Date Distributed: January 20th, 2015

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

SUBGROUP REPAIRS and ALTERATIONS

MINUTES

Meeting of January 20, 2015
Orlando, FL

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 – 8:00 a.m.**

2. **Announcements**
   Angelo Bramucci and Bill Vallance presented the announcements pertaining to the activities for the week.

3. **Adoption of the Agenda**
   A motion was made and approved to accept the agenda as amended.

4. **Approval of Minutes of July 15, 2014 meeting**
   A motion was made and approved to accept the July 15, 2014 General and Specific Committees Minutes.

5. **Review of the Roster** (Attachment page 1- 6)

Mr. Joel Amato would like to become a member of the SG on Repairs and Alterations. A vote will be taken.
A motion was and Mr. Amato was approved for membership to the Subgroup pending the approval of the Chairman of the Board of Trustees.

Ms. Kathy Moore would like to become a member of the SG on Repairs and Alterations. A vote will be taken.
A motion was made and Ms. Moore was approved for membership to the Subgroup pending the approval of the Chairman of the Board of Trustees.

Mr. Tom White would like to become a member of the SG on Repairs and Alterations. A vote will be taken.
A motion was made and Mr. White was approved for membership to the Subgroup pending the approval of the Chairman of the Board of Trustees.

Messrs. Brian Boseo, Larry McManomon,Jr, Brian Morelock,PE, and Ron Pulliam are eligible for reappointment to the SG on Repair and Alteration pending the approval of the Chairman of the Board of Trustees.
A motion was made and approved to reappoint them to the Subgroup pending approval of the Chairman of the Board of Trustees.

6. **Action Items**

NB12-0801 - Part 3 - Repair and alteration of Gasketed PHEs in the field. (Attachment pages 7-16)

January 2015
Mr. Cauthon is expected to report.
Mr. Cauthon presented a progress report informing the committee there is still need for Section VIII Div-1 to incorporate an appendix for PHE vessels for the task group to repair and alteration code requirements.

The task group consists of Mr. Cauthon as the New Project Manager, with new members Nathan Carter, and Bob Wielgoszinski.

NB14-0301 - Part 3 – ~~Manufactured parts~~ Encapsulation (Attachment 17-19)

January 2015
Mr. Wielgoszinski is expected to report.
Mr. Wielgoszinski presented a document to be sent out for a Review and Comment vote ballet. To accompany the document he wants sent out ASME BCC2.
A motion was made and approved to send out the documents for a review and comment ballet

NB14-0302 - Part 3, S6 – Addition of TR forms (Attachment pages 20-28)

January 2015
A progress report is expected.
A task group was set up with Chuck Withers as the Project Manager, and members Bob Underwood, Kathy Moore and Bill Vallance to address the TR program revisions that need to be incorporated into Part 3.

NB14-0701 - Part 3, 3.2.2 c) - This action item is a result of IN13-0301. The rationalization is to support an intent interpretation that addresses an R-Certificate holder's capability to fabricate ASME pressure parts to be used in a repair or alteration being performed by the same R-Certificate holder who is fabricating the ASME pressure part. The current words in NBIC Part 3 do not support this. (Attachment pages 29-30)

January 2015
Mr. Wielgoszinski is expected to report.
Mr. Wielgoszinski presented a document to send out for an up or down vote letter ballet at the Subcommittee.
A motion was made and approved to present the document to the Subcommittee to be sent out for an up or down letter ballet vote.

NB14-2401 - Part 3, S6.5 - Replacing the referenced TR-1 form with a TR-3 form. (Attachment pages 31-33)

January 2015
A progress report is expected.
A task group was set up with Chuck Withers as the Project Manager, and members Bob Underwood, Kathy Moore and Bill Vallance to address the TR program revisions that need to be incorporated into Part 3.

NB14-2402 - Part 3, S6.3 - TR accreditation. his will be addressed in TR NB document on accreditation of TR certificate holders. The paragraphs referenced will be removed from NBIC part 3 and placed into the NB document. (Attachment pages 34-35)

January 2015
A progress report is expected.
A task group was set up with Chuck Withers as the Project Manager, and members Bob Underwood, Kathy Moore and Bill Vallance to address the TR program revisions that need to be incorporated into Part 3.

NB15-0507 – Part 3, 1.2 f)- This item is a result of PR15-0104 - It is recognized that "DOT" is the US Department of Transportation. "DOT", however, is used throughout, but is not defined in Part 3. Since the NBIC is an International Standard, in my opinion this should be defined. As this section is the first occurrence of "DOT" in Part 3, this could be handled by the following change, which would also inherently limit the text to the DOT by the inclusion of "i.e.". Part 3, 1.2 (f) : "the Competent Authority, i.e. the US Department of Transportation (DOT), shall…." (Attachment pages 36-37)

January 2015
A task group is expected to be formed to address this item.
Nathan Carter submitted proposed code change for NBIC Part 3 paragraph: 1.2 f) addressed in PR15-0104.
A motion was made and approved to define DOT in Part 3, 1.2 f)

NB15-0508 –Part 3, 1.8.7.2 - This item is a result of PR15-0125, PR15-0126, PR15-0127 and PR15-0130 - The personnel qualification programs and documents listed do not comply with 2013 Edition Section XI. Only CP-189 and the ACCP Certification program is listed in IWA-2310, with the exception of SNT-TC-1A, which is valid only until recertification is required, which is a 5 year recommended maximum per SNT-TC-1A 2006. As a result, I interpret IWA-2310 to mean SNTTC-1A is being discontinued and is no longer valid for new Certifications. Also, the ASNT NDT Level II and III programs are not recognized as acceptable for stand-alone use by any current ASME BPV Construction Code, but historically, it may have been. I am assuming that is what is inferred by the term "ASNT".

January 2015
A task group is expected to be formed to address this item.
NB15-0508 was motioned and approved to be closed and 4 new action items opened to address each public review comment separately. These new action items are as follows NB15-1406 thru NB15-1409.

NB15-1406 A motion was made by George Galanes and approved to close this Item associated with PR15-0125 without changes. (Attachment page 38)
NB15-1407 Part 3, 1.8.8.2 A motion was made and approved to add wording "brazing and fusing" to 1.8.8.2 QUALITY PROGRAM ELEMENTS to close item associated with PR15-0126. (Attachment pages 39-40)
NB15-1408 Part 3, 1.8.7.2 n) A motion was made and approved to add the wording to change NBIC Part 3 paragraph: 1.8.7.2 n) 2) f) to add ASME Section V Article 2into the text to close item associated PR15-0127. (Attachment pages 41-42)
NB15-1409 Part 3 1.8.7.2 g) A motion was made and approved to add the wording to change NBIC Part 3 paragraph: 1.8.7.2 g) to begin the paragraph with the word, Purchase of materials, and eliminate the first seven (7) words to close item associated with PR15-0130. (Attachment pages 43-44)

NB15-0509- Part 3, 2.5.3.6 – This action item is a result of PR15-0157, PR15-0158, PR15-0156 and PR15-0501. These comments all pertain to Welding Method 6. (Attachment pages 45-47)

January 2015
A task group is expected to be formed to address this issue.
A motion was made and approved to add wording to change NBIC Part 3 paragraph: 2.5.3.6 c) 5) d) to add e.g to the 4 filler metal designations to close this item associated with PR15-0156.

A motion was made and approved to correspond with Mr. Kinc as his public review comment PR15-0501 is parallel to PR15-0156.

A motion was made and approved to open a new action item **NB15-1402** to address PR15-0157 and PR15-0158.

NB15-1402 Humidity, Weld Method 6- Task group was formed with George Galanes as project manager and members Nathan Carter and John Siefert to work on the public comments PR15-0157 & PR15-0158. (Attachment pages 48-49)

NB15-0510 – Part 3, 3.3.3.4.9 b) –This item is a result of PR15-0119. What about for a brazed boiler, should tube plugging by brazing be considered for inclusion? I have no knowledge of its use. (Attachment page 50)

January 2015
A task group is expected to be formed to address this issue.
A motion was made and approved to take no action on PR15-0119 as strength calculations would be impracticable for brazing.

NB15-0511- Part 3, 5.13.5.1- This item is a result of PR15-0120- What about Category 3

repairs/alterations, etc. What if it was performed to an International Code other than Section III or XI? Per the instruction, there isn't a way to address this situation. (Attachment page 51)

January 2015
A task group is expected to be formed to address this issue.

A task group was formed with the Project Manager as Paul Edwards, with the members as Ben Schafer, Bob Wielgoszinski, and Chuck Withers.

NB15-0512 –Part 3, ~~S3.5.5.b~~ S3.5.6b) – This item is a result of PR15-0121. My comment refers to Section VIII, Division 1, Part UGI-79 and UGI-80 referenced on the last line. After reading these paragraphs in whole, I do not understand why only some of the subsections are listed and not the whole of UGI-79 and UGI-80. In my opinion, all of UGI-79 and UGI-80 should be included. (Attachment page 52)

January 2015
A task group is expected to be formed to address this issue.

Discussion was made to have this item moved to the SG on Graphite. Information should be presented that this SG agrees with the information in PR15-0121.

NB15-0513 –Part 3, S6.14.1- This action item is a result of PR15-0136 and PR15-0122. Fifth line down. "Registered Inspector" is used but is not defined in Part 3. Use of the term "Inspector" and "Registered Inspector" is also used interchangeably in the current published text not under review. Consistency is needed in this Supplement. (Attachment page 53)

January 2015
A task group is expected to be formed to address this issue.
A task group was set up with Chuck Withers as the Project Manager, and members Bob Underwood, Kathy Moore and Bill Vallance to address the TR program revisions that need to be incorporated into Part 3 for PR15-0122.

A motion was made and approved to open a new action item **NB15-1410** to address PR15-0136.
NB15-1410 Part 3 Embossing and Nameplates for S6.14.1 f) (Attachment pages 54-55)
A motion was made and approved to accept the proposed revision to the 2017 code part 3 S6.14.1.f) that was associated with RP15-0136.

NB15-1003 Part 3 – Address wording of "ASME Code Symbol Stamp" vs. "Symbol" vs. "Code Symbol" vs. "Stamp" vs. "Certification (No attachment)

January 2015
A task group is expected to be formed to address this item.

A task group was formed with Rob Trout as Project Manager with members Joel Amato and James Pillow to include a possible footnote or harmonize the code wording.

NB15-1101 Part 3 - Testing and certification of carbon fiber reinforced plastic systems (No attachment)

January 2015
A task group is expected to be formed to address this item. John Huedepohl from HJ3 Composite Technologies, LLC is expected to present
George Galanes gave a progress report that HJ3 Composite Technologies, LLC is expected to give a presentation at the July 2015 meeting.

NB15-1201 - Part 3, 5.6- "R" should be deleted in the text of 5.6 to make the requirement for form logs applicable to "R", "VR", and "NR"; also the title should be changed. (No attachment)

January 2015
Action is expected to be taken to address this issue.
A progress report was given and this item requires further information from NB staff for action to be taken.

7. New Business

NB15-1401 Part 3 – 3.3.4.3 Weld Build-up Thin Walled Tubes
A task group was formed with Walt Sperko as Project manager, members George Galanes and John Siefert. (Attachment Pages 56-64)

NB15-1403 Part 3 New Supplement Weld Repair of CSEF Grade 91 Steels
A task group was formed with George Galanes as Project Manager with member John Siefert.
John Siefert presented a power point presentation giving research information for a possible supplement. (Attachment Pages 65-102)

NB15-1404 Part 3-Definition for Existing Material (ref, 1.6.1 i and 3.2.1)
A task group was formed with Wayne Jones as the Project Manager and members Marty Toth, Joel Amato, and Rob Trout to develop a definition or a footnote for the term existing material. (Attachment Pages 103-104)

IN14-0401 Part 3, 1.2, SC on R and A –
Question 1: The NBIC Part 3 paragraph 1.2 states that a repair shall be carried out "insofar as possible to the section and edition of the ASME code most applicable to the work planned." If a vessel is constructed using SA-517-E (P-11B) material to ASME Section VIII Div. 1, where production and weld procedure impact tests were required during construction, would a repair to a crack in the shell require production and weld procedure impact testing under the NBIC? Proposed Reply 1: Yes.

Question 2: If the answer to Question 1 is yes and there was no SA-517-E material from the original lot available, would the repair require the addition of new base material (e.g. a flush patch around the area of the crack) so that production impact tests could be performed with the original base metal to the new base metal? Proposed Reply 1: Yes.

Question 3: If the vessel described in Question 1 was to be altered by adding an SA-675 (P-1) pump flange to the shell, would production and weld procedure impact tests be required using the same lot P-1 and P-11B base materials as used in the alteration? Proposed Reply 1:Yes.

January 2015
Mr. Wielgoszinski is expected to report.
A motion was made to close this interpretation and open up a new action Item.
The new action item will be:
NB15-1405 Part 3-Impact testing of P-11 Material (From IN14-0401)
A task group was formed with Bob Wielgoszinski, as project manager and member Ben Schaefer, Walt Sperko, Monty Bost, and Dave Ford. (Attachment pages 105-106)

IN14-0701 - Part 3 PWHT of a Vessel - Subject: NBIC 2010, Part 3, Post Weld Heat Treatment of a Vessel. Q1. Must a company that performs post weld heat treatment be required to hold an "R" certification? ANS: YES Q2. Is this post weld heat treatment now considered an "Alteration" to this vessel, as per NBIC part 3? ANS: YES Q3. Shall this "Alteration" be documented on a NBIC R-2 form? ANS: YES) (Attachment page 107)

January 2015
Mr. Galanes is expected to report.

With Mr. Galanes guiding committee members responses to the interpretation they came up with 3 committee questions and answers.
A motion was made and approved to accept the final draft.

IN14-0801 – Part 3, 3.3.3 s) Question: 2013 NBIC, Part 3, Section 3.3.3, paragraph s)
Is it the intent of the term "minimum required thickness" to mean nominal wall minus corrosion allowance as shown on the manufacturer's U-1 form? Reply: Yes (Attachment pages 108-123)

January 2015
Mr. Morelock is expected to report.

Mr. Trout Presented the task groups response for the committee. After deliberating over the revisions to documents a motion was made and the result of the vote was 7 members voted negative and all others abstained.
The negative votes were, James Pillow, Dave Matinez, Rob Trout, Joel Amato, Ben Schaefer, Mike Webb, and Brian Boseo.
The task group will revise the wording and submit it to the Subcommittee at tomorrow's meeting.

8. **Future Meetings**

   July 2015 – Columbus, Ohio
   January 2016 – Arizona, (city to be determined)

9. **Adjournment at 4:30 pm**
   Respectfully Submitted,

   Bill Vallance
   Secretary

Last Name	First Name	Interest Category	Role	Exp. Date
Bramucci	Angelo	~~Authorized Inspection Agencies~~ MANUFACTURER	Chair	01/31/2016
Schulte	Bryan	Users	Vice Chair	07/31/2015
Vallance	William		Secretary	01/31/2099
Boseo	Brian	National Board Certificate Holders	Member	01/31/2015
Cauthon	~~Randall~~ Randal	Manufacturers	Member	07/31/2016
Edwards	Paul	National Board Certificate Holders	Member	07/31/2015
Galanes, PE	George	Users	Member	07/31/2015
Hopkins	Craig	National Board Certificate Holders	Member	01/31/2016
Johnson	Frank	Users	Member	07/31/2015
Jones	Wayne	Authorized Inspection Agencies	Member	08/31/2017
Larson	James	Authorized Inspection Agencies	Member	07/31/2015
Martinez	David	Authorized Inspection Agencies	Member	07/31/2016
McManamon, Jr.	Larry	Labor	Member	01/31/2015
Miletti	Ray	Manufacturers	Member	07/31/2015
Morelock, PE	Brian	Users	Member	01/31/2015
~~Ortman~~	~~Edward~~	~~Users~~ Removed	~~Member~~	~~07/31/2016~~
Pillow	James	General Interest	Member	07/31/2015
Pulliam	Ron	Manufacturers	Member	01/31/2015
Schaefer	Benjamin	National Board Certificate Holders	Member	01/31/2017
Sekely	James	General Interest	Member	07/31/2015
Sperko	Walter	General Interest	Member	07/31/2016
Toth	Martin	National Board Certificate Holders	Member	07/31/2016
Troutt	Rob	Jurisdictional Authorities	Member	08/31/2017
Valdez	Rick	Manufacturers	Member	08/31/2017
Webb	Michael	Users	Member	07/31/2015

Attendance List Subgroup Repairs and Alterations

Meeting Date: **January 20 2015,**

Angelo Bramucci Alstom Power Inc., HRSG 175 Addison Road Windsor, CT 06095 Phone: (860)285-9176 Fax: Email: angelo.c.bramucci@power.alstom.com	Attended: Yes ☑ No ☐ *Initial*	**Craig Hopkins** Seattle Boiler Works 500 South Myrtle Street	Attended: Yes ☐ No ☐ *Initial*
Walter Sperko Sperko Eng 4803 Archwood Drive Greensboro, NC 27406 Phone: (336)674-0600 Fax: Email: sperko@asme.org	Attended: Yes ☑ No ☐ *Initial*	**Benjamin Schaefer** American Electric Power ~~Service Corporation~~ 1 Riverside Plaza 18 Floor Columbus, OH 43215 Phone: (614)716-1843 Fax: (614) 716-1744 Email: bschaefer@aep.com	Attended: Yes ☑ No ☐ *Initial*
Rick Valdez ARB, Inc. 3500 Pegasus Drive Bakersfield, CA 93308 Phone: (661)331-6024 Fax: Email:rvaldez@arbinc.com	Attended: Yes ☐ No ☐ *Initial*	~~Martin~~ **Toth** Marty Boiler Supply Company, Inc. Director of Service Operations 2950 Foster Creighton Drive Nashville, TN 37204 Phone: (615)504-9064 mtoth@boisco.com	Attended: Yes ☑ No ☐ *Initial*
Ron Pulliam Babcock & Wilcox Power Generation Group, Inc. 20 South Van Buren Avenue Barberton, OH 44203 Phone: (330)860-2856 RLPulliam@babcock.com	Attended: Yes ☒ No ☐ *Initial*	~~Randall Cauthon~~ RANDAL (RANDY) ~~APComPower Inc.~~ ALSTOM POWER INC. 200 Great Pond Drive Windsor, CT 06095 Phone: (860)285-3481 Fax: Email: randal.t.cauthon@power.alstom.com	Attended: Yes ☑ No ☐ *Initial*

Attendance List Subgroup Repairs and Alterations

Meeting Date: **January 20 2015,**

Brian Boseo Graycor Services LLC Two Mid America Plaza, Suite 400 Oakbrook Terrace, IL 60181 Ph: 708-941-3016 Fax: 630-684-7116 E-mail: brian_boseo@graycor.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 McManamon** Great Lakes Apprenticeship Program 566 W. 95th Street Oak Lawn, IL 60453 Ph: 708.636.6656 Fax: E-mail: Lmac@gLabap.com	Attended: Yes ☐ No ☐ Initial
Rob Troutt State of Texas Chief Boiler Inspector Texas Department of Licensing and Regulation Boiler Program 920 Colorado Street Austin, TX 78701 Phone: (512)539-5720 Fax: Email: rob.troutt@tdlr.texas.gov	Attended: Yes ☑ No ☐ Initial	**Ray Miletti** Babcock & Wilcox Construction Company, Inc. 74 Robinson Avenue Barberton, OH 44203 Phone: (330)860-2589 Fax: Email: RLMILETTI@BABCOCK.COM	Attended: Yes ☒ No ☐ Initial

Attendance List Subgroup Repairs and Alterations

Meeting Date: **January 20 2015,**

Paul Edwards Director ASME Programs CB&I Construction Department Power Sector 150 Royall Street Canton, MA 02072 Ph: 617-589-5690 Fax: 617-589-~~1792~~ 5677 CBI Email: paul.edwards@~~chawgrp~~.com	Attended: Yes ☑ No ☐ Initial	**William Vallance** The National Board 1055 Crupper Ave. Columbus, OH 43229 Ph: 614-888-8320 Fax: 614-847-1828 E-mail: bvallance@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** Metallurgical Consulting Engineer Diamond Technical Services, Inc./Lisle, IL Office Ph: 630-799-8162 Office 312-925-1341 Cell Fax: ggalanes@diamondtechnicalservices.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	**Brian Morelock** Eastman Chemical Company P.O. Box 511 B54D Kingsport, TN 37660 Ph: 423-229-1205 Fax: 423-229-6099 Email: morelock@eastman.com	Attended: Yes ☒ No ☐ Initial

Attendance List Subgroup Repairs and Alterations

Meeting Date: **January 20 2015,**

David Martinez M FM Global 2100 Reston Parkway Reston, VA 20191 Phone: (703)262-6311 Fax: david.martinez@fmglobal.com	Attended: Yes ☑ No ☐ DM Initial	**Frank Johnson** F1819 Woodville Road Oregon, OH 43616-3159 M Phone: (419)698-6614 419-386-8450 Cell Fax: Email: Frank.Johnson@pbfenergy.com	Attended: Yes ☑ No ☐ FJ Initial
Name: Brian Boseo M Company: Graycor Services LLC Address: Two Mid America Plaza City/State/Zip: Oakbrook Terrace, IL 60181 Ph: 630.684.7300 Ext. Fax: 630.684.7116 E-mail: brian_boseo@graycor.com		Name: Brad Besserman Company: National Board Address: City/State/Zip: Ph: Ext. Fax: E-mail:	
Name: Joel T. Amato Company: State of MN Address: 443 Lafayette Rd N City/State/Zip: St. Paul, MN 55155 Ph: 651-284-5137 Ext. Fax: E-mail: joel.amato@State.MN.us		Name: DAN MAREK Company: MAINTHIA TECHNOLOGIES INC Address: 21000 BROOKPARK RD, MS. 5-5 City/State/Zip: CLEVELAND, OH 44035 Ph: 216-433-5494 Ext. Fax: E-mail: DANIEL.T.MAREK@NASA.GOV	

Attendance List Subgroup Repairs and Alterations

Meeting Date: **January 20 2015,**

Name: WARREN TAYLOR III Company: DOMINION Address: 5000 DOMINION BLVD City/State/Zip: GLEN ALLEN VA 23060 Ph: 804 273 3226 Ext. Fax: E-mail: WARREN.TAYLOR@DOM.COM	Name: CLAYTON NOVAK Company: STATE of ILLINOIS Address: 100 W. RANDOLPH ST, CHICAGO City/State/Zip: IL 60601 Ph: 815-263-1144 Ext. Fax: E-mail: CLAYTON.NOVAK@ILLINOIS.GOV
Name: ROBERT UNDERWOOD Company: HSB GLOBAL STANDARDS Address: 1011 Warrenville Rd Ste 400 City/State/Zip: Lisle, IL 60532 Ph: 618-593-6231 Ext. Fax: E-mail: robert_underwood@hsbct.com	Name: Bonnie Petersen Company: MarquipWard United Address: 1300 N Airport Rd City/State/Zip: Phillips, WI 54553 Ph: 715-339-2191 Ext. 1235 Fax: E-mail: bonnie.petersen@marquipwardunited.com
Name: MONTE BOST Company: HSB Global Standards Address: 1011 Warrenville Rd Ste 400 City/State/Zip: Lisle, IL 60532 Ph: 937-620-3676 Ext. Fax: E-mail: MONTE_BOST@HSBCT.COM	Name: MATTHEW VAZQUEZ Company: ASME Address: 2 Park Ave City/State/Zip: New York, NY 10016 Ph: (212) 591-8522 Ext. Fax: E-mail: VAZQUEZM@ASME.ORG
Name: JAMIE WALKER Company: HAYES MECHANICAL Address: 5959 S. HARLEM AVE. City/State/Zip: CHICAGO, IL 60638 Ph: 773.252.2707 Ext. Fax: 773.784.0010 E-mail: JWALKER@HAYESMECHANICAL.COM	Name: Company: Address: City/State/Zip: Ph: Ext. Fax: E-mail:

NBIC Subcommittee R&A Action Block

Subject	Gasketed Plate Heat Exchangers		
File Number	NB12-0801	**Prop. on Pg.**	1 thru 9
Proposed Revision	Add examples of routine repairs, repairs, and alterations for gasketed plate heat exchangers and revise R-1 form to include gasketed PHEs.		
Statement of Need	Because of the unique design of the PHE, the current ASME Pressure Vessel and NBIC Codes do not specific ally address the design of PHE's, nor the potential r epairs or alterati ons. This is intended to provide guidance to the industry and the Jurisdictions.		
Project Manager	Ed Ortman		

SubGroup	R&A Specific		
SubGroup Negatives		**SG Meeting Date**	July 16, 2013

SubCommittee Negatives		**SC Meeting Date**	July 17, 2013

3.2.5 CALCULATIONS

For alterations, calculations shall be completed prior to the start of any physical work. All design calculations shall be completed by an organization experienced in the design portion of the standard used for construction of the item. All calculations shall be made available for review by the Inspector accepting the design.

3.2.6 REFERENCE TO OTHER CODES AND STANDARDS

Other codes, standards, and practices pertaining to the repair and alteration of pressure retaining items can provide useful guidance. Use of these codes, standards and practices is subject to review and acceptance by the Inspector, and when required, by the Jurisdiction. The user is cautioned that the referenced codes, standards and practices may address methods categorized as repairs; however, some of these methods are considered alterations by the NBIC.

In the event of a conflict with the requirements of the NBIC, the requirements of the NBIC take precedence. Some examples are as follows:

(a) National Board *Bulletin* - National Board Classic Articles Series;

(b) ASME PCC-1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly;

(c) ASME PCC-2, Repair of Pressure Equipment and Piping.

3.3 REPAIRS TO PRESSURE-RETAINING ITEMS

3.3.1 DEFECT REPAIRS

Before a repair is made to a defect in a welded joint or base metal, care should be taken to investigate its cause and to determine its extent and likelihood of recurrence.

3.3.2 ROUTINE REPAIRS

a) Routine repairs are repairs for which the requirements for in-process involvement by the Inspector and stamping by the "R" Certificate Holder may be waived as determined appropriate by the Jurisdiction and the Inspector. All other applicable requirements of this Code shall be met. Prior to performing routine repairs, the "R" Certificate Holder should determine that routine repairs are acceptable to the Jurisdiction where the pressure-retaining item is installed;

b) The Inspector, with the knowledge and understanding of jurisdictional requirements, shall be responsible for meeting jurisdictional requirements and the requirements of this Code;

c) The "R" Certificate Holder's Quality System Program shall describe the process for identifying, controlling, and implementing routine repairs. Routine repairs shall be documented on Form R-1 with this statement in the Remarks section: "Routine Repair.";

d) Repairs falling within one or more of the following categories may be considered routine:

1) Welded repairs or replacements of valves, fittings, tubes, or pipes NPS 5 (DN 125) in diameter and smaller, or sections thereof, where neither postweld heat treatment nor NDE other than visual is re-

5) The following on gasketed plate heat exchangers:
   i) Removal and replacement of heat transfer plates identical to those listed on the Manufacturer's Data Report;
   ii) In kind replacement of tightening bolts;
   iii) A change in welded attachments (e.g. welded feet).

3) Weld buildup of wasted areas in heads and shells not exceeding an area of 100 sq. inches (64,520 sq. mm) or a thickness of 25% of nominal wall thickness or ½ inch (13 mm), whichever is less; A11

4) Corrosion resistance weld overlay not exceeding 100 sq. in. (64,520 sq. mm).

3.3.3 EXAMPLES OF REPAIRS

a) Weld repairs or replacement of pressure parts or attachments that have failed in a weld or in the base material;

b) The addition of welded attachments to pressure parts, such as:

   1) Studs for insulation or refractory lining;

   2) Hex steel or expanded metal for refractory lining;

   3) Ladder clips;

   4) Brackets having loadings that do not affect the design of the pressure-retaining item to which they are attached; and

   5) Tray support rings.

c) Corrosion resistant strip lining, or weld overlay;

d) Weld buildup of wasted areas;

e) Replacement of heat exchanger tubesheets in accordance with the original design;

f) Replacement of boiler and heat exchanger tubes where welding is involved;

g) In a boiler, a change in the arrangement of tubes in furnace walls, economizers, or super heater sections;

h) Replacement of pressure-retaining parts identical to those existing on the pressure-retaining item and described on the original *Manufacturer's Data Report*. For example:

   1) Replacement of furnace floor tubes and/or sidewall tubes in a boiler;

   2) Replacement of a shell or head in accordance with the original design;

   3) Rewelding a circumferential or longitudinal seam in a shell or head;

   4) Replacement of nozzles of a size where reinforcement is not a consideration;

i) Installation of new nozzles or openings of such a size and connection type that reinforcement and strength calculations are not a consideration required by the original code of construction;

j) The addition of a nozzle where reinforcement is a consideration may be considered to be a repair, provided the nozzle is identical to one in the original design, located in a similar part of the vessel, and not closer than three times its diameter from another nozzle. The addition of such a nozzle shall be restricted by any service requirements;

k) The installation of a flush patch to a pressure-retaining item;

l) The replacement of a shell course in a cylindrical pressure vessel;

m) Welding of gage holes;

n) Welding of wasted or distorted flange faces;

o) Replacement of slip-on flanges with weld neck flanges or vice versa;

p) Seal welding of buttstraps and rivets;

q) Subject to the administrative procedures of the Jurisdiction and approval of the Inspector, the replacement of a riveted section or part by welding;

r) The repair or replacement of a pressure part with a code-accepted material that has a nominal composition and strength that is equivalent to the original material, and is suitable for the intended service; and

s) Replacement of a pressure-retaining part with a material of different nominal composition, equal to or greater in allowable stress from that used in the original design, provided the replacement material satisfies the material and design requirements of the original code of construction under which the vessel was built. The minimum required thickness shall be at least equal to the thickness stated on the original *Manufacturer's Data Report*.

t) The replacement of a Pressure Relieving Device (PRD) attached by welding, provided the replacement device's relieving capacity is equal to or greater than the PRD-capacity required by the original code of construction.

3.3.4 REPAIR METHODS

u) In a gasketed plate heat exchanger:
1) Weld repair of any pressure part (e.g. nozzle repair or in kind replacement of nozzle);
2) In kind replacement of frame or pressure plates.

Except as provided in NBIC Part 3, 3.3.4.6, a repair of a defect in a welded joint or base material shall not be made until the defect has been removed. A suitable Nondestructive Examination (NDE) method, such as Magnetic Particle (MT) or Liquid Penetrant (PT), may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required, by the Jurisdiction.

3.4 ALTERATIONS

3.4.1 RE-RATING[10]

Re-rating of a pressure-retaining item by increasing the maximum allowable working pressure (internal or external) or temperature or decreasing the minimum design metal temperature below which notch toughness testing is required by the original code of construction, shall be done only after the following requirements have been met to the satisfaction of the Jurisdiction at the location of the installation:

a) Revised calculations verifying the new service conditions shall be prepared in accordance with the "R" Certificate Holder's Quality Control System. Establishing a higher joint efficiency to re-rate a pressure-retaining item is not permitted;

b) All re-ratings shall be established in accordance with the requirements of the construction standard to which the pressure-retaining item was built;

c) Current inspection records verify that the pressure-retaining item is satisfactory for the proposed service conditions;

d) The pressure-retaining item has been pressure tested, as required, for the new service conditions. Any insulation, coatings, or coverings that may inhibit or compromise a meaningful pressure test shall be removed, to the extent identified by the Inspector;

e) In lieu of pressure testing, alternative methods can be used to ensure the structural integrity of the re-rated pressure-retaining item. The alternative methods shall be documented and subject to review and approval by the Jurisdiction.

3.4.2 ALTERATIONS BASED ON ALLOWABLE STRESS VALUES

For re-rating or re-calculating a new minimum wall thickness for a pressure-retaining item using a later edition/addenda of the original code of construction or selected construction standard or code that permits use of higher allowable material stress values than were used in the original construction, the following requirements shall apply:

a) The "R" Certificate Holder shall verify, by calculations and other means, that the re-rated item can be satisfactorily operated at the new service condition (e.g., stiffness, buckling, external mechanical loadings);

b) The pressure-retaining item shall not be used in lethal service;

c) The pressure-retaining item shall not be used in high-cycle operation or fatigue service (i.e., loadings other than primary membrane stress are controlling design considerations) unless the pressure-retaining item was originally designed for fatigue service and a fatigue analysis is performed;

d) The pressure-retaining item shall have been constructed to the 1968 edition or later edition/addenda of the original code of construction;

e) The pressure-retaining item shall be shown to comply with all relevant requirements of the edition/addenda of the code of construction, which permits the higher allowable stress values (e.g., reinforcement, toughness, examination, pressure testing);

10 Re-rating: Except as provided for Yankee Dryers in Supplement 5, this code does not provide rules for de-rating boilers or pressure vessels; however, when the MAWP and/or allowable temperature of a boiler or pressure vessel is reduced, the Jurisdiction where the object is installed should be contacted to determine if specific procedures should be followed.

f) The pressure-retaining item shall have a satisfactory operating history and current inspection of the pressure-retaining item shall verify the item exhibits no unrepaired damage (e.g., cracks, corrosion, erosion). Areas of corrosion or erosion may be left in place provided the remaining wall thickness is greater than the minimum thickness for the new design conditions;

g) The re-rating shall be acceptable to the Inspector and, where required, the Jurisdiction;

h) All other requirements of Part 3, as applicable, and jurisdictional requirements shall be met;

i) Use of this paragraph shall be documented in the Remarks section of Form R-2.

3.4.3 EXAMPLES OF ALTERATIONS

a) An increase in the maximum allowable working pressure (internal or external) or temperature of a pressure-retaining item regardless of whether or not a physical change was made to the pressure-retaining item;

b) A decrease in the minimum temperature;

c) The addition of new nozzles or openings in a boiler or pressure vessel except those classified as repairs;

d) A change in the dimensions or contour of a pressure-retaining item;

e) In a boiler, an increase in the heating surface or steaming capacity as described on the original Manufacture's Data Report;

f) The addition of a pressurized jacket to a pressure vessel;

g) Except as permitted in NBIC, Part 3, 3.3.3 s);

h) Replacement of a pressure-retaining part in a pressure-retaining item with a material of different allowable stress or nominal composition from that used in the original design; and

i) The addition of a bracket or an increase in loading on an existing bracket that affects the design of the pressure-retaining item to which it is attached.

j) The replacement of a Pressure Relieving Device (PRD) as a result of work completed on a Pressure-Retaining Item (PRI) that changes the resultant capacity to exceed the Minimum Required Relieving Capacity (MRRC) required by the original code of construction as described on the original Manufacturer's Data Report.

3.4.4 ALTERATION OF ASME CODE SECTION VIII, DIVISION 2 OR 3, PRESSURE VESSELS

k) The following on gasketed plate heat exchangers:
a) A change in heat transfer plate material;
b) A change in thickness of heat transfer plates;
c) A change in tightening bolt material or grade;
d) A change in tightening bolt diameter
e) A change in the material or thickness of the frame plate of pressure plates.

The alteration plan shall be reviewed and certified by an Engineer meeting the criteria of ASME Section VIII, Division 2 or 3, as applicable, for an Engineer signing and certifying a Manufacturer's Design Report. The review and certification shall be such as to ensure the work involved in the alteration is compatible with the user's design specification and the Manufacturer's Design Report.

5.13.1 FORM R-1, REPORT OF REPAIR

FORM R-1 REPORT OF REPAIR
in accordance with provisions of the *National Board Inspection Code*

1. Work performed by (1) (name of repair organization) (2) (Form Registration No.)
   (53) (PO No., Job No., etc.)
2. Owner (3) (name)
   (address)
3. Location of installation (4) (name)
   (address)
4. Item identification (5) (boiler, pressure vessel or piping) Name of original manufacturer (6)
5. Identifying nos.: (7) (mfg. serial no.) (8) (National Board No.) (8) (jurisdiction No.) (8) (other) (9) (year built)
6. NBIC Edition/Addenda: (10) (edition) (10) (addenda)
   Original Code of Construction for Item: (11) (name/section/division) (11) (edition/addenda)
   Construction Code Used for Repair Performed: (11) (name/section/division) (11) (edition/addenda)
7. Repair Type: (55) ☐ Welded ☐ Graphite Pressure Equipment ☐ FRP Pressure Equipment
8. Description of work: (12) ☐ Form R-4, Report Supplementary Sheet is attached ☐ FFSA Form (NB-403) is attached
   (use Form R-4, if necessary)

   _____ Pressure Test, if applied (13) _____ psi MAWP (54) _____ psi
9. Replacement Parts. Attached are Manufacturer's Partial Data Reports or Form R-3s properly completed for the following items of this report:
   (14) (name of part, item number, data report type or Certificate of Compliance, mfg. name, and identifying stamp)
10. Remarks: (15)

Note to Editor: Add as part of line 7

☐ Gasketed Plate Heat Exchanger

SECTION 5

CERTIFICATE OF COMPLIANCE

I, (16), 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 Repair conforms to the *National Board Inspection Code*.
National Board "R" Certificate of Authorization No. (17) expires on (18), _____
Date (19), _____ (20) (name of repair organization) Signed (21) (authorized representative)

CERTIFICATE OF INSPECTION

I, (22), holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of (23)
and employed by (24) of (25)
have inspected the work described in this report on (26), _____ 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 certicate, 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 (19), _____ Signed (27) (inspector) Commissions (28) (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-66 Rev. 12

5.13.4.1 INSTRUCTIONS FOR COMPLETING NATIONAL BOARD FORM "R" REPORTS A11

These instructions are to be used when completing the National Board Form "R" Reports. When computer generated, the format of the form shall replicate the type and relative location of the information depicted on the Form "R" Reports shown in NBIC Part 3, 5.13.1 through 5.13.4.

1. The name and address of the "R" Certificate Holder performing the work as it appears on the "Certificate of Authorization". On a Form R-2, the organization that performed the design work will complete sheet 1 of 2, and the organization completing the construction activities will complete sheet 2 of 2. A11

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 NBIC Part 3,5.6, a log shall be maintained identifying sequentially, any Form "R" registered with the National Board. For re-rating only, the Design Organization registers the Form R-2. Where physical work is also performed, the Construction Organization registers the Form R-2. A11

3. Name and address of the Owner of the pressure-retaining item.

4. Name and address of plant or facility where the pressure-retaining item is installed.

5. Description of the pressure-retaining item, such as boiler or pressure vessel, or piping. Include the applicable unit identification. A11

6. Name of the original manufacturer of the pressure-retaining item. If the original manufacturer is unknown, indicate by, "unknown". A11

7. Document the serial number of the pressure-retaining item if assigned by the original manufacturer. If there is no serial number assigned or is unknown, indicate "unknown". A11

8. When the pressure-retaining item is registered with the National Board, document the applicable registration number. If the pressure-retaining item is installed in Canada, indicate the Canadian design registration number (CRN), and list the drawing number under "other." If the item is not registered, indicate, "none". A11

9. Identify the year in which fabrication/construction of the item was completed.

10. Indicate edition and addenda of the NBIC under which this work is being performed.

11. Indicate the name, section, division, edition, and addenda of the original code of construction for the pressure-retaining item. Also indicate the name, section, division, edition, and addenda of the construction code used for the work being performed. If code cases are used, they shall be identified in the "Remarks" section.

12. Provide a summary describing the exact scope of work that was completed to a Pressure-Retaining Item (PRI). The Information to be included when describing the scope of work shall consider items such as, 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 remove a defect or as allowed by NBIC Part 3, 3.3.4.8 to remain in place, the welding process and procedure when used, any special processes required such as PWHT; noting the soak time and temperatures recorded, and any acceptable in-process and final NDE-examinations or tests performed. When additional space is needed to fully describe the scope of work, a Form R-4 shall be used and attached.. A11

13. Indicate test pressure applied.

A11 14. As applicable, identify what parts manufactured by welding or bonding were introduced as needed to complete the scope of work. Indicate part, item number, manufacturer's name, stamped identification, and data report type or Certificate of Compliance.

15. Indicate any additional information pertaining to the work involved (e.g., routine repairs, code cases). For Form R-3, the part manufacturer is to indicate the extent he has performed any or all of the design function. If only a portion of the design, state which portion.

A11 16. Type or print name of authorized representative of the "R" Certificate Holder attesting to accuracy of the work described.

17. Indicate National Board "R" *Certificate or Authorization* number.

18. Indicate month, day, and year that the "R" certificate expires.

19. Enter date certified.

A11 20. Record name of "R" Certificate Holder who performed the described work, using full name as shown on the *Certificate of Authorization* or an abbreviation acceptable to the National Board.

21. Signature of authorized representative.

22. Type or print name of Inspector.

23. Indicate Inspector's Jurisdiction.

24. Indicate Inspector's employer.

25. Indicate address of Inspector's employer (city and state or province).

26. Indicate month, day, and year of inspection by Inspector. In case of Routine Repairs this shall be the month, day, and year the Inspector reviews the completed Routine Repair package.

27. Signature of Inspector.

28. National Board commission number of Inspector, and when required by the Jurisdiction, the applicable State or Provincial numbers.

A11 29. Document name and address of organization that purchased the parts for incorporation into the repair or alteration. If the part's origin is unknown or the part was built for stock, so state.

A11 30. Document name of organization responsible for specifying the code design conditions, if known. If origin of design conditions are unknown, state "unknown".

A11 31. Document name of organization responsible for performing the code design, if known. If code design organization is unknown, state "unknown".

A11 32. Name, section, and division of the design code, if known. If the design is unknown, state "unknown"

33. Indicate code edition year used for fabrication.

34. Indicate code addenda date used for fabrication.

35. Indicate the code paragraph reference for formula used to establish the MAWP, if known. If the code reference of the formula is unknown, state "unknown". A11

36. If available, identify component by part's original name, function, or use the original equipment manufacturer's "mark or item number." A11

37. Indicate quantity of named parts.

38. Match line number references for identification of parts and description of parts.

39. Indicate manufacturer's serial number for the named part.

40. Indicate drawing number for the named part.

41. Indicate Maximum Allowable Working Pressure for the part, if known.

42. Use inside diameter for size: indicate shape as square, round, etc.

43. Indicate the complete material specification number and grade.

44. Indicate nominal thickness of plate and minimum thickness after forming.

45. Indicate shape as flat, dished, ellipsoidal, or hemispherical.

46. Indicate minimum thickness after forming.

47. Indicate outside diameter.

48. Indicate minimum thickness of tubes.

49. Complete information identical to that shown on the Form R to which this sheet is supplementary.

50. Indicate the Form R type. Example: Form R-1, Form R-2, Form R-3.

51. Indicate the reference line number from the Form R to which this sheet is supplementary.

52. Complete information for which there was insufficient space on the reference Form R.

53. If applicable, document the unique purchase order, job, or tracking number, assigned by organization performing work. A11

54. Indicate the maximum allowable working pressure of the pressure-retaining item.

55. Indicate the type of repair, e.g., welded, graphite pressure equipment, or fiber-reinforced plastic pressure equipment, or gasketed plate heat exchanger.

Item NB14-0301

3.3.3 EXAMPLE OF REPAIRS

u) The installation of a welded leak box.

3.3.9 ENCAPSULATION

Encapsulation is a repair method to restore the pressure retaining capability of an item by building a new pressure containing boundary over the item in the form of a welded leak box.

a) Welded Leak Box

1) Welded leak box design consists of a pressure retaining enclosure used to seal off leaking components or reinforce damaged or thinned components. The use of a leak box~~,~~ is subject to~~and may be used with~~ concurrence of the inspector and, when applicable, the jurisdiction.

a. A leak box can take a variety of shapes (e.g., cylindrical, rectangular, with either flat or formed heads), often following the contour of the component being encapsulated. Leak boxes may be fabricated by welding split pipe, pipe caps, or plates to encapsulate a pressure retaining item. Consideration should be given to add centering guides to aid with the installation. An example of a Welded Leak Box is shown in NBIC Part 3, Figure 3.3.9.

b. The annular space between the leak box and the component may be filled with an inert material (i.e., epoxy, sealant, fiber, refractory, etc.) which will support the effectiveness of the repair under pressure.

2) A welded leak box shall not be used to encapsulate a crack.

3) A Fitness for Service Assessment (FFSA) shall have been performed on the part being encapsulated in accordance with NBIC, Part 2, 4.4.1, supporting the continued service of the item. The leak box shall not remain in place beyond the calculated life of the pressure retaining item.

4) Design of the box and fabrication welds shall be in accordance with the original code of construction for the pressure retaining item being encapsulated, using original design conditions, taking into account current operating and shutdown conditions. Corrosion resistance, and mechanical properties of the leak box shall be taken into account.

a. The leak box design shall consider the potential introduction of new failure modes including that of the encapsulated component (i.e., encapsulated parts, expansion joints, pressure thrust, temperature differential, differential expansion, additional weight, sealant seepage, etc.).

5) The following are requirements for the leak box design;

a. The welded leak box assembly should be designed with vents and drains to permit venting the leak during assembly.

b. The leak box shall fully encapsulate the ~~thinned~~thinned or leaking area to a distance where sound metal is achieved.

1. The encapsulated component shall be ultrasonically scanned to ensure sufficient wall thickness at the weld locations.

c. When sealant is injected between the leak box and the component, consideration shall be given to off-gassing of sealant compounds as they cure.

~~5)~~6) The WPS followed shall be qualified in accordance with ASME Section IX. When the code of construction requires post weld heat treatment (PWHT) or the encapsulated component required PWHT, the WPS followed shall be qualified with PWHT. As an alternative and with concurrence of the inspector an alternate welding method may be used in accordance with NBIC Part 3, 2.5.3.

a. The nominal chemical composition of the deposited weld metal shall be compatible with the materials of construction. In addition, the nominal tensile strength of the deposited weld metal shall be equal to or exceed the encapsulated component's specified minimum tensile strength and shall be based on the requirements of the welding consumable.

b. When pressure retaining butt welds of the encapsulated component will be welded over, they shall be ground flush and volumetrically examined in accordance with the code of construction to ensure the existing weld is free from defects.

c. Longitudinal weld seams of the leak box components shall be staggered at a distance of at least five (5) times the thickness of the thicker component.

d. When welding to a component that is under pressure, the following shall be considered in developing the WPS: ppreheat temperature, the effect of process fluid flow on weld cooling rate, the effect of the weldingg temperature on the strength of the metal under service conditions and the risk of burn through. When possible, consideration should be given to stopping leak to be encapsulated, prior to welding.

~~6)~~7)Welds shall be subjected to the nondestructive examination method used in the original code of construction or an alternative acceptable to the inspector. In addition, all full penetration longitudinal leak box welds shall be volumetrically examined and evaluated in accordance with the code of construction.

a. When pressure testing of the leak box is performed, the external pressure collapse of the encapsulated component during the test should be considered when determining the test pressure.

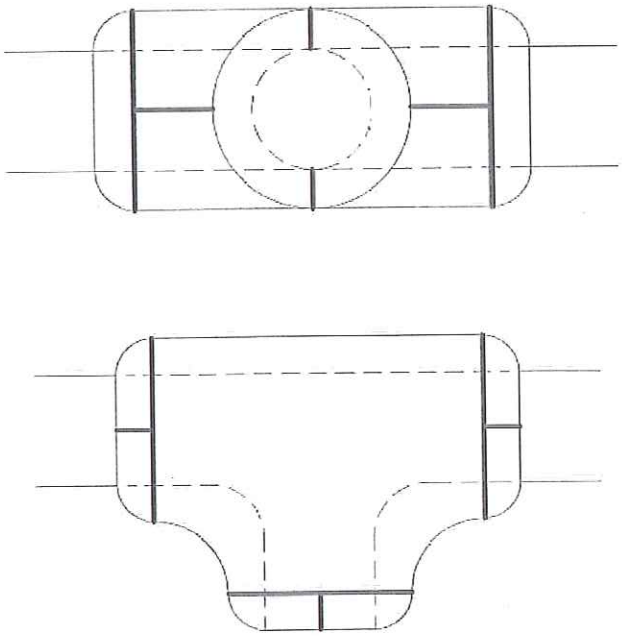
~~7)~~8)The "R" Stamp Holder performing the ~~alteration~~repair shall provide detailed information on the Form R-~~2~~1, describing the extent of the ~~alteration~~repair and include the specific location the work was performed on the item. ~~When a FFSA has been performed as described in NBIC, Part 2, 4.4.1, the remaining life of the item shall be documented on the Report of FFSA Form and in the Remarks section for the Form R-2. The Report of FFSA Form shall be affixed to the Form R-2.~~

a. The remaining life of the encapsulated pressure retaining item shall be documented on the Report of FFSA in the Remarks section. The Report of FFSA Form shall be affixed to the Form R-1.

DEFINITIONS

Encapsulation – to enclose, seal off or reinforce a component.

FIGURE 3.3.4
Welded Leak Box



NB 14-0302

5.13.1 FORM R-1, REPORT OF REPAIR

FORM R-1 REPORT OF REPAIR

in accordance with provisions of the *National Board Inspection Code*

1. Work performed by (1) (name of repair organization) (2) (Form Registration No.)
   (53) (PO No., Job No., etc.)
2. Owner (3) (name)
   (address)
3. Location of installation (4) (name) USA, Canada, NPT#43 ...
   (address)
4. Item identification (5) (boiler, pressure vessel or piping) Name of original manufacturer (6)
5. Identifying nos.: (7) (mfg. serial no.) (8) (National Board No.) (8) (Jurisdiction No.) (8) (other) (9) (year built)
6. NBIC Edition/Addenda: (10) (edition) (10) (addenda)
   Original Code of Construction for Item: (11) (name/section/division) (11) (edition/addenda)
   Construction Code Used for Repair Performed: (11) (name/section/division) (11) (edition/addenda)
7. Repair Type: (55) ☐ Welded ☑ Graphite Pressure Equipment ☐ FRP Pressure Equipment
8. Description of work: (12) ☐ Form R-1, Report Supplementary Sheet is attached ☐ FFSA Form (NB-403) is attached
   (use Form R-1, if necessary)

   _____ Pressure Test, if applied (13) _____ psi MAWP (51) _____ psi
9. Replacement Parts. Attached are Manufacturer's Partial Data Reports or Form R-3s properly completed for the following items of this report:
   (14) (name of part, item number, data report type or Certificate of Compliance, mfg. name, and identifying stamp)
10. Remarks: (15)

CERTIFICATE OF COMPLIANCE

I, (16), 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 Repair conforms to the *National Board Inspection Code*. National Board "R" Certificate of Authorization No. (17) expires on (18)

Date (19), (20) (name of repair organization) Signed (21) (authorized representative)

CERTIFICATE OF INSPECTION

I, (22), holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of (23) and employed by (24) of (25) have inspected the work described in this report on (26), 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 certicate, 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 (19), Signed (27) (inspector) Commissions (28) (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-66 Rev. 12

SECTION 5

A13 5.13.2 FORM R-2, REPORT OF ALTERATION

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: Service _____
(name) (USA, Canada, Mexico, etc.)

(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)

NB-239, Rev. 6, (03/25/13)

FORM R-2 BACK

A13

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 _____ _____ Signed _____
(name of design organization) (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, where required, 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 _____ Commissions _____
(inspector) (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 _____ _____ Signed _____
(name of alteration organization) (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, where required, 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 _____ Commissions _____
(inspector) (National Board and jurisdiction no.)

5.13.3 FORM R-3, REPORT OF FABRICATED PARTS

FORM R-3 REPORT OF PARTS FABRICATED BY WELDING
in accordance with provisions of the *National Board Inspection Code*

1. Manufactured by (1) _____ (2) _____
   _____ (53) _____
2. Manufactured for (29) _____
   _____
3. Design Condition specified by (30) _____ Code design by (31) _____
4. Design Code (32) _____ (33) _____ (34) _____ (35) _____
5. Identification of Parts

Name of Part	Qty.	Line No.	Manufacturer's Identifying No.	Manufacturer's Drawing No.	MAWP	Shop Hydro PSI	Year Built
(36)	(37)	(38)	(39)	(40)	(41)	(13)	(9)

6. Description of Parts

	(a) Connections other than tubes			Heads or Ends			(b) Tubes		
Line No.	Size and Shape	Material Spec. No.	Thickness (in.)	Shape	Thickness (in.)	Material Spec. No.	Diameter (in.)	Thickness (in.)	Material Spec. No.
(38)	(42)	(43)	(44)	(45)	(46)	(43)	(47)	(48)	(43)

7. Remarks (15) _____
   _____
   _____
   _____
   _____

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229 NB-230 Rev 2

Form R-3 (back) (2) (Form "R" No.)

CERTIFICATE OF COMPLIANCE

I, (16) _____, certify that to the best of my knowledge and belief the statements in this report are correct and that all material, fabrication, construction, and workmanship of the described parts conforms to the *National Board Inspection Code* and standards of construction cited.

National Board "R" Certificate of Authorization No. (17) _____ expires on (18) _____, _____

Date (19) _____, _____ (20) _____ Signed (21) _____
(name of "R" Certificate Holder) (authorized representative)

CERTIFICATE OF INSPECTION

I, (22) _____, holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the jurisdiction of (23) _____ and employed by (24) _____ of (25) _____ have inspected the parts described in this report on (26) _____, _____ and state that to the best of my knowledge and belief the parts comply 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 (26) _____, _____ Signed (27) _____ Commissions (28) _____
(inspector) (National Board and Jurisdiction No.)

5.13.4 · FORM R-4, REPORT SUPPLEMENTARY SHEET

FORM R-4 REPORT SUPPLEMENTARY SHEET
in accordance with provisions of the *National Board Inspection Code*

1. Work performed by (1) (49) _____ (name) (2) (49) _____ (Form "R" referenced)
_____ (address) (53) (49) _____ (PO No., Job No., etc.)
2. Owner (3) or (29) (49) _____ (name)
_____ (address)
3. Location of installation _____ (name)
_____ (address)

Reference Line No. (51) | Continued from Form R– (50) (52)

Date (19) _____, _____ Signed (21) _____ (authorized representative) Name (20) (49) _____ (Name of "R" Certificate Holder)

Date (19) _____, _____ Signed (27) _____ (inspector) Commissions (28) _____ (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-231 Rev. 2

5.13.4.1 INSTRUCTIONS FOR COMPLETING NATIONAL BOARD FORM "R" REPORTS

These instructions are to be used when completing the National Board Form "R" Reports. When computer generated, the format of the form shall replicate the type and relative location of the information depicted on the Form "R" Reports shown in NBIC Part 3, 5.13.1 through 5.13.4. [OR NEW 5.6.19.4]

1. The name and address of the "R" Certificate Holder performing the work as it appears on the "Certificate of Authorization". On a Form R-2, the organization that performed the design work will complete line 1b) and the organization completing the construction activities will complete line 1a).

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 NBIC Part 3, 5.6, a log shall be maintained identifying sequentially, any Form "R" registered with the National Board. For re-rating only, the Design Organization registers the Form R-2. Where physical work is also performed, the Construction Organization registers the Form R-2.

3. Name and address of the Owner of the pressure-retaining item.

4. Name and address of plant or facility where the pressure-retaining item is installed.

5. Description of the pressure-retaining item, such as boiler or pressure vessel, or piping. Include the applicable unit identification.

6. Name of the original manufacturer of the pressure-retaining item. If the original manufacturer is unknown, indicate by, "unknown".

7. Document the serial number of the pressure-retaining item if assigned by the original manufacturer. If there is no serial number assigned or is unknown, indicate "unknown".

8. When the pressure-retaining item is registered with the National Board, document the applicable registration number. If the pressure-retaining item is installed in Canada, indicate the Canadian design registration number (CRN), and list the drawing number under "other." If the item is not registered, indicate, "none".

9. Identify the year in which fabrication/construction of the item was completed.

10. Indicate edition and addenda of the NBIC under which this work is being performed.

11. Indicate the name, section, division, edition, and addenda of the original code of construction for the pressure-retaining item. Also indicate the name, section, division, edition, and addenda of the construction code used for the work being performed. If code cases are used, they shall be identified in the "Remarks" section.

12. Provide a detailed 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 (i.e. welding, bonding, cementing), the specific location of the work performed to the PRI, the steps taken to remove a defect or as allowed by 3.3.4.8 to remain in place, the method of repair or alteration described as listed in the examples of Part 3, Section 3 or supplemental section if applicable, 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 the Form. A13

13. Indicate test pressure applied.

14. As applicable, identify what parts manufactured by welding or bonding were introduced as needed to complete the scope of work. Indicate part, item number, manufacturer's name, stamped identification, and data report type or Certificate of Compliance.

15. Indicate any additional information pertaining to the work involved (e.g., routine repairs, code cases). For Form R-3, the part manufacturer is to indicate the extent he has performed any or all of the design function. If only a portion of the design, state which portion.

16. Type or print name of authorized representative of the "R" Certificate Holder attesting to accuracy of the work described.

17. Indicate National Board "R" Certificate or Authorization number.

18. Indicate month, day, and year that the "R" certificate expires.

19. Enter date certified.

20. Record name of "R" Certificate Holder who performed the described work, using full name as shown on the Certificate of Authorization or an abbreviation acceptable to the National Board.

21. Signature of authorized representative.

22. Type or print name of Inspector.

23. Indicate Inspector's Jurisdiction. (US or Canadian)

24. Indicate Inspector's employer.

25. Indicate address of Inspector's employer (city and state or province).

26. Indicate month, day, and year of inspection by Inspector. In case of Routine Repairs this shall be the month, day, and year the Inspector reviews the completed Routine Repair package.

27. Signature of Inspector.

28. National Board commission number of Inspector, and when required by the Jurisdiction, the applicable State or Provincial numbers.
Registration

29. Document name and address of organization that purchased the parts for incorporation into the repair or alteration. If the part's origin is unknown or the part was built for stock, so state.

30. Document name of organization responsible for specifying the code design conditions, if known. If origin of design conditions are unknown, state "unknown".

31. Document name of organization responsible for performing the code design, if known. If code design organization is unknown, state "unknown".

32. Name, section, and division of the design code, if known. If the design is unknown, state "unknown"

33. Indicate code edition year used for fabrication.

34. Indicate code addenda date used for fabrication.

35. Indicate the code paragraph reference for formula used to establish the MAWP, if known. If the code reference of the formula is unknown, state "unknown".

36. If available, identify component by part's original name, function, or use the original equipment manufacturer's "mark or item number."

37. Indicate quantity of named parts.

38. Match line number references for identification of parts and description of parts.

39. Indicate manufacturer's serial number for the named part.

40. Indicate drawing number for the named part.

41. Indicate Maximum Allowable Working Pressure for the part, if known.

42. Use inside diameter for size: indicate shape as square, round, etc.

43. Indicate the complete material specification number and grade.

44. Indicate nominal thickness of plate and minimum thickness after forming.

45. Indicate shape as flat, dished, ellipsoidal, or hemispherical.

46. Indicate minimum thickness after forming.

47. Indicate outside diameter.

48. Indicate minimum thickness of tubes.

49. Complete information identical to that shown on the Form R to which this sheet is supplementary.

50. Indicate the Form R type. Example: Form R-1, Form R-2, Form R-3.

51. Indicate the reference line number from the Form R to which this sheet is supplementary.

52. Complete information for which there was insufficient space on the reference Form R.

53. If applicable, document the unique purchase order, job, or tracking number, assigned by organization performing work.

54. Indicate the maximum allowable working pressure of the pressure-retaining item.

55. Indicate the type of repair, e.g., welded, graphite pressure equipment, or fiber-reinforced plastic pressure equipment.

NB-14-0701

Attachment 2
In addition propose revised words in the code, additional a new second paragraph to be **added** to 3.2.2 c).

ASME stamping and completion of an ASME Manufacturer's Partial Data Report is not required for components fabricated by the "R" Certificate Holder that will be used on pressure retaining items being repaired or altered by the same "R" Certificate Holder. The controls for this activity shall be described in the quality control system.

	Comment	
Canonico	I disapprove of this action because I do not agree that R Stamp holders should be fabricating pressure parts. Pressure parts should be fabricated by an accredited ASME Stamp holder. Furthermore, this action is in direct conflict with what is currently in 3-3.2.2 (c).	This is why the change is being proposed. The intent is not to fabricate complete items, but only to fabricate assemblies that he would use in his repair or alteration.
Reetz	I reaffirm my disapproval of this action and for the same reasons given by myself earlier and by many others who have disappoved for the same reasons.	See response to Bob Reetz below
Riley	Reaffirm Disapproval after initial balloting. The proposed addition to 3.2.2c) to allow R-stamp part manufacture contradicts the first paragraph requireing ASME CoA and Partial Data Report. The reliance on 'controls described in the QC system' as a catch-all for replacement of stamping and data reports is too open ended.	See response to Dr Canonaco. Re: "controls" there are established criteria in ASME Code for similar actions.
Galanes	I disapprove of the proposed code change after giving this item considerable thought. ASME parts should be supplied by an ASME Certificate holder, and not an R-Certificate holder.	See response to Dr Canonico
Edwards	This revision would reverse a long-standing requirement of the NBIC which I believe needs further consideration prior to being adopted. Backgound on the code and/or industry changes warranting revision of our requirements for fabrication of ASME parts needs to be provided.	See response to Dr Canonico
Schulte	The verbiage proposed for section 3.2.2 provides additional clarification. The AI must accept these parts fabricated by the R Certificate holder, just as he as is	Thanks for your comment

	the case with any other parts or materials utilized.	
Richards	There should be either 1) a limit on a 'part' or 2) allowing the A/I to accept a 'part' for use based on a recognized industry standard/definition.	1) This sounds like a definition for part. See response to Mr Reetz 2) This is ok as long as it's covered in the QC Manual
Riley	Agree with comments from Mrs. Reetz, Webb, and Scribner. (1)The part wording may be similar to the following to address limitation of scope:'A part that is a portion, division, piece, or limited segment of the whole' may be fabricated by the R-Stamp holder (2) Agree with requiring the R-Stamp QC system to include description and controls (3) The R-1 should list the parts fabricated in the description or attach a description so they are clear for future inspectors (4) 3.2.2 should be changed to include the new allowance to make it clear.	
Reetz	My comment is that this new paragraph contradicts what presently is in 3.2.2. I do not approve of this change. If various small parts only are to be included I would not object. A definition of "parts" is clearly needed.	My opinion – defining parts will not only be difficult to do, it will cause more problems than it solves.

NB14-2401

Action Item Request Form

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:

S6.5 Replacement Parts
d) When the original code of construction is other than ASME, replacement parts subject to internal or external pressure fabricated by welding shall be manufactured by an organization certified as required by the original code of construction. The item shall be inspected and stamped as required by the original code of construction. Certification to the original code of construction as required by the original code of construction or equivalent shall be supplied with the item. When this is not possible or practicable the organization fabricating the part may have a National Board *Certificate* of *Authorization*. Replacement parts shall be documented on Form TR-1 and the 'TR" Stamp applied as described in NBIC Part 3, S6.14.

b) Statement of Need

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

The need is to be consistent with NBIC part 3 for replacement parts fabricated by a TR stamp holder. The parts should be documented on a separate form similar to the one for an R stamp holder completes. The form referenced on the last line should be a TR-3 not 1.

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.

Throughout Supplement 6 the work that is done is documented on one form (TR-1). This can be a repair or alteration or modification. To develop a form to also address replacement parts is extremely difficult.

Paragraph S6.5 would be affected.

34. Indicate code addenda date used for fabrication.

35. Indicate the code paragraph reference for formula used to establish the MAWP, if known. If the code reference of the formula is unknown, state "unknown".

36. If available, identify component by part's original name, function, or use the original equipment manufacturer's "mark or item number."

37. Indicate quantity of named parts.

38. Match line number references for identification of parts and description of parts.

39. Indicate manufacturer's serial number for the named part.

40. Indicate drawing number for the named part.

41. Indicate Maximum Allowable Working Pressure for the part, if known.

42. Use inside diameter for size: indicate shape as square, round, etc.

43. Indicate the complete material specification number and grade.

44. Indicate nominal thickness of plate and minimum thickness after forming.

45. Indicate shape as flat, dished, ellipsoidal, or hemispherical.

46. Indicate minimum thickness after forming.

47. Indicate outside diameter.

48. Indicate minimum thickness of tubes.

49. Complete information identical to that shown on the Form R to which this sheet is supplementary.

50. Indicate the Form R type. Example: Form R-1, Form R-2, Form R-3.

51. Indicate the reference line number from the Form R to which this sheet is supplementary.

52. Complete information for which there was insufficient space on the reference Form R.

53. If applicable, document the unique purchase order, job, or tracking number, assigned by organization performing work.

54. Indicate the maximum allowable working pressure of the pressure-retaining item.

55. Indicate the type of repair, e.g., welded, graphite pressure equipment, or fiber-reinforced plastic pressure equipment.

NB14-2402

Action Item Request Form

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:

S6.3 ACCREDITATION
Organizations performing repairs, alterations, or modifications shall be accredited as in accordance with the National Board "TR" Program.

b) Statement of Need

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

The need is to discuss in text the accreditation process for a TR program in the supplement.

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.

S6.3 ACCREDITATION

Organizations performing repairs, alterations, or modifications shall be accredited as in accordance with **NBIC Part 3, Accreditation, Section 1; Major Section 1.5 and Section 1.5.1.** ~~the National Board "TR" Program.~~

NB15-0507

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 1.2 (f)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

It is recognized that "DOT" is the US Department of Transportation. "DOT", however, is used throughout, but is not defined in Part 3. Since the NBIC is an International Standard, in my opinion this should be defined. As this section is the first occurrence of "DOT" in Part 3, this could be handled by the following change, which would also inherently limit the text to the DOT by the inclusion of "i.e.". Part 3, 1.2 (f): "the Competent Authority, i.e. the US Department of Transportation (DOT), shall..."

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 04

Project Committee Referred To: SC Repairs and Alterations

NB15-0507; PR15-0104

NBIC Part 3 paragraph: 1.2 f)

f) For Transport Tanks, the Competent Authority, i.e. The US Department of Transportation (DOT), shall be consulted for any requirements which it has established since they take precedence for repairs,

NB15--1406
NB15-0508

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 1.8.7.2 n)2)f)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

The personnel qualification programs and documents listed do not comply with 2013 Edition Section XI. Only CP-189 and the ACCP Certification program is listed in IWA-2310, with the exception of SNT-TC-1A, which is valid only until recertification is required, which is a 5 year recommended maximum per SNT-TC-1A 2006. As a result, I interpret IWA-2310 to mean SNT-TC-1A is being discontinued and is no longer valid for new Certifications. Also, the ASNT NDT Level II and III programs are not recognized as acceptable for stand alone use by any current ASME BPV Construction Code, but historically, it may have been. I am assuming that is what is inferred by the term "ASNT".

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 25

Project Committee Referred To:
SC Repair and Alteration

NBIC Part 3

1.8.8.2 QUALITY PROGRAM ELEMENTS

j) Examinations, Tests and Inspections

A repair / replacement plan shall address all required information for performing examinations, tests and inspections including but not limited to:

- Establishing hold points
- Identifying procedures, methods, acceptance criteria
- Defects identified, removal methods, welding, brazing, fusing, and material requirements, reference points used for identification
- Evaluations of results

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax:

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 1.8.8.2 j)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

In the third bullet, consider adding "brazing and fusing" in addition to welding.

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 26

Project Committee Referred To:
SC Repair and Alteration

NB15-1408; PR15-0127

NBIC Part 3 paragraph: 1.8.7.2 n) 2) f)

f) Nondestructive examination reports, including results of examinations, shall identify the ASNT, SNT-TC-1A, CP-189, or ACCP certification level of personnel interpreting the examination results. Final radiographs shall be included where radiography has been performed. Radiographs may be microfilmed or digitally reproduced in accordance with the requirements listed in ASME Section V, Article 2, Mandatory Appendix VI. The accuracy of the reproduction process shall be verified and monitored for legibility, storage, retrievability and reproduction quality;

NB15-0508

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 1.8.7.2 n)2)f) another

Comment/Recommendation: *Proposed Solution:* □ New Text ☒ Revise Text □ Delete Text

Fourth line down. "Radiographs may be microfilmed or digitally reproduced". Consider making the following addition at the end of the sentence, "in accordance with the requirements listed in the latest Edition of ASME Section V, Article 2, Mandatory Appendix VI." This Mandatory Appendix is titled, "MANDATORY APPENDIX VI DIGITAL IMAGE ACQUISITION, DISPLAY, INTERPRETATION, AND STORAGE OF RADIOGRAPHS FOR NUCLEAR APPLICATIONS." It provides rules for the proper considerations in digitizing analog radiographs and storage requirements, etc.

Source: ☒ Own Experience/Idea □ Other Source/Article/Code/Standard _____

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 27

Project Committee Referred To: SC Repair and Alteration

NB15-1409; PR15-0130

NBIC Part 3 paragraph: 1.8.7.2 g)

~~When the Owner performs repair/replacement activities, p~~Purchase of materials and small products shall meet the requirements specified in ASME Section XI, IWA 4142. Measures shall be established to ensure that purchased material, items, and services conform to the Owner's requirements and applicable edition and addenda of the Code of Construction and ASME Section XI. 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.

NB15-0508

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 1.8.7.2 g)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

This section does not address the situation when the Owner subcontracts the repair/replacement for Category 2, only when the Owner performs the repair/replacement activities.

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 30

Project Committee Referred To: SC Repair and Alteration

NB15-0509; PR15-0156

NBIC Part 3 paragraph: 2.5.3.6 c) 5) d)

d) The filler metal shall be limited to an austenitic, nickel-base filler metal having a designation F-No. 43 and limited to the following consumables: ERNiCr-3 (e.g. Filler Metal 82), ENiCrFe-3 (e.g. INCONEL Welding Electrode 182), ENiCrFe-2 (e.g. INCO-WELD A), ASME B&PV Code Cases 2733 and 2734 (e.g. EPRI P87).

NB15-0509

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 7, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 2.5.3.6 5) d)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

Filler Metal 82, Inconel Welding Electrode 182, and INCO-WELD A are all Brand names for ~~consumables sold by Special Metals. EPRI P87 is a Brand name, I believe licensed~~ to be sold by Metrode at least. Why are the consumable classifications and Code Cases by themselves not sufficient. Without an "e.g." in the parenthesis after each classification, it can be read that these Brand names are required, which would restrict trade by not allowing other manufacturers from supplying consumables to those ~~classifications and Code Cases.~~

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard _____

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 56

Project Committee Referred To:
SC Repair and Alteration

NB15-0509

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: 10/13/14

Commenter Name: Mark R. Kincs

Commenter Address: Xcel Energy Services Inc.
1518 Chestnut Ave., Minneapolis, MN 55403

Commenter Phone: (612) 630-4152

Commenter Fax: (612) 630-4367

Commenter Email: mark.r.kincs@xcelenergy.com

Section/Subsection Referenced: Part 3 - Section 2.5.3.6 d)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

The proposed language references Code Case filler metals acceptable for consideration as F-No. 43 for welding performance qualifications only (ref. Code Cases 2733 & 2734). Also, the accepted F-No. 43 materials, as presented, allow supply by a single manufacturer only. The following alternative language is proposed.

"Filler metals shall be austenitic, nickel-based consumables limited to ASME Code Case 2733, Code Case 2734, or one of the following F-No. 43 materials listed in ASME Section IX: ERNiCr-3, ENiCrFe-2, or ENiCrFe-3."

Source: ☒ Own Experience/Idea ☒ Other Source/Article/Code/Standard **ASME Sect. IX & CC 2733, 2734**

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-05

Comment No. Issued: 01

Project Committee Referred To: SC Repair and Alteration

NB15-1402

NB15-0509

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 7, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax:

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 2.5.3.6 c) another

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

Quantify humid environment. Humid is a relative term. What is Humid to an R-Certificate ~~Holder in North Dakota may not be to an R Certificate Holder in southern Georgia.~~ I understand the intent here, but really the R-Certificate holder needs to understand Relative Humidity vs. Dewpoint and the concern for Condensate forming on the post repaired "cold" tubes. Also, the repair may occur during the day when the humidity is acceptable, but during the night (potentially when the repair location is not being ~~manned), the temperature may approach the dewpoint resulting in condensation, which~~ may evaporate off of the tubes before the day shift resumes and nobody knows of the moisture contamination. If you state in the code that a Moisture Barrier Coating is required to be applied after the repair, this concern is mitigated.

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 57

Project Committee Referred To: SC Repair and Alteration

NB15-0509

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 7, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 2.5.3.6 c)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

After the weld repair is completed and the R-1 signed, how is the requirement that the ~~repair region be kept from humid or moist environments to be verified, if for inst~~ance there is a delay in the return to service after this specific repair? During consideration of this item, presentations discussed the use of Moisture Barrier Coatings as being adequate to protect the repair region. If this is an adequate solution, which reduces risk, why not list the use of a moisture barrier coating is recommended at the ~~very least, if not requiring its use?~~

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 58

Project Committee Referred To:
SC Repair and Alteration

NB15-0510

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 3.3.4.9 b)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ☒ Revise Text ☐ Delete Text

What about for a brazed boiler, should tube plugging by brazing be considered for inclusion? I have no knowledge of its use.

Source: ☒ Own Experience/Idea ☐ Other Source/Article/Code/Standard _____

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 19

Project Committee Referred To: SC Repair and Alteration

NB15-0511

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, 5.13.5.1 31.

Comment/Recommendation: *Proposed Solution:* □ New Text ☒ Revise Text □ Delete Text

What about Category 3 repairs/alterations, etc? What if it was performed to an International Code other than Section III or XI? Per the instruction, there isn't a way to address this situation.

Also, Hyphenate "rerating" to "re-rating" to be consistent with the NBIC.

Source: ☒ Own Experience/Idea □ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 20

Project Committee Referred To: SC Repair and Alteration

NB15-0512

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, S3.5.5 b)

Comment/Recommendation: *Proposed Solution:* □ New Text ☒ Revise Text □ Delete Text

My comment refers to Section VIII, Division 1, Part UGI-79 and UGI-80 referenced on the last line. After reading these paragraphs in whole, I ~~do not understand why only some of the subsections are listed and not~~ the whole of UGI-79 and UGI-80. In my opinion, all of UGI-79 and UGI-80 should be included.

Source: ☒ Own Experience/Idea □ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 21

Project Committee Referred To:
SC Repair and Alteration

NB15-0513

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, S6.14.1

Comment/Recommendation: *Proposed Solution:* □ New Text ☒ Revise Text □ Delete Text

Fifth line down. "Registered Inspector" is used but is not defined in Part 3. Use of the term "Inspector" and "Registered Inspector" is also ~~used interchangeably in the current published text not under review.~~ Consistency is needed in this Supplement.

Source: ☒ Own Experience/Idea □ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 36

Project Committee Referred To:
SC Repair and Alteration

NB15-1410 ~~0513;~~ PR15-0122

NBIC Part 3 paragraph: S6.14.1 f)

f) The non-embossed Code Symbol stamping, when directly applied on the item or when a nameplate is used shall be applied adjacent to the original manufacturer's stamping or nameplate. A single repair~~, alteration, or modification~~ stamping or nameplate may be used for more than one repair to a Transport Tank, provided the repair ~~, alteration, or modification~~ activity is carried out by the same certificate holder;

NB15-0513

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2015 Draft Edition

PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 13, 2014

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: October 1, 2014

Commenter Name: Nathan Carter

Commenter Address: HSB Global Standards, One State Street, PO Box 299
Hartford, CT 06141-0299

Commenter Phone: 860-722-5750

Commenter Fax: _____

Commenter Email: nathan_carter@hsbct.com

Section/Subsection Referenced: Part 3, S6.14.1 f)

Comment/Recommendation: *Proposed Solution:* □ New Text ☒ Revise Text □ Delete Text

I understand the intent for numerous repairs throughout the life of a Transport Tank using one nameplate under the conditions listed. Do you ~~really mean for infinite "alterations and modifications" to be allowed~~ under a single nameplate/stamping? Please reconsider this.

Source: ☒ Own Experience/Idea □ Other Source/Article/Code/Standard

Submit Form To: Robin Hough, Secretary, NBIC Committee, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, fax 614-847-1828, email, rhough@nationalboard.org

NB Use Only

Commenter No. Issued: PR15-01

Comment No. Issued: 22

Project Committee Referred To: SC Repair and Alteration

Action Item Request Form

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 2013, Part 3

3.3.4.3 WASTED AREAS

d) Tubes
1) Wasted areas on tubes may be repaired by welding, provided that, in the judgment of the Inspector the strength of the tube has not been impaired. Where deemed necessary, competent technical advice should be obtained from the manufacturer or from another qualified source. This may be necessary when considering such items as size limitations of repaired areas, minimum tube thickness to be repaired, tube environment, location of the tube in the boiler, and other similar conditions.

2) The WPS followed shall be qualified for weld metal buildup in accordance with ASME Section IX. When the code of construction required postweld heat treatment (PWHT) for butt welds, the WPS followed for the weld buildup, shall be qualified with PWHT.

b) Statement of Need

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

This Item opened to address a minimum wall thickness of base metal and welding processes prior to commencing build-up of wasted areas.
Reference National Boiler Service, Inc. report presented to Black Liquor Recovery Boiler Advisory Committee during October 2013 meeting.

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.

See attached report. (8 Pages)

From: Parrish, David [mailto:david.parrish@fmglobal.com]
Sent: Thursday, September 25, 2014 11:10 AM
To: George Galanes; jpillow@commonarc.com
Cc: bvallance@nationalboard.org; Martinez, David; Barker, Timothy
Subject: Weld Buildup Wasted Areas - Tubes

Thought your committee members might find attached interesting. It is extracted from the BLRBAC October 2013 meeting minutes (posted on the www.blrbac.org website). Wasted areas of tubes are frequently repaired by "pad" welding – even for leaks. A few operators do not permit pad weld repair if failure could admit water to furnace (smelt-water explosion potential). Some operators replace tube section at next maintenance outage. For remainder, the pad weld becomes a long-term solution that may again leak.

It might be helpful for this industry if a "Welding Method" could be developed for inclusion in Part 3.

Best Regards,

Dave P
Senior Staff Engineering Specialist
FM Global - Engineering Standards, Equipment Hazards
781-255-4734

NATIONAL BOILER SERVICE, INC.

Weld Build Up Research

This report contains the results of *Weld Build Ups* that were performed on the outside diameter of boiler tubes (approx.180 thick) that were turned down (milled) on a lathe to a thickness of .120", .100", .090", .080", .070" thick to simulate boiler tube thinning for this research.

Weld Build Up of Wasted Area is the correct term for this type of repair in the Boiler and Pressure Vessel industry. Other jargon or terms used to describe this type of repair are Pad Welding (which is most frequently used) and Weld Overlay.

The objective of this research is to identify and/or determine what the welding process is doing to the inside of the tubes after weld build up was performed and at what wall thicknesses the tubes were adversely affected.

The Following Welding Processes were used:
- GTAW (TIG) - 3/32" Filler Metal
- SMAW (Stick) - 3/32" Filler Metal
- GMAW (MIG) (Hard Wire) - .035" Bare Wire Filler Metal

Note: The tubes must be cleaned thoroughly before welding.

The Tube positions when the weld build up was performed was about 45° and Vertical positions to simulate different configurations in a boiler such as vertical (Water-wall Tubes), Flat (Floor or Roof Tubes) and approximately 45° (Arch or Sloped Floor Tubes etc.).

The following photos are of weld build up that were performed on tube specimens that were cut in half to view and inspect the inside of the tubes. A description of our findings is under each photo.

Welding Terms:
- Burn-thru – A hole is burned through the base metal.
- Melt-thru – The welding filler metal is melted through to the inside of the base metal (push-thru).
- Sugaring - Oxidation of the weld or base metal.

Base Metal Designations and Terms:
* P1 - Carbon Steel Tubes ,"SA 178, 210 etc."
* P3 - Carbon/Moly Steel Tubes, "SA 209 T1"
* P4 - 1.25% Chrom, Alloy Steel Tubes, "SA 213 T11"
* P5 - 2.25% Chrom, Alloy Steel Tubes , "SA 213 T22
* P8 – Stainless Steel Tubes, "SA 213 TP 304,308,316 etc."

Conclusion

From this research, It is our opinion, the GTAW (TIG) process, is not recommended to perform Weld Build Up on P1, P3, P4 or P5 base metals that are below .100" thick. Burn-thru and melt-thru is virtually inevitable.
The GMAW (MIG) process (downhill progression with .035 Wire Size) can be used to Perform Weld Build Up on Tubes as thin as .080" thick, with minimal melt-thru or burn thru.
For stainless base metals (P8), it is not good practice or recommended to perform Weld Build Up on base metals that are below .120" thick. Extreme oxidization (Sugaring) virtually cannot be avoided on the Inside diameter of the tube where no backing or shielding gas is utilized.

Steve Harville
Corporate Quality Control Manager
176 North Industrial Blvd. PO Box 279, Trenton, GA 30752 P:(706) 657-6200 F: (706) 657-4875
www.nationalboiler.com

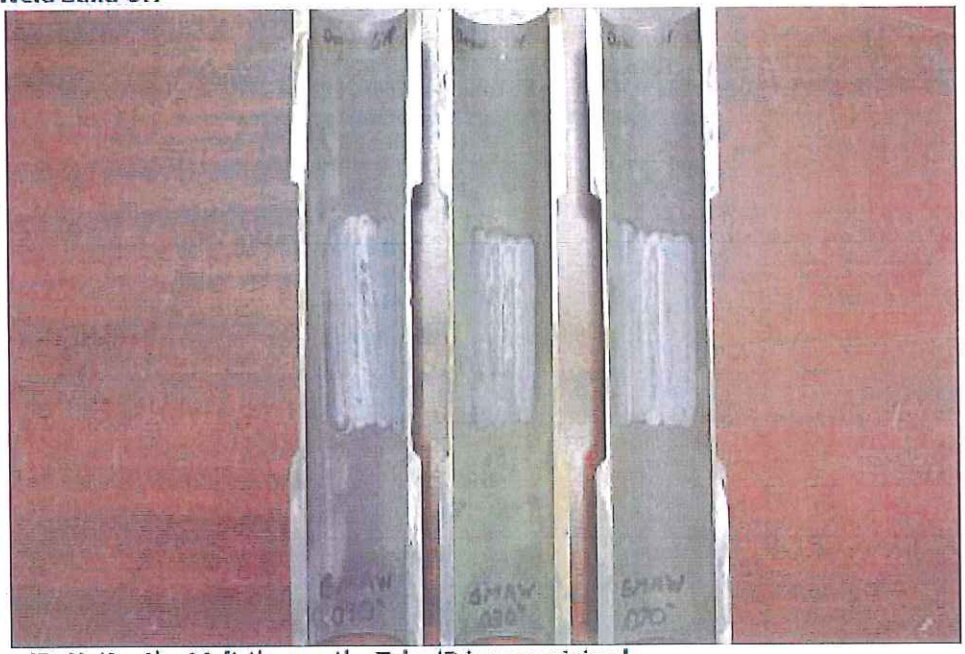
OD: Carbon Steel (P1) ***SMAW (Stick) process with E 7018 - 3/32"*** was used on these samples. The Weld Progression was Uphill. On all 4 of these samples the Welder Burned-thru the base metal, as the samples got thinner, the Burn-thru was more frequent.

ID: Carbon Steel (P1) The Burn-thru that you see here is not "Melt-thru" it is "Burn-thru." Holes were actually burned in the base metal and filled back up with the SMAW process as the Welder was welding. Note: .070" sample was too thin to Weld.

OD: Carbon Steel (P1), *GTAW (TIG) process with E 70 S2 - 3/32"* was used on these samples. The Weld Progression was Uphill. On all 4 of these samples the Welder Melted-thru the base metal, as the samples got thinner, the Melt-thru was more frequent and excessive.

ID: The Melt-thru here is very excessive on the .090", .080" and .070" Samples

OD: Carbon Steel (P1), *GMAW (MIG) process with E 70 S2 - .035"* Wire was used on these samples. The Weld Progression was Downhill. Uphill is not recommended. On all of these samples the Welder had very minimal Melt-thru on all thicknesses of the base metal. The GMAW Process requires the base metal to be very clean. When applying Weld Build Up on Tubes of approximatly .120" and below, GMAW (MIG) is the preferred method for Weld Build UP.



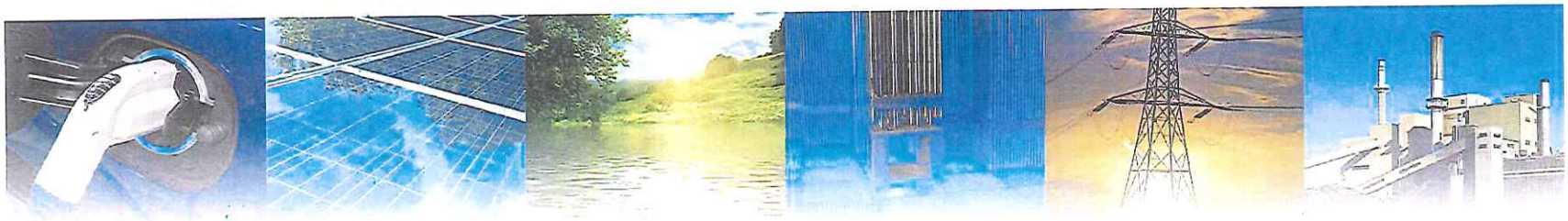
ID: Notice the Melt-thru on the Tube ID is very minimal.

OD: Stainless: *GTAW (TIG) process with E 316L* - 3/32" was used on these samples. The Weld Progression was Uphill. On all 3 of these samples the Welder Melted-thru the base metal, as the samples got thinner, the Melt-thru was more frequent and excessive.

ID: Stainless: The Melt-thru on the .100" & .080" thick samples was excessive and "Sugared" (oxidized) the ID of the Tube. This is because the ID of the Tube is not accessible to use a Backing Gas such as Argon to shield the base metal or weld area.

OD: 1-1/4 Chrome (P4), SA 213 T11: *Superheat Tube Simulation* (with Water in the Tube). *GTAW (TIG) process with ER 80S B3*- 3/32" was used. The Weld Progression was Uphill. Welder Burned-thru the base metal once on the .090" sample and multiple times on the .070" sample.

ID: 1-1/4 Chrome (P4), SA 213 T11 *Superheat Tube Simulation* (with Water in the Tube). With water in the Tube, there is little to no indication it is about to burn though the base metal. With the .070" Tube we had to let it cool 3 to 5 minutes between weld passes or between half a weld pass.



EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Weld Repair of Grade 91 Piping and Components Phase 3 Technology Transfer

Best Practice Guideline for Well-Engineered Weld Repair of Grade 91 Steel (3002003383)

John A. Siefert and Jonathan D. Parker
Program 87 Fossil Materials and Repair

National Board Inspection Code Part 3
January 20th, 2015

Program 87 Technology Transfer Week
Location: Brown Hotel, Denver, CO

Date	Subject	Who can attend
Jun 22 Jun 23 (8am-noon)	Weld Repair of Grade 91 Piping and Components – Technology Transfer (SPN 3002001569)	Supplemental Project Funders Only
Jun 23 (1pm-5pm)	**New Supplemental Program Launch:** *Application of Well-Engineered Weld Repairs for Grade 91 and other Creep Strength-Enhanced Ferritic (CSEF) Steels* (SPN 3002004332)	Open to Industry for Comment (future meetings for funders only)
Jun 23	Industry Reception	Open to industry
Jun 24	CSEF Interest Group Topic: Life Management of Gr. 91 Steel	Open to industry
Jun 25 Jun 26 (8am-noon)	EPRI Fossil Materials & Repair (P87) Technology Transfer	Program 87 Funders Only

More details on P87 cockpit and EPRI calendar of events

EPRI ELECTRIC POWER RESEARCH INSTITUTE

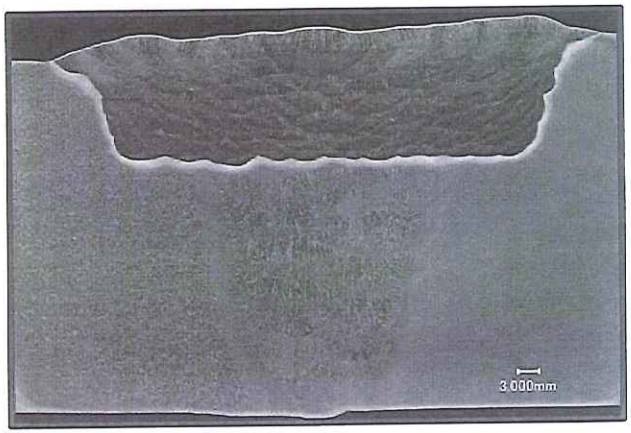
Application of Well Engineered Weld Repairs for Gr. 91 and other Creep Strength Enhanced Ferritic (CSEF) Steels

Objectives and Scope

- Develop and apply well-engineered weld repairs to:
  - Specific components
  - Specific damage mechanisms
  - Other CSEF steels such as Grades 23/24/92

Value

- Increased safety of weld repair through application of a damage tolerant weld design
- Increased inspectability using non destructive evaluation techniques
- Partners will hold one meeting per year to prioritize and agree on broader collaboration



Details and Contact

- The participant cost is $30k/year with a three years minimum commitment
- Qualifies for Tailored Collaboration (TC) and Self-Directed Funds (SDF)

John Siefert or Jonathan Parker

- jsiefert@epri.com; 704-595-2886
- jparker@epri.com; 704-595-2791

SPN Number: 3002004332

Effectively transfer welding and repair technology through targeted repairs for CSEF Steels

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Acknowledgements

- Aside from the principal investigators, there were numerous members and industry experts who contributed to the document:
  - Tim Bacha, Steve Brett, Mike Crichton, David Finch, Phil Flenner, George Galanes, Charles Henley Jeff Henry, Graham Holloway, Erick Liebl, Spencer Luke, Ken Mitchell, Bill Newell, Adam Storey, Bob Worthington

- Contributions from others are welcome and this is by no means an "invitation-only list"

Introduction

- *Best Practice Guideline for Well-Engineered Weld Repair of Grade 91 Steel* (EPRI Report 3002003383) has been made publically available and is available:
  - http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002003833

- This guideline should be considered as a document which initiates a review process with the National Board for inclusion of material-specific repair methods into the NBIC not currently covered by Welding Method 6

Purpose

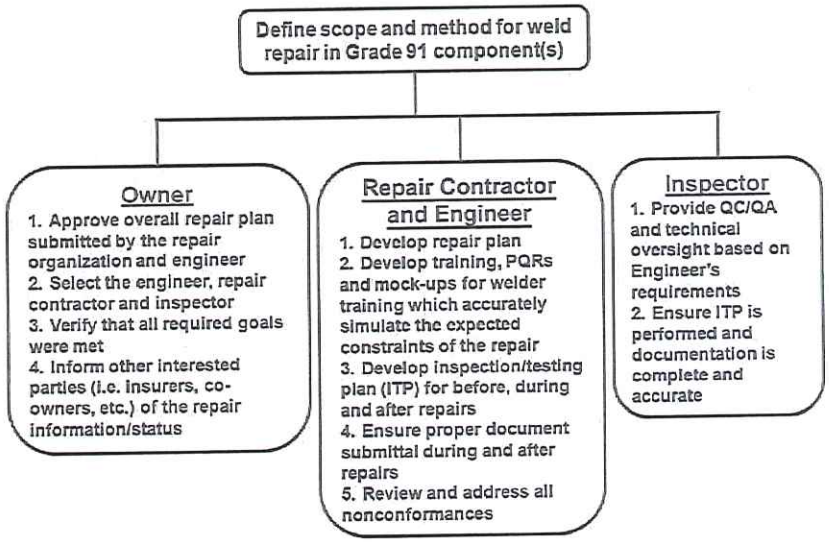
- This guideline describes **best practices** which should be used for fabrication of a **well-engineered weld repair** using **alternative** strategies for ***post-construction*** mitigation of damaged Grade 91 steel components.
  - Although emphasis is on alternative weld repair techniques, the guidance can be utilized to assist in the development of welding procedures where "traditional" PWHT is required

Sections

- Introduction
- Responsibilities
- Acceptable weld repair methods
- General guidelines
- Qualification
- Training and familiarization
- Repair roadmap
- Root cause analysis
- Assessment of base metal
- Selection of welding procedure
- Excavation of defects
- Geometry of weld repair
- Fill technique
- PWHT guidance (where applicable)
- NDE of weld repair
- Post-repair testing
- Post-repair inspection intervals
- Avoidance of stress corrosion cracking
- Conclusions
- References
- 9 Appendices

Responsibilities

- Responsibilities and expectations must be defined for each stakeholder in the repair process:
  - Owner/User
  - Responsible Engineer
  - Repair Contractor
  - Repair Contract Inspector
  - Verification Inspector (or Owner's Inspector)
  - Inspector
  - Quality Assurance
  - Quality Control



EPRI ELECTRIC POWER RESEARCH INSTITUTE

Acceptable Weld Repair Methods

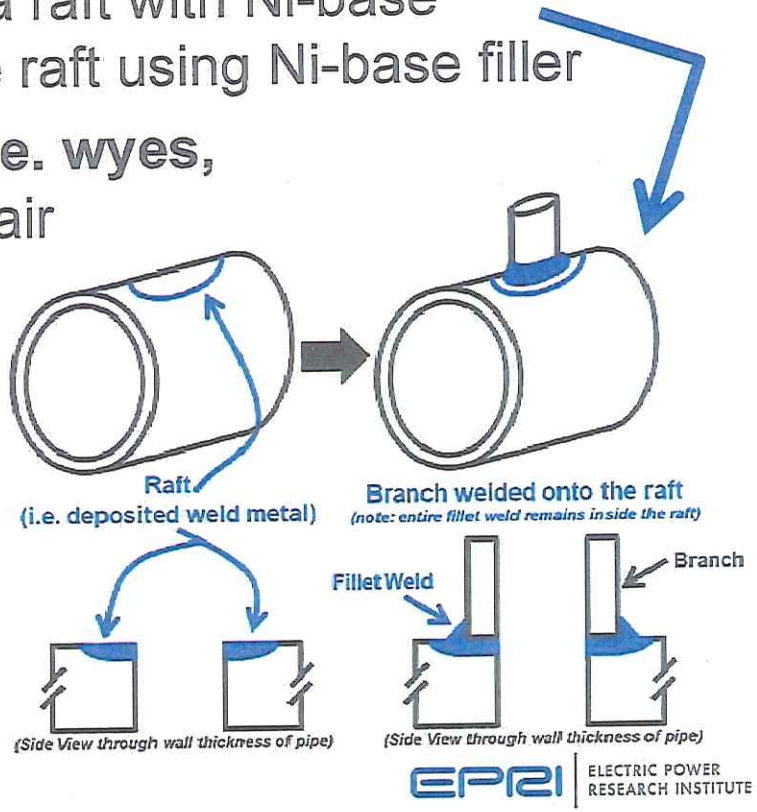
Filler	Method	PWHT	Filler Metal AWS Classification	
Matching	Controlled Fill	1250°F (675°C)[1]	SMAW	E9015-B9[A]
			FCAW	E91T1-B9[A]
			GTAW	ER90S-B9[A]
9Cr-1Mo		None	SMAW	E8015-B8
			FCAW	E81T1-B8
			GTAW	ER80S-B8
Ni-base			SMAW	ENiFeCr-4[B], ENiCrFe-2[C], ENiCrFe-3[D]
			FCAW	None
			GTAW	ERNiCrFe-4[B], ERNiCr-3[E]

[1]Minimum time at PWHT temperature to be conducted to requirements in applied construction code
[A]B91 classification is pending for the various Grade 91 matching filler metal product forms
[B]Also known as EPRI P87 filler metal
[C]Also known as INCO-WELD A
[D]Also known as INCONEL 182
[E]Also known as Filler Metal 82
Note: *INCONEL and INCO-WELD are registered trademarks of the Special Metals Corporation family of companies*

EPRI ELECTRIC POWER RESEARCH INSTITUTE

General Guidelines have been Provided for Each of the Three Welding Methods

- Selection, application and approach for excavation of a given weld repair method is a complex process
  - **For stub to header welds**, a raft with Ni-base filler and weld the stub to the raft using Ni-base filler
  - **For welded components (i.e. wyes, tees, branches)**, a local repair using E8015-B8 until the component can be replaced with a forging
  - **For through-thickness girth welds**, E9015-B9 with a step weld and low PWHT



How One Utility Classified Repair Procedures and the Issue of Permanent vs. Temporary

- "TVA employs two types of repair welding procedures. The first is the so-called "permanent repair", and the second "temporary repair." **These terms have little meaning in a literal sense. The choice of the terminology was made for the following reason: permanent repair includes stress-relief.** We use a welding electrode very compatible to the base material and apply a full stress-relief to alleviate the low ductility in the HAZ. We consider that a permanent repair."

From: "TVA's Experience with Casings." *Workshop Proceedings: Life Assessment and Repair of Steam Turbine Casings*. EPRI, Palo Alto, CA: CS-4676-SR. [July 1986]

Permanent vs. Temporary Repair is not a Function of PWHT, but of Design, Damage and Welding Procedure

- "For temporary repairs, two different procedures are used – one with an Inconel electrode and another with a low-alloy electrode. These procedures do not include stress-relief. At some later date, we will remove that temporary repair and put in a permanent repair when we have time, when it is economical and feasible, and other conditions are met.
- **But temporary repairs sometimes run for 15 years, and permanent repairs sometimes crack again after three years. So one cannot call either one permanent or temporary – the quality of the repair seems to be a function of the stress and the thermal cycles for that particular part of the casing."**

From: "TVA's Experience with Casings." *Workshop Proceedings: Life Assessment and Repair of Steam Turbine Casings*. EPRI, Palo Alto, CA: CS-4676-SR. [July 1986]

Qualification

- Where defects were not present in the as-deposited filler metal, there were no issues in qualifying:
  - E9015-B9 + Low PWHT
  - Ni-base + No PWHT
- The only issue arising in qualification was ensuring that E8015-B8 had sufficient ductility to pass the standard 2T side bend test
  - Documented elongation in the filler metal and in the as-welded condition is 14% (as opposed to minimum of 18% for SA-387 Grade 91)
  - **NBIC should consider relaxed qualification requirements for side bend testing of E8015-B8 repairs**
- Language/discussion added to invalidate requirements for QW-290 (i.e. "temper bead" rules)

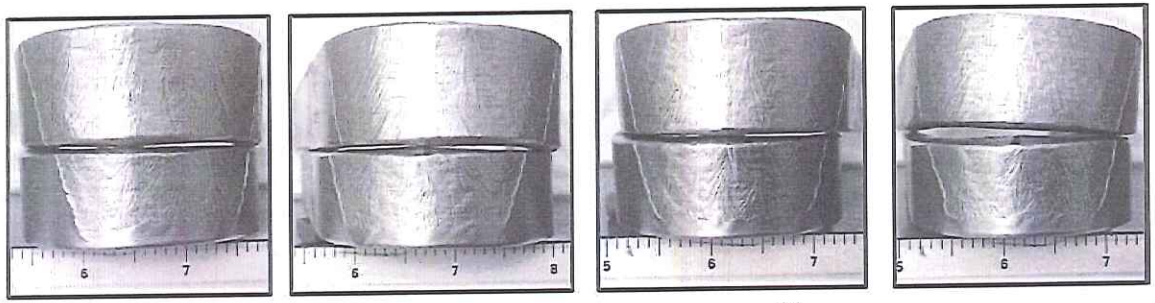
Example of an ASME B&PV Code Section IX PQR Results (Results shown for E9015-B9 + Low PWHT)

Sample	UTS[1]		Failure Location
	ksi	MPa	
RTT1a	100.6	693.8	Base
RTT1b	100.4	692.4	Base
RTT2a	100.8	695.2	Base
RTT2b	100.0	689.7	Base

[1]UTS = Ultimate Tensile Strength. The minimum UTS for SA-387 Grade 91 is 85 ksi

Bend[1,2]	Results	Comments
1a	Pass	No Cracks Observed
1b	Pass	No Cracks Observed
2a	Pass	<1/8" Crack Observed
2b	Pass	No Cracks Observed
3a	Pass	No Cracks Observed
3b	Pass	No Cracks Observed
4a	Pass	No Cracks Observed
4b	Pass	No Cracks Observed

[1]"a" are the "top" bend tests
[2]"b" are the "bottom" bend tests



Training and Familiarization

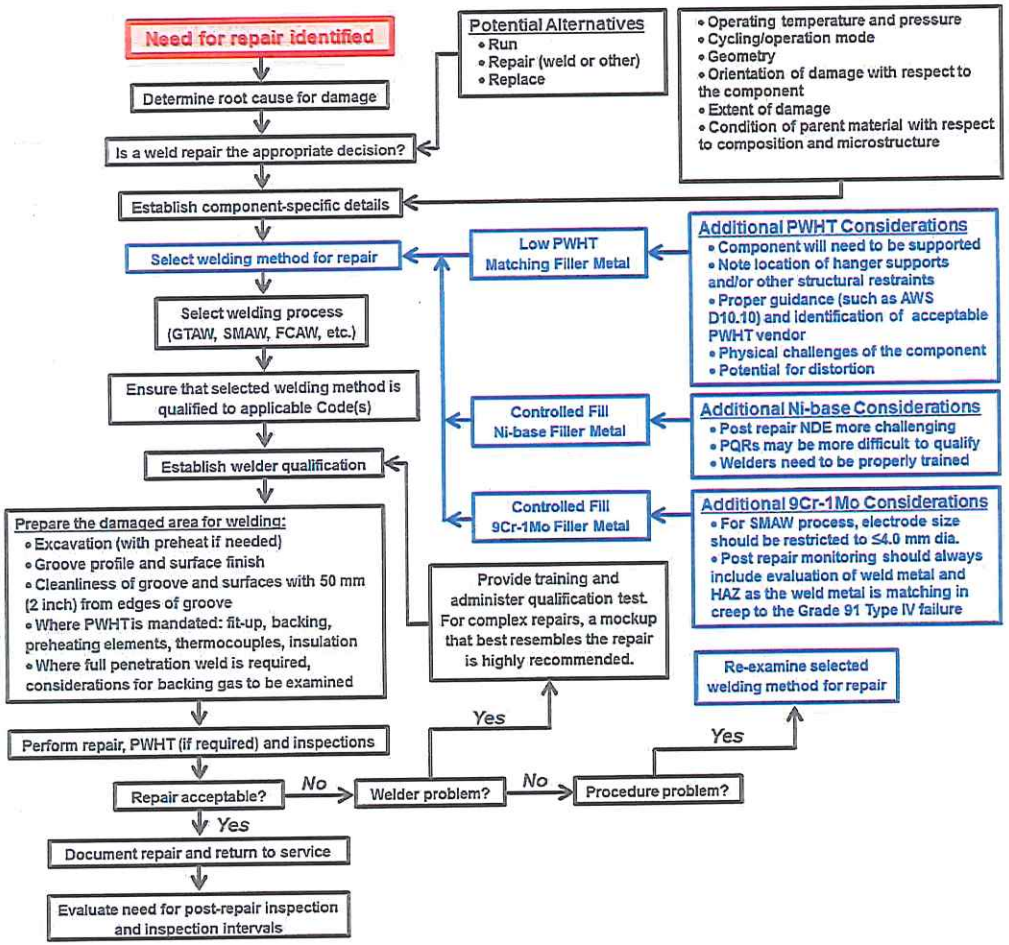
- Must be conscious of the craft labor (capabilities and nationalities)
  - Mock-ups
  - Ni-base versus Fe-base
  - Native language?
  - "TVA uses some special techniques on turbine casings. One is to run mock-up tests. For configurations that restrict access to the weld, it is often necessary to use mirror welding. In such a case, we use a mock-up test to familiarize the welders with the weld area."

From: "TVA's Experience with Casings." *Workshop Proceedings: Life Assessment and Repair of Steam Turbine Casings*. EPRI, Palo Alto, CA: CS-4676-SR. [July 1986]

The use of mock-up tests and careful screening will always be a necessity. The stakes for a weld repair are higher and there may be little margin for error

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Repair Roadmap



- This roadmap is not all-inclusive, but intended to be a starting point for the engineer and end-user to write a specification and identify critical steps in the repair process

Root Cause Analysis

- The type of damage
- Location/extent of damage
- And issues in design, operation, fabrication and construction are critical to outlining a well-engineered repair

Design

- Welded construction (i.e. flat end-caps, wyes, tees)
- System loads
- Cold spring
- DMWs
- WSRFs

Operation

- Temperatures above design
- High system loads
- Transients, cycling

Fabrication

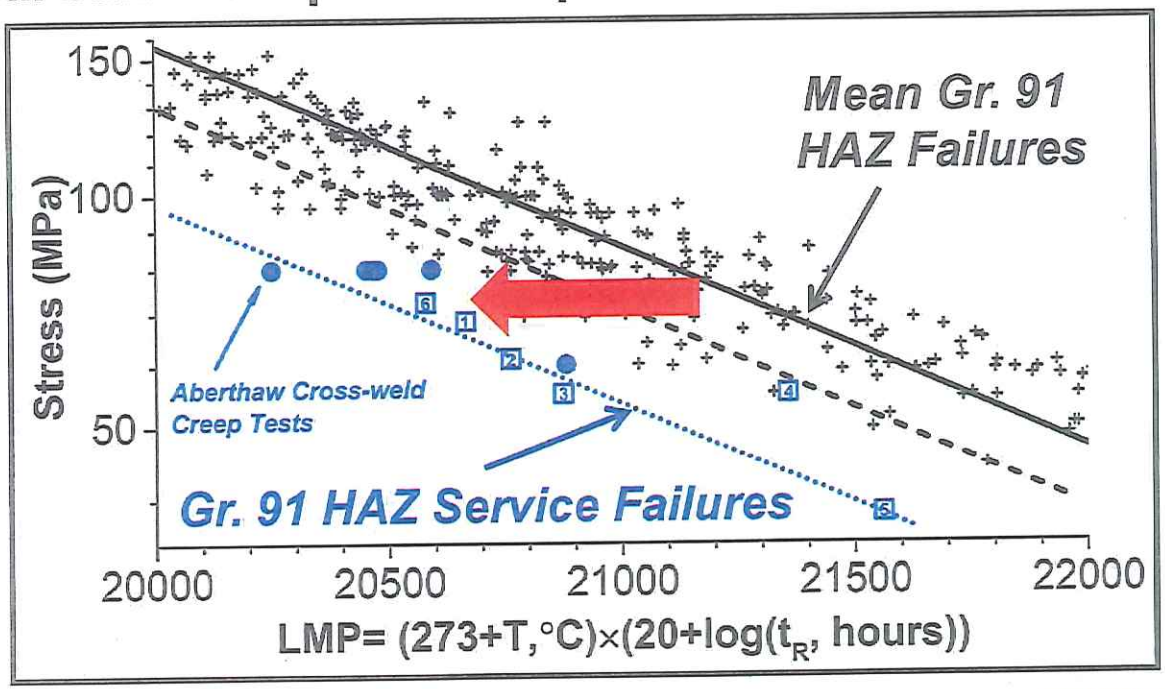
- Composition of materials
- Lack of monitoring of preheat, interpass or PWHT
- Excessive PWHT
- Excessive tempering

Construction

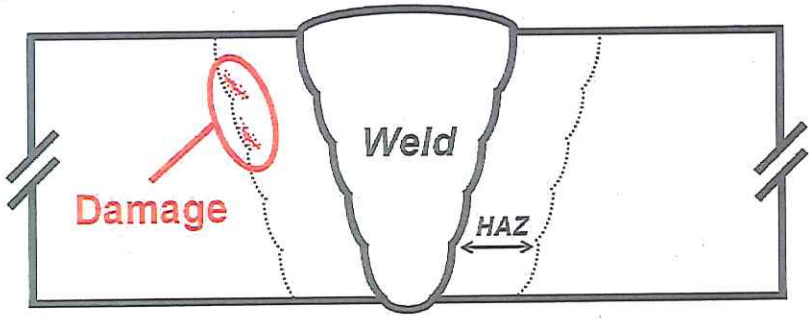
- Temporary weld attachments
- Lack of control of welding consumables
- Repair/remediation
- Quality assurance
- Documentation of work actually performed

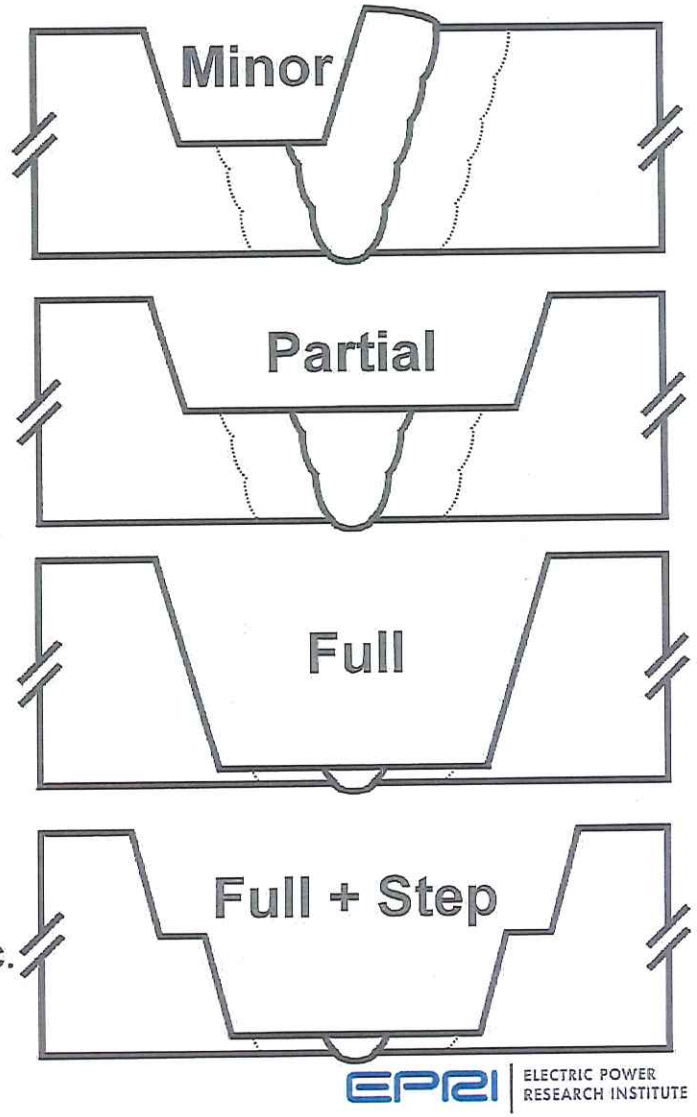
Assessment of Base Metal Condition

- This is a complex topic that warrants more detail and is the subject of on-going research in Program 87
- **Even a well-engineered weld repair in poorly performing material cannot improve the performance of this material**



Excavation of Damage Requires a Well-Engineered Approach



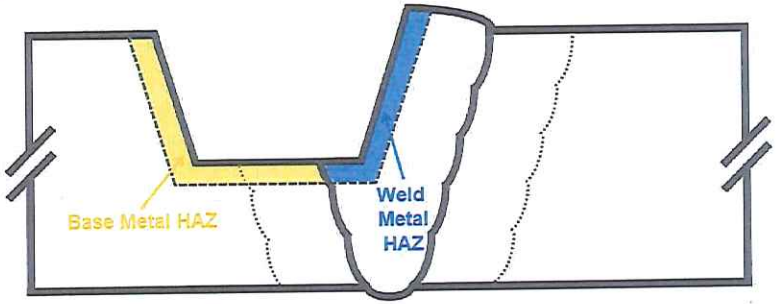


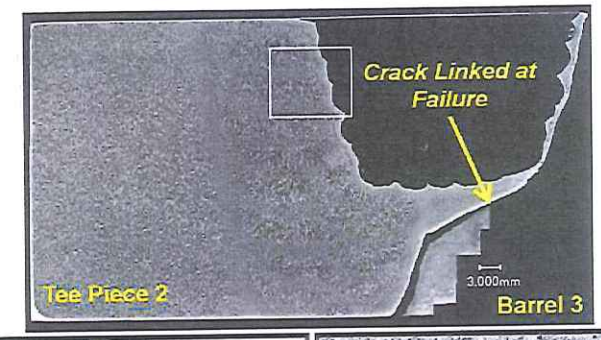
- Where damage is identified in a specific location, key questions arise:
  - Is the parent material identical on both sides of the weld? If not:
    - Composition vastly different?
    - Manufacturing route for material?
      - i.e. Pipe vs. forging vs. casting
  - Is damage expected to be isolated, or present through the thickness of the HAZ?
  - What is the geometry of the weldment?
    - i.e. compound bevel vs. single bevel etc.
  - Urgency of the repair and need for a permanent solution

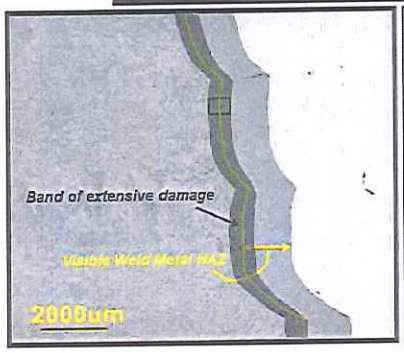
EPRI | ELECTRIC POWER RESEARCH INSTITUTE

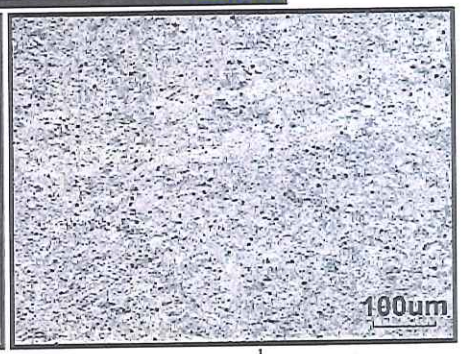
Repair where the Damage is Excavated with a "Minor Repair" is not Optimal

- In this scenario, a weld metal HAZ is created in the as-deposited filler metal
  - In some cases, extensive damage has been documented in this scenario in EPRI testing
  - Furthermore, **"If weld repairs of CSEF steels are required, it is absolutely essential to avoid making HAZ formed in ex-service weld metal"**
    - From: Kubushiro et al. "Microstructure and Creep Property of Long-term Serviced Mod. 9Cr-1Mo Steels after Repair Welding." *2014 PVP Conference*.









EPRI ELECTRIC POWER RESEARCH INSTITUTE

Controlled Fill Technique – 6 Simple Rules

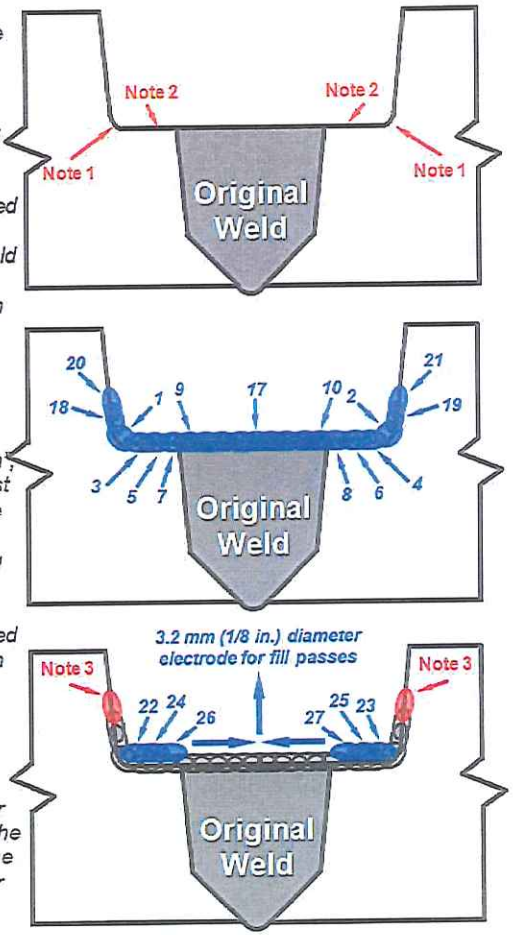
1. Weld starting on the bevel and working to the center of the excavation
2. 50% overlap bead to bead
3. Stringer beads only
4. 300°F (150°C) minimum preheat
5. 550°F (290°C) maximum interpass
6. Electrode diameter limitation
   - **Fe-base:** 2.5 mm (3/32 inch) or 3.2 mm (1/8 inch)
   - **Ni-base:** 3.2 mm (1/8 inch) for beads in contact with bevel and 3.2 mm (1/8 inch) or 4.0 mm (5/32 inch) for fill

Notes:

1. *The excavation should have rounded corners to prevent lack of fusion. It may be advisable to use a smaller diameter electrode (such as 2.5 mm or 3/32 in.) to ensure good tie in.*
2. *The step should be machined at least 10 mm beyond the fusion line of the original weld*
3. *The fill passes along the bevel should be restricted in height so as to not reduce access to the bottom of the excavation for the welder*

Additional Instructions:

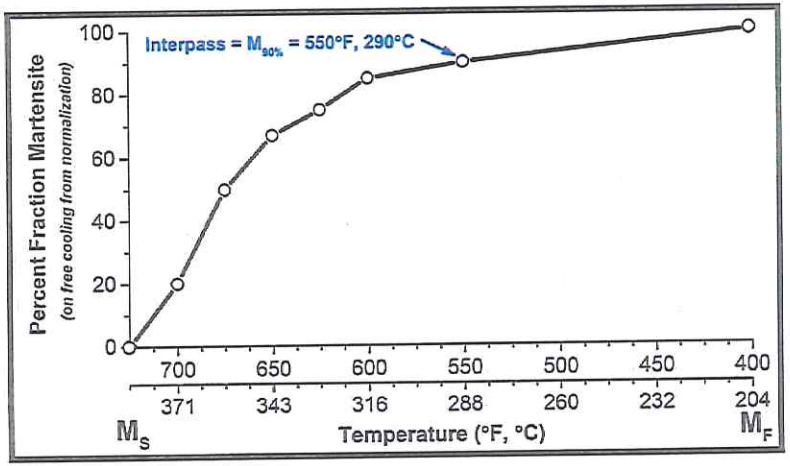
- *The fill passes should be conducted working "outside-in", whereby the fill passes are first deposited on either side of the excavation and additional fill passes are deposited welding towards the center of excavation*
- *50% overlap is recommended for all welding passes either in contact with the bevel or fill*
- *Stringer beads only are recommended for all welding passes either in contact with the bevel or fill*
- *A 2.5 mm (3/32 in.) diameter electrode may be utilized for the weld passes in contact with the bevel but is not mandated nor required for acceptable performance*

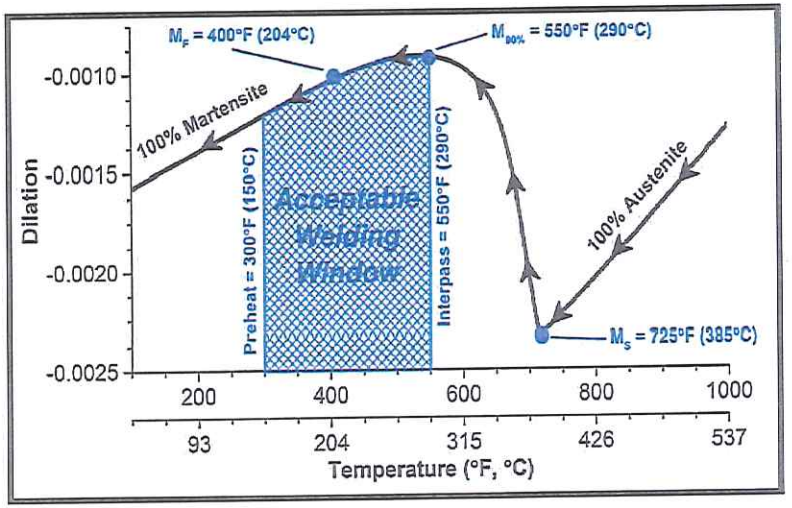


EPRI ELECTRIC POWER RESEARCH INSTITUTE

Justification for Preheat and Interpass Recommendations

- The "acceptable welding window" has been defined by practical and scientific limits:
  - Preheat of 300°F (150°C) to avoid hydrogen induced cracking
  - Interpass of 550°F (290°C) to promote tempering within a layer (i.e. bead to bead)
  - This does not mandate a lower minimum preheat should an end-user wish to utilize a preheat of ~400°F (204°C) or if a construction code mandated it





EPRI ELECTRIC POWER RESEARCH INSTITUTE

Post Weld Heat Treatment (PWHT) Guidance is beyond that of AWS D10.10

- Pads must wrapped onto the parts without gaps and never overlap
- Minimize gaps between heating pads
- In addition to AWS D10.10, it is recommended to have at least one thermocouple installed under each pad
- Thermocouples under pads must be insulated
- A single control thermocouple should not control multiple heaters
- Monitoring or control thermocouples should be located underneath pads in the location of the expected highest temp.
- For thickness transitions, mandate multiple control zones
- Redundancy of control thermocouples
- If possible, ID should be monitored
- Single point monitoring is unacceptable
- Avoid excessively high ramp rates

NDE and Post Repair Testing

- NBIC NB-23 requires that all repairs to pressure-retaining items shall be verified by examination or test. Liquid pressure testing, also known as hydro-testing, is widely used for this purpose.
  - 2013 Edition of the NBIC Part 3, Table 4.4.2
- The NBIC does not restrict post-repair testing to only liquid pressure tests; alternate testing methods are recognized in NBIC, Part 3, 4.4.1
  - Based on critical flaw size calculations, a minimum critical flaw size of ~0.10 inch (3 mm) should be detected by the selected NDE method.
- Post-repair inspection is not considered a single event
  - A recommended base re-inspection interval is every other planned major outage or six years, whichever is less.
  - The Owner/User may expand or compress the re-inspection interval based on trend results from previous inspections.

Stress Corrosion Cracking – 3 Simple Rules

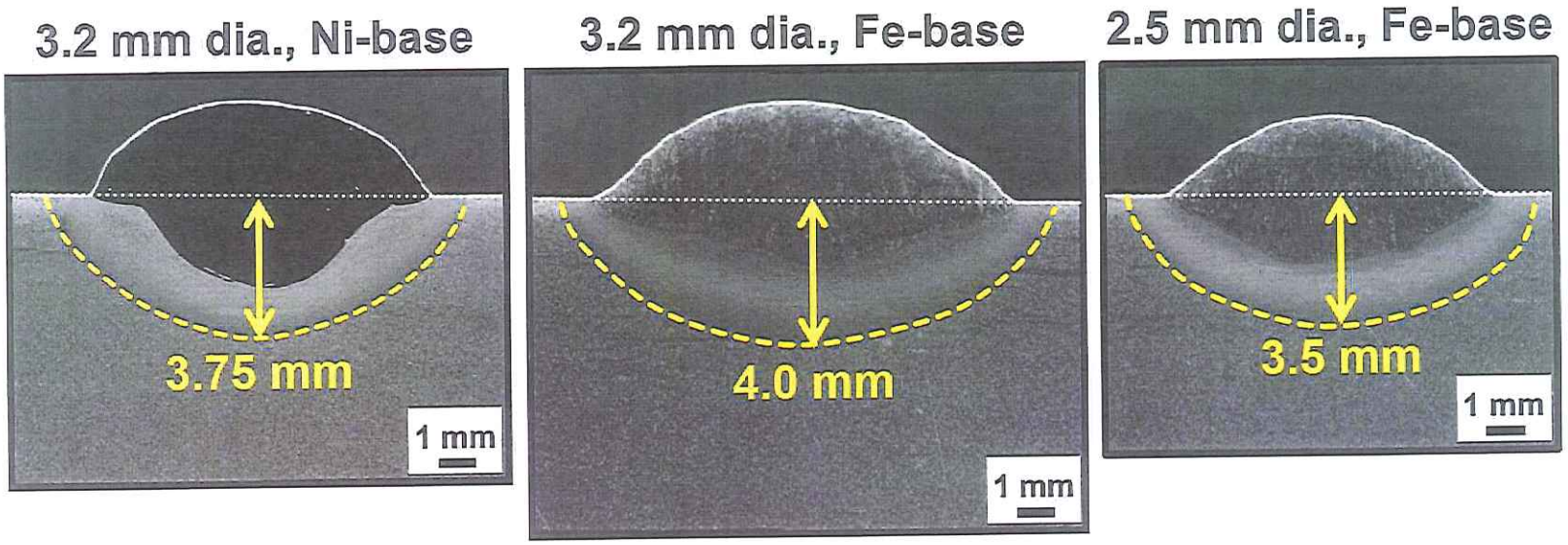
- ***Rule 1 – Apply and keep dry***
  - The outside diameter of the weld repair should be coated with a water-resistant coating including ~1 inch (25 mm) beyond the weld on either side of the fusion line
    - Vaseline, paint, WD-40, Crisco, etc.
  - The weldment be properly protected from all moisture or preserved "dry" prior to unit startup, especially where the piping is directly exposed to the environment, such as in some combined cycle power plants.

Stress Corrosion Cracking – 3 Simple Rules

- ***Rule 2 – Full penetration weld repairs should undergo a PWHT***
  - For weld repairs that must be made using a full penetration weld, it is recommended that the weldment be made using the matching -B9 consumables and a minimum PWHT of 675°C (1250°F)

Stress Corrosion Cracking – 3 Simple Rules

Bead on Plate Experiments – Depth of HAZ in Grade 91 Steel



- ***Rule 3 – When a land can be left for a full penetration weld, limit the diameter of the electrode in direct contact with the land to 2.5 mm (3/32 inch) or use controlled GTAW process***
  - For weld repairs where a land can be left in the weldment, it is recommended that the land be at least 0.20 inch (5 mm) thick to avoid creating an HAZ that is exposed to the ID surface.

Appendices

More will be added as-required

- A – Filler Metal Compositions, as Listed in ASME B&PV Code Section IIC and Code Cases
- B – Common Base Metal Compositions for Grade 91 Product Forms as Listed in ASME B&PV Code Section IIA
- C – Exemplar Filler Metal Procurement Form
- D – Evaluation of Hardenability of Filler Metal E8015-B9 (9Cr-1Mo)
- E – Evaluation of Hardenability of Filler Metal E9015-B9 (9Cr-1Mo-VNbN) in the As-welded and Low PWHT Condition
- F – Performance of Through-thickness Weld Repairs in Grade 91 Steel
- G – Performance of Weld Repairs Using E8015-B8 Filler Metal and Importance of the Grade 91 Parent Metal Condition
- H – Effect of the Weld Repair Quality on Performance
- I – Effect of Geometry on the Performance of Weld Repairs in Grade 91 Steel

Conclusions

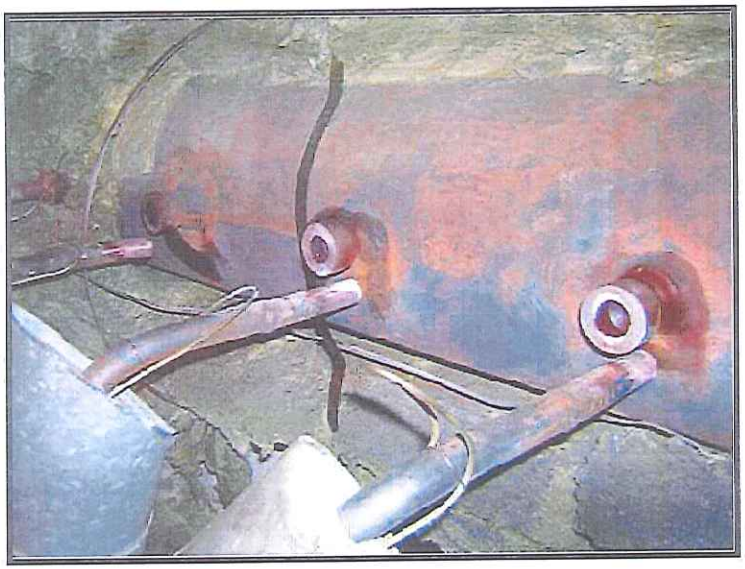
- It is clear that the technical details for "best practice" regarding welding of low alloy bainitic steels do not apply directly to welding of tempered martensitic steel. Thus, repair techniques commonplace for "conventional" low-alloy steels are not directly relevant for repairs on Grade 91 steels.
  - **And the need for an NBIC supplement to address weld repair of Grade 91 steel not covered in Welding Method 6**
- Furthermore, technical definition of the best-option repair in Grade 91 steel components is not a one-size-fits-all approach

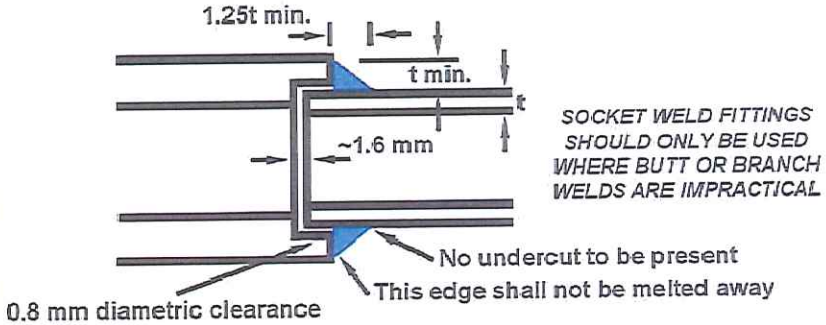
Proposed Path Forward

- NBIC committee members to review draft and provide feedback prior to July 2015 meeting
  - EPRI will address any issues, concerns, comments, etc.
- Draft NBIC Supplement covering the balance of repair scenarios for Grade 91 steel to be brought forward by end of 2015 for voting in 2016

Weld Repair of Grade 91 Steel is being Performed or Planned Using Procedures without PWHT

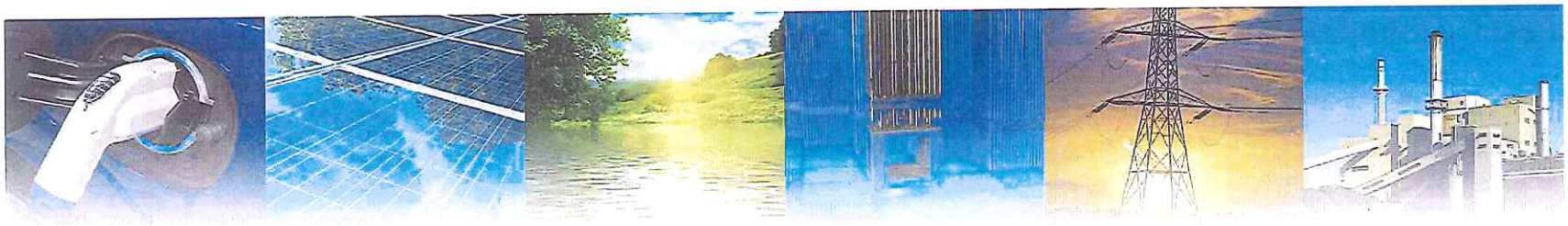
- An HRSG unit was brought off load shortly before a planned outage as a result of a steam leak from a small diameter HP superheater outlet pressure impulse line (incorrect material). Temporary repairs to three lines were carried out using nickel-based GTAW socket welds to allow rapid return to service.





From: *Cold Weld Repair of Ferritic Components – Case Studies of UK Power Stations*. EPRI, Palo Alto, CA: 3002003362. 2014.

EPRI | ELECTRIC POWER RESEARCH INSTITUTE



EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Together…Shaping the Future of Electricity

Post Weld Heat Treatment (PWHT) is Complicated

- Additional guidance is provided to supplement AWS D10.10
- Guidance below is for a pipe that is 14 inch OD (356 mm) X 1.25 inch (31.75 mm) wall thickness, horizontally aligned with no thickness transition

Scenario	AWS D10.10	Option 1[A]	Option 2[B]	
Control Band Width	3t	3t	12.8t	19.2t
Heated Band Width	20 inches (508 mm)	49 inches (1245 mm)	20 inches (508 mm)	28 inches (711 mm)
Gradient Control Band Width	30 inches (762 mm)	60 inches (1524 mm)	30 inches (762 mm)	38 inches (965 mm)
Reduction in through-wall temperature gradient	0% (52°F, 29°C)	40%	40% (~30°F, 17°C)	60%

[A]Increase the heated band width

[B]Change from a soak band width scenario to a control band width scenario

General Guidelines – Considerations for Weld Method 1 (Matching + PWHT)

- Matching filler metal is used
- Electrode size restricted to ≤ 5/32 inch (4.0 mm) dia.
- Low PWHT decreases the potential for excessive tempering in the HAZ or base material
- Low PWHT will decrease risk of exceeding the AC_1 for Grade 91
- Low PWHT can be expected to relieve some or most of the welding residual stresses in the component
- Recommend minimum PWHT temperature (1250°F, 675°C) is below ASME B&PV Code minimum specified in Sec. I or B31.1
- Restraints and accommodation of thermal expansion stresses during PWHT need to be addressed
- Where charpy impact toughness tests are required, a low PWHT may not be sufficient to meet the specified requirements

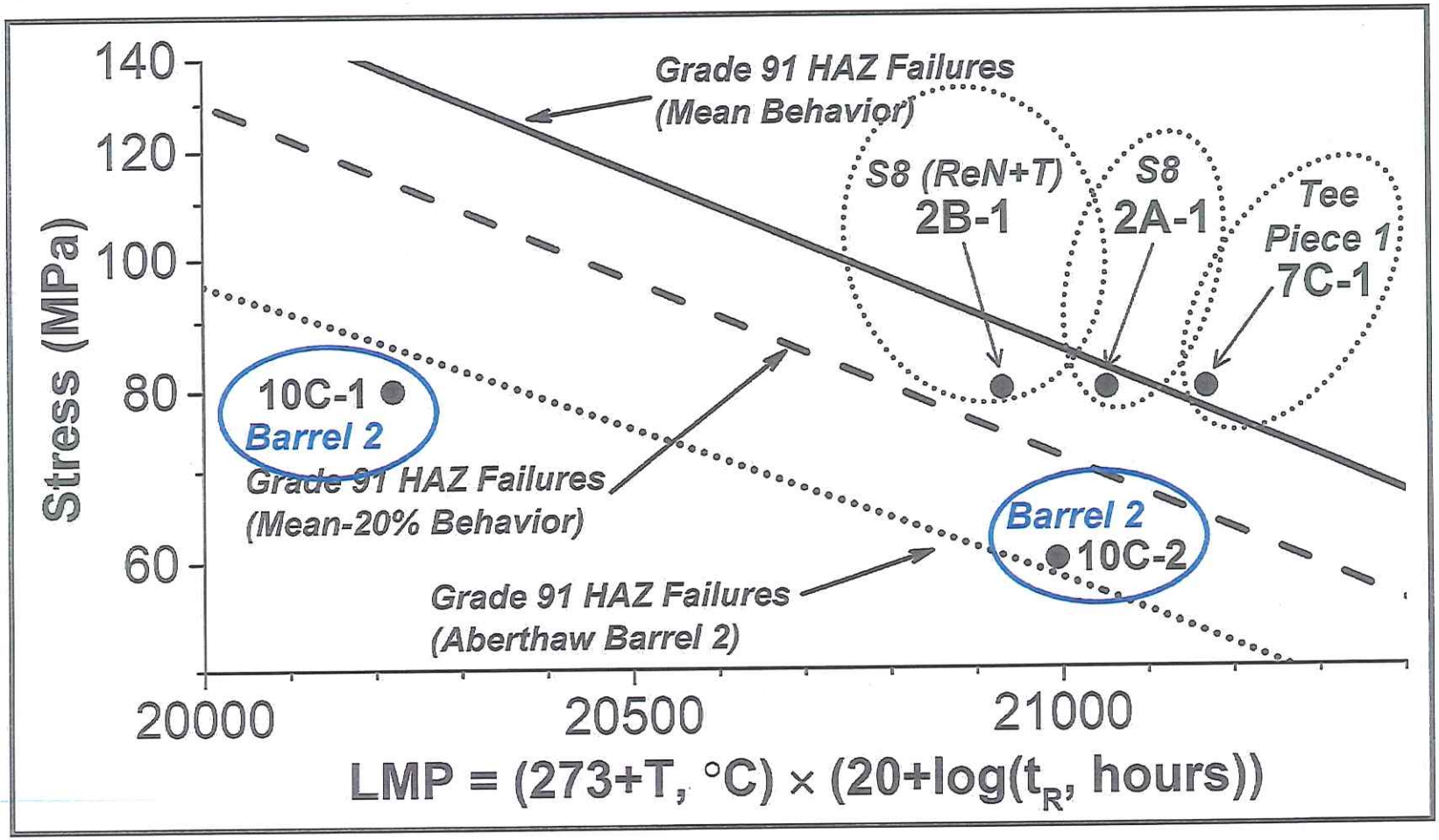
General Guidelines – Considerations for Weld Method 2 (9Cr-1Mo + No PWHT)

- Filler metal matches the creep strength of the Grade 91 HAZ
- Filler metal is less hardenable than matching filler metal and tempers more readily during welding and in service
- No concern for carbon migration as the Cr content is matching to Grade 91 steel
- Electrode size should always be restricted to ≤ 5/32 inch (4.0 mm) in diameter and more preferably to ≤ 1/8 inch (3.2 mm)
- Post-repair inspection and inspection intervals will need to include weld metal and HAZ
  - Depending on the creep strength of the base metal, damage may occur in either the HAZ or weld metal or both

General Guidelines – Considerations for Weld Method 3 (Ni-base+ No PWHT)

- The electrode size for fill passes against the bevel should be 1/8 inch (3.2 mm) diameter
- The electrode size for all fill passes can be 5/32 inch (4.0 mm) diameter
- Increased defect tolerance in weld metal
- NDE is more challenging during the repair and following repair
- Tendency to form microfissures and/or lack of fusion defects
  - The defects have not been shown to contribute to a reduction in performance
- The skill of the welder can be an important variable
- The temperature of the component as welding residual stresses may not relax rapidly at temperatures <550°C (1022°F)
- Post-repair inspection and inspection intervals will need to include fusion line and HAZ as there may be a risk for damage in both locations and consistent with reported DMW failures

Results for Four Parent Metal Conditions and the Same Welding Procedure (E9015-B9 + Low PWHT)



Controlled Fill Technique Schematics

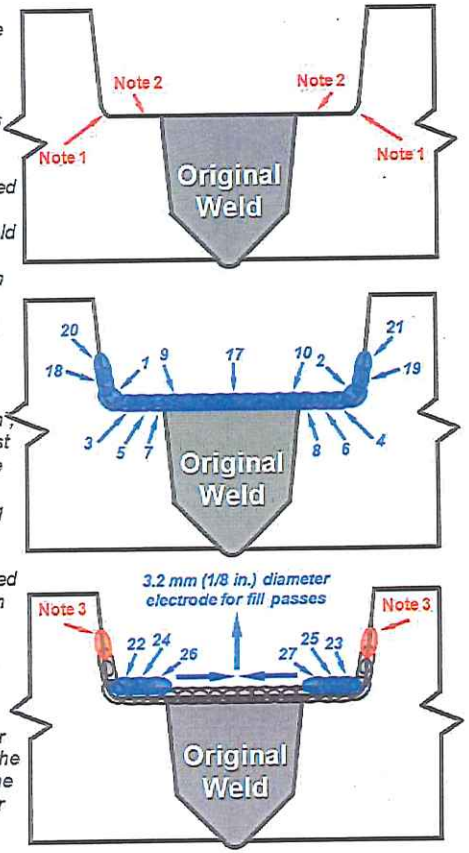
Partial Weld Repair

Notes:

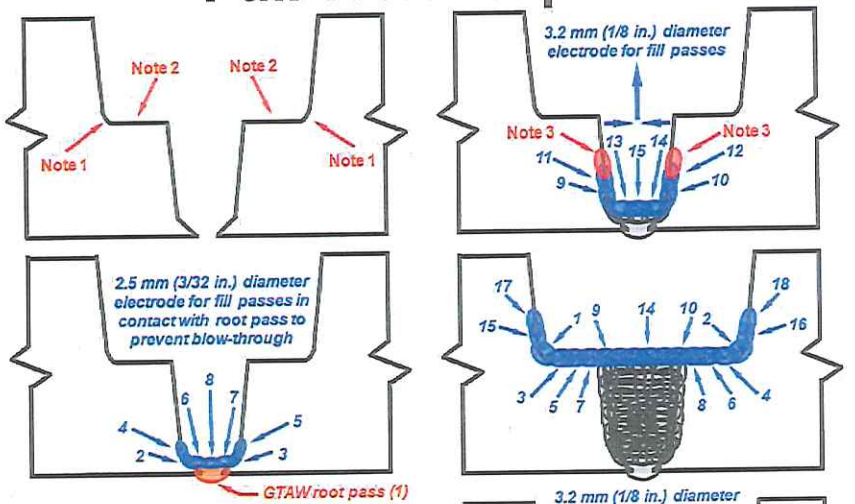
1. The excavation should have rounded corners to prevent lack of fusion. It may be advisable to use a smaller diameter electrode (such as 2.5 mm or 3/32 in.) to ensure good tie in.
2. The step should be machined at least 10 mm beyond the fusion line of the original weld
3. The fill passes along the bevel should be restricted in height so as to not reduce access to the bottom of the excavation for the welder

Additional Instructions:

- The fill passes should be conducted working "outside-in", whereby the fill passes are first deposited on either side of the excavation and additional fill passes are deposited welding towards the center of excavation
- 50% overlap is recommended for all welding passes either in contact with the bevel or fill
- Stringer beads only are recommended for all welding passes either in contact with the bevel or fill
- A 2.5 mm (3/32 in.) diameter electrode may be utilized for the weld passes in contact with the bevel but is not mandated nor required for acceptable performance



Full Weld Repair



Notes:

1. The excavation should have rounded corners to prevent lack of fusion. It may be advisable to use a smaller diameter electrode (such as 2.5 mm or 3/32 in.) to ensure good tie in.
2. The step should be at least 10 mm in width
3. The fill passes along the bevel should be restricted in height so as to not reduce access to the bottom of the excavation for the welder

Additional Instructions:

- The fill passes should be conducted working "outside-in", whereby the fill passes are first deposited on either side of the excavation and additional fill passes are deposited welding towards the center of excavation
- 50% overlap is recommended for all welding passes either in contact with the bevel or fill
- Stringer beads only are recommended for all welding passes either in contact with the bevel or fill
- A 2.5 mm (3/32 in.) diameter electrode may be utilized for the weld passes in contact with the bevel but is not mandated nor required for acceptable performance

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Action Item Request Form

NB15-1404

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:

Part 3
1.6.1
Materials

i) The manual shall describe the method used to ensure 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.

3.2.1 MATERIAL REQUIREMENTS FOR REPAIRS AND ALTERATIONS

a) The materials used in making repairs or alterations shall conform insofar as possible to the original code of construction or construction standard or code selected, including the material specification requirements used for the work planned. Carbon or alloy steel having a carbon content of more than 0.35% shall not be welded unless permitted by the original code of construction. The "R" Certificate Holder is responsible for verifying identification of existing materials from original data, drawings, or pressure-retaining item records, and identification of the materials to be installed. Consideration shall be given to the condition of the **existing material**, especially in the weld preparation area. If the **existing material** cannot be verified (unknown), the "R" Certificate Holder shall perform a chemical analysis and hardness testing, as a minimum, of the unknown material to verify its weldability and strength or may elect to qualify a weld procedure. If there is a question with regard to the weldability characteristics of the material, then competent technical advice should be obtained.

b) Statement of Need

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

1. Repair organizations are required to add to the quality manual a description of how existing material is identified. In 1.6.1 i)

2. Organizations are required to consider and verify existing material as part of their responsibility in 3.2.1 a)

These organizations are somewhat confused what is meant by existing material in NBIC Part 3.

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.

This was discussed at the NBIC Subgroup Repair and Alteration meeting on January 20, 2015.

These organizations are somewhat confused what existing material is meant in NBIC Part 3. They have asked to add a definition or explanation in Part 3 as what is meant by existing material.

d) Task Group Assigned

Project Manager: Wayne Jones,

Members: Marty Toth, Joel Amato, and Rob Trout

Action Item NB15-1405 from Request for Interpretation

Robert V. Wielgoszinski
Hartford Steam Boiler of CT

Item	NB15-1405 *(was IN 14-0401)*
Purpose	Code Interpretation & possible revision to present Code rules
Scope:	Repairs and alterations to vessels constructed of ferritic materials with tensile properties enhanced by heat treatment, i.e. Part UHT material.
Background	During the construction of liquid propane vessels it is typical to use SA-517 Gr. E (P-No. 11B) for use as heads and shells for propane transport tanks. The ASME Code requires the base materials, welding materials, and the WPS's to be qualified with impact tests. Also, the Code requires production impact testing to be performed. This is where the actual vessel material, actual filler materials, are welded with the actual WPS to be used in production, and the weld coupon is impact tested to meet the specified results of Section VIII. To do so, the Manufacturer of the vessel is sure to purchase enough extra base and filler material to perform these tests. When repairs / alterations are made to these vessels the NBIC requires the rules of the original construction Code to be followed. As such, any new material to be added to a vessel or any WPS's used or any filler metal used for the repair must then be impact tested and meet the results stated in Section VIII. Also, production impacts must therefore be made since this is a mandatory Section VIII requirement. This is usually accomplished by making a weld coupon out of existing material cut from the vessel and welding it to the new material to be added to the vessel, and then impact testing specimens from that coupon. But, not all repairs / alterations lend themselves the ability to take existing material from the vessel. If a small nozzle is added to the vessel, only a few inches of material is taken from the vessel. Or say a crack is to be weld repaired or there is weld metal build up to be made on some worn or wasted area. Then there is no extra material to be taken away from the vessel to run coupons for production impacts. Strict interpretation of the ASME Code would now require a piece of steel to be removed to run production impacts and then a flush patch installed over the area removed. Some individuals look at the words in NBIC, Part 3, Section 1, paragraph 1.2, where it says, "...the standard governing the original construction shall conform, insofar as possible..." gives one the leeway to not require production impacts because it's not possible. Others indicated that it is possible but not practical to cut perfectly good material out of a vessel when there is no need to. And others will say that the ASME clearly requires existing material to be removed to run impact tests. One thing is clear though, and that is there is lack of uniformity in applying these rules. So we are looking to the NBIC to provide some guidance in this matter. The

	Jurisdiction in this case is the US DOT, and 49CFR Chapter 1 § 180.413(a)(1) states that the NBIC is to be followed for repairs and modifications. DOT is also looking to the NBIC for clarification. Depending on the responses to the inquiry it may be prudent revise the Code to be more specific in this area of UHT materials.
Proposed Questions	**Question 1:** The NBIC Part 3 paragraph 1.2 states that a repair shall be carried out "insofar as possible to the section and edition of the ASME code most applicable to the work planned." If a vessel is constructed using SA-517-E (P-11B) material to ASME Section VIII Div. 1, where production and weld procedure impact tests were required during construction, would a repair to a crack in the shell require production and weld procedure impact testing under the NBIC? **Proposed Reply 1:** Yes. **Question 2:** If the answer to Question 1 is yes and there was no SA-517-E material from the original lot available, would the repair require the addition of new base material (e.g. a flush patch around the area of the crack) so that production impact tests could be performed with the original base metal to the new base metal? **Proposed Reply 1:** Yes. **Question 3:** If the vessel described in Question 1 was to be altered by adding an SA-675 (P-1) pump flange to the shell, would production and weld procedure impact tests be required using the same lot P-1 and P-11B base materials as used in the alteration? **Proposed Reply 1:** Yes.

NBIC Interpretation Draft

IN14-0701 - *Part 3 PWHT* - Subject: NBIC 2010, part 3, Post Weld Heat Treatment of a Vessel.

Q1. Must a company that performs post weld heat treatment be required to hold an "R" certification?
ANS: YES

Q2. Is this post weld heat treatment now considered an "Alteration" to this vessel, as per NBIC part 3?
ANS:
YES

Q3. Shall this "Alteration" be documented on a NBIC R-2 form? ANS: YES

Subject: NBIC 2010 Edition, Part 3, Post Weld Heat Treatment of a Vessel

Committee Question 1

An R-Certificate holder decides to perform post weld heat treatment (PWHT) of a vessel at the request of a client, where no PWHT was performed in the original construction. Is the performance of PWHT of the vessel considered an alteration and subject to documentation using a Form R2?

Reply: Yes.

Committee Question 2

For the vessel described above, must the weld procedures used for construction of the vessel be qualified with PWHT?

Reply: Yes.

Committee Question 3

Must the PWHT described above be performed by the R-Certificate holder?

Reply: No, the PWHT may be subcontracted; however the R certificate holder retains the responsibility for the performance of the PWHT.

Rationale: PWHT can reduce the mechanical properties and/or notch toughness of the original vessel material affecting the pressure retaining capability, which is the definition of an alteration in the NBIC.

PROPOSED INTERPRETATION

Inquiry No.	IN14-0801				
Source	William R Chalfant, PBF Energy, Delaware City Refinery				
Subject	**2013 NBIC , Part 3, Section 3.3.3 s) and 3.3.4.3.a)**				
Edition	2013				
Question	Question #1: 2013 NBIC, Part 3, Section 3.3.4.3.a) When performing weld metal buildup of wasted areas of pressure retaining items in accordance with NBIC Part 3, paragraph 3.3.4.3.a), is the interpretation that the final metal thickness (including base metal and weld metal build up) shall be the calculated minimum required thickness in accordance with the original Code of Construction plus any future corrosion allowance for the desired remaining life? Question #2: 2013 NBIC, Part 3, Section 3.3.3, paragraph s) When replacing a part on a pressure retaining item in accordance with NBIC Part 3, paragraph 3.3.3.s), is it the intent of the term "minimum required thickness" to mean nominal wall thickness minus corrosion allowance as shown on the original Manufacturer's Data Report?				
Reply	Reply #1: Yes. Reply #2: Yes.				
Committee's Question	**Question #1: 2013 NBIC, Part 3, Section 3.3.4.3.a) When performing weld metal buildup of wasted areas of pressure retaining items in accordance with NBIC Part 3, paragraph 3.3.4.3.a), the final thickness (current base metal thickness of the repair area plus weld metal build up) of the repair shall be the nominal thickness shown on the original Manufacturer's Data Report or the minimum required thickness plus any future corrosion allowance for the desired remaining life?**				
Committee's Reply	**Reply #1: Yes. Note that when weld buildup is based upon minimum required thickness plus any future corrosion allowance for the desired remaining life, NBIC Part 2, Section 4.4 shall be used for assessment of damage mechanisms, remaining life, inspection frequency, etc.**				
Rationale	**See Below.**				
SC Vote	Unanimous	No. Affirmative	No. Negative	No. Abstain	No. Not Voting
NBIC Vote	Unanimous	No. Affirmative	No. Negative	No. Abstain	No. Not Voting

Negative Vote Comments	

Reference:

2013 NBIC Part 3, Section 3.3.3 s): s) Replacement of a pressure-retaining part with a material of different nominal composition and, equal to or greater in allowable stress from that used in the original design, provided the replacement material satisfies the material and design requirements of the original code of construction under which the vessel was built. The minimum required thickness shall be at least equal to the thickness stated on the original *Manufacturer's Data Report.*

2013 NBIC Part 3, Section 3.3.4.3.a)

a) Shells, Drums, Headers

Wasted areas in stayed and unstayed shells, drums, and headers may be built up by welding, provided that in the judgment of the Inspector the strength of the structure has not been impaired. Where extensive weld buildup is employed, the Inspector may require an appropriate method of NDE for the completed surface of the repair. For suggested methods of building up wasted areas by welding. (See NBIC Part 3, Figure 3.3.4.3-a).

Rationale:

ASME Section VIII, Division 1 references:

MANDATORY APPENDIX 3 DEFINITIONS

3-2 DEFINITIONS OF TERMS

thickness of vessel wall:

(a) design thickness: the sum of the required thickness and the corrosion allowance (see UG-25).

(b) required thickness: that computed by the equations in this Division before corrosion allowance is added (see UG-22).

(c) nominal thickness: except as defined in UW-40(f) and modified in UW-11(g), the nominal thickness is the thickness selected as commercially available, and supplied to the Manufacturer. For plate material, the nominal thickness shall be, at the Manufacturer's option, either the thickness shown on the Material Test Report {or material Certificate of Compliance [UG-93(a)(1)]} before forming, or the measured thickness of the plate at the joint or location under consideration.

UG-16 GENERAL

(b) Minimum Thickness of Pressure Retaining Components. Except for the special provisions listed below, the minimum thickness permitted for shells and heads, after forming and regardless of product form and material, shall be 1/16 in. (1.5 mm) exclusive of any corrosion allowance.

Exceptions:

(1) the minimum thickness does not apply to heat transfer plates of plate-type heat exchangers;

(2) this minimum thickness does not apply to the inner pipe of double pipe heat exchangers nor to pipes and tubes that are enclosed and protected from

mechanical damage by a shell, casing, or ducting, where such pipes or tubes are NPS 6 (DN 150) and less.

(3) the minimum thickness of shells and heads of unfired steam boilers shall be 1/4 in. (6 mm) exclusive of any corrosion allowance; (4) the minimum thickness of shells and heads used in compressed air service, steam service, and water service, made from materials listed in Table UCS-23, shall be 3/32 in. (2.5 mm) exclusive of any corrosion allowance.

(5) this minimum thickness does not apply to the tubes in air cooled and cooling tower heat exchangers

(e) Corrosion Allowance in Design Formulas. The dimensional symbols used in all design formulas throughout this Division represent dimensions in the corroded condition.

UG-25 CORROSION

(a) The user or his designated agent (see U-2) shall specify corrosion allowances other than those required by the rules of this Division. Where corrosion allowances are not provided, this fact shall be indicated on the Data Report.

(b) Vessels or parts of vessels subject to thinning by corrosion, erosion, or mechanical abrasion shall have provision made for the desired life of the vessel by a suitable increase in the thickness of the material over that determined by the design formulas, or by using some other suitable method of protection. (See Nonmandatory Appendix E.)

NONMANDATORY APPENDIX E SUGGESTED GOOD PRACTICE REGARDING CORROSION ALLOWANCE

E-2

When the rate of corrosion is closely predictable, additional metal thickness over and above that required for the initial operating conditions should be provided, which should be at least equal to the expected corrosion loss during the desired life of the vessel.

E-3

When corrosion effects are indeterminate prior to design of the vessel, although known to be inherent to some degree in the service for which the vessel is to be used, or when corrosion is incidental, localized, and/or variable in rate and extent, the designer must exercise his best judgment in establishing a reasonable maximum excess shell thickness. This minimum allowance may, of course, be increased according to the designer's judgment.

UG-27 THICKNESS OF SHELLS UNDER INTERNAL PRESSURE,

(a) The minimum required thickness of shells under internal pressure shall not be less than that computed by the following formulas,[18] except as permitted by Mandatory Appendix 1 or Mandatory Appendix 32.

t = minimum required thickness of shell

$$t = \frac{PR}{SE - 0.6P} \quad \text{or} \quad P = \frac{SEt}{R + 0.6t}$$

UG-34 UNSTAYED FLAT HEADS AND COVERS

(a) The minimum thickness of unstayed flat heads, cover plates and blind flanges shall conform to the requirements given in this paragraph. These requirements apply to both circular and noncircular[24] heads and covers. Some acceptable types of flat heads and covers are shown in Figure UG-34. In this figure, the dimensions of the component parts and the dimensions of the welds are exclusive of extra metal required for corrosion allowance.

UG-45 NOZZLE NECK THICKNESS

The minimum wall thickness of nozzle necks shall be determined as given below.
For access openings and openings used only for inspection:

$$t_{\text{UG-45}} = t_a$$

For other nozzles:

Determine t_b.

$$t_b = \min\left[t_{b3},\ \max\left(t_{b1},\ t_{b2}\right)\right]$$

$$t_{\text{UG-45}} = \max\left(t_a,\ t_b\right)$$

where

t_a = minimum neck thickness required for internal and external pressure using UG-27 and UG-28 (plus corrosion allowance), as applicable.
t_{b1} = for vessels under internal pressure, the thickness (plus corrosion allowance) required for pressure…
t_{b2} = for vessels under external pressure, the thickness (plus corrosion allowance) obtained by using the external design pressure as an equivalent internal design pressure…
t_{b3} = the thickness given in Table UG-45 plus the thickness added for corrosion allowance.
$t_{\text{UG-45}}$ = minimum wall thickness of nozzle necks

UG-80 PERMISSIBLE OUT - OF - ROUNDNESS OF CYLINDRICAL, CONICAL, AND SPHERICAL SHELLS

(b) External Pressure. The shell of a completed vessel to operate under external pressure shall meet the following requirements at any cross section:

(3) For cylinders and spheres, the value of t shall be determined as follows:

(-a) For vessels with butt joints, t is the nominal plate thickness less corrosion allowance.

(-c) Where the shell at any cross section is made of plates having different thicknesses, t is the nominal thickness of the thinnest plate less corrosion allowance.

UG-98 MAXIMUM ALLOWABLE WORKING PRESSURE

(b) The maximum allowable working pressure for a vessel part is the maximum internal or external pressure, including the static head thereon, as determined by the rules and equations in this Division, together with the effect of any combination of loadings listed in UG-22 which are likely to occur, for the designated coincident temperature, excluding any metal thickness specified as corrosion allowance. See UG-25.

MANDATORY APPENDIX 3 DEFINITIONS

3-2 DEFINITIONS OF TERMS

thickness of vessel wall:

(a) design thickness: the sum of the required thickness and the corrosion allowance (see UG-25).

(b) required thickness: that computed by the equations in this Division before corrosion allowance is added (see UG-22).

(c) nominal thickness: except as defined in UW-40(f) and modified in UW-11(g), the nominal thickness is the thickness selected as commercially available, and supplied to the Manufacturer. For plate material, the nominal thickness shall be, at the Manufacturer's option, either the thickness shown on the Material Test Report {or material Certificate of Compliance [UG-93(a)(1)]} before forming, or the measured thickness of the plate at the joint or location under consideration.

ASME Section VIII, Division 2,

Table 2-D.1 Instructions For The Preparation Of Manufacturer's Data Reports

Note No. 16: Thickness is the nominal thickness of the material used in the fabrication of the vessel. It includes corrosion allowance.

4.1.2 MINIMUM THICKNESS REQUIREMENTS

Except for the special provisions listed below, the minimum thickness permitted for shells and heads, after forming and regardless of product form and material, shall be 1.6 mm (0.0625 in.) exclusive of any corrosion allowance.

4.1.4 CORROSION ALLOWANCE IN DESIGN EQUATIONS

4.1.4.3 The user shall determine the required corrosion allowance over the life of the vessel and specify such in the User's Design Specification. The Manufacturer shall add the required allowance to all minimum required thicknesses in order to arrive at the minimum ordered material thickness.

4.1.5 DESIGN BASIS

4.1.5.1 Design Thickness.

... the design thickness shall not be less than the minimum thickness specified in paragraph 4.1.2 plus any corrosion allowance required by paragraph 4.1.4.

Jim Pillon

IN14-0801

I vote negative because there was too much disagreement on wording during the discussions. I believe a better proposal can be developed.

Jim Pillon

Negative
INT-0801

Repair - restore a pressure retaining item to a safe & satisfactory operating condition.

The use of the calculation in the code (boiler) identifies the min. pressure retaining thickness or the max. pressure based on math. to be used.

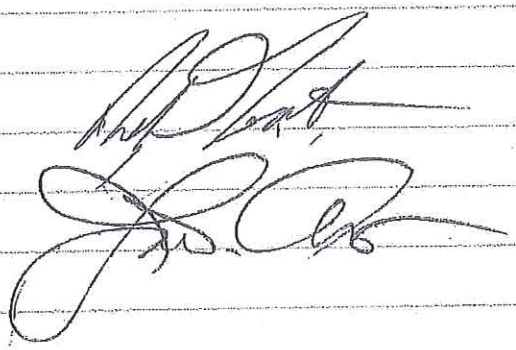
Granted, the product of the calculation may not take into account other loadings and weight — but for welded metal build-up, the practical application will be limited in area, the surrounding thickness likely representing "as described" on mfg. Data Report. ~~min. thickness calculation is not good~~

The item would've offered more guidance by displacing the designers "corrosion allowance", justifying immediate return to service. (boiler)
— M. Webb

Rob Trauth and Joel Arneta

14-0801 Vote opposed

To much disagreement within the committee



IN14-OP01

I voted negative as I believe corrosion allowance needs to be taken into consideration.

Brian Bosed

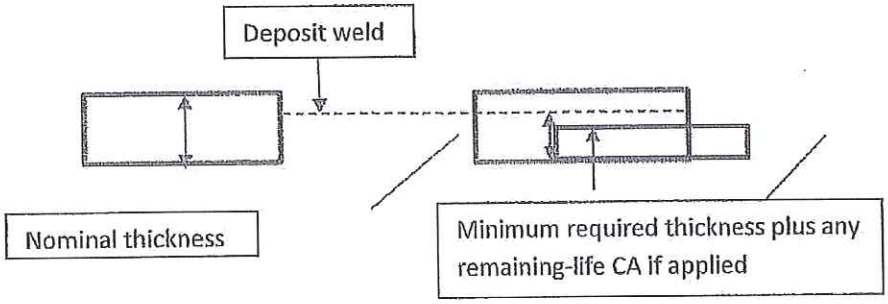
From: David Martinez

Date: January 26, 2015

Subject: **I voted "Negative" to the proposed wording of response to IN14-0801**

Question #1: 2013 NBIC, Part 3, Section 3.3.4.3.a)
When performing weld metal buildup of wasted areas of pressure retaining items in accordance with NBIC Part 3, paragraph 3.3.4.3.a), is the interpretation that the final metal thickness (including base metal and weld metal build up) shall be the calculated minimum required thickness in accordance with the original Code of Construction plus any future corrosion allowance for the desired remaining life?
API 510 allows for an alternative method for determining required thickness. This means that

API 510 allows for an alternative method for determining minimum required thickness. The proposed response will require final weld build-up to be a specific thickness above the minimum thickness required, where-as the owner should be able to perform weld metal build-up to a finished thickness the owner desires, as long as weld build-up at least equals minimum thickness required as attained by the calculation options available to them for determining the minimum required thickness. The current proposed wording restricts the owner to deposit weld to Nominal thickness minus the Corrosion Allowance (CA). The owner should be allowed to deposit weld to at least Nominal thickness minus the CA, but not limit the owner to Nominal thickness minus the CA.



API 510 - Pressure Vessel Inspection Code

For vessels with inside diameters less than or equal to 60 in. (150 cm), one-half the vessel diameter or 20 in. (50 cm), whichever is less.

For vessels with inside diameters greater than 60 in. (150 cm), one-third the vessel diameter or 40 in. (100 cm), whichever is less.

7.4.2.2 Along the designated length, the thickness readings should be equally spaced. For areas of considerable size, multiple lines in the corroded area may have to be evaluated to determine which length has the lowest average thickness.

PRESSURE VESSEL INSPECTION CODE: IN-SERVICE INSPECTION, RATING, REPAIR, AND ALTERATION7-3

7.4.2.3 If circumferential stresses govern, (typical for most vessels) the thickness readings are taken along a longitudinal length. If longitudinal stresses govern (because of wind loads or other factors), the thickness readings are taken along a circumferential length (an arc).

7.4.2.4 When performing corrosion averaging near a nozzle, the designated length shall not extend within the limits of the reinforcement as defined in the construction code.

7.4.2.5 When performing remaining life calculations in 7.2, the lowest average of any length in the corroded area is substituted for tactual.

7.4.3 Evaluation of Pitting

During the current inspection, widely scattered pits may be ignored as long as all of the following are true:

a.The remaining thickness below the pit is greater than one-half the required thickness (1/2 trequired).
b.The total area of the pitting that is deeper than the corrosion allowance does not exceed 7 in.2 (45 cm2) within any 8-in. (20- cm) diameter circle.

c.The sum of the pit dimensions that is deeper than the corrosion allowance along any straight 8-in. (20-cm) line does not exceed 2 in. (5 cm).

7.4.4 Alternative Evaluation Methods for Thinning

7.4.4.1 An alternative to the procedures in 7.4.2 and 7.4.3, components with thinning below the required thickness may be evaluated by employing the design by analysis methods of either ASME Section VIII, Division 2, Appendix 4, or API 579 Appendix B. These methods may also be used to evaluate blend

ground areas where defects have been removed. It is important to ensure that there are no sharp corners in blend ground areas to minimize stress concentration effects.

7.4.4.2 When using ASME Section VIII, Division 2, Appendix 4, the stress value used in the original pressure vessel design shall be substituted for the Sm value of Division 2 if the design stress is less than or equal to 2/3-specified minimum yield strength (SMYS) at temperature. If the original design stress is greater than 2/3-specified minimum yield strength at temperature, then 2/3- specified minimum yield strength shall be substituted for Sm. When this approach is to be used, an engineer shall perform this analysis.

7.4.5 Joint Efficiency Adjustments

When the vessel surface away from a weld is corroded and the joint efficiency is less than 1.0, an independent calculation using the appropriate weld joint factor (typically 1.0) can be made. For this calculation, the surface at a weld includes 1 in. (2.5 cm) on either side of the weld (measured from the toe) or twice the required thickness on either side of the weld, whichever is greater.

7.4.6 Corroded Areas in Vessel Heads 7.4.6.1 The required thickness at corroded areas of ellipsoidal and torispherical heads can be determined as follows:

a.In the knuckle region of the head, use the appropriate head formula in the construction code.

b.In the central portion of the head, use the hemi-spherical head formula in the construction code. The central portion of the head is defined as the center of the head with a diameter equal to 80% of the shell diameter.

7.4.6.2 For torispherical heads, the radius to use in the hemi-spherical head formula is the crown radius (equal to the outside diameter of the shell for standard torispherical heads, though other radii have been permitted).

7.4.6.3 For ellipsoidal heads, the radius to use in the hemi-spherical head formula shall be the equivalent spherical radius K1D, where D is the shell diameter (equal to the inside diameter) and K1 is given in Table 7-1. In Table 7-1, h is one-half the length of the minor axis [equal to the inside depth of the ellipsoidal head measured from the tangent line. For many ellipsoidal heads, D/2h equals 2.0.

7.5 API 579 Fitness-for-Service Evaluations

Pressure containing components found to have damage that could affect their load carrying capability (pressure loads and other applicable loads, e.g., weight, wind, etc., per API 579) shall be evaluated for continued service. Fitness-for-service evaluations,

Table 7-1—Values of Spherical Radius Factor K1

D/2h	K1
3.0	1.36
2.8	1.27
2.6	1.18
2.4	1.08
2.2	0.99
2.0	0.90
1.8	0.81
1.6	0.73
1.4	0.65
1.2	0.57
1.0	0.50

Note: The equivalent spherical radius equals K1D; the axis ratio equals D/2h. Interpolation is permitted for intermediate values.

7-4API 510 such as those documented in API 579, may be used for this evaluation and must be applicable to the specific damage observed. The following techniques may be used as an alternative to the evaluation techniques in 7.4.

a.To evaluate metal loss in excess of the corrosion allowance, a fitness-for-service assessment may be performed in accordance with API 579, Parts 4 or 5, as applicable. This assessment requires the use of a future corrosion allowance, which shall be established based on Section 6 of this inspection code.

b.To evaluate blisters and laminations, a fitness-for-service assessment should be performed in accordance with API 579, Part 7. In some cases, this evaluation will require the use of a future corrosion allowance, which shall be established based on Section 6 of this inspection code.

c.To evaluate weld misalignment and shell distortions, a fitness-for-service assessment should be performed in accordance with API 579, Part 8.

d.To evaluate crack-like flaws, a fitness-for-service assessment should be performed in accordance with API 579, Part 9. When manual shear wave ultrasonic techniques are employed to size flaws, an industry-qualified UT shear wave examiner shall be used.

e.To evaluate the effects of fire damage, a fitness-for-service assessment should be performed in accordance with API 579, Part 1.

7.6 Required Thickness Determination

The required thickness shall be based on pressure, mechanical, and structural considerations using the appropriate design formulae and code allowable stress. For services with high potential consequences if failure were to occur, the engineer should consider increasing the required thickness above the calculated

minimum thickness to provide for unanticipated or unknown loadings, undiscovered metal loss, or resistance to normal abuse.

8.1 Repairs and Alterations

All repairs and alterations shall be performed by a repair organization in accordance with the applicable principles of the ASME Code, or the applicable construction or repair code. Repairs to pressure-relieving devices should follow API 576. The repair organization must follow all applicable safety requirements as designated in 5.3.

8.1.1 Authorization

All repair and alteration work must be authorized by the inspector before the work is started by a repair organization. Authorization for alterations to pressure vessels that comply with ASME Section VIII, Divisions 1 and 2, and for repairs to pressure vessels that comply with ASME Section VIII, Division 2, may not be given until an engineer has also authorized the work. The inspector will designate the hold points that are required. The inspector may give prior general authorization for limited or routine repairs on a specific vessel provided the inspector is satisfied with the competency of the repair organization and the repairs are the kind that will not require a pressure test (e.g. weld overlay of pitting on a vessel that does not require post-weld heat treatment).

8.1.2 Approval

8.1.2.1 Before any repairs or alterations are performed, all proposed methods of design, execution, materials, welding procedures, NDE, and testing must be approved by the inspector and, if an alteration, by an engineer. The inspector may establish hold points to be implemented during the work execution.

8.1.2.2 The inspector shall approve all specified repair and alteration work at designated hold points and after completion of the work in accordance with the repair plan.

8-2API 510

The inspection plans shall include monitoring the integrity of the temporary repair until permanent repairs are complete.

8.1.5.1.2.1 Fillet-welded patches may be used to make temporary repairs to damaged, corroded, or eroded areas of pressure vessel components. Cracks shall not be repaired in this manner unless the engineer determines that the cracks will not be expected to propagate from under the patch. In some cases, the engineer may need to perform a fitness-for-service analysis. Temporary repairs using fillet-welded patches shall be approved by an inspector and engineer. The use of fillet-welded patches may be subject to the acceptance of the governing jurisdiction.

8.1.5.1.2.2 Fillet-welded patches require special design consideration, especially related to weld joint efficiency. Fillet-welded patches may be applied to the internal or external surfaces of shells, heads, and headers provided that, in the judgment of the engineer, either of the following is true:

a.The fillet-welded patches provide design safety equivalent to reinforced openings designed according to the applicable construction code.

b.The fillet-welded patches are designed to absorb the membrane strain of the parts so that in accordance with the rules of the applicable construction code, the following result:

1. The allowable membrane stress is not exceeded in the vessel parts or the patches. 2. The strain in the patches does not result in fillet-weld stresses that exceed allowable stresses for such welds.

Exceptions to this requirement shall be justified with an appropriate fitness-for-service analysis.

8.1.5.1.2.3 A fillet-welded patch shall not be installed on top of an existing fillet-welded patch. When installing a fillet-welded patch adjacent to an existing fillet-welded patch, the distance between the toes of the fillet weld shall not be less than:

where d= minimum distance between toes of fillet welds of adjacent fillet weld attachments, in in. (m), R=the inside radius of the vessel, in in. (m), t= the actual thickness of the underlying vessel wall, in in. (m). 8.1.5.1.2.4 Fillet-welded patch plates shall have rounded corners with a minimum radius of 1 in. (25 m) minimum radius.

8.1.5.1.3 Lap Band Repairs A full encirclement lap band repair may be considered if the following requirements are met:

a.The design is approved and documented by the engineer and inspector. b.The repair is not covering a crack in the vessel shell. c.The band is designed to contain the full vessel design pressure.

d.All longitudinal seams in the repair band are full penetration butt welds with the design joint efficiency and inspection consistent with the appropriate code.

e.The circumferential fillet welds attaching the band to the vessel shell are designed to transfer the full longitudinal load in the vessel shell, using a joint efficiency of 0.45. Where significant, the eccentricity effects of the band relative to the original shell shall be considered in sizing the band attachment welds.

8.1.5.3 Filler Metal Strength for Overlay and Repairs to Existing Welds

8.1.5.3.1 The filler metal used for weld repairs should have minimum specified tensile strength equal to or greater than the minimum specified tensile strength of the base metal.

8.1.5.3.2 If a filler metal is used that has a minimum specified tensile strength lower than the minimum specified tensile strength of the base metal, the compatibility of the filler metal chemistry with the base metal chemistry shall be considered regarding weldability and service damage. In addition, all of the following shall be met:

a.The repair thickness shall not be more than 50% of the required thickness of the base metal (this excludes corrosion allowance).

b.The thickness of the repair weld shall be increased by a ratio of minimum specified tensile strength of the base metal and minimum specified tensile of the filler metal used for the repair.

Tfill = d x Sbase/Sfill where

Tfill= thickness of repair weld metal, in in. (m), d = depth of base metal lost by corrosion and weld preparation, in in. (m),

Sbase = base metal tensile strength, in ksi (MPa), Sfill= filler metal tensile strength, in ksi (MPa).

8-4API 510 c.The increased thickness of the repair shall have rounded corners and shall be blended into the base metal using a 3-to-1 taper. d.The repair shall be made with a minimum of two passes.

8.1.5.4 Repairs to Stainless Steel Weld Overlay and Cladding