare the Form R-2, including the gathering and attaching of the supporting reports.	c) …The construction organization shall complete the Form R-2 provided by the design organization, including the "Construction Certification" section of the form. When no construction work is performed (e.g., a re-rating or design-only with no physical changes), the "R" Certificate Holder responsible for the design shall prepare the Form R-2, including the gathering and attaching of the supporting reports and other information pertaining to the work.	Adding design only merely represents consistency to the thought of limited scope throughout the section. The addition reflecting the reports and other information pertaining to the work. merely affirms instruction item-12 and instruction item-15 @ 5.13.4.1.

Accepted by MC by Letter Ballot, (NOT PUBLISHED) for '11-Edition- 2-Page, single side

Separated Form R-2- DESIGN REPORT- Sheet 1

FORM R-2 REPORT OF ALTERATION
in accordance with provisions of the *National Board Inspection Code*

DESIGN REPORT SHEET 1 OF 2

1. Design performed by _____ (name of "R" organization responsible for design) _____ (Form "R" Registration No.)
_____ (address) _____ (P.O. No., Job No., etc.)
2. Owner _____ (name)
_____ (address)
3. Location of installation _____ (name)
_____ (address)
4. Item identification _____ (boiler, pressure vessel, or piping) Name of original manufacturer _____
5. Identifying nos.: _____ (mfg. serial no.) _____ (National Board No.) _____ (jurisdiction no.) _____ (other) _____ (year built)
6. NBIC Edition / Addenda: _____ (edition) _____ (addenda)
Original Code of Construction for Item: _____ (name / section / division) _____ (edition / addenda)
Construction Code Used for Alteration Performed: _____ (name / section / division) _____ (edition / addenda)
7. Description of Design Scope: _____
(use supplemental sheet, Form R-4, if necessary) ☐ FORM R-4, REPORT SUPPLEMENTARY SHEET IS ATTACHED
_____
_____
_____
Pressure Test, if applied _____ psi MAWP _____ psi
8. Replacement Parts. Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report:
_____ (name of part, item number, data report type or Certificate of Compliance, mfg's. name and identifying stamp)
_____
_____
9. Remarks: _____
_____

DESIGN CERTIFICATION

I, _____ certify that to the best of my knowledge and belief the statements in this report are correct and that the Design Change described in this report conforms to the *National Board Inspection Code*.
National Board "R" Certificate of Authorization No. _____ expires on _____
Date _____ _____ (name of design organization) Signed _____ (authorized representative)

CERTIFICATE OF DESIGN CHANGE REVIEW

I, _____ holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the jurisdiction of _____ and employed by _____ of _____ have reviewed the design change as described in this report and state that to the best of my knowledge and belief such change complies with the applicable requirements of the *National Board Inspection Code*.
By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss of any kind arising from or connected with this inspection.
Date _____ Signed _____ (inspector) Commissions _____ (National Board and jurisdiction no.)

Separated form R-2- CONSTRUCTION REPORT- Sheet 2

FORM R-2 REPORT OF ALTERATION
in accordance with provisions of the *National Board Inspection Code*

CONSTRUCTION REPORT SHEET 2 OF 2

1. Construction performed by _____ (name of "R" organization responsible for construction) _____ (Form "R" Registration No.)
_____ (address) _____ (P.O. No., Job No., etc.)
2. Owner _____ (name)
_____ (address)
3. Location of installation _____ (name)
_____ (address)
4. Item identification _____ (boiler, pressure vessel, or piping) Name of original manufacturer _____
5. Identifying nos.: _____ (mfg. serial no.) _____ (National Board No.) _____ (jurisdiction no.) _____ (other) _____ (year built)

CERTIFICATE of DESIGN _____ (Identify the design organization's Form "R" Registration No.) **, ACKNOWLEDGED by CONSTRUCTION OGANIZATION** (or referencing P.O., job, or tracking number if the Form "R" Report is not registered)
I, _____ acknowledge the provisions and requirements of design described on the DESIGN REPORT, sheet 1, and the design was introduced into the construction scope as required by the *National Board Inspection Code*.
Date _____ _____ (name of construction organization) Signed _____ (authorized representative)

7. Description of Construction Scope: _____
(use supplemental sheet, Form R-4, if necessary) ☐ FORM R-4, REPORT SUPPLEMENTARY SHEET IS ATTACHED
_____
_____
_____
Pressure Test, if applied _____ psi MAWP _____ psi
8. Replacement Parts. Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report:
_____ (name of part, item number, data report type or Certificate of Compliance, mfg's. name and identifying stamp)
_____
_____
9. Remarks: _____
_____

CONSTRUCTION CERTIFICATION

I, _____ certify that to the best of my knowledge and belief the statements in this report are correct and that all material, construction, and workmanship on this Alteration conforms to the *National Board Inspection Code*.
National Board "R" Certificate of Authorization No. _____ expires on _____
Date _____ _____ (name of alteration organization) Signed _____ (authorized representative)

CERTIFICATE OF INSPECTION

I, _____ holding a valid Commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the jurisdiction of _____ and employed by _____ of _____ have inspected the work described in this report on _____ and state that to the best of my knowledge and belief this work complies with the applicable requirements of the *National Board Inspection Code*.
By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss of any kind arising from or connected with this inspection.
Date _____ Signed _____ (inspector) Commissions _____ (National Board and jurisdiction no.)

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229 NB-229 Rev. 5

PROPOSED Change #4- - RETURN TO 1-PAGE, 2-SIDED FORM (See objectives page 1)

PROPOSED- Front page

FORM R-2 REPORT OF ALTERATION
in accordance with provisions of the *National Board Inspection Code*

_____ (Form "R" Registration No.)

_____ (P.O. No., Job No., etc.)

1a. Design performed by: _____
(name of "R" organization responsible for design)

(address)

1b. Construction performed by _____
(name of "R" organization responsible for construction)

(address)

2. Owner of Pressure Retaining Item _____
(name)

(address)

3. Location of installation _____
(name)

(address)

4. Item identification _____ Name of original manufacturer _____
(boiler, pressure vessel , or piping)

5. Identifying nos.: _____ (mfg. serial no.) _____ (National Board No.) _____ (Jurisdiction No.) _____ (other) _____ (year built)

6. NBIC Edition / Addenda: _____ (edition) _____ (addenda)

Original Code of Construction for Item: _____ (name / section / division) _____ (edition / addenda)

Construction Code Used for Alteration Performed: _____ (name / section / division) _____ (edition / addenda)

7a Description of Design Scope: _____

☐ Form R-4, Report Supplementary Sheet is attached

7b Description of Construction Scope: _____

☐ Form R-4, Report Supplementary Sheet is attached

Pressure Test, if applied _____ psi MAWP _____ psi

8. Replacement Parts. Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report:

_____
(name of part, item number, data report type or Certificate of Compliance, mfg's. name and identifying stamp)

PROPOSED- Back page

Form R-2 (back)

_____ (Form "R" Registration No.)

_____ (P.O. No., Job No., etc.)

9. Remarks: _____

DESIGN CERTIFICATION

I, _____ certify that to the best of my knowledge and belief the statements in this report are correct and that the Design Change described in this report conforms to the *National Board Inspection Code*.
National Board "R" Certificate of Authorization No. _____ expires on _____
Date _____ _____ (name of design organization) Signed _____ (authorized representative)

CERTIFICATE OF DESIGN CHANGE REVIEW

I, _____ holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the jurisdiction of _____ and employed by _____ of _____ have reviewed the design change as described in this report and state that to the best of my knowledge and belief such change complies with the applicable requirements of the *National Board Inspection Code*.
By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss of any kind arising from or connected with this inspection.
Date _____ Signed _____ (inspector) Commissions _____ (National Board and jurisdiction no.)

CONSTRUCTION CERTIFICATION

I, _____ certify that to the best of my knowledge and belief the statements in this report are correct and that all material, construction, and workmanship on this Alteration conforms to the *National Board Inspection Code*.
National Board "R" Certificate of Authorization No. _____ expires on _____
Date _____ _____ (name of alteration organization) Signed _____ (authorized representative)

CERTIFICATE OF INSPECTION

I, _____ holding a valid Commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the jurisdiction of _____ and employed by _____ of _____ have inspected the work described in this report on _____ and state that to the best of my knowledge and belief this work complies with the applicable requirements of the *National Board Inspection Code*.
By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss of any kind arising from or connected with this inspection.
Date _____ Signed _____ (inspector) Commissions _____ (National Board and jurisdiction no.)

Action Item

NB12-2001

8.3 CODE REVISIONS OR ADDITIONS

Request for Code revisions or additions shall provide the following:

a) Proposed Revisions or Additions

For revisions, identify the rules of the Code that require revision and submit a copy of the appropriate rules as they appear in the Code, marked up with the proposed revision. For additions, provide the recommended wording referenced to the existing Code rules.

Existing Text: NBIC Part 3, 5.13.4.1

12. Provide a summary describing the exact scope of work that was completed to a Pressure Retaining I (PRI). The information to be included when describing the scope of work shall consider items such a: the nature of the repair or alteration characterized by the listed examples, the specific location of the work performed to the PRI, the method of repair used to include as applicable, the steps taken to ren a defect or as allowed by 3.3.4.8 to remain in place, the welding process and procedure when used, special processes required such as PWHT; noting the soak time and temperatures recorded, and an acceptable in-process and final NDE-examinations or tests performed. When additional space is nee to fully describe the scope of work, a Form R-4 shall be used and attached.

b) Statement of Need

Provide a brief explanation of the need for the revision or addition.

Revise text in this section to address the inconsistent interpretations of item 12 of the R Form. This item will be handled by the same TG handling NB12-1101.

c) Background Information

Provide background information to support the revision or addition, including any data or changes in technology that form the basis for the request that will allow the Committee to adequately evaluate the proposed revision or addition. Sketches, tables, figures, and graphs should be submitted as appropriate.

When applicable, identify any pertinent paragraph in the Code that would be affected by the revision or addition and identify paragraphs in the Code that reference the paragraphs that are to be revised or added.

NB-12-2001 NBIC Part 3, 5.13.4.1

12. Provide a summary describing the scope of work that was completed to a Pressure-Retaining Item (PRI). The information to be considered when describing the scope of work should include such items as the nature of the repair or alteration (e.g. welding, bonding, plugging) , the specific location on the PRI of the work completed, the steps taken to remove a defect or as allowed by NBIC Part 3, 3.3.4.8 to remain in place, the method of repair or alterations described as listed in the examples of Part 3, Section 3, and the acceptance testing and/or examination method used in accordance with the NBIC. When additional space is needed to describe the scope of work, a Form R-4 shall be used and attached. Information determined to be of a proprietary nature need not be included, but shall be stated on Form.

NB 12-2101

Toledo Refining Company

May 30, 2012

Shawn Tiedeken
Inspection Superintendent
Toledo Refining Company, LLC
1819 Woodville Road
Oregon, OH 43616

Secretary, NBIC Committee
The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229
NBICinquiry@nationalboard.org

Re: Revision inquiry to 2011 National Board Inspection Code (NBIC), Part 3, Section 4, Subsection 4.2, Nondestructive Examination

Dear NBIC Committee Secretary,

National Board Inspection Code (NBIC), 2011 edition, Part 3, Section 4, Repairs and Alterations – Examination and Testing, Subsection 4.2 Nondestructive Examination, paragraph (b) states, " NDE personnel shall be qualified and certified in accordance with the requirements of the original code of construction. When this is not possible or practicable, NDE personnel may be qualified and certified in accordance with their employer's written practice. ASNT SNT-TC-1A, Recommended Practice Non-destructive Testing Personnel Qualification and Certification (~~2001~~ 2006 edition), or ASNT CP-189, Standard for Qualification and Certification of Nondestructive Testing Personnel (~~2001~~ 2006 edition), shall be used as a guideline for employers to establish their written practice."

It is recommended to revise the "2001 edition" requirements to state "2006 edition" requirements. (See Attachment 1)

This revision is being requested such that there will be consistency between the NBIC required editions of ASNT SNT TC-1A and those specified in the latest versions of ASME Section VIII, ASME Section V, B31.1 codes of construction. The following provides background requirements from the applicable codes of construction. The numbering of each code reference is consistent the attached references.

1. Within the 2010 with 2011 Addenda, ASME Boiler and Pressure Vessel Code, Section VIII, Rules for the Construction of Pressure Vessels, Table U-3, the 2006 edition is specified for both ASNT CP-189 and SNT-TC-1A.
2. In 2010 ed., ASME B31.1, Power Piping, Chapter VI, Inspection, Examination, and Testing, paragraph 136.3.2, NDE personnel are qualified and certified per a developed program consisting of training, on the job training, oral or written examination, vision acuity examination, and documented certification. As an alternative, Section V, ASME Boiler and Pressure Vessel Code, Section V, Article 1 can be used for the qualification of NDE personnel.

Toledo
Refining Company

3. 2010 with 2011 addenda, ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination, Subsection A, Nondestructive Methods of Examination, Article 1, General Requirements, Paragraph T-120, General, sub paragraph (e) requires that NDE personnel are qualified and certified per their employer's written practice, which shall be in accordance with one of the following: (1), SNT-TC-1A (footnote 3) Personnel Qualification and Certification in Nondestructive Testing or (2) ANSI/ASNT CP-189 (footnote 3), ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel. Footnote 3 states that the 2006 edition is required for both SNT-TC-1A and ANSI/ASNT CP-189.
4. ASME B31.3, Process Piping Code, Section 342, Examination Personnel, Paragraph 342.1, it states that NDE personnel or "examiners" shall have training and experience commensurate with the needs of the examination type or method. The footnote reference specifies that SNT-TC-1A may be used as a guide to develop the training and respective experience requirements in performing the examination type or method. No year is specified.

In all the referenced code paragraphs, it is clear that the latest versions of the codes applicable to NBIC specify the 2006 edition of SNT-TC-1A and ANSI/ASNTCP-189.

Should there be any question, please do not hesitate to contact the undersigned at (419) 698-7445.

Sincerely,

Shawn J. Tiedeken
Inspection Superintendent
Toledo Refining Company, LLC

Attachment 1

PART 3, SECTION 4
REPAIRS AND ALTERATIONS — EXAMINATION AND TESTING

4.1 SCOPE

This section provides requirements and guidelines for performing examinations and tests for repairs and alterations to pressure-retaining items.

4.2 NONDESTRUCTIVE EXAMINATION

a) The nondestructive examination (NDE) requirements, including technique, extent of coverage, procedures, personnel qualification, and acceptance criteria, shall be in accordance with the original code of construction for the pressure-retaining item. Weld repairs and alterations shall be subjected to the same nondestructive examination requirements as the original welds. Where this is not possible or practicable, alternative NDE methods acceptable to the Inspector and the Jurisdiction where the pressure-retaining item is installed, where required, may be used.

b) NDE personnel shall be qualified and certified in accordance with the requirements of the original code of construction. When this is not possible or practicable, NDE personnel may be qualified and certified in accordance with their employer's written practice. ASNT SNT-TC-1A, *Recommended Practice Nondestructive Testing Personnel Qualification and Certification* (2001 edition), or ASNT CP-189, *Standard for Qualification and Certification of Nondestructive Testing Personnel* (2001 edition), shall be used as a guideline for employers to establish their written practice. The ASNT Central Certification Program (ACCP, Rev. 3, Nov. 1997) may be used to fulfill the examination and demonstration requirements of the employer's written practice. Provisions for training, experience, qualification, and certification of NDE personnel shall be described in the "R" Certificate Holder's written quality system.

4.3 PRESSURE GAGES, MEASUREMENT, EXAMINATION, AND TEST EQUIPMENT

The calibration of pressure gages, measurement, examination, and test equipment, and documentation of calibration shall be performed, as required, by the applicable standard used for construction.

4.4 EXAMINATION AND TEST FOR REPAIRS AND ALTERATIONS

The following requirements shall apply to all repairs and alterations to pressure-retaining items:

a) The integrity of repairs, alterations, and replacement parts used in repairs and alterations shall be verified by examination or test;

b) Testing methods used shall be suitable for providing meaningful results to verify the integrity of the repair or alteration. Any insulation, coatings, or coverings that may inhibit or compromise a meaningful test method shall be removed, to the extent identified by the Inspector;

c) The "R" Certificate Holder is responsible for all activities relating to examination and test of repairs and alterations;

d) Examinations and tests to be used shall be subject to acceptance of the Inspector and, where required, acceptance of the Jurisdiction.

Reference 1

(10)
(a)

TABLE U-3
YEAR OF ACCEPTABLE EDITION OF REFERENCED STANDARDS IN THIS DIVISION

Title	Number	Year
Seat Tightness of Pressure Relief Valves	API Std. 527	1991 (R2007)(1)
Unified Inch Screw Threads (UN and UNR Thread Form)	ASME B1.1	Latest edition
Pipe Threads, General Purpose (Inch)	ANSI/ASME B1.20.1	Latest edition
Cast Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, and 250	ASME B16.1	2005
Pipe Flanges and Flanged Fittings	ASME B16.5	2009(2)
Factory-Made Wrought Buttwelding Fittings	ASME B16.9	Latest edition
Forged Fittings, Socket-Welding and Threaded	ASME B16.11	Latest edition
Cast Bronze Threaded Fittings, Classes 125 and 250	ASME B16.15	Latest edition
Metallic Gaskets for Pipe Flanges — Ring-Joint, Spiral-Wound, and Jacketed	ASME B16.20	Latest edition
Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500, and 2500	ASME B16.24	2006
Ductile Iron Pipe Flanges and Flanged Fittings, Class 150 and 300	ASME B16.42	1998 (R2006)
Large Diameter Steel Flanges, NPS 26 Through NPS 60	ASME B16.47	2006
Square and Hex Nuts (Inch Series)	ASME B18.2.2	Latest edition
Welded and Seamless Wrought Steel Pipe	ASME B36.10M	Latest edition
Guidelines for Pressure Boundary Bolted Flange Joint Assembly	ASME PCC-1	2010
Repair of Pressure Equipment and Piping	ASME PCC-2	2008
Pressure Relief Devices	ASME PTC 25	2008
Qualifications for Authorized Inspection	ASME QAI-1	Latest edition (3)
ASNT Central Certification Program	ACCP	Rev 7
ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel	ANSI/ASNT CP-189	2006
Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing	SNT TC 1A	2006
Standard Test Methods for Flash Point by Tag Closed Tester	ASTM D 56	Latest edition
Standard Test Methods for Flash Point by Pensky-Martens Closed Tester	ASTM D 93	Latest edition
Standard Guide for Preparation of Metallographic Specimens	ASTM E 3	2001 (R2007)
Pressure Relieving and Depressuring Systems	ANSI/API Std. 521	5th Ed., January 2007
Reference Photographs for Magnetic Particle Indications on Ferrous Castings	ASTM E 125	1963 (R2008)(1)
Hardness Conversion Tables for Metals	ASTM E 140	Latest edition
Standard Reference Radiographs for Heavy-Walled [2 to 4½-in. (51 to 114-mm)] Steel Castings	ASTM E 186	1998 (R2004)
Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels	ASTM E 208	2006
Standard Reference Radiographs for Heavy-Walled (4½ to 12-in. (114 to 305-mm)) Steel Castings	ASTM E 280	2010
Standard Reference Radiographs for Steel Castings up to 2 in. (51 mm) in Thickness	ASTM E 446	2010
Marking and Labeling Systems	ANSI/UL-969	1995

Repair & Alteration

4/8

Reference 2

Chapter VI
Inspection, Examination, and Testing

136 INSPECTION AND EXAMINATION

136.1 Inspection

136.1.1 General. This Code distinguishes between "examination" and "inspection." Inspection is the responsibility of the Owner and may be performed by employees of the Owner or a party authorized by the Owner, except for the inspections required by para. 136.2. Prior to initial operation, a piping installation shall be inspected to ensure compliance with the engineering design and with the material, fabrication, assembly, examination, and test requirements of this Code.

136.1.2 Verification of Compliance. Compliance with the requirements of this Code shall be verified by an Authorized Inspector when a Code stamp is required by Section I of the ASME Boiler and Pressure Vessel Code. The rules of this Code and the quality control system requirements of Appendix A-300 of Section I of the ASME Boiler and Pressure Vessel Code shall apply. The quality control system requirements are shown in Appendix J of this Code. The duty of the Inspector shall be as defined in PG-90, Section I, of the ASME Boiler and Pressure Vessel Code. Data Report Forms are included in the Appendix of ASME Section I for use in developing the necessary inspection records. The Inspector shall assure himself/herself that the piping has been constructed in accordance with the applicable requirements of this Code.

136.1.3 Rights of Inspectors. Inspectors shall have access to any place where work concerned with the piping is being performed. This includes manufacture, fabrication, heat treatment, assembly, erection, examination, and testing of the piping. They shall have the right to audit any examination, to inspect the piping using any appropriate examination method required by the engineering design or this Code, and to review all certifications and records necessary to satisfy the Owner's responsibility as stated in para. 136.1.1.

136.1.4 Qualifications of the Owner's Inspector

(A) The Owner's Inspector shall be designated by the Owner and shall be an employee of the Owner, an employee of an engineering or scientific organization, or of a recognized insurance or inspection company acting as the Owner's agent. The Owner's Inspector shall not represent nor be an employee of the piping manufacturer, fabricator, or erector unless the Owner is also the manufacturer, fabricator, or erector.

(B) The Owner's Inspector shall have not less than 10 years of experience in the design, manufacture, erection, fabrication, or inspection of power piping. Each year of satisfactorily completed work toward an engineering degree recognized by the Accreditation Board for Engineering and Technology shall be considered equivalent to 1 year of experience, up to 5 years total.

(C) In delegating the performance of inspections, the Owner is responsible for determining that a person to whom an inspection function is delegated is qualified to perform that function.

136.2 Inspection and Qualification of Authorized Inspector for Boiler External Piping

136.2.1 Piping for which inspection and stamping is required as determined in accordance with para. 100.1.2(A) shall be inspected during construction and after completion and at the option of the Authorized Inspector at such stages of the work as he/she may designate. For specific requirements see the applicable parts of Section I of the ASME Boiler and Pressure Vessel Code, PG-104 through PG-113. Each manufacturer, fabricator, or assembler is required to arrange for the services of Authorized Inspectors.

136.2.1.1 The inspections required by this Section shall be performed by an Inspector employed by an ASME accredited Authorized Inspection Agency.

136.2.2 Certification by stamping and Data Reports, where required, shall be as per PG-104, PG-105, PG-109, PG-110, PG-111, and PG-112 of Section I of the ASME Boiler and Pressure Vessel Code.

136.3 Examination

136.3.1 General. Examination denotes the functions performed by the manufacturer, fabricator, erector, or a party authorized by the Owner that include nondestructive examinations (NDE), such as visual, radiography, ultrasonic, eddy current, liquid penetrant, and magnetic particle methods. The degree of examination and the acceptance standards beyond the requirements of this Code shall be a matter of prior agreement between the manufacturer, fabricator, or erector and the Owner.

136.3.2 Qualification of NDE Personnel. Personnel who perform nondestructive examination of welds shall be qualified and certified for each examination method in accordance with a program established by the

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Reference 2

employer of the personnel being certified, which shall be based on the following minimum requirements:

(A) instruction in the fundamentals of the nondestructive examination method.

(B) on-the-job training to familiarize the NDE personnel with the appearance and interpretation of indications of weld defects. The length of time for such training shall be sufficient to ensure adequate assimilation of the knowledge required.

(C) an eye examination performed at least once each year to determine optical capability of NDE personnel to perform the required examinations.

(D) upon completion of (A) and (B) above, the NDE personnel shall be given an oral or written examination and performance examination by the employer to determine if the NDE personnel are qualified to perform the required examinations and interpretation of results.

(E) certified NDE personnel whose work has not included performance of a specific examination method for a period of 1 yr or more shall be recertified by successfully completing the examination of (D) above and also passing the visual examination of (C) above. Substantial changes in procedures or equipment shall require recertification of the NDE personnel.

As an alternative to the preceding program, the requirements of the ASME Boiler and Pressure Vessel Code, Section V, Article 1 may be used for the qualification of NDE personnel. Personnel qualified to AWS QC1 may be used for the visual examination of welds.

136.4 Examination Methods of Welds

136.4.1 Nondestructive Examination. Nondestructive examinations shall be performed in accordance with the requirements of this Chapter. The types and extent of mandatory examinations for pressure welds and welds to pressure retaining components are specified in Table 136.4. For welds other than those covered by Table 136.4, only visual examination is required. Welds requiring nondestructive examination shall comply with the applicable acceptance standards for indications as specified in paras. 136.4.2 through 136.4.6. As a guide, the detection capabilities for the examination method are shown in Table 136.4.1. Welds not requiring examination (i.e., RT, UT, MT, or PT) by this Code or the engineering design shall be judged acceptable if they meet the examination requirements of para. 136.4.2 and the pressure test requirements specified in para. 137. NDE for P-Nos. 3, 4, 5A, 5B, and 15E material welds shall be performed after postweld heat treatment unless directed otherwise by engineering design. Required NDE for welds in all other materials may be performed before or after postweld heat treatment.

136.4.2 Visual Examination. Visual examination as defined in para. 100.2 shall be performed in accordance with the methods described in Section V, Article 9, of the ASME Boiler and Pressure Vessel Code. Visual examinations may be conducted, as necessary, during the fabrication and erection of piping components to provide verification that the design and WPS requirements are being met. In addition, visual examination shall be performed to verify that all completed welds in pipe and piping components comply with the acceptance standards specified in (A) below or with the limitations on imperfections specified in the material specification under which the pipe or component was furnished.

(A) Acceptance Standards. The following indications are unacceptable:

(A.1) cracks — external surface.

(A.2) undercut on surface that is greater than $\frac{1}{32}$ in. (1.0 mm) deep.

(A.3) weld reinforcement greater than specified in Table 127.4.2.

(A.4) lack of fusion on surface.

(A.5) incomplete penetration (applies only when inside surface is readily accessible).

(A.6) any other linear indications greater than $\frac{3}{16}$ in. (5.0 mm) long.

(A.7) surface porosity with rounded indications having dimensions greater than $\frac{3}{16}$ in. (5.0 mm) or four or more rounded indications separated by $\frac{1}{16}$ in. (2.0 mm) or less edge to edge in any direction. Rounded indications are indications that are circular or elliptical with their length less than three times their width.

136.4.3 Magnetic Particle Examination. Whenever required by this Chapter (see Table 136.4), magnetic particle examination shall be performed in accordance with the methods of Article 7, Section V, of the ASME Boiler and Pressure Vessel Code.

(A) Evaluation of Indications

(A.1) Mechanical discontinuities at the surface will be indicated by the retention of the examination medium. All indications are not necessarily defects; however, certain metallurgical discontinuities and magnetic permeability variations may produce similar indications that are not relevant to the detection of unacceptable discontinuities.

(A.2) Any indication that is believed to be nonrelevant shall be reexamined to verify whether or not actual defects are present. Surface conditioning may precede the reexamination. Nonrelevant indications that would mask indications of defects are unacceptable.

(A.3) Relevant indications are those that result from unacceptable mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications that are circular or elliptical with the length less than three times the width.

(A.4) An indication of a discontinuity may be larger than the discontinuity that causes it; however, the size of the indication and not the size of the discontinuity is the basis of acceptance or rejection.

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NBIC Subcommittee R&A Action Block

Subject Alternative Repair Option for CSEF Steel, Grade 91

File Number NB12-0403 **Prop. on Pg.**

Proposal Develop code text to address use of temper bead weld repair for Grade 91 tube material

Explanation

EPRI has been working on temper bead weld repair initiatives for Grade 91 tubing since development of a new Ni-base filler metal. This project will provide test results on weld procedure qualification and elevated temperature testing of weld coupons.

Project Manager Galanes/EPRI

Task Group **TG Meeting Date**

Negatives

Temper Bead Repair of T91 Using EPRI P87 Filler Metal

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Abstract

Tube failures in grade 91 (9Cr-1Mo-V steel) occur in fossil-fired power plants and heat recovery steam generators. Due to the hardenability of grade 91, post-weld heat-treatment (PWHT) after welding is required. In this work, thin section Grade 91 was welded utilizing a nickel-based filler metal, EPRI P87, the gas tungsten arc welding (GTAW) process, and various temper bead techniques. The goal of this study was to establish whether it may be possible to forgo PWHT after welding of grade 91 and still provide satisfactory material performance in cases where shortening the repair duration is advantageous. For example if a sudden outage occurs and it is critical for a plant to get back online as quickly as possible, it may be difficult to organize all of the necessary requirements of the material (such as PWHT). Limited studies and industry experience have suggested that a temper bead repair may be possible. For this research, weldments were analyzed using hardness and metallography to screen the two different approaches to the temper bead technique, and to ultimately determine if there is promise in continuing to pursue such a radical repair technique for Grade 91.

Introduction

Temper bead procedures have been utilized since the 1960s. The advantages of these methods lies in the avoidance of a potentially complicated and costly post weld heat treatment (PWHT) and the potential increase in life over a comparable PWHT condition. Success of a temper bead technique lies in the application of a carefully controlled procedure with a compatible material. Through the 1980s and 1990s, EPRI and others demonstrated a wide range of temper bead techniques across a wide range of materials, including nuclear pressure vessel steels and low alloy power generations steels [1,2].

The use of newly developed creep strength enhanced ferritic (CSEF) steels has increased greatly over the last two decades. Such increase has displaced some of the use of low alloy Chromium-Molybdenum (CrMo) steels like Grades 11, 12 and 22. Because temper bead procedures have been successfully applied to these low alloy steels, inquiries have arisen regarding the applicability of a temper bead procedure to the more complicated CSEF family of materials - especially Grade 91. Because Grade 91 components have been employed since the early 1990s, there is sufficient interest in rapid nonconventional (radical) welding procedures for replacement and repair, even if such welding procedures were only regarded as temporary. Additionally, because Grade 91 requires PWHT regardless of thickness, it is often difficult to coordinate both the welding and the PWHT procedure in situations where access is difficult and/or in situations where an unplanned outage was the result of a Grade 91 material failure.

The set of experiments detailed in this paper focus on the development of two different welding techniques for tubing applications. The majority of unplanned outages can be attributed to tube failures. Furthermore, access to a failed tube can be extremely limited, preventing the use of a half-bead technique or buttering the ends of the tubing prior to welding the fill passes. Because of this, two temper bead procedures were selected that would ideally temper the HAZ through the thickness of the weldment. The automated gas tungsten arc welding (GTAW) process was selected for use; if successful, the documented techniques and parameters may be extrapolated to manual processes like GTAW or SMAW. The two temper bead approaches are described below [3,4]:

1. **Consistent Layer.** The consistent layer technique requires that each subsequent weld layer penetrate the underlying layer to develop overlapping temperature profiles while preventing additional transformation of the underlying HAZ. This procedure utilizes controlled heat energy dissipation to develop a tempered martensitic microstructure in the first few millimeters of the HAZ [3]. It can be applied with the SMAW or GTAW process and uses identical heat inputs and/or electrode diameters for each layer.
2. **Controlled Deposition.** In this temper bead process, the heat input is increased in each layer by 30-80%. Because this temper bead technique is normally implemented with the SMAW process, the increase in heat input is typically achieved by increased the electrode diameter one sequential size (i.e. 3/32” to 1/8” to 5/32”, 2.5mm to 3.2mm to 4.0mm). In each layer, the adjacent weld pass overlaps the previously deposited bead by 50%.

The filler metal selected for this demonstration was the nickel-base filler material EPRI P87; its development is detailed elsewhere [6]. Because this filler metal matches Grade 91 in Cr, C and carbide formers, the development of detrimental Type I carbides in service is severely retarded. Additionally, nickel-base filler metals have the added advantage of good toughness and low susceptibility to hydrogen-induced cracking during welding. EPRI P87 has several unique

attributes over conventional nickel-base (i.e. ERNiFe-2 or ERNiCr-3) and ferritic filler materials (i.e. –B91 or –B23) that may increase the success of a temper bead procedure in repair and replacement scenarios for Grade 91:

1. Excellent thermal stability with respect to carbide formation, Figure 1;
2. Excellent stability with respect to hardness, Figure 2;
3. Excellent creep ductility, Figure 3;
4. Thermal expansion comparable to Grade 91, Figure 4.

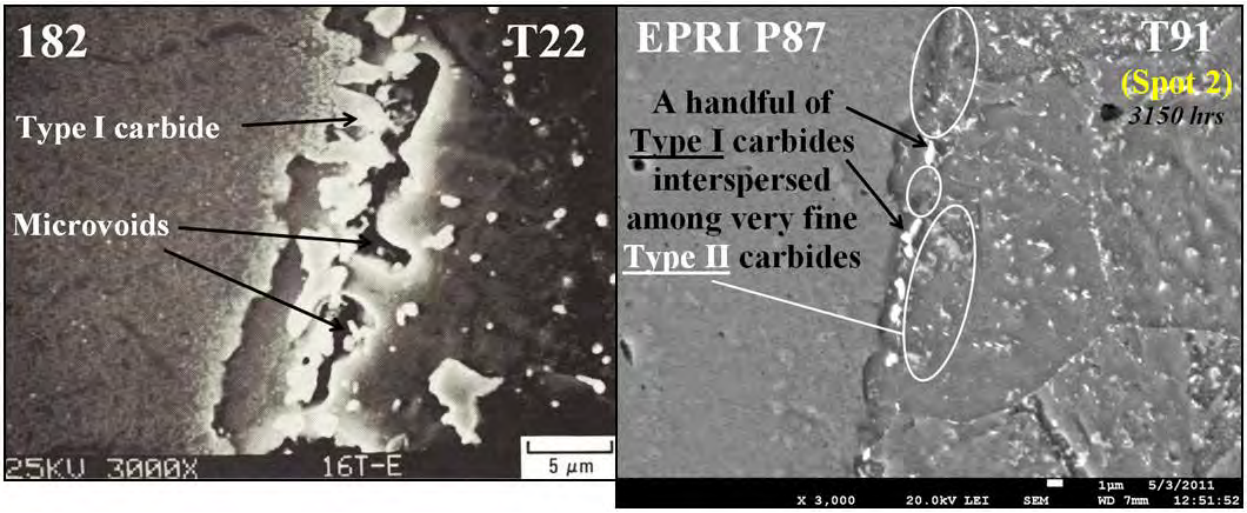

Figure 1
IN182 and EPRI P87 Thermal Stability Comparison
IN182 was exposed for 77,000hrs between 1100-1155F, LMP = 21560-22320 (as determined by oxide scale measurements) [5]. EPRI P87 was exposed for 3,150hrs at 1200F, LMP = 21665 [6].
Note: Figures were sized to match the micron bars for comparison.

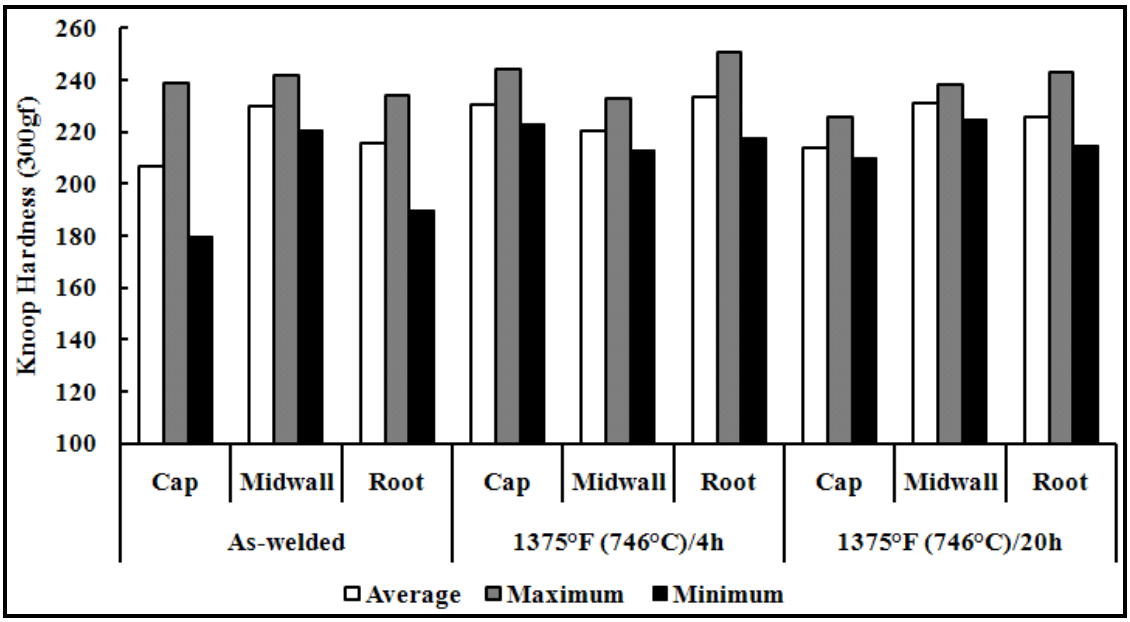

Figure 2
EPRI P87 Weld Metal Hardness Comparison [6]

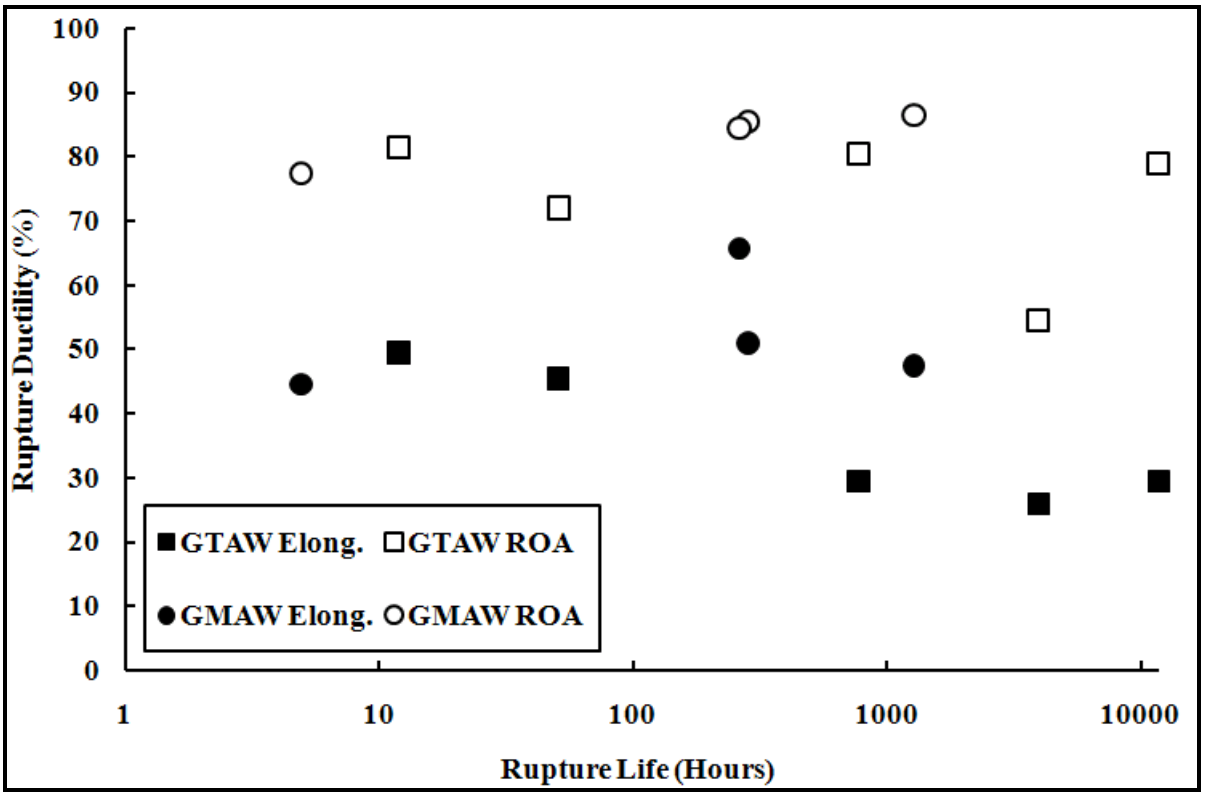

Figure 3
Creep Ductility, GTAW and GMAW All Weld Metal Creep Tests [6]

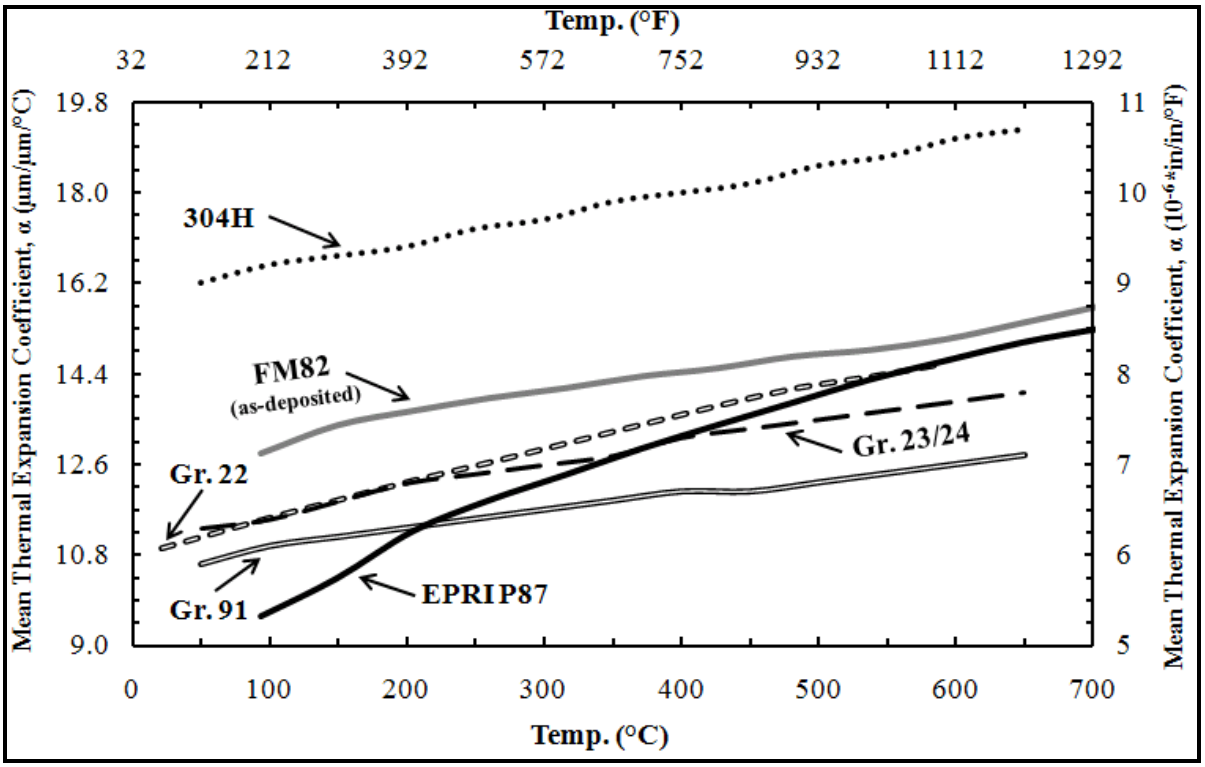

Figure 4
Mean Thermal Expansion Coefficient Comparison [6]

A low preheat (200°F, 93°C) and interpass (250°F, 121°C) was utilized to ensure complete transformation of the deposited weld metal prior to performing the next fill pass. If too high a preheat and interpass were utilized in welding Grade 91, incomplete transformation to martensite on cooling would ensure that fresh martensite would be present in the as-welded microstructure following the completion of the weld. The fresh martensite would not only increase hardness, but reduce toughness and potentially increase susceptibility to cracking phenomena like stress corrosion cracking. M_F temperatures for Grade 91 are given in Figure 5. The $M_{F,OSU}$ band represents a compilation of Grade 91 base material data at a range of cooling rates [7].

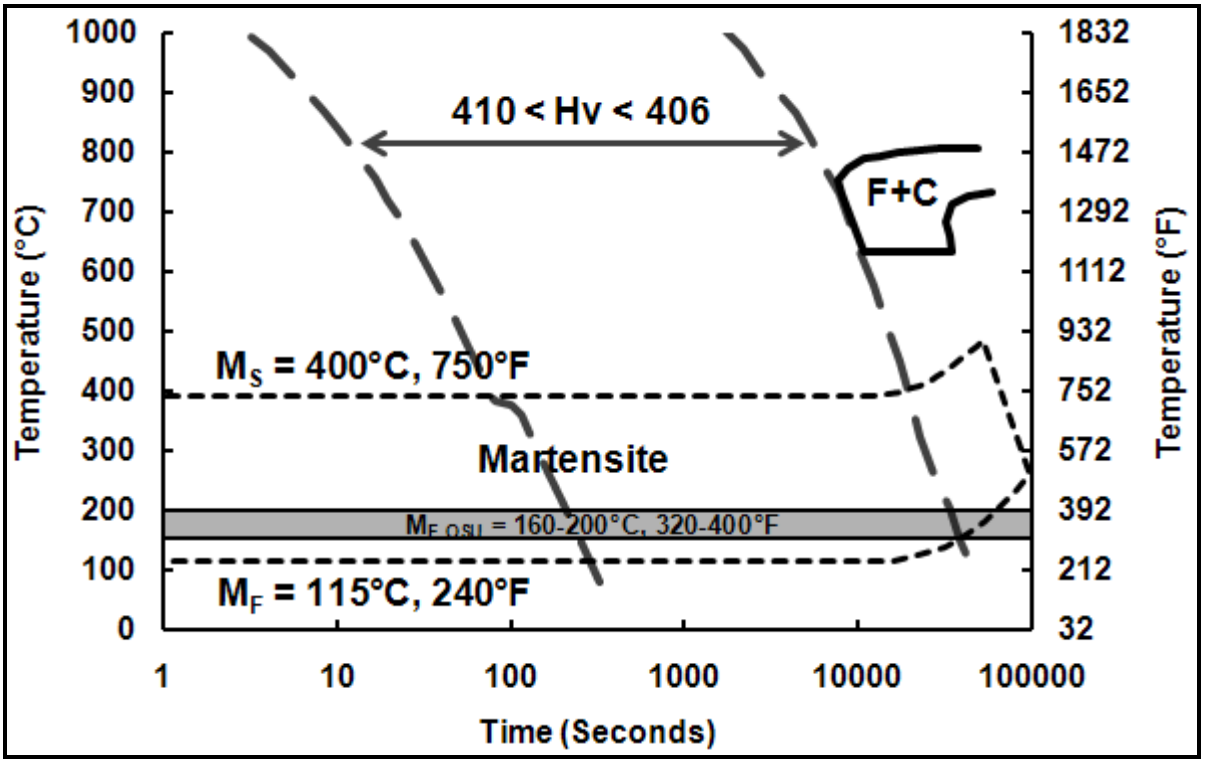

Figure 5
CCT Curve for Grade 91 Adapted from [7,8]

Because the two previously mentioned temper bead techniques were applied in this paper to *T91* material, it was critical to ensure as few weld passes and as simple a welding procedure as possible. Additionally, the development of a temper bead technique for tube to tube butt welds necessitates the consideration of the application. Tube to tube butt welds can be oriented in virtually any position and difficult to access; these two facts complicate the success of *any* welding procedure, let alone a temper bead technique. Because of this, it was decided that grinding (as in half-bead) and buttering of either side of the tube to tube butt weld (as typically done in thick-section temper bead procedures) prior to performing fill passes would be avoided. This paper details the welding development of the consistent layer and controlled deposition temper bead techniques on thin plate material representative of T91 material. Analysis was completed utilizing light microscopy and extensive hardness mapping for screening the success of the two procedures.

Experimental Procedure

Two weldments were made in Grade 91 plate using 0.035" diameter EPRI P87 filler metal. The chemical composition for the base material and filler metal are given in Table 1; these compositions are as reported from the material certifications. The semi-automated gas tungsten arc welding (GTAW) process was used to complete two weldments; one labeled "consistent layer" and the other "controlled deposition." The shielding gas was 100% Argon. Each weldment was machined to identical dimensions, Figure 6. The mismatch in the groove geometry in Figure 6 was intentional for two purposes:

1. To determine the importance of the bevel on the through-thickness tempering behavior of the HAZ;
2. To determine more accurate impact results in future mechanical testing. The 0° bevel should, theoretically, force crack propagation through the HAZ and not into the weld metal or base material.

Table 1
Chemical Composition of Grade 91 Base Material and EPRI P87 Filler Metal

Element	Grade 91		EPRI P87	
	EPRI Spec. [9]	***Plate R1976***	***Spec. [6]***	***WO35419***
C	0.08-0.12	0.080	0.09-0.14	0.11
Mn	0.30-0.60	0.46	1.2-1.8	1.55
P	0.020 max	0.009	0.01	0.008
S	0.010 max	0.004	0.01	0.003
Cu	0.25 max	0.06		
Si	0.20-0.50	0.35	0.05-0.25	0.16
Ni	0.20 max	0.09	54 max	Bal.
Cr	8.00-9.50	8.59	8.5-9.5	8.52
Mo	0.85-1.05	0.89	1.8-2.2	2.02
V	0.18-0.25	0.207		
Ti	0.010 max	0.002		
Al	0.020 max	0.009		
Zr	0.010 max	0.001		
Cb	0.06-0.10	0.078	0.90-1.40	1.09
N	0.035-0.070	0.0476		
Others	As: 0.012 max Sn: 0.010 max Sb: 0.003 max	NS	Fe: 38-42	Fe: 38.8
N/Al Ratio	4.0 min.	5.3		
C+N	>0.12	0.1276		

The welding parameters for each weldment are given in Tables 2 and 3. A 200°F (93°C) preheat and 250°F (121°C) maximum interpass was instituted; actual starting temperature of the weldment prior to each subsequent pass is shown in Tables 2 and 3. The fundamental layout of each weldment is shown in Figures 8 and 10. During welding, the fill layers were staggered along the length of the weld by ~1" (25.4mm) to allow for individual characterization of each

layer, Figure 7. A completed weldment is shown in Figure 7, detailing the sections of the weldment utilized for destructive testing and metallographic analysis.

Metallographic samples were taken from each fill pass as shown in Figures 9 and 11. Analysis included detailed light microscopy and hardness mapping. An automated hardness mapping system, utilizing a Vickers hardness indenter, 200g load with a spatial distance of 0.15mm was utilized in the creation of the hardness maps. Mapping was done on as-polished samples and every indent was visually verified for accuracy.

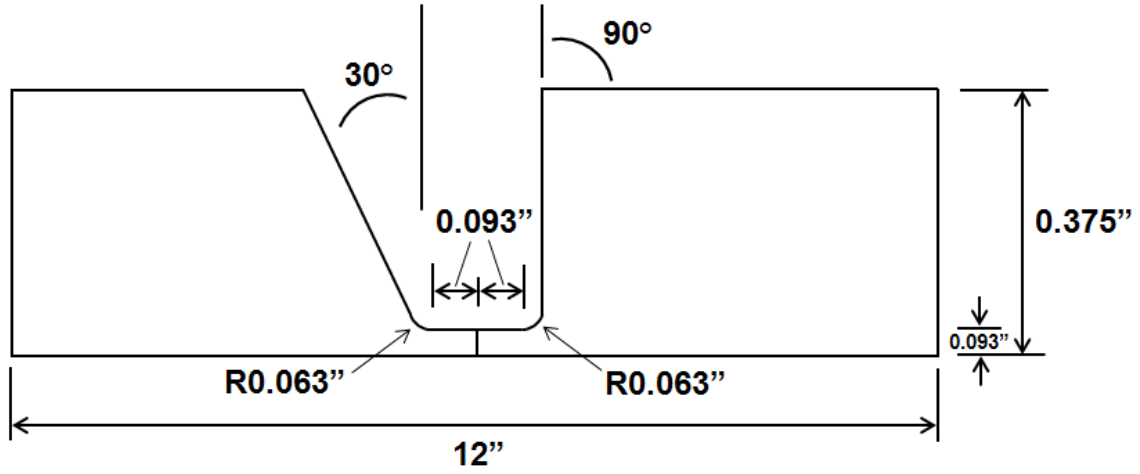

Figure 6
Weldment Dimensions

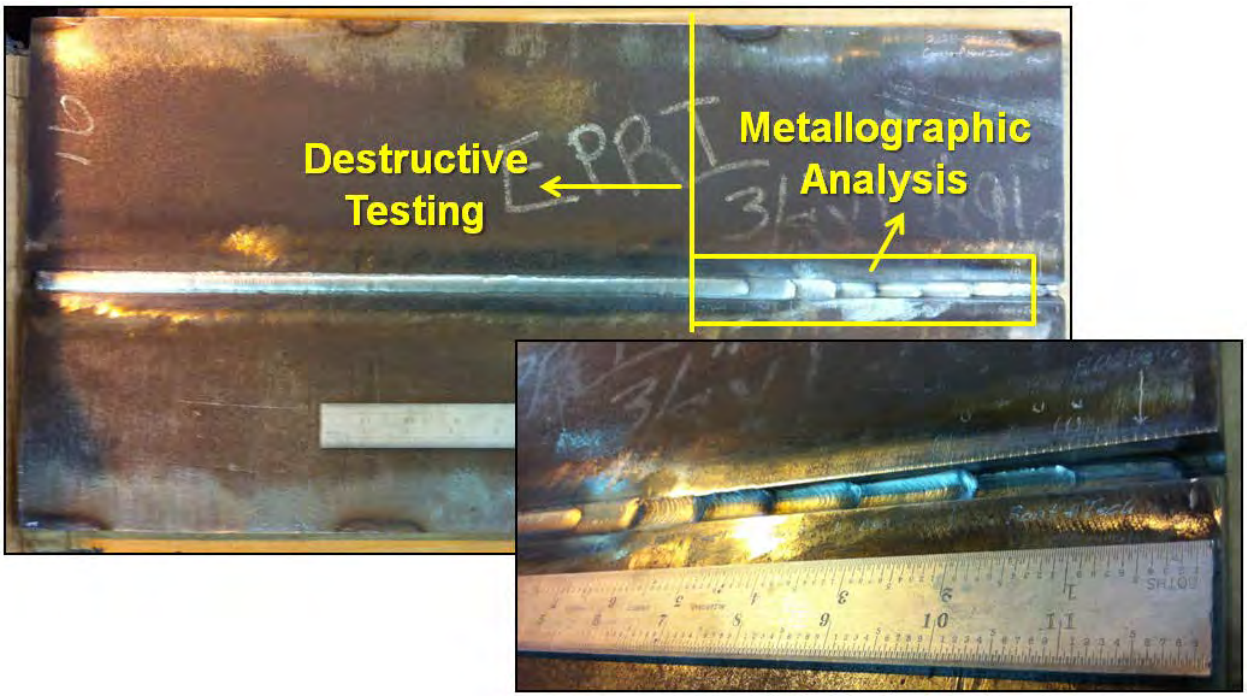

Figure 7
Example of Welded Plate and Sectioning

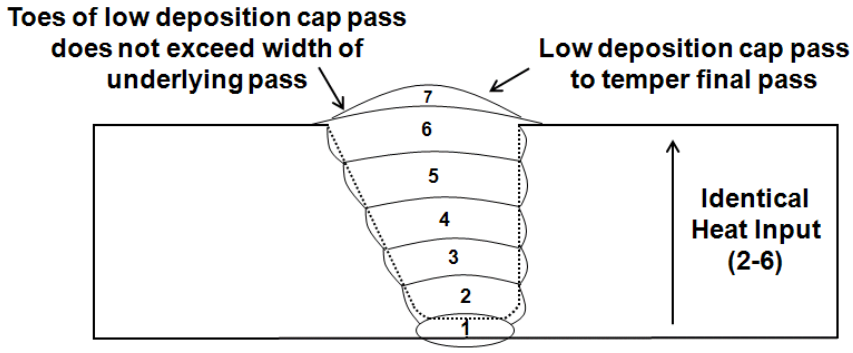

Figure 8
Consistent Layer Weldment Fill Layout

Table 2
Consistent Layer Weldment Parameters

	Current (A)	Voltage (V)	TS[1] (ipm, mm/s)	HI[2] (kJ/in, % inc.)	Start Temp.[4] (°F, °C)
Root	175			28.5, +0%	216, 102
Fill 1					220, 202
Fill 2					216, 198
Fill 3	190	9.5	3.5, 88.9	30.9, +8.4%	218, 200
Fill 4					207, 189
Fill 5					202, 184
Low Dep. Wash Pass	140			22.8, -26.2%	232, 214

[1]TS = Travel Speed

[2]HI = Heat Input; HI (kJ/in) = Voltage*Amperage*60/TS

[3]% inc. = Percentage increase in heat input over previous weld pass

[4]Start Temp. = Starting temperature of weldment prior to deposition of indicated weld pass

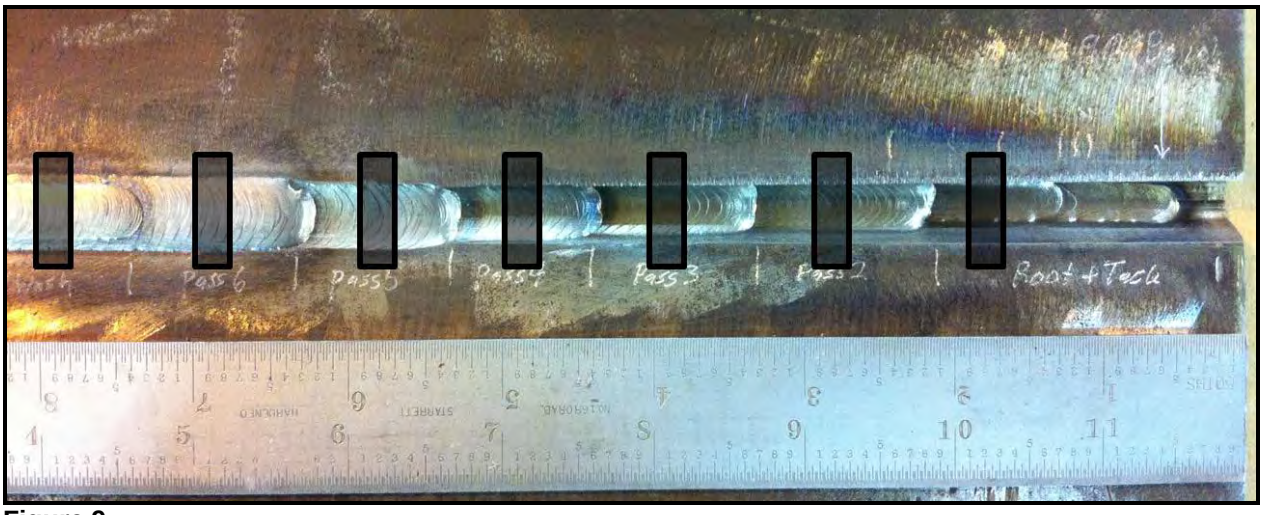

Figure 9
Consistent Layer Metallographic Sample Locations

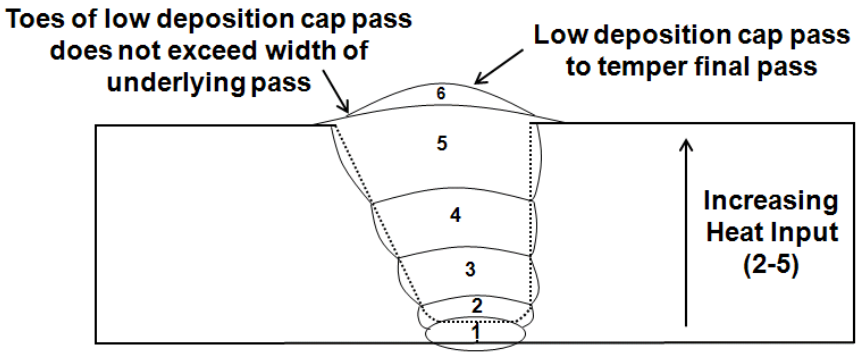

Figure 10
Controlled Deposition Weldment Fill Layout

Table 3
Controlled Deposition Weldment Parameters

Weld Pass	Current (A)	Voltage (V)	TS[1] (ipm, mm/s)	HI[2] (kJ/in, % inc.[3])	Start Temp.[4] (°F, °C)
Root	170	9.5	3.5, 88.9	27.7, +0%	220, 104
Fill 1	190			30.9, +11.5%	213, 195
Fill 2	200			32.6, +5.5%	214, 196
Fill 3	210			34.2, +4.9%	206, 188
Fill 4	220			35.8, +4.7%	219, 201
Low Dep. Wash Pass	140			22.8, -36.3%	229, 211

[1]TS = Travel Speed

[2]HI = Heat Input; HI = V*I*60/TS

[3]% inc. = Percentage increase in heat input over previous weld pass

[4]Start Temp. = Starting temperature of weldment prior to deposition of indicated weld pass

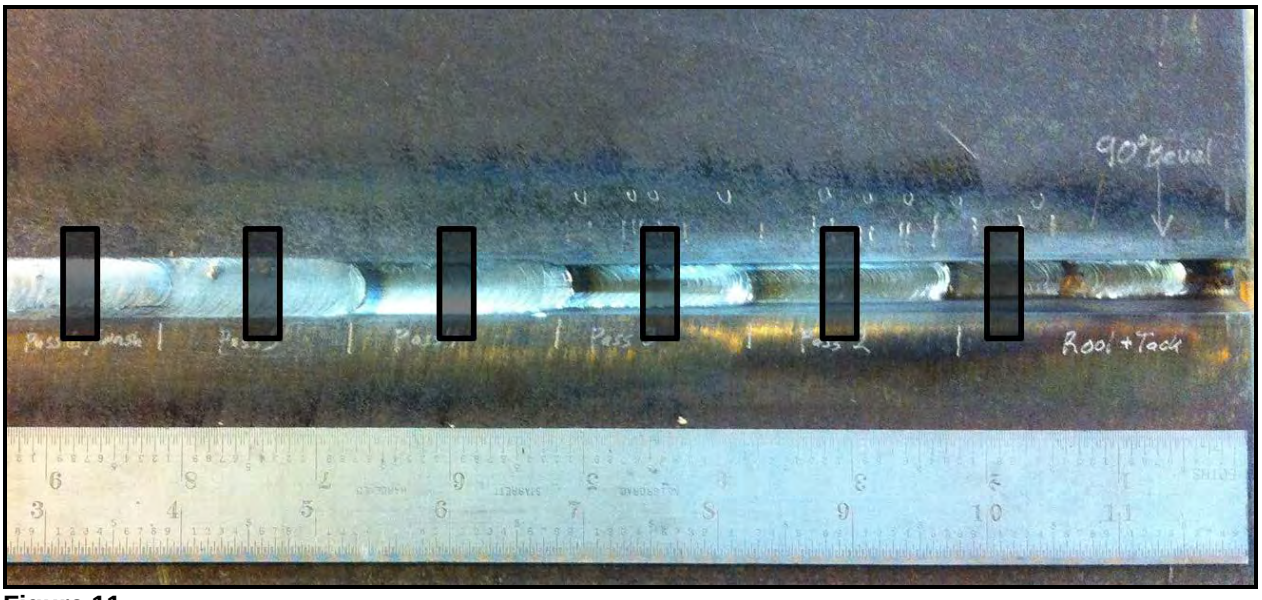

Figure 11
Controlled Deposition Metallographic Sample Locations

Results

Macro images for each weld pass in the consistent layer and controlled deposition weldments are shown in Figures 12 and 13, respectively. For each weldment, the width of the HAZ is similar with no major improvement in size or width in the 0° bevel side of the weldment. For the controlled layer technique, the wash pass provided necessary reinforcement to complete the weldment. In the case of the consistent layer technique, the wash pass was not needed to provide sufficient reinforcement. In either case, the wash pass could be ground away in the field should it be deemed excessive.

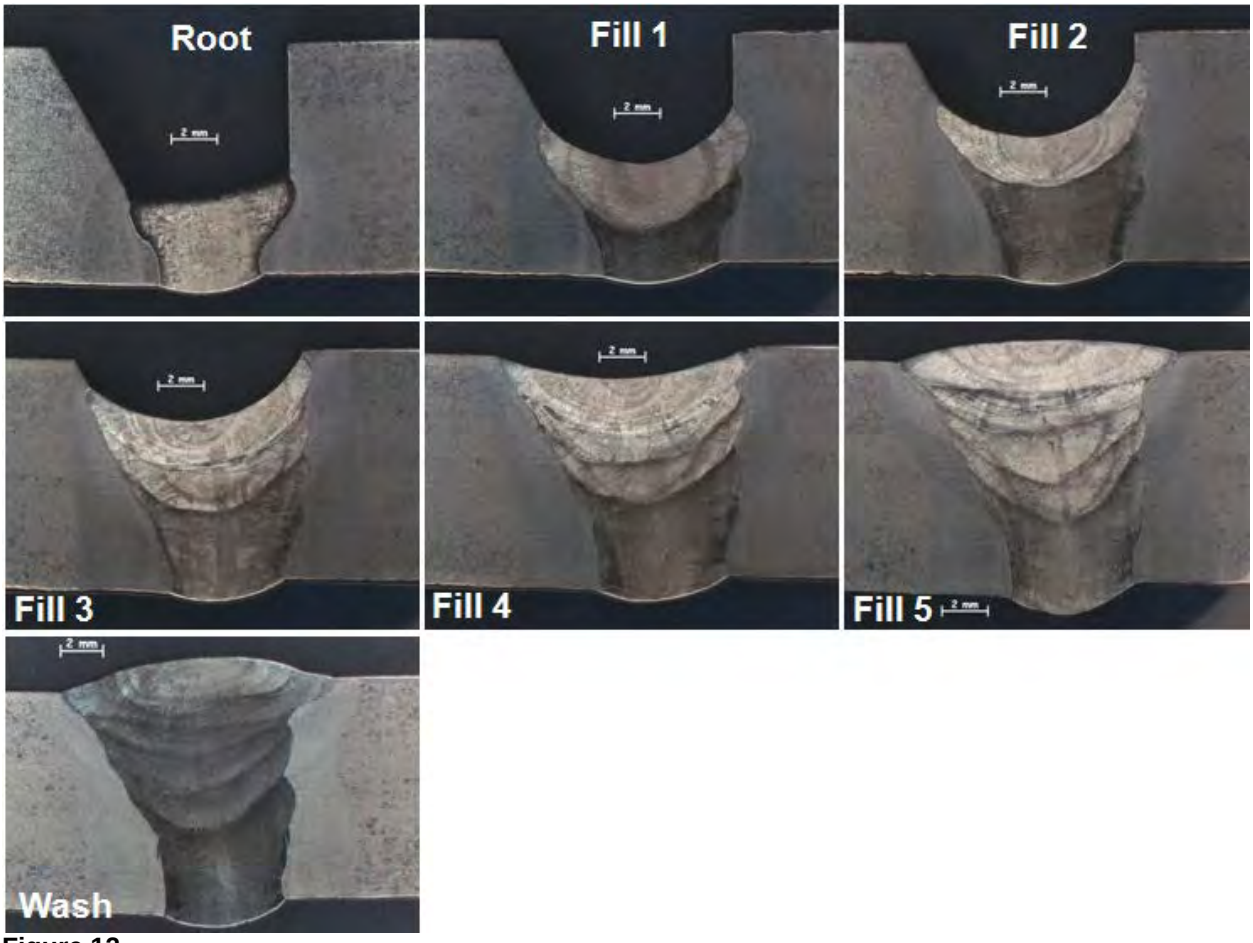

Figure 12
Consistent Layer Weld Passes

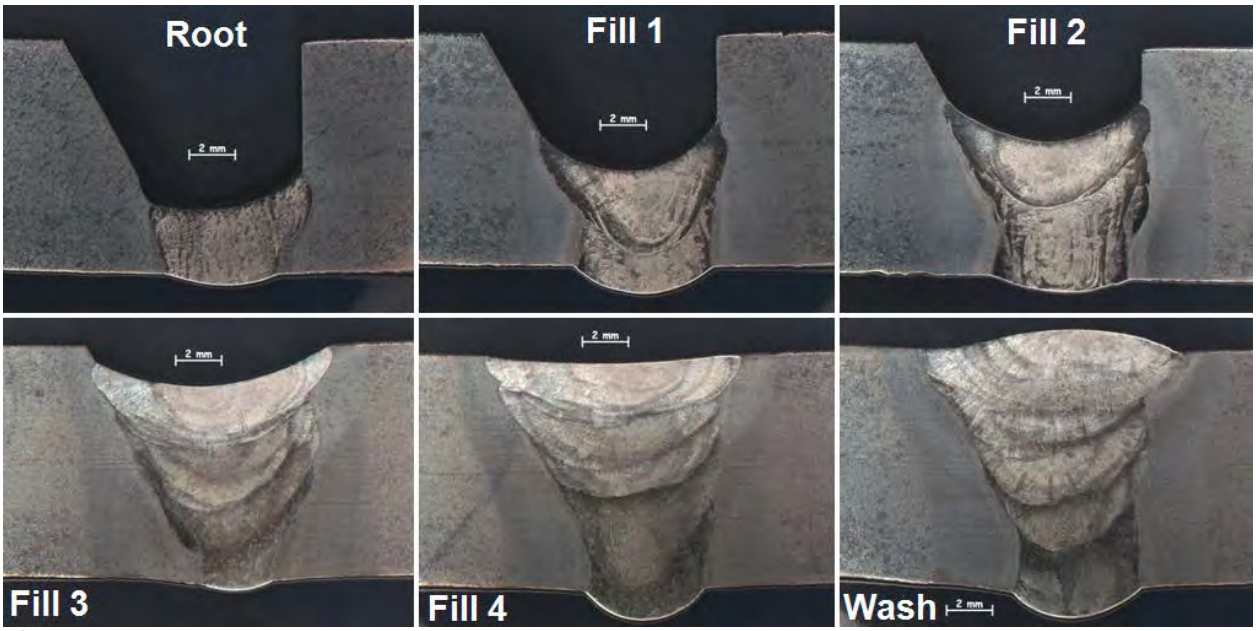

Figure 13
Controlled Deposition Weld Layers

The hardness data for each of the weldments was post-processed and plotted using a contour map. In Figures 14 and 15, each color represents a range of 50HV and the scales are identical for both maps:

- 150-200HV 0.2 ➔ Blue
- 200-250HV 0.2 ➔ Light Blue
- 250-300HV 0.2 ➔ Green
- 300-350HV 0.2 ➔ Yellow
- 350-400HV 0.2 ➔ Orange + Hashes
- 400-450HV 0.2 ➔ Red + Cross Hashes
- > 450HV 0.2 ➔ Black

To compare the overall tempering of the weldments more methodically, all of the data points in each hardness map below 225HV 0.2 were deleted for statistical analysis. This was done to eliminate all of the base metal hardness data and most (if not all) of the weld metal data. Using this comparison, the effectiveness of tempering in the HAZ was compared. The deletion of these data resulted in a sample size of 1102 indents for the consistent layer weldment and 1267 indents for the controlled deposition weldment. The histograms for each of these data sets are shown in Figure 16. The percentage of indents above a stated hardness value is shown in Table 4.

The hardness data for the consistent layer technique was plotted onto a macro image of the tested area, Figure 17. The hardness data plotted in Figure 17 was limited to the highest measured data points, those above 325HV.

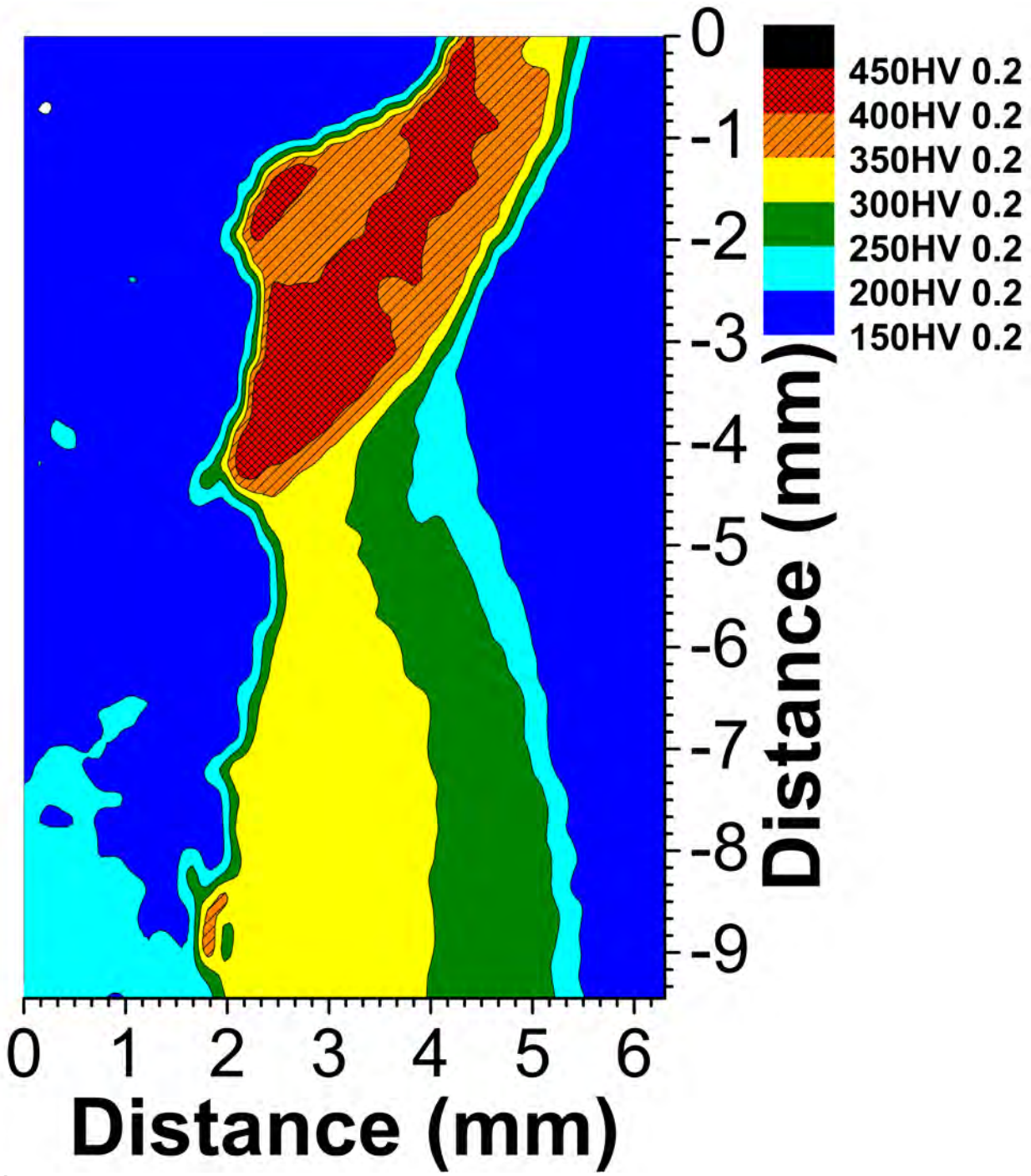

Figure 14
Consistent Layer Technique Hardness Map, 0° Bevel

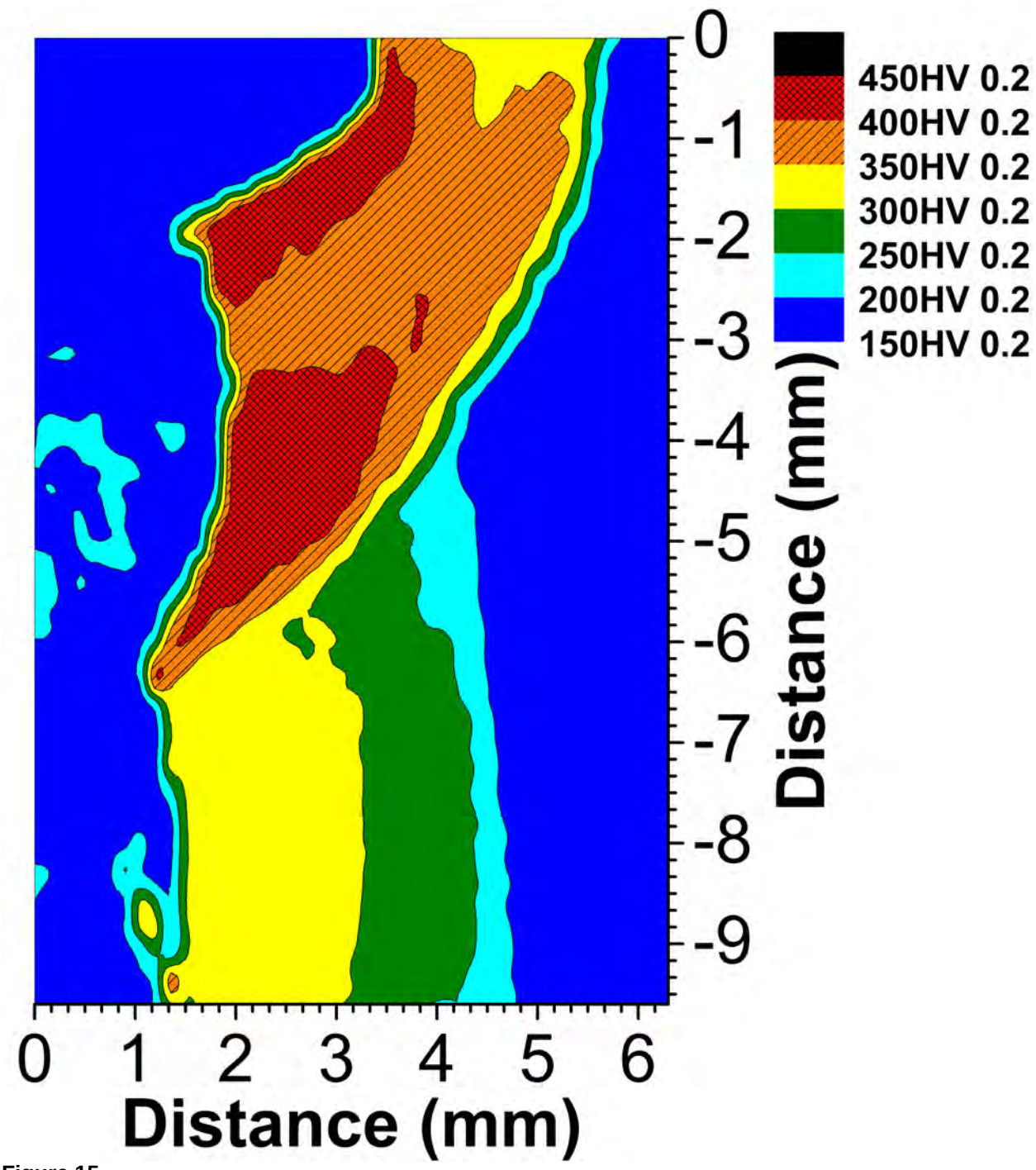

Figure 15
Controlled Deposition Technique, 0° Bevel

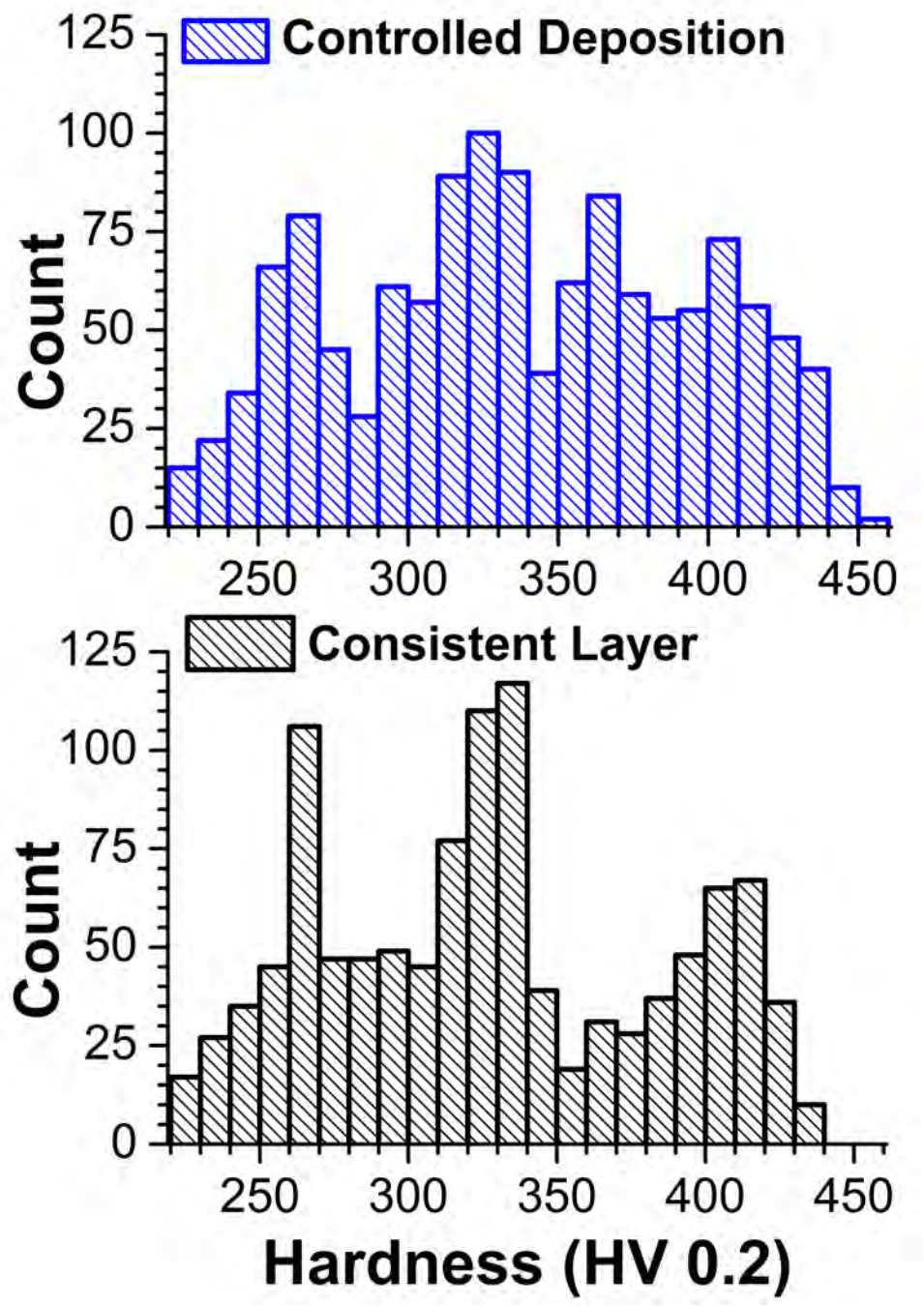

Figure 16
Histogram Comparison for Values above HV>225

Table 4
Percentage of Hardness Values for each Weldment above the Indicated Value

Weldment	>300HV	>325HV	>350HV	>375HV	>400HV	>425HV
Consistent Layer	65%	49%	34%	24%	15%	2%
Controlled Deposition	72%	56%	42%	28%	16%	5%

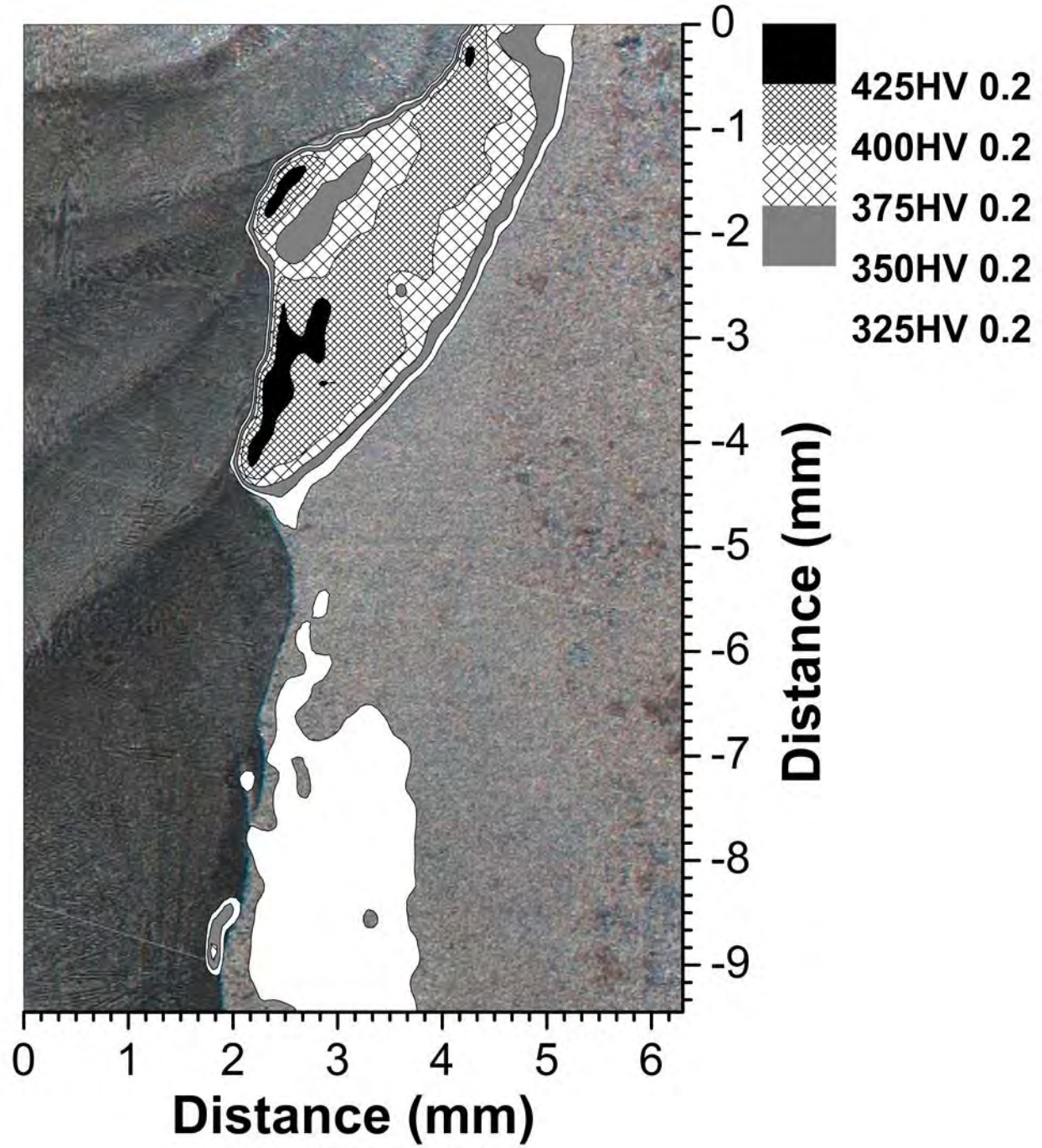

Figure 17
Location of Highest hardness Regions in the Consistent Layer Weldment

Discussion

The analysis of the 0° bevel of each procedure in Figures 14 and 15 show that ample tempering was achieved near the root and midwall on each weldment. Hardness data in typical Grade 91 weldments have shown values to approach 450HV in the HAZ. The data in Figures 14 and 15 indicate that virtually no data points lie above 450HV 0.2 with the vast majority of the data being below 400HV 0.2. To date, there has not been a systematic study governing acceptable hardness values in the HAZ of Grade 91, although hardness maximums have been instituted for as-received base material (263HV) and for the weld metal (295HV) following PWHT [9].

The consistent layer technique shows slightly better tempering through the entirety of the HAZ, as indicated in the histograms shown in Figure 16. The amount of data points below 350HV in the consistent layer technique are further shown in Table 4. The overall slight increase in tempering is likely attributed to the fact that there was one additional fill pass in this weldment as compared to the controlled deposition weldment. The increased heat input in the controlled deposition weldment appears to have had no significant affect in the tempering behavior of the Grade 91 HAZ. Based on these observations, it seems most beneficial to deposit as many fill passes as possible to increase the chances of tempering through the entirely of the HAZ.

A graph of the data points above 325HV overlaid on the analyzed area in Figure 17 shows the location of the hardest regions in the consistent layer technique. This graph clearly indicates that a great deal of the HAZ is below 325HV. The location of the hardest regions (in black) may be a result of the way in which the 0° bevel was welded. When approaching the 0° bevel, the automated voltage control will increase the arc length and cause the weld puddle to wash higher up on the wall (Figure 12, Fill 2). This added reinforcement on the wall may prevent adequate heat from overlying fill passes to penetrate the deposited weld pass to temper the HAZ.

Most of this preliminary analysis is concentrated around the measured hardness values. The importance of a threshold hardness value may have implications with respect to the stress corrosion cracking susceptibility (SCC) of the weldment. Although significant SCC has been documented in other CSEF steels (primarily Grades 23/24) [10, 11], the instances of SCC in Grade 91 weldments are not widely documented. In the few instances of documented SCC in Grade 91, the components were left in an uncontrolled environment for an extended period of time. More widespread cases of SCC have not been documented in Grade 91 due to the requirement of PWHT for *any* weld made in a Grade 91 component.

General SCC susceptibility is defined by the interaction of the environment, a susceptible material and the stress state. Because a wide variety of environments can pass through the ID of the tubing (acid cleaning, various steam qualities), it was especially prudent in these studies to reduce the hardness at the root of the weldment. The reduction in hardness at the root was evident in both procedures. Furthermore, it must be noted that the relationship between hardness and SCC susceptibility is not well understood for the CSEF family of alloys. Research on potential SCC mechanisms in Grade 24 weldments have revealed that the susceptibility of the material is not an obvious function of maximum hardness, but primarily on the water chemistry and secondarily to an acid cleaning environment passing through the tube [11]. Additionally, the application of Grade 24 in waterwalls induces this material to a very high restraint condition and

creates the necessary conditions for SCC. Because the intended application of the temper bead welding procedure described in this paper is in T91, it is conceivable that the residual stresses are substantially lower than in other highly restrained situations. The application of a temper bead procedure to T91 likely further limits its use to tubing that is present inside the boiler, and inherently shielding these locations from environmental conditions which might induce SCC on the outside diameter of the tubing.

Conclusions & Future Plans

As-welded HAZ values in Grade 91 for typical welding procedures regularly approach values 450HV. Tempering of Grade 91 using a temper bead technique and relying solely on the heat input from welding is a challenging prospect. Despite this, tempering was observed in the Grade 91, with overall hardness values being reduced by ~100HV in specific regions. A few conclusions from these preliminary set of studies are shown below:

1. Use of a nickel-base filler material offers unique advantages for repair applications in Grade 91 because it does not require tempering or removal of material (as in half-bead) to ensure adequate tempering through the thickness. This greatly reduces the complexity of the applied temper bead welding procedure.
2. The consistent layer technique demonstrated overall lower hardness values than the controlled deposition technique.
3. Regardless of welding technique, the majority (~75%) of the overall hardness values were below 375HV. Because Grade 91 HAZ hardness values regularly exceed 400HV and can reach 450HV, tempering of the Grade 91 HAZ below 375HV is encouraging considering that Grade 91 was purposely designed to be resistant to tempering.
4. The majority of the observed tempering in each weldment was documented in the root and midwall locations. Such observations suggest that there was ample heat input to temper the HAZ through ~half of the weldment. These same observations suggest that more fill passes may be required to more effectively temper the upper half of the weldment.
5. The least tempering was documented in the cap location and indicated that a low deposition wash pass was not adequate to achieve any noticeable tempering.

Planned destructive test evaluation and individual analysis on the effect of each layer will demonstrate the individual and/or cumulative effect of the fill passes on the tempering behavior of each of these weldments. Additional future studies, should address the potential implications of a temper bead procedure in Grade 91. Such studies should address the tempering characteristics of the Grade 91 HAZ in the as-welded state and at service temperature, the cross-weld creep behavior, stress corrosion cracking susceptibility and fracture toughness.

The initial hardness values indicate that the Grade 91 HAZ can be consistently tempered with relatively simple approaches and carefully controlled procedures. This tempering provides an encouraging step in the on-going examination of temper bead procedures for at least temporary repair options in T91 applications.

References

1. *State-of-the-Art Weld Repair Technology for High Temperature and Pressure Parts, Volume 4: Weld Repair of 2-1/4Cr-1Mo Pipe/Header Girth Welds*. EPRI, Palo Alto, CA: 1998. TR-103592-V4.
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11. Private Correspondence, 10/25/11.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Novel Approaches to Repair of Grade 91 Using Temperbead Welding Procedures

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Electric Power Research Institute

George Galanes
National Board Inspection Code

Introduction

- Two on-going projects within EPRI
  - Temperbead of T91 Using EPRI P87 Filler Metal
  - Weld Repair of Grade 91 Piping and Components
- Motivation
  - Grade 91 components have been used for >20 years and widely put into service over the last 15 years
  - Little thought has been given to establishing the best repair method for specific components
  - PWHT adds a layer of complexity
  - Ensuring *good PWHT* can be very difficult
  - More life may be obtainable through eliminating PWHT

Temperbead Concept for Tubing Applications

- Nickel-base filler metal reduces complexity
- Carefully controlled procedure to temper the T91 HAZ
- Use of EPRI P87 nickel-base filler metal (matching to Grade 91 in C, Cr and carbide-formers) prevents two potential, long-term failure mechanisms:
  - Carbon migration (and the formation of a weak zone)
  - Type I carbide nucleation **and growth** along ferritic-side of fusion line (growth eventually results in creep cavitation at Type I carbides)
  - For more information, EPRI Report 1019786 (free)
- **Goal: Provide an alternative repair approach that results in safe operation without the need for PWHT.**

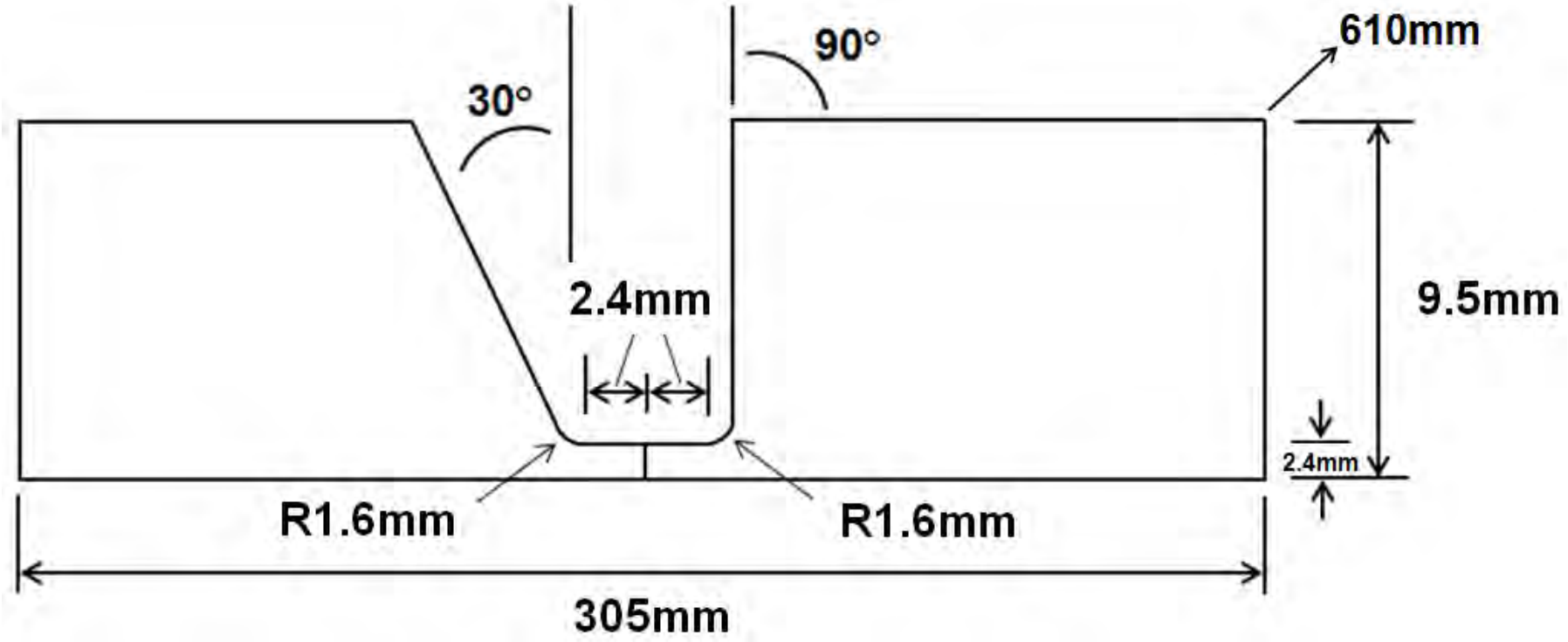
Approach

- Attempt two different, established temper bead welding techniques using automated GTAW process
  - **Consistent Layer** – heat input for fill passes was identical
  - **Controlled Deposition** – heat input was purposely increased through the thickness
- Weld was staggered to examine the effect of each layer on the tempering response of the Grade 91 HAZ
- Preheat 200°F with max interpass of 250°F to ensure complete transformation to martensite prior to deposition of the next, overlying layer

Procedure Validation and Testing

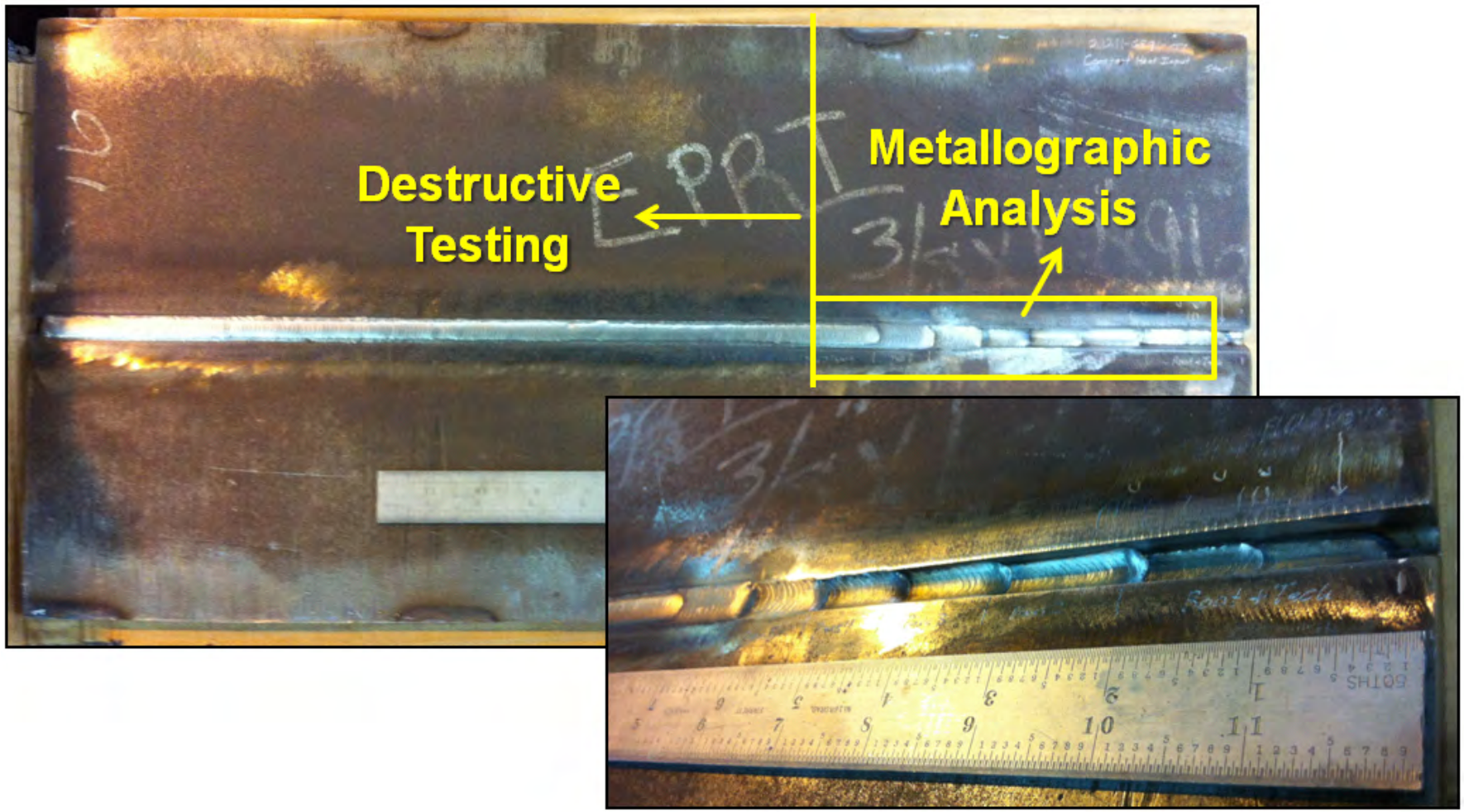
- Metallography
- Hardness (per procedure)
  - 200g Hardness Maps
  - 0.15mm spatial spacing
  - ~2800 indents per map on each side of the weld
- Mechanical Testing (per procedure)
  - Room temperature impact testing (10mm square)
  - ASME Section IX qualification (4 side bends + 2 RTTs)
  - Elevated temperature tensile testing (550-620°C @ 14°C increments)

Welding Geometry

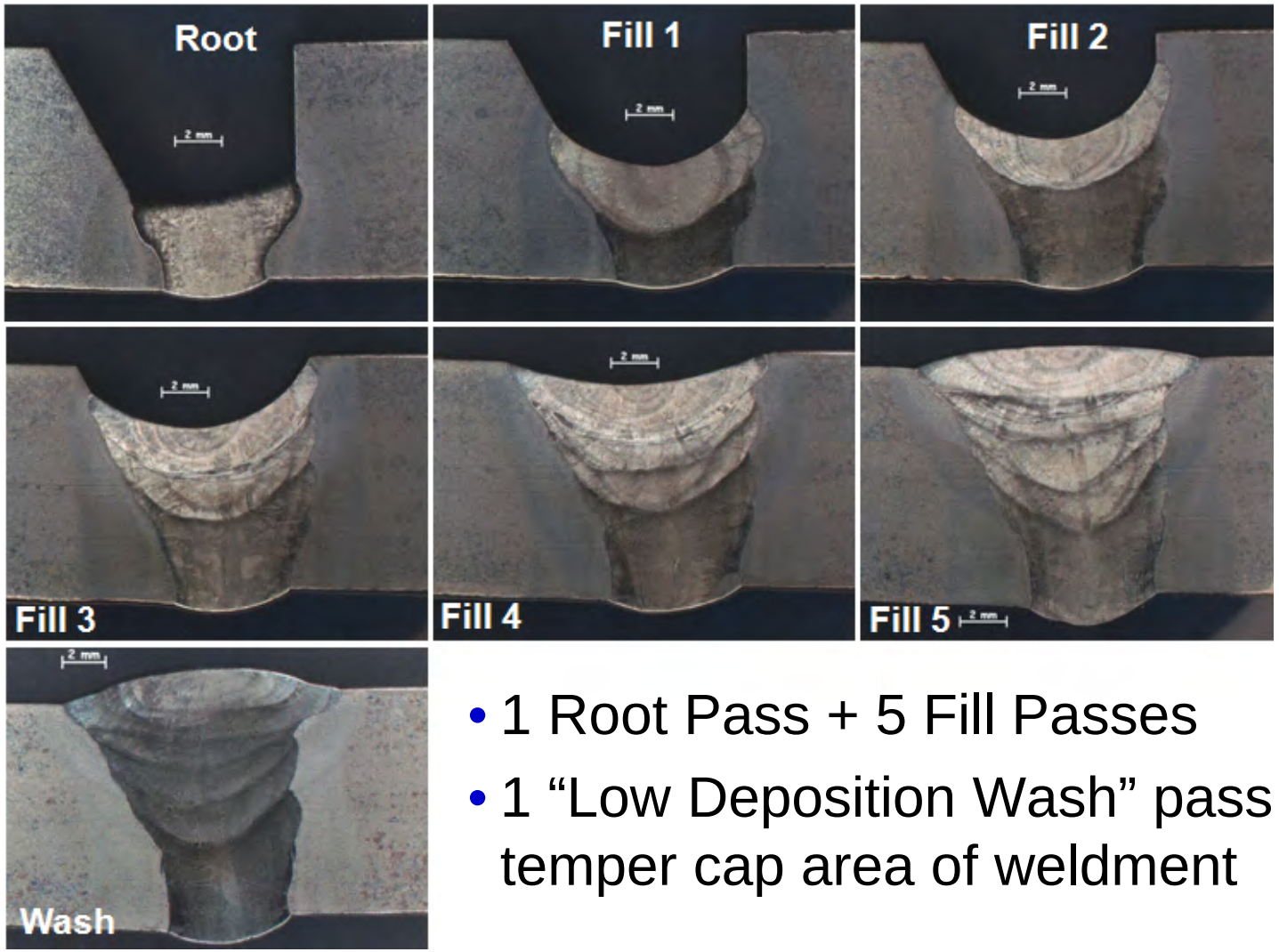


- Straight bevel was utilized for two reasons:
  - Potentially allows for impact strength measurement in HAZ
  - Establish if the bevel is a critical variable

Finished Weldment

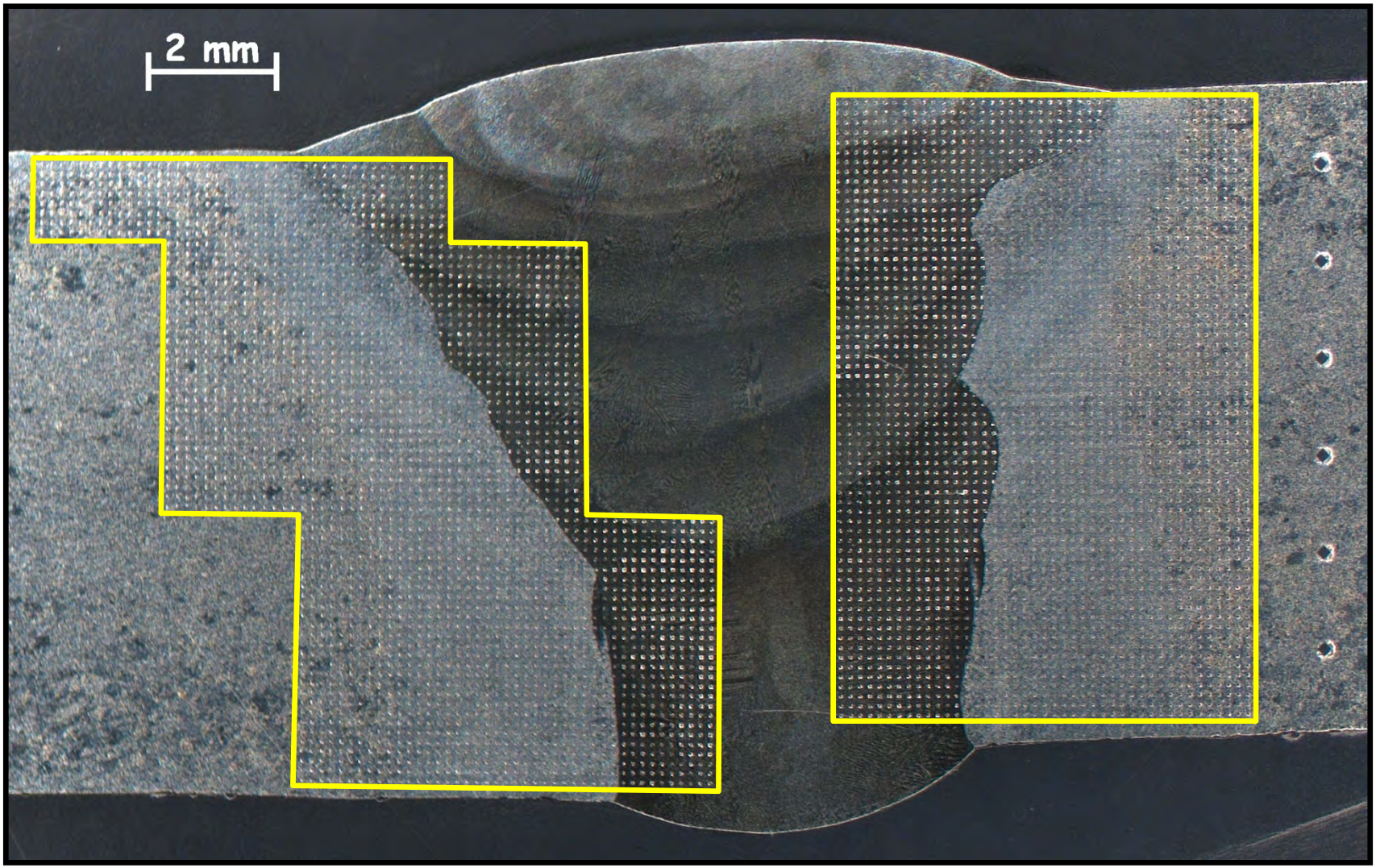


Consistent Layer Macro Images

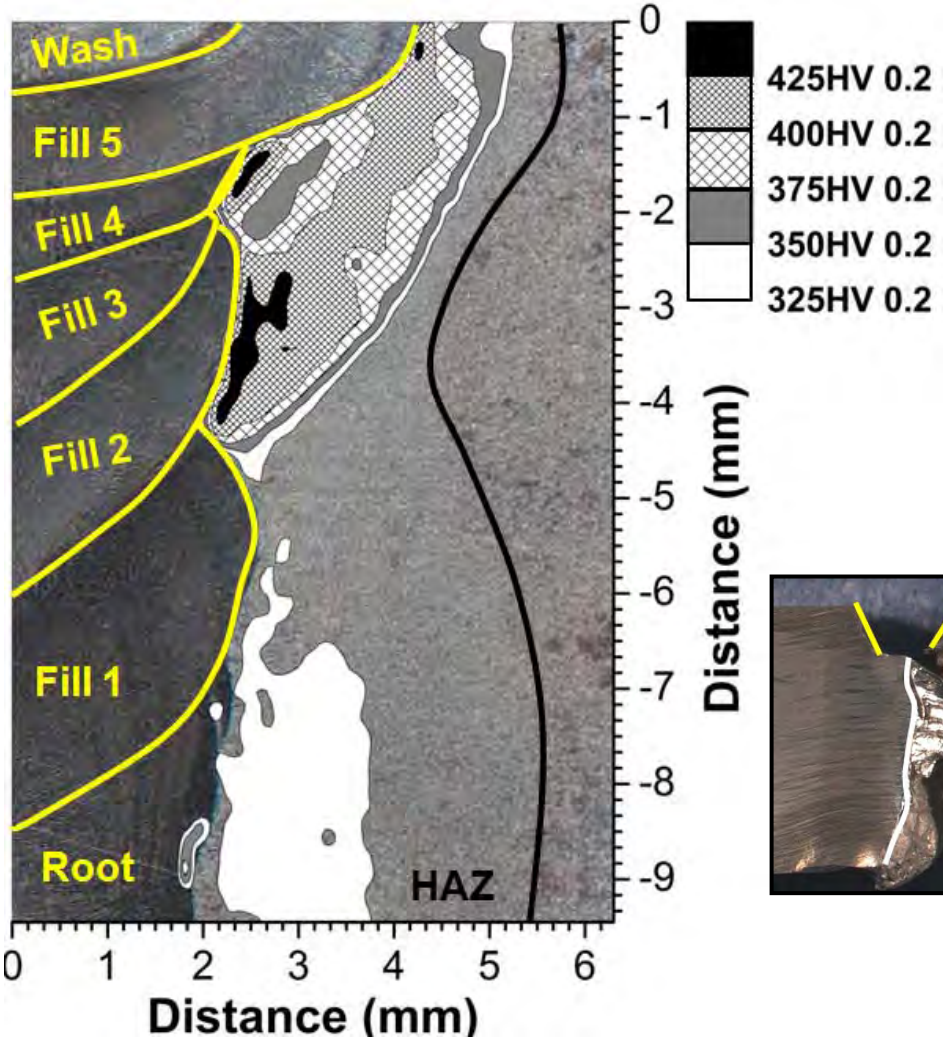


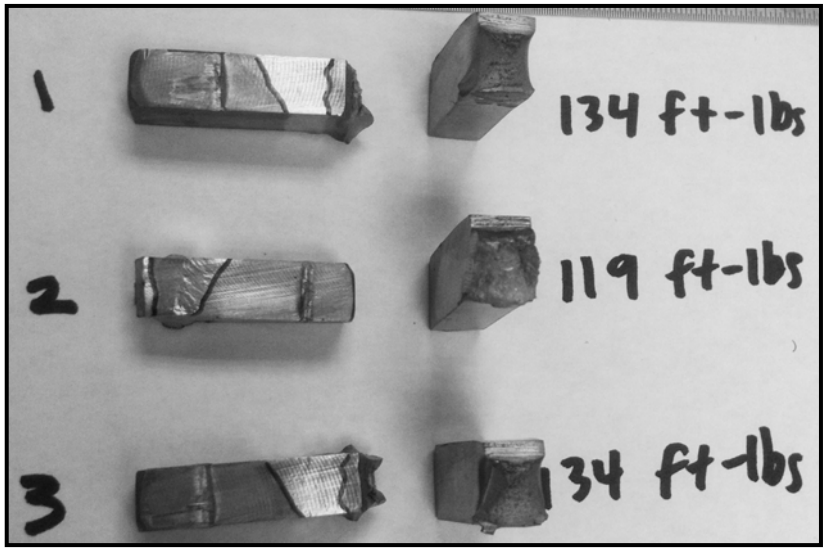
- 1 Root Pass + 5 Fill Passes
- 1 “Low Deposition Wash” pass to temper cap area of weldment

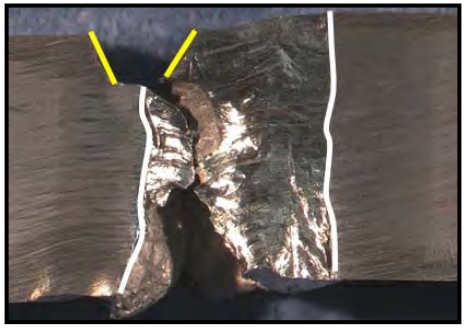
Consistent Layer Hardness Maps in Completed Weldment



Consistent Layer – Example of Data Analysis







Conclusions to Date and Future Work

- It is possible to temper the Grade 91 HAZ and a reduction of hardness (<350HV 0.2) at root appears feasible
- Destructive evaluation results (thus far) are promising

Future Work:

- Application manual GTAW
- Application to manual GTAW root + SMAW fill
- Metallographic, hardness and destructive evaluation

- **Questions or comments ?**

Weld Repair of Grade 91 Piping and Components

Objectives and Scope

- Ability to remove damaged material efficiently and effectively
- Design and execute repairs
- Guide to lifing and ongoing inspection requirements of repair

Value

- Minimize the time and costs associated with making a repair
- Maximize the potential that the repair will provide at least adequate in-service performance.

Details and Contact

- The participant total cost is $40,000 payable over 2 years.
- Qualifies for Tailored Collaboration

Jonathan Parker

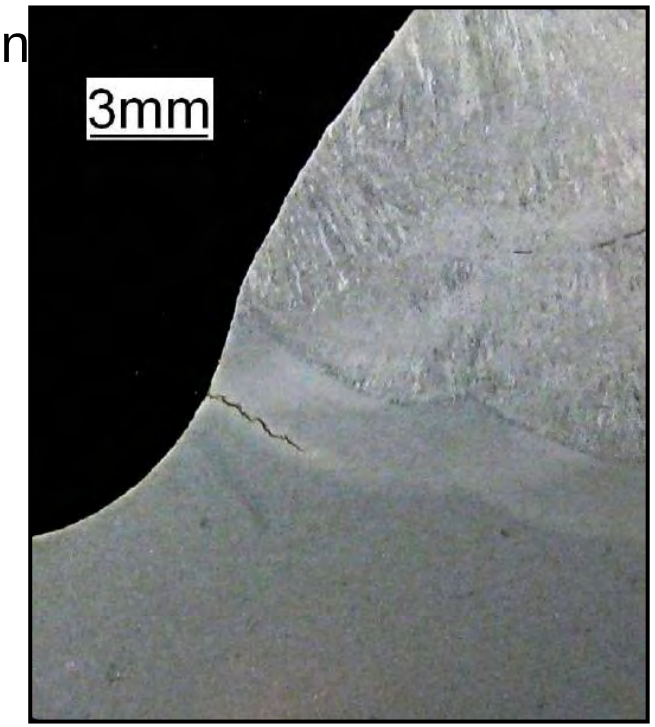
- jparker@epri.com, (704) 595-2791

SPN Number: 1022801

Have confidence that repair methods will be effective

Phase 1 – Ranking of Repair Performance

- Discussion of methods and extent of excavation
- Weld procedure considerations – identified variables:
  - Base material condition (Renormalized and service-exposed)
  - Filler metal selection (6 total)
  - Temperbead vs. normal procedure comparison
  - Proper vs. improper temperbead
  - Temperbead layer procedure (4 total)
  - Post weld heat treatment (3 total)
- Post repair evaluation of microstructure, damage, etc.
- Specimen geometry and testing conditions
- Development of test matrix



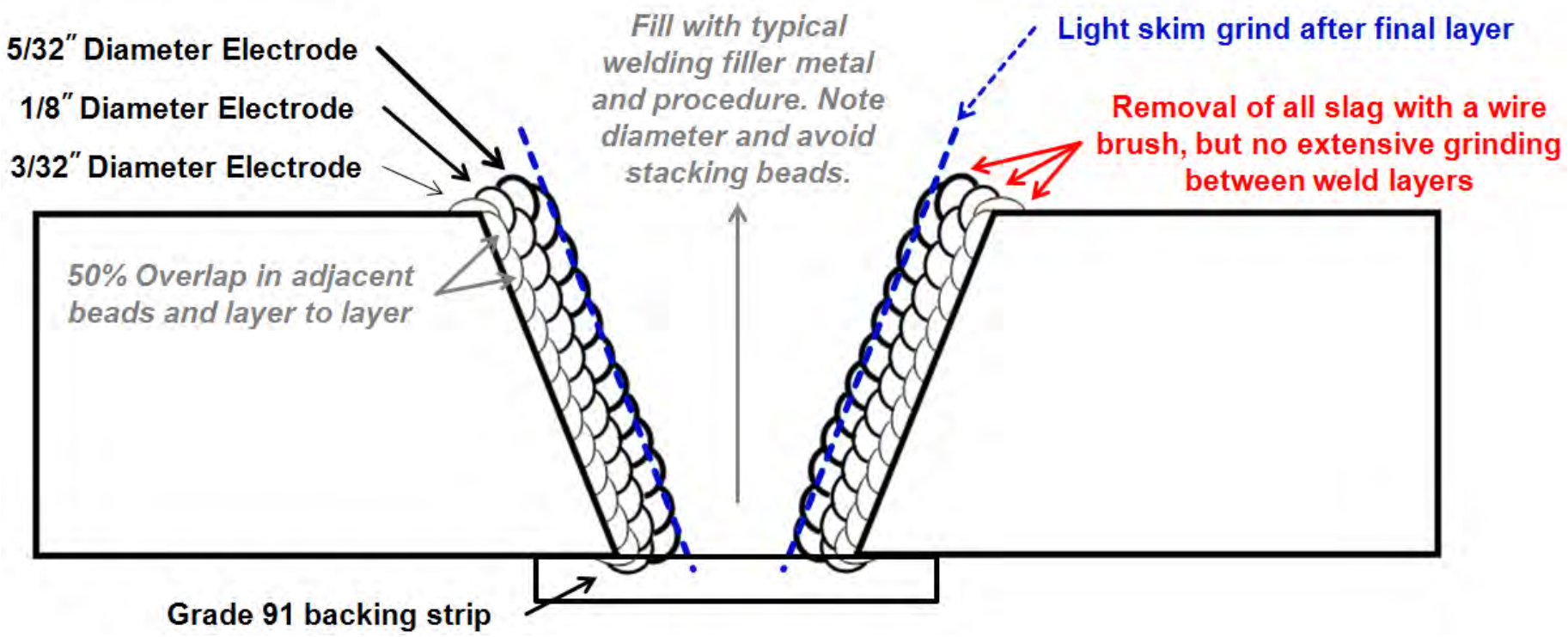
Analysis to identify best option repairs – generate ranking table

Phase 1 Welding Matrix – All Welds Completed

Weld	Base Material	Weld Metal		Preheat/ Interpass	Welding Procedure	PWHT
		AWS Desig.	Trade Name			
1A	As-received Grade 91 (Sample 8) "A" Material	E9015-B9 H4	Thermanit Chromo 9V Mod.	300°F/600°F	Normal + Rec'd. PWHT	1375±25°F/2h
2A				300°F/600°F	Normal + Min. PWHT	1250±10°F/2h
3A				300°F/600°F	Temperbead	None
4A				300°F/600°F	Poor Practice Temperbead	None
5A		E8015-B8	9Cr-1Mo	300°F/600°F	Temperbead	None
6A		E9015-G	Thermanit P23	300°F/600°F	Temperbead	None
7A				300°F/600°F	Normal + Rec'd. PWHT	1375±25°F/2h
8A		E9018-B3 H4	Bohler E9018-B3	300°F/600°F	Temperbead	None
9A		EPRI P87	EPRI P87	300°F/600°F	Temperbead	None
10A		ENiCrFe-2	INCO-WELD A	300°F/600°F	Temperbead	None
1B	Renormalized Grade 91 (Sample 8) "B" Material	E9015-B9 H4	Thermanit Chromo 9V Mod.	300°F/600°F	Normal + Renormalization + Temper	1930°F±20°F/2h 1375±25°F/2h
2B				300°F/600°F	Normal + Min. PWHT	1250±10°F/2h
3B				300°F/600°F	Temperbead	None
4B				300°F/600°F	Poor Practice Temperbead	None
5B		E8015-B8	9Cr-1Mo	300°F/600°F	Temperbead	None
6B		E9015-G	Thermanit P23	300°F/600°F	Temperbead	None
7B				300°F/600°F	Normal + Rec'd. PWHT	1375±25°F/2h
8B		E9018-B3 H4	Bohler E9018-B3	300°F/600°F	Temperbead	None
9B		EPRI P87	EPRI P87	300°F/600°F	Temperbead	None
10B		ENiCrFe-2	INCO-WELD A	300°F/600°F	Temperbead	None

Weldment 10B [ENiCrFe-2 Filler Metal, TBW]

Welding Procedure for Three Layer Approach

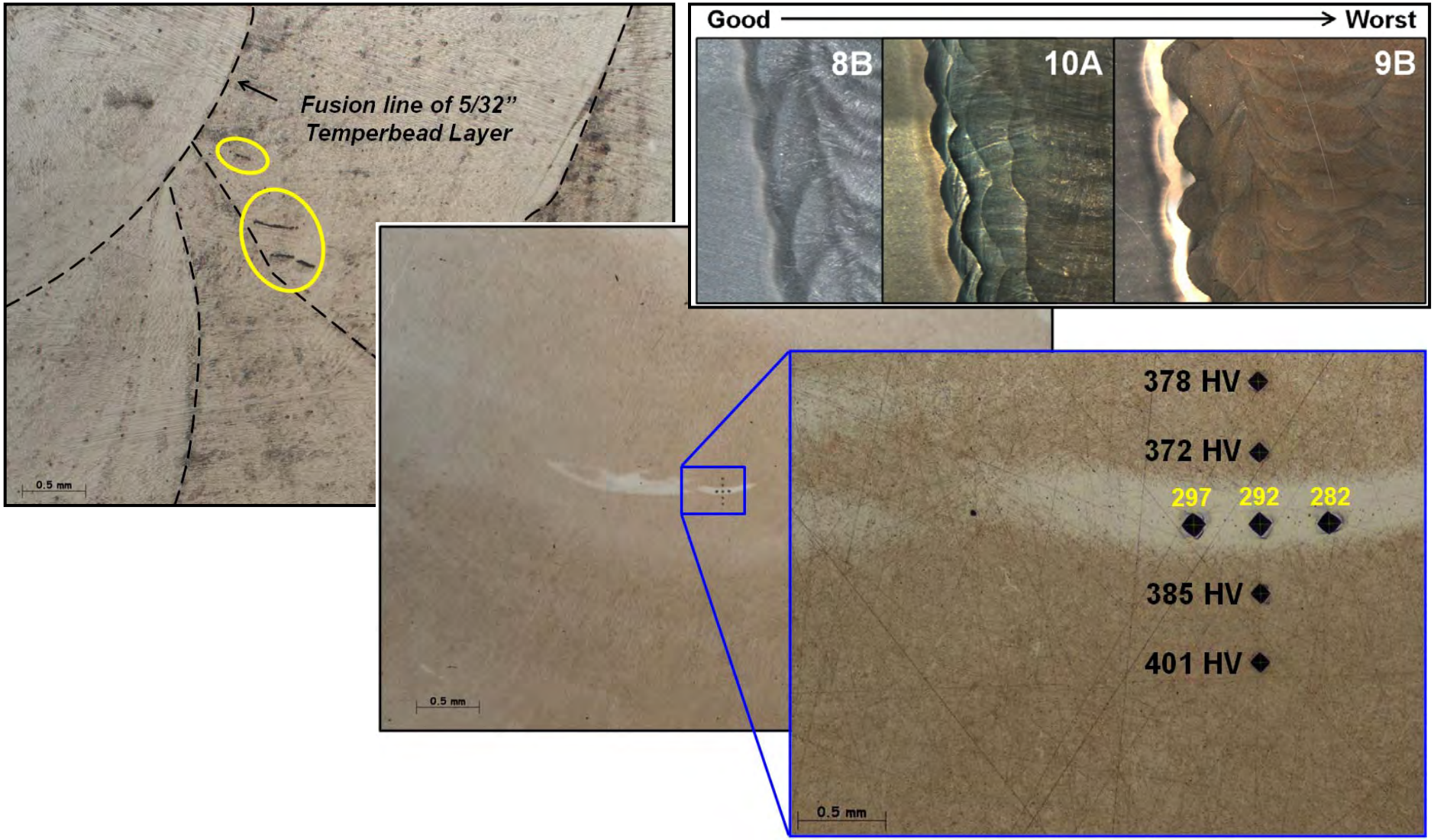


- SMAW Process
- 300°F (149°C) Preheat, 600°F (316°C) Interpass

Weldment 10B [ENiCrFe-2 Filler Metal, TBW]

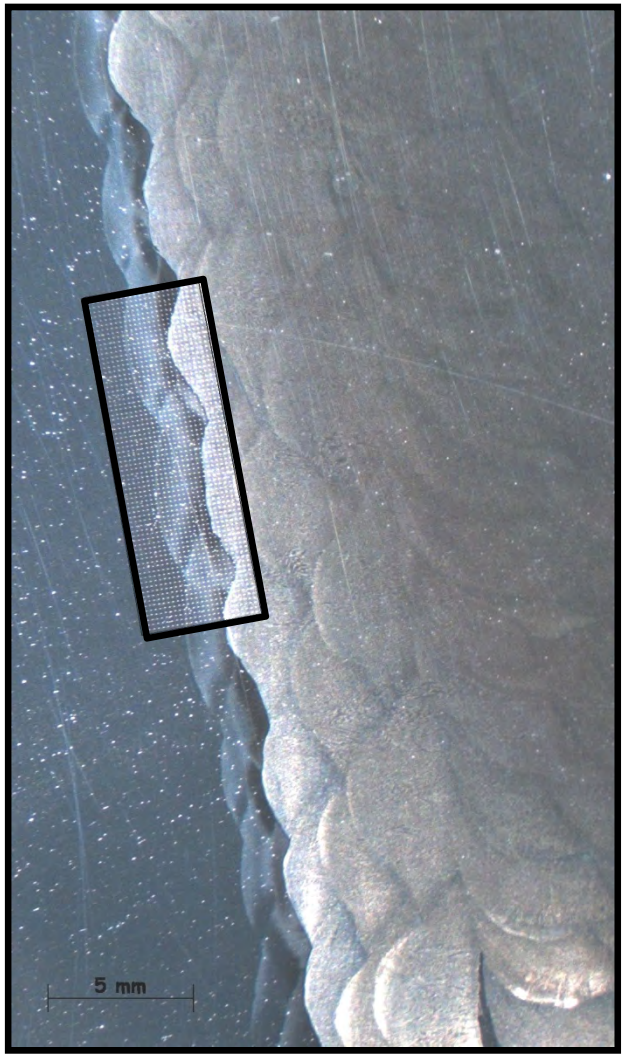
Welding Assessment – Completed Weldment

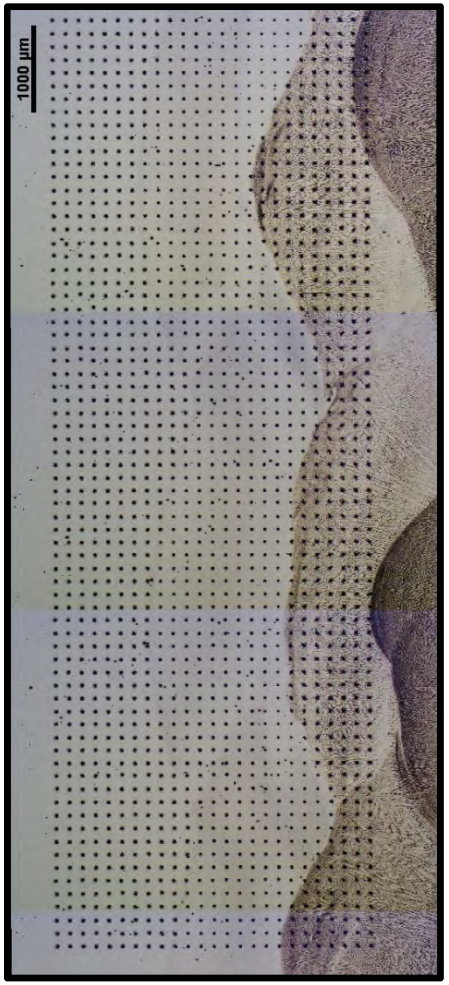
Metallographic Assessment

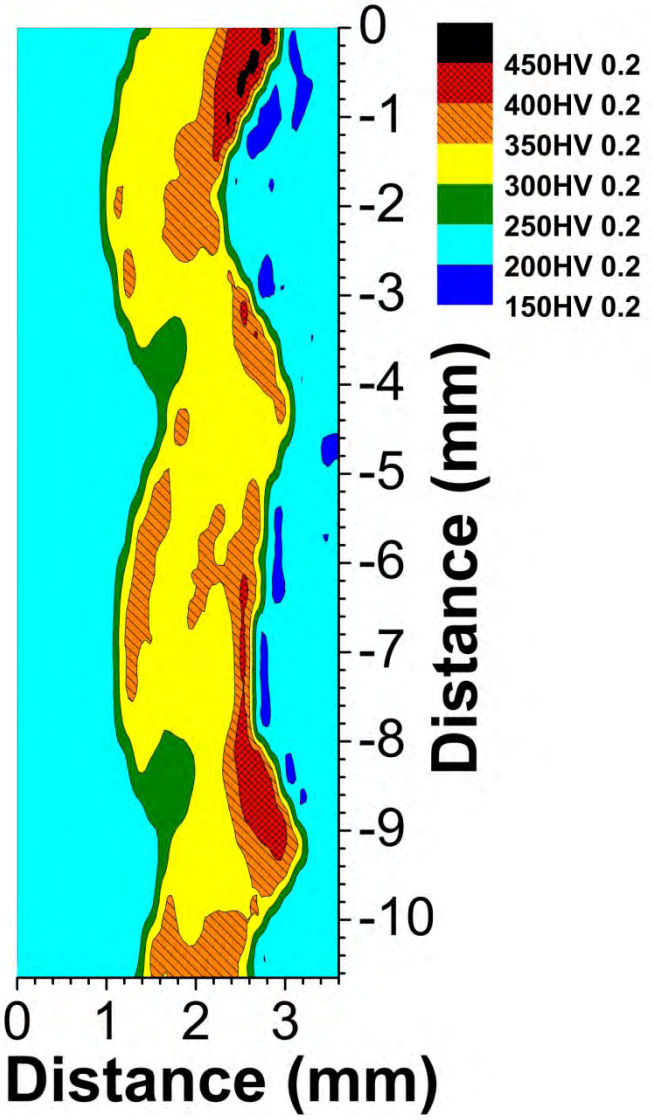


Weldment 10B [ENiCrFe-2, TBW]

Hardness Assessment – HAZ Hardness Map







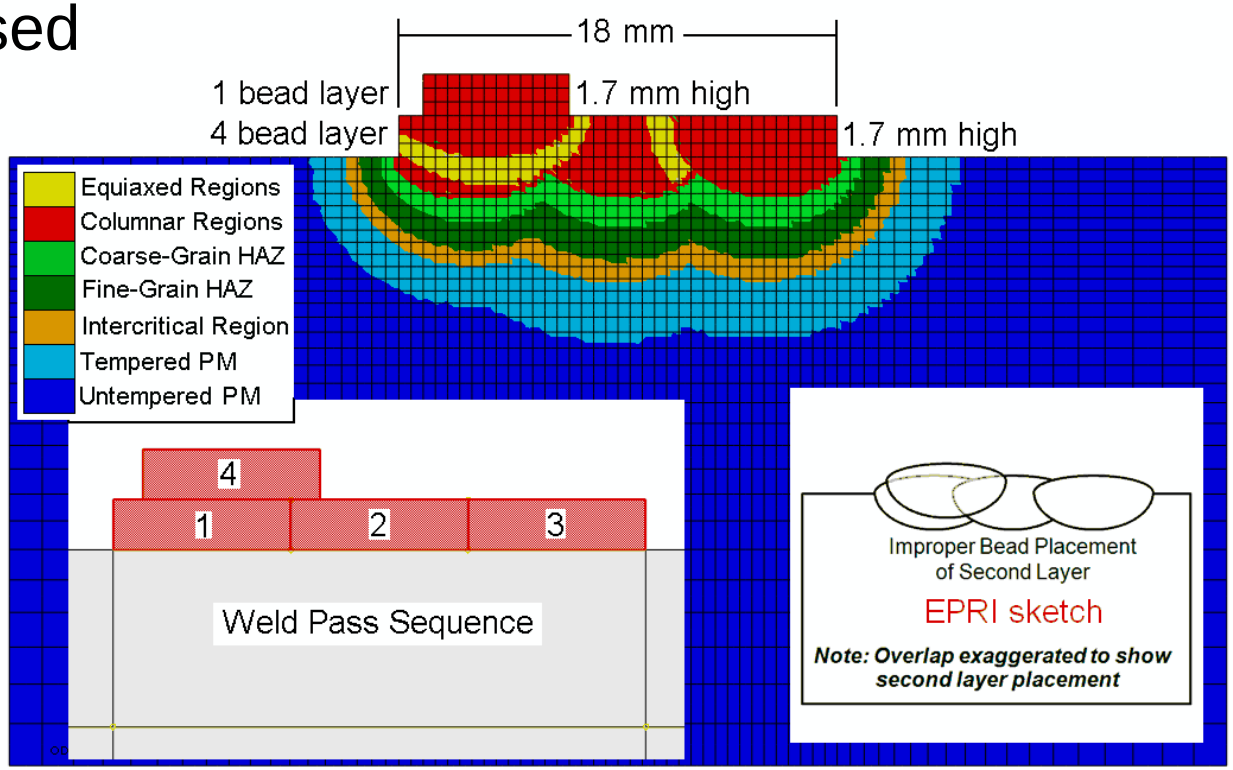
Machined and Tested Creep Samples

Creep testing being conducted at 625°C, 80MPa (~5,000 hr life)

Samples include the entirety of the weld metal and temperbead layers on either side of the weld

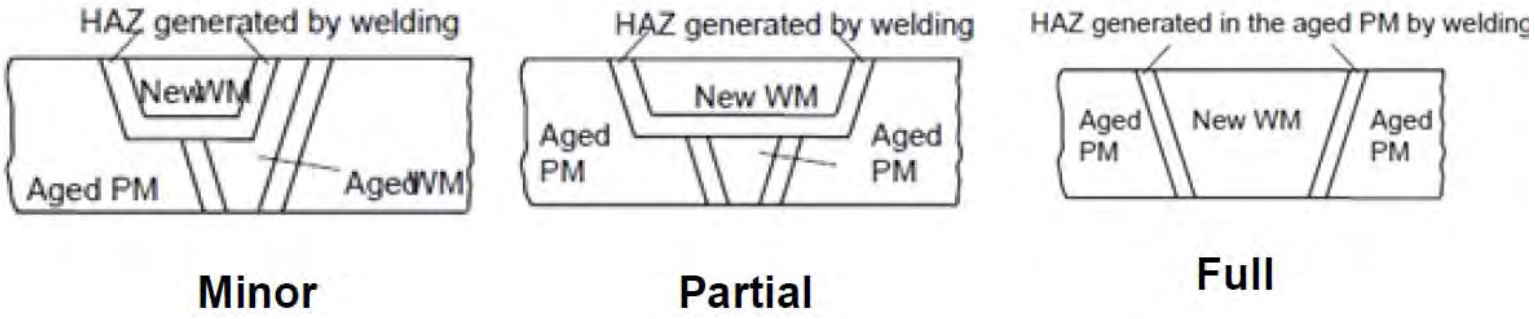
Modeling

- Modeling in Phase 1 is being conducted to understand procedure issues associated with temperbead welding (i.e. bead overlap, bead placement and electrode size)
- Modeling is focused in identifying the position and influence of overlapping thermal cycles

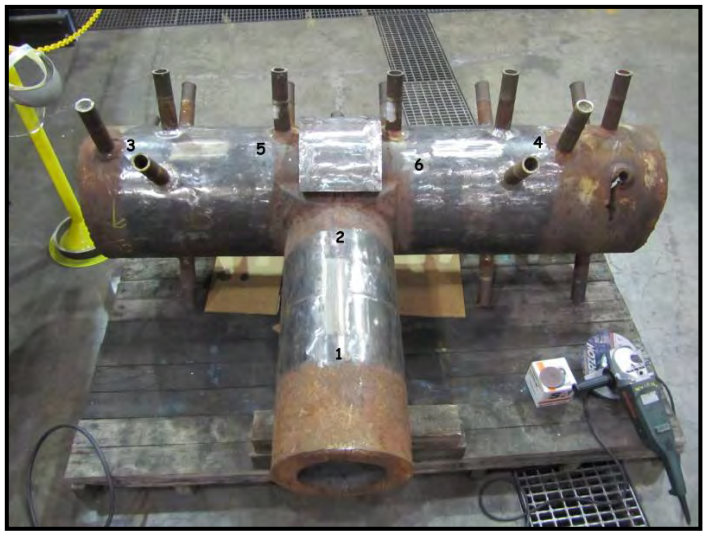


Phase 2 – Application of Best Option Repair Method(s) to Ex-service Header

- Discussion of methods and extent of excavation



- Weld procedure considerations
- Post repair evaluation of microstructure, damage, etc.
- Development of test matrix and cross-weld creep



Conclusions

- The 20 weldments have been completed and preliminary analysis has been conducted:
  - Metallographic
  - Hardness testing and mapping
  - Statistical analysis of hardness results
- Creep testing is underway of all weldments
  - Once completed, results will be presented to NBIC
- Modeling and bead on plate studies have provided insight to “best procedure guidelines” for future Phase 2 work
- Phase 2 to being ~September/October 2012
- **Questions or comments?**

Contact Information

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- Jonathan Parker, Senior Project Manager
  - 704-595-2791, jparker@epri.com

Together…Shaping the Future of Electricity

Subject: 2007 Edition, Part 3, Supplement 2, S2.13.9.1 – Weld Buildup of Wastage and Grooving in Unstayed Areas

File Number: NB11-0203

Prop. Page: 155 & 156

Proposal: Clarify the 60% minimum required thickness.

Explanation: An area of 3 square inches has been added to allow for the buildup of pits and grooving in smaller area's where the thickness is less than the 60% of minimum required.

1. Add "in an area exceeding 3 sq. in. (1,950 sq. mm)." to a)
2. Add "and have an area exceeding 3 sq. in. (1,950 sq. mm)" to b)
3. Update figure S2.13.9.

Update text and diagram can be found on page 3

Item #1
Add the text below:

in an area exceeding 3 sq. in. (1,950 sq. mm).

S2.13.9.1 WELD BUILDUP OF WASTAGE AND GROOVING IN UNSTAYED AREAS

a) Weld buildup shall not be used if the affected section of plate has wasted below 60% of the minimum required thickness per NBIC Part 2, Supplement 2. (See NBIC Part 3, Figure S2.13.9.1).

b) Wasted sections that have wasted below 60% of the minimum required thickness shall be repaired by installing a flush patch using full penetration welds.

Item #2
Add the text below:

and have an area exceeding 3 sq. in. (1,950 sq. mm).

c) Weld buildup of wasted areas shall not exceed 100 sq. in. (65,000 sq. mm).

d) Weld buildup is to replace material that has been lost due to wastage and grooving, and is not to replace thickness on the opposite side of the sheet. Weld buildup must be applied to the side of the sheet that is wasted or grooved.

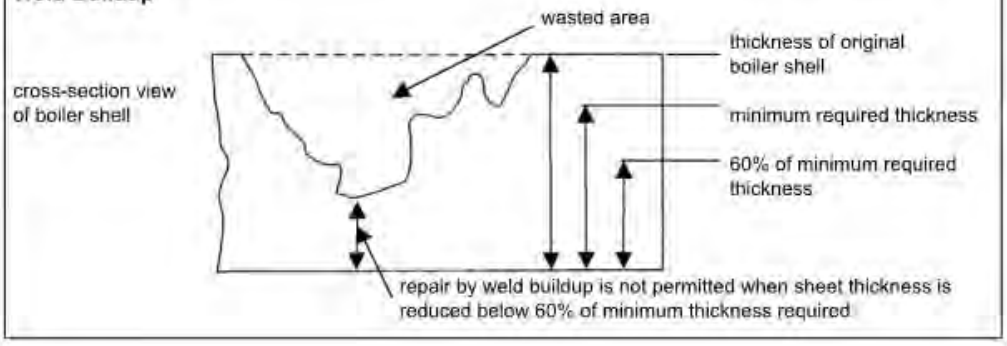
e) Prior to welding, the rivets in the wasted area should be removed.

f) Rivets holes should be reamed after welding.

g) Welding shall not cover rivet heads.

Item # 3 Replace this with the Figure S2.13.9.1 on page 3

FIGURE S2.13.9.1
Weld Buildup



S2.13.9.1 – Weld Buildup of Wastage and Grooving in Unstayed Areas

a) Weld buildup shall not be used if the affected section of plate has wasted below 60% of the minimum required thickness per Part 2, Supplement 2 in an area exceeding 3 sq. in. (1,950 sq. mm). (See NBIC Part 3, Figure S2.13.9.1)

b) Wasted sections that have wasted below 60% of the minimum required thickness and have an area exceeding 3 sq. in. (1,950 sq. mm), shall be repaired by installing a flush patch using full penetration welds.

c) Weld buildup of wasted areas shall not exceed 100 sq. in. (65,000 sq. mm).

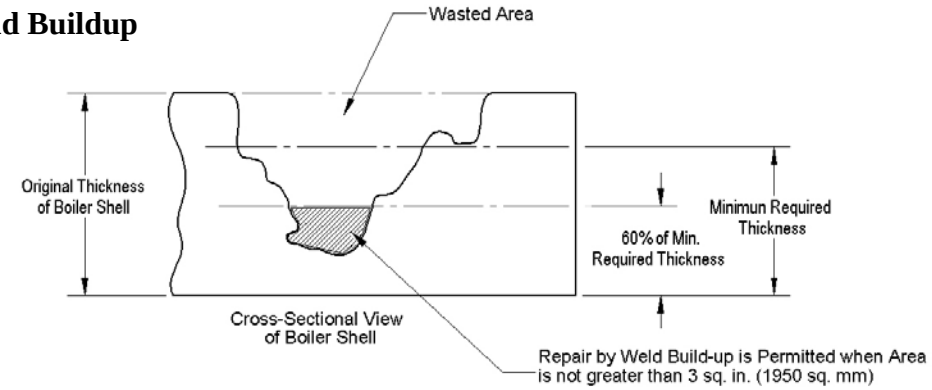
d) Weld buildup is to replace material that has been lost due to wastage and grooving, and is not to replace thickness on the opposite side of the sheet. Weld buildup must be applied to the side of eth sheet that is wasted or grooved.

e) Prior to welding, the rivets in the wasted area should be removed.

f) Rivets holes should be reamed after welding.

g) Welding shall not cover rivet heads.

Figure S2.13.9.1
Weld Buildup



NB13-0201

Subject: 2007 Edition, Part 3, Supplement 2, S2.13.10.1 – Weld Buildup of Wastage and Grooving in Stayed Areas

File Number: NB13-0201

Prop. Page: 159 & 160

Proposal: Update text to clarify additional requirements, fix 2 typo's and removes a reference that is incorrect.

Explanation This area currently is confusing and can be updated and corrected to fix these issues. There are four issues to address.

1. Remove "welding shall not cover rivet or stay bolt heads" due to redundancy with c)
2. Add the following text at the end of the requirement statement match the others in S2.13.10.2 & S2.13.10.3. "apply with the following additional requirements identified below."
3. Remove typo ";and"
4. Remove d) completely. Figure has no reference to weld buildup. The figure is for Part 3, supplement 2, S2.13.10.3 and is referenced there.

Update text can be found on page 3

Item # 2

"apply with the following additional requirements identified below."

Item # 1

Remove text

S2.13.10.1 WELD BUILDUP OF WASTAGE AND GROOVING IN STAYED AREAS

Requirements specified in NBIC Part 3, S2.13.9.1 shall ~~be followed. Welding shall not cover rivet or staybolt heads.~~

a) Prior to welding the rivets and or staybolts in the wasted areas should be removed.

b) Threaded staybolt holes shall be retapped after welding.

c) Welding shall not cover rivet or staybolt heads; ~~and~~

d) ~~See NBIC Part 3, Figure S2.13.10.3-a.~~

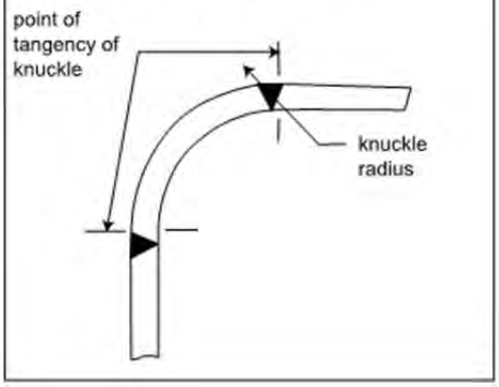
Item # 3

Remove text

Item # 4

Remove text

FIGURE S2.13.10.3-a
Knuckle Point of Tangency



Updated text and Diagram

S2.13.10.1 – Weld Buildup of Wastage and Grooving in Stayed Areas

Requirements specified in NBIC Part 3, S2.13.9.1 shall apply with the following additional requirements identified below.

a) Prior to welding the rivets and or staybolts in the wasted areas should be removed.

b) Threaded staybolt holes shall be retapped after welding.

c) Welding shall not cover rivet or staybolt heads.

NB13-0201

Subject: 2007 Edition, Part 3, Supplement 2, S2.13.10.2 – Weld Repair of Cracks in Stayed Area's

File Number: NB13-0201

Prop. Page: 159

Proposal: Update text to clarify additional requirements, fix 2 typo's and removes a reference that is incorrect.

Explanation This area currently is confusing and can be updated and corrected to fix these issues. There are four issues to address.

1. Remove b) c) and d) due to redundancy with requirements in 2.13.9.2
2. Add a new b) that states "Threaded staybolt holes shall be retapped after welding."

Update text can be found on page 3

Item # 1

Remove text for b) c) & d)

S2.13.10.2 WELDED REPAIR OF CRACKS IN STAYED AREAS

Requirements specified in NBIC Part 3, S2.13.9.2 shall apply with the following additional requirements identified below:

a) If the crack extends into a staybolt hole, the staybolt shall be removed prior to making the repair;

~~b) In riveted joints, tack bolts should be placed in alternating holes to hold the plate laps firmly;~~

~~c) Rivets holes should be reamed after welding; and~~

~~d) Welding shall not cover rivet or staybolt heads.~~

Item #2
Add Text
b) Threaded staybolt holes shall be retapped after welding.

Updated text and Diagram

S2.13.10.2 – Weld Repair of Cracks in Stayed Area's

Requirements specified in NBIC Part 3, S2.13.9.1 shall apply with the following additional requirement identified below.

a) If the crack extends into a staybolt hole, the staybolt shall be removed prior to make the repair.

b) Threaded staybolt holes shall be retapped after welding.

NB13-0201

Subject: 2007 Edition, Part 2, Supplement 2, S2.13.10.4 –Repair of Stayed Firebox Sheets Grooved or Wasted at the Mudring

File Number: NB13-0201

Prop. Page: 161

Proposal: Change the wording in providing more guidance for evaluating local pitting corrosion versus general corrosion.

Explanation: Clarify the 60% minimum required thickness and make the description the same in all area's that figure S.2.13.9.1 reference.

1. Change text in b) to include the area exceeding 3 sq. in. (1,950 sq. mm)." Text would state "For mudrings of the locomotive style (See NBIC Part 3, Figure S2.13.10.4), weld buildup shall not be used if the affected section of plate has wasted below 60% of the minimum required thickness per Part 2, Supplement 2 in an area exceeding 3 sq. in. (1,950 sq. mm). (See NBIC Part 3, Figure S2.13.9.1) Repair by weld buildup cannot be used if the wastage extends below the waterside surface of the mudring or if the strength of the structure will be impaired. If extensive welding is required, the affected area shall be removed and replaced with a flush patch."

2. Change text in c) to state "Wasted sections that have wasted below 60% of the minimum required thickness and have an area exceeding 3 sq. in. (1,950 sq. mm) shall be repaired by installing a flush patch using full penetration welds."

Update text can be found on page 3

Item #1
Update Text

Item #2
Update Text

S2.13.10.4 REPAIR OF STAYED FIREBOX SHEETS GROOVED OR WASTED AT THE MUDRING

a) Mudrings of the Ogee style (knuckle) shall be repaired in accordance with NBIC Part 3, S2.13.11.

b) For Mudrings of the locomotive style (see NBIC Part 3, Figure S2.13.10.4), grooved or wasted firebox sheets having greater than 60% of the minimum required thickness (see NBIC Part 3, Figure S2.13.9.1) remaining may be repaired by weld buildup provided the wastage does not extend below the waterside surface of the mudring and the strength of the structure will not be impaired. If extensive welding is required, the affected area shall be removed and replaced with a flush patch.

c) If the sheet thickness has been reduced to less than 60% of the minimum required thickness, the affected section shall be removed and replaced with a flush patch.

d) If wastage and grooving extends below the mudring waterside surface and if the plate thickness remaining has been reduced to less than the minimum required thickness, the affected section shall be removed and replaced with a flush patch. (See NBIC Part 3, Figure S2.13.10.4).

e) Flush patches shall be arranged to include the mudring rivets and at least the first row of staybolts above the mudring. (See NBIC Part 3, Figure S2.13.10.4-a).

f) For mudrings of the locomotive style, pitted and wasted sections of mudrings may be built up by welding provided the strength of the mudring will not be impaired. Where extensive weld buildup is employed, the Inspector may require an appropriate method of NDE for the repair.

g) Cracked or broken mudrings may be repaired by welding or installing flush patches using full penetration welds. Patches shall be made from material that is at least equal in strength and thickness to the original material. Patches shall fit flush on waterside surfaces. Where necessary, firebox sheets on both sides of the defect may be removed to provide access for inspection and welding.

FIGURE S2.13.10.4
Mudring Wastage Repair

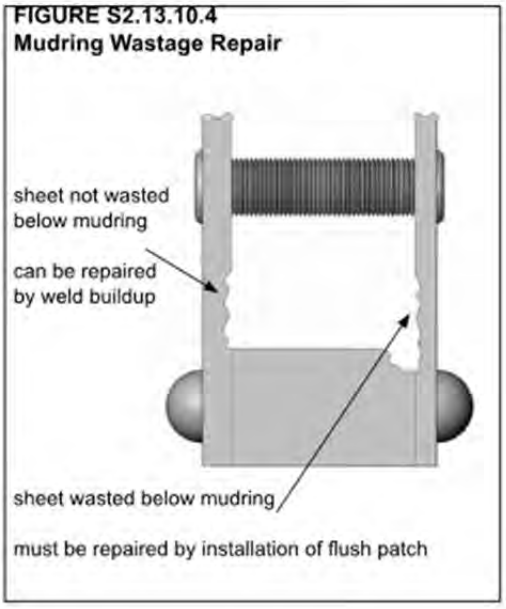
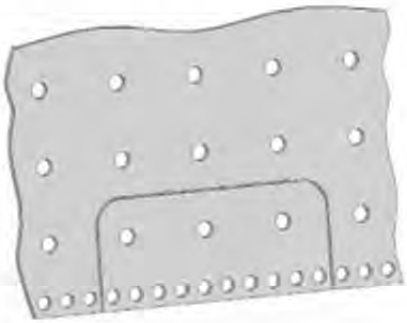


FIGURE S2.13.10.4-a
Mudring Flush Patch



S2.13.10.4 REPAIR OF STAYED FIREBOX SHEETS GROOVED OR WASTED AT THE MUDRING

b) For mudrings of the locomotive style (See NBIC Part 3, Figure S2.13.10.4), weld buildup shall not be used if the affected section of plate has wasted below 60% of the minimum required thickness per Part 2, Supplement 2 in an area exceeding 3 sq. in. (1,950 sq. mm). (See NBIC Part 3, Figure S2.13.9.1) Repair by weld buildup cannot be used if the wastage extends below the waterside surface of the mudring or if the strength of the structure will be impaired. If extensive welding is required, the affected area shall be removed and replaced with a flush patch."

c) Wasted sections that have wasted below 60% of the minimum required thickness and have an area exceeding 3 sq. in. (1,950 sq. mm) shall be repaired by installing a flush patch using full penetration welds.

NB13-0201

Subject: 2007 Edition, Part 3, Supplement 2, S2.13.14.2 – Repair of Handhole Openings

File Number: NB13-0201

Prop. Page: 170 & 171

Proposal: Change the wording in providing more guidance for evaluating local pitting corrosion versus general corrosion.

Explanation: Clarify the 60% minimum required thickness and make the description the same in all area's that figure S.2.13.9.1 reference.

1. Add "in an area exceeding 3 sq. in. (1,950 sq. mm)." to a)
2. Move Text "Weld buildup of wasted areas shall not exceed 100 sq. in. (65,000 sq. mm)." to item d) to match other area's of the NBIC repair section.
3. Add "and have an area exceeding 3 sq. in. (1,950 sq. mm)" to c)

Update text and diagram can be found on page 3

Item #1
Add the text below:

in an area exceeding 3 sq. in. (1,950 sq. mm).

S2.13.14.2 REPAIR OF HANDHOLE OPENINGS

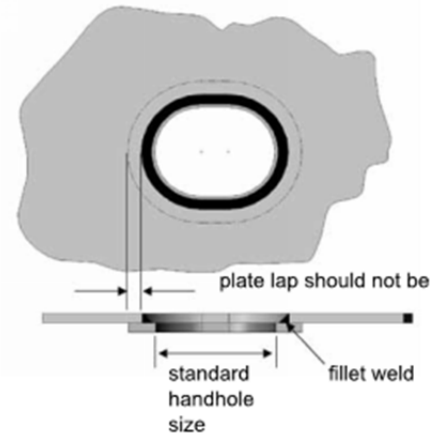
a) Weld buildup shall not be used if the affected section of plate has wasted below 60% of the original thickness per NBIC Part 3, Supplement 2. (See NBIC Part 3, Figure S2.13.9.1.) Weld buildup of wasted areas shall not exceed 100 sq. in. (65,000 sq. mm).

Item #2
Move circle text to new item d)

b) Weld buildup is to replace material that has been lost due to wastage and grooving, and is not to replace thickness on the opposite side of the sheet. Weld buildup must be applied to the side of the sheet that is wasted or grooved.

c) Wasted sections that have wasted below 60% of the minimum required thickness shall be repaired by installing a flush patch using full penetration welds or by the installation of a ring on the inside (pressure side) of the sheet. (See NBIC Part 3, Figure S2.13.14.2).

FIGURE S2.13.14.2
Repair of Handhole Opening



Item #3
Add the text below:

and have an area exceeding 3 sq. in. (1,950 sq. mm).

S2.13.14.2 Repair of Handhole Openings

a) Weld buildup shall not be used if the affected section of plate has wasted below 60% of the minimum required thickness per Part 2, Supplement 2 in an area exceeding 3 sq. in. (1,950 sq. mm). (See NBIC Part 3, Figure S2.13.9.1)

b) Weld buildup is to replace material that has been lost due to wastage and grooving, and is not to replace thickness on the opposite side of the sheet. Weld buildup must be applied to the side of eth sheet that is wasted or grooved.

c) Wasted sections that have wasted below 60% of the minimum required thickness and have an area exceeding 3 sq. in. (1,950 sq. mm), shall be repaired by installing a flush patch using full penetration welds.

d) Weld buildup of wasted areas shall not exceed 100 sq. in. (65,000 sq. mm).