Date Distributed: December 17, 2012

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

SUBCOMMITTEE REPAIRS and ALTERATIONS

AGENDA

Meeting of January 16, 2013
Mobile, Alabama

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**

3. **Adoption of the Agenda**

4. **Approval of Minutes of July 17, 2012**

5. **Review of the Roster (Attachment 1)**

   Mr. David Martinez would like to become a member of the Subgroups Repair and Alteration General and Specific. Please see his attached resume. A vote will be taken.

   Mr. Angelo Bramucci is eligible for reappointment to both the Subgroups Repair and Alteration General and Specific. A vote will be taken.

6. **Public Review Comments (Attachment 2)**

   PR13-0301 Part 3, 4.5.3 ***SC Repair and Alteration***- This qualification shall be documented and provisions made to retain such documentation for a period of at least five years after the lift device is retired. Documentation of this qualification shall include but not limited to: We should add "assist" or delete "lift" for consistency, i.e. Lift Assist Device or just plain device rather than Lift Device. It is called Lift Assist Device everywhere else in the document. (Attachment 2, p. 1)

   PR13-0401 Part 3, S7.10.5*SC Repair and Alteration* Only external adjustments to restore the set pressure shown on the repair nameplate or stamping and/or performance of a pressure relief valve shall be made under the provisions of NBIC Part 3, S7.10.1 and Part 2, 2.5.7. Reasoning: Clarification to ensure that the adjustment is made only to return the valve to its current set pressure. If the valve previously underwent a set pressure change properly executed under a "VR" repair, the adjustment should be to the set pressure marked on the repair nameplate, not the original nameplate set. (Attachment 2, p. 2)

   PR13-0402 Part 3, 1.7.3-1.7.6 ***SC Repair and Alteration*** Do not remove these sections. Leave existing text. These are requirements related to the VR program and should remain in the NBIC. If the intention is to move these requirements to another document other than the NBIC, I would oppose that action as all aspects of the VR program should be subject to the oversight of the consensus NBIC committee and subcommittees. Additionally, such action would likely require "VR" programs to obtain and track an additional National Board documentation creating additional and unnecessary burden. (Attachment 2, p. 3)

   PR13-0403, ***Part 3, 1.8.2-1.8.4 and 1.8.6 SC R and A*** Do not remove these sections. Leave existing text. These are requirements related to the VR program and should remain in the NBIC. If the intention is to move these requirements to another document other than the NBIC, I would oppose that action as all aspects of the VR program should be subject to the oversight of the consensus NBIC committee and subcommittees. Additionally, such action would likely require "VR" programs to obtain and track an additional National Board documentation creating additional and unnecessary burden. (Attachment 2, p. 4)

   PR13-0404 ***SC Repair and Alteration*** **Part 3, 5.12.4** Where a valve has been tested and adjusted to restore set pressure shown on the repair nameplate or unmodified original nameplate or stamping as permitted by NBIC Part 3, S7.10.1 but not otherwise repaired a "Test Only" nameplate shall be applied that contains the following information: Reasoning: Clarification to ensure that the adjustment is made only to return the valve to its current set pressure. If the valve previously underwent a set pressure change properly executed under a "VR" repair, the adjustment should

be to the set pressure marked on the repair nameplate, not the original nameplate set. (Attachment 2, p. 5)

PR13-0405 Part 3, S7.10.1 ***SC Repair and Alteration*** The Jurisdiction may authorize properly trained and qualified employees of boiler and pressure vessel owners/users or the designees to confirm or restore the set pressure shown on the repair nameplate or unmodified original nameplate or stamping and/or performance of pressure relief valves. Reasoning: Clarification to ensure that the adjustment is made only to return the valve to its current set pressure. If the valve previously underwent a set pressure change properly executed under a "VR" repair the adjustment should be to the set pressure marked on the repair nameplate, not on the original nameplate set. (Attachment 2, p. 6)

PR13-0218 ***Part 3: 2.5.3.2d) SC Repair and Alteration*** - Please revise the text. The paragraph as written is confusing. (Attachment 2, p. 7)

PR13-0219 ***Part 3: 4.4.1.4 SC Repair and Alteration*** Pre-warming? That is the temperature of the liquid before it is warmed. Revise to read: "... and Table 4.4.1.4 may be used in lieu of notch toughness tests. Table 4.4.1.4 contains minimum liquid temperatures based on metal thickness of the pressure retaining part." (Attachment 2, p. 8)

PR13-0220 ***Part 3: Table 4.4.1.4 SC Repair and Alteration*** Revise the math symbol. The correct symbol for less than or equal is: <=. There is no slash. (Attachment 2, p. 9)

PR13-0221 ***Part 3, Table 4.4.2*** Delete this table. It should be identical to Table 4.4.1.4. Also the math symbols in Table 4.4.2 need corrected. The slash through the equal sign means not equal. The correct symbol for less than or equal is <=. There is no slash in the symbol. (Attachment 2, p. 10)

PR13-0222 ***Part 3: 4.4.1.3.4 SC Repair and Alteration*** Delete grade70 from the SA-515 reference. There are grades 55, 60, and 65 in addition to grade 70. The table should apply to all. (Attachment 2, p. 11)

PR13-0223 ***Part 3: 5.5a) SC Repair and Alteration***-Why are R forms exempt from registration? It is expected and many jurisdictions require registration of pressure vessels. It is not logical to register other organizations paper, but not your own. Registration is also a safety issue. There should be cradle to grave documentation for vessels. There is a considerable market in used vessels, and the documentation does not go with the vessels. All repairs and alterations should be registered. (Attachment 2, p. 12)

7. **Interpretations (Attachment 3)**

IN13-0201 ***Part 3, 3.2.2 c), SC on Repair and Alteration,*** - **Question 1**: In accordance with Part3, 5.7.2 c), is the attachment of a repair nameplate to be by a method such as welding, brazing, soldering, or tamper-resistant mechanical fasteners which will not allow easy removal of the nameplate? **Answer 1**: Yes (Attachment 3, pp.1-3)

Question 2: In accordance with Part 3, 5.7.3, is the attachment of an alteration nameplate to be by a method such as welding, brazing, soldering, or tamper-resistant mechanical fasteners which will allow easy removal of the nameplate? **Answer 2**: Yes. (Attachment 3, pp.1-3)

January 2013
Mr. Galanes is expected to report.

IN13-0301 ***Part 3, 3.2.2 c)SC on Repair and Alteration,*** - **Question 1**: Does Part 3, 3.2.2 c) prevent an "R" Certificate Holder with the capabilities within his shop from rolling and welding a shell or other such items as headers, nozzles,(flange to pipe) for replacement in a vessel or boiler

has is repairing or altering? **Answer 1**: No (Attachment 3, pp.4-5)

Question 2: If the answer is No to the above question, if the same Certificate Holder could not fabricate the replacement items within his capabilities and received these parts from an outside source then these items would have to be fabricated by an organization holding the appropriate Code Certificate of Authorization. **Answer 2**: Yes. (Attachment 3, pp.4-5)

January 2013
Mr. Galanes is expected to report.

IN13-0401 ***Part 3, 3.2.5, SC Repair and Alteration-*** **Question 1**: Is it the intent of the requirements in paragraph 3.2.5 that calculations be both completed and also made available to the Inspector for review prior to the start of any physical work? **Answer 1**: Yes (Attachment 3, pp.6-9)

Question 2: Does the requirement in paragraph 3.2.5 that calculations be completed and also mean that the calculations as required by paragraph 3.2.5 be an "R" Certificate Holder? **Answer 2**: No. However the R-Certificate holder responsible for executing the "Design Certification" portion of the R-2 Form, must assure himself that the design complies with the NBIC and by signing the Design Certification accepts responsibility for the design. Attachment 3, pp.6-9)

Alternate Proposed Reply Question 2: Yes; "the organization" in paragraph 3.2.5 refers to the "R" Certificate holder responsible for preparing and executing "Design Certification" portion of the R-2 Form. This does not preclude the "R" Certificate Holder from having the calculations prepared or otherwise obtaining the calculations from others, but the "R" Certificate older must assure himself that the design complies with the NBIC and by signing the Design Certification accepts responsibility for the design.

Question 3: If an alteration involves the Installation of a replacement part (as defined in Paragraph 3.2.2 c) that has been designed, fabricated, inspected and stamped in accordance with the original code of construction and for which the part fabricator has documented on the partial data report that they have certified the design of the part for a specific set of design conditions (MAWP,MAWT,MDMT, corrosion allowance, etc.), must the "R" Certificate Holder responsible for executing the Design Certification on the R-2 Form obtain the calculations from the part fabricator and make available for review by the Inspector? **Answer 3**: No, however the "R" Certificate holder responsible for executing the Design Certification must assure that the design conditions certified for the new part are consistent with the original vessel design conditions. Additionally the R Certificate holder would be responsible for assessing whether the installation of the new part impacted in any manner the existing components in the overall vessel design and for completing any calculations that might be required to address such impact. (Attachment 3, pp.6-9)

8. Action Items (Attachment 4)

NB08-0322 ***Part 3 3.2 SG R/A General*** Add a new paragraph to 3.2 General Requirements for Repairs and Alterations to address change of service for a pressure vessel. These requirements should caution inspectors, owners, repair organizations and jurisdictional authorities of the inherent dangers involved when changing service. A new supplement should be added to address the specific requirements for repairs and alterations of pressure vessels that have been converted from one service to another. A task group representing all three parts of the NBIC has been formed under the leadership of Bob Wielgoszinski. Task group members from R & A are P. Edwards and B. Schulte. (Attachment 4, pp. 1-6)

July 2008
A task group was assigned.

July 2011
A report was provided by Bob Wielgoszinski. The TG has made progress on this item and may provide a proposal before the January, 2012 NBIC meeting.

January 2012
A progress report was provided by B. Schulte and a goal of having a proposal for the July 2012 meeting was discussed.

July 2012
A progress report was provided by Mr. Paul Edwards.

January 2013
Mr. Wielgoszinski is expected to report.

NB10-0110 ***Part 3 S6.19.1 TG DOT-*** Combine and clarify requirements within S6.15 for TR Forms, S6.18 Preparation of TR-Forms and S6.19 for Reports of Repairs, Alterations and Modifications. (Attachment 4, pp. 7- 12)

July 2010
Mr. Stan Staniszewski presented a progress report. The task group of Stan and Jim Riley are aiming to present by the January 2011 meeting.

January 2011
No report was presented.

July 2011
No report was presented.

January 2012
A progress report was provided by S. Staniszewski and he indicated the DOT had a working draft and was restructuring Whole Forms, Section 6. A task group working on it consists of S. Staniszewski, Greg McRae and Jim Riley.

July 2012
Mr. Staniszewski sent a progress report to the NBIC Committee Secretary.

January 2013
Mr. Staniszewski (if present) is expected to report.

NB11-0203 ***Part 3, S2.13.9.1 SG on Historical Boilers*** Revise text and Figure to incorporate the correct percentage of wasting allowed. A Task Group consisting of M. Wahl and T. Dillon was assigned. (No Attachment)

July 2010
A task group of M. Wahl and T. Dillon was assigned.

January 2011
A progress report was given.

July 2011
No progress.

January 2012

A progress report was given by Mr. Reetz.

July 2012
Action item was moved to the SC on Repair and Alteration.

January 2013
Mr. Galanes is expected to report.

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

January 2011
Mr. Charles Withers presented a progress report.

July 2011
Mr. Galanes reported that Francis Brown reported that they should have something ready for the January 2012 meeting.

January 2012
A progress report was provided by C. Withers and a goal of having a proposal for the July 2012 meeting was discussed.

July 2012
A progress report was provided by Mr. Francis Brown.

January 2013
Mr. Galanes is expected to report.

NB11-1001 ***Part 3, 3.3.4.9 SG R/A Specific-*** Tube plugging for fire tube boilers. (Attachment 4, p. 13)

January 2011
Mr. James Pillow presented a progress report. The committee is in agreement that guidelines are needed in the code. More work regarding proposed guidelines will be done for the next meeting.

July 2011
A progress report was provided by George Galanes based on the SG meeting notes. It was recommended to continue working this item from the perspective of providing guidance to control installation versus design guidance.

January 2012
A progress report was provided by J. Pillow and a task group consisting of J. Pillow (Chair), Angelo Bramucci, W. Jones and R. Miletti was formed.

July 2012
A progress report was provided by Mr. Jim Pillow.

January 2013
Mr. Pillow is expected to report.

NB11-1201 ***Part 3, 1.8, SG R/A General-*** Revise Part 3, 1.8 "NR" Accreditation requirements to include repairs to ASME Section III stamped components. (Attachment 4, pp. 14-16)

January 2011
Mr. Charles Withers presented a progress report. A task group of C. Withers, P.

Edwards, B. Schaefer, and B. Wielgoszinski (or a designated HSBCT Representative) and P. Nightengale was assigned to take a look at the NR Program.

July 2011
Mr. Withers gave a progress report.

January 2012
A progress report was provided by P. Edwards and a task group consisting of P. Edwards (Chair), B. Schaefer, B Wielgoszinski, P. Nightengale, Clay Smith, Rick Swain and C. Withers was formed.

July 2012
A progress report was provided by Mr. Ben Schaefer.

January 2013
Mr. Edwards is expected to report.

NB12-0403 ***Part 3 R/A Specific*** CSEF Weld Repair Options using temper bead welding. (Attachment 4, pp. 17-60)

July 2012
Mr. George Galanes gave a presentation on NB12-0403 to the Subcommittee. This item was taken as a progress report.

January 2013
Mr. Galanes is expected to report.

NB12-0501 ***Part 3, 3.2.2 c) SG R/A General-*** Hydrostatic testing of pressure parts. (Attachment 4, pp. 61-63)

July 2011
A TG of R. Wielgoszinski (Chair) G. Galanes and B. Moore was formed.

January 2012
A progress report and handouts (2 ea.) with proposed revisions were provided by Bob Wielgoszinski.

The handouts consisted of Version 1 and Version 2 and were discussed by the subcommittee.

July 2012
A progress report was provided by Mr. George Galanes.

January 2013
Mr. Wielgoszinski is expected to report.

NB12-0801 ***Part 3, SG R/A Specific*** Repair and Alteration of Gasketed PHE's in the field.(Attachment 4, pp. 64-65)

January 2012
A progress report was provided by J. Pillow and a task group consisting of E. Ortman (Chair), J. Pillow G. Galanes and B. Wielgoszinski was assigned.

July 2012
A progress report was provided by Mr. Jim Pillow.

January 2013
Mr. Pillow is expected to report.

NB13-0501 ***Part 3, Figure 3.3.4.6 b) SG R/A Specific***-Add a cautionary or informational note: "Air currents within the tube (i.e. chimney effect) may affect the retention of the shielding gas at the welding arc when using the gas tungsten-arc welding process on the inside of the tube." (Attachment 4, p. 66)

January 2013
Mr. Galanes is expected to report.

9. New Business

10. Future Meetings

July 15-19, 2013, Columbus, Ohio
January 13-17, 2014, San Antonio, TX

11. Adjournment

Respectfully Submitted,

Jim McGimpsey, Secretary
:rh

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ATTACHMENT 1

SC on Repairs and Alteration

Member	Title	ExpirDate	Interest Category
Boseo, Brian		8/31/2015	NB Certificate Holders
Edwards, Paul D.		8/31/2012	NB Certificate Holders
Galanes, PE, George W.	Chairman	8/31/2015	Users
Jones, Wayne		1/31/2015	Auth Inpection Agencies
Larson, James P.		8/31/2012	Auth Inpection Agencies
McGimpsey, Jim	Secretary		
McManamon, Larry		1/31/2015	Organized Labor
Ortman, Edward		8/30/2013	Manufacturer
Pavlovicz, Frank		8/31/2012	Manufacturer
Pillow, James T.	Vice Chair	7/31/2013	General Interest
Schulte, Bryan		8/31/2012	Users
Sekely, James		8/31/2015	General Interest
Vallance, William		1/31/2015	Jurisdictional Authorities
Webb, Michael		8/31/2015	Users
Total Members:	13		

David Martinez
44393 Oakmont Manor Square
Ashburn, VA 20147
757-274-6106 (cell)
703-726-8183 (home)
703-262-6311(office)

August 31, 2012

Objective and Summary of Experience

It is my objective and goal to engage and participate in the NBIC - Repairs and Alterations Subcommittee utilizing my 38 years of experience in the boiler and pressure vessel inspection field. My entire career has been involved in the inspection of boilers, pressure vessels, relief valves, tanks and piping. Over my career, I have inspected boilers and pressure vessels, repaired boilers and pressure vessels (certified welder for over 25 years), taught welding, cutting and brazing at a technical college, performed NDT on repairs of boilers and pressure vessels, and I was the R-stamp coordinator and shop inspector for the BP Toledo Refinery in Toledo, Ohio for many years. While employed in the refining sector (36 years), I was a non-voting member of API - Committee for Refinery Inspection. During the later years of my refinery career, I regularly reviewed and provided comments for suggested changes to API 510, API 570 and API653 codes. For the past two years, I have managed 16 National Board commissioned inspectors who provide in-service inspection or AI inspection services for our clients.

Employment History

Factory Mutual Insurance Company – FM Global; 2010 - Present
Chief Inspector – Washington D.C. Operations

- Manage FM Global – Washington D.C Operations AIA Program which includes managing 16 National Board Commissioned Inspectors who perform Jurisdictional Inspections of BPVs for FM Global clients; liaison with the Chief Inspectors of each jurisdiction associated with the Washington D.C. Operations (VA, MD, DE, PA, NJ and D.C.)
- Provide AIA jurisdictional inspection coverage in six jurisdictions: VA, MD, DE, PA, NJ and D.C.;
- Provide annual inspector training in accordance with NBIC requirements

Western Refinery Yorktown, Inc. - Yorktown, VA
Manager of Inspection and Mechanical Integrity, 2008 – 2010

- Manage two Authorized Inspectors and five NDT contractors who are responsible for performing the required inspections of fixed refinery equipment
- Wrote thirteen inspection procedures for inspecting refinery fixed equipment
- Responsible for maintenance of the plant inspection database (PCMS software)
- Managed $1.2 MM department budget;
- API-CRI member; reviewed ballot issues and provided comments for various API code re-writes (API 510, 570 and 653)

Hovensa L.L.C. – Christiansted, U.S. Virgin Islands
Superintendent of Inspection Services, 2005 – 2008

- Supervised, coached and mentored ten refinery inspectors
- Coordinated utilization of 45 inspection contractors
- Performed gap analysis of inspection processes and implemented recommendations for remediation of gaps
- Managed $5.2 MM inspection budget; under budget in 2006 and 2007
- Performed Authorized Inspector roles for repairs and alterations of refinery fixed equipment

B.P. Chemicals – Joliet Works - Joliet, Illinois
Chief Inspector, 2003 - 2004

- Coordinated and scheduled required inspections of fixed equipment
- Supervised two refinery inspectors and three contract inspection NDT technicians

- Performed gap analysis of inspection processes and provided remediation plan for gaps
- Re-wrote quality control procedure manual to improve inspection processes and procedures
- Performed Authorized Inspector roles for repairs and alterations of chemical plant fixed equipment
- Selected for temporary Inspection Leader assignments at two refineries in Australia

BP – Toledo Refinery – Oregon, Ohio
Plant Inspector, 1985 - 2003

- Supervised the Mechanical Integrity/On-stream Thickness Management Program utilizing fifteen direct reports; 12 NDT technicians, two draftsmen and one clerk
- Managed $1.2 MM budget;
- Served as NBIC R-Stamp Coordinator for refinery assuring compliance with jurisdictional regulations for equipment repairs and alterations
- Developed a temporary compression patch system to stop a pinhole leak in a pressure vessel; unit was subsequently shutdown safely and under control

BP – Toledo Refinery – Oregon, Ohio (continued)
Plant Inspector, 1985 - 2003

- Collaborated with Maintenance department to develop and create a positive sealing device for pinching-off pigtails associated with Hydrogen furnace tubes; the device worked well and I was recognized for the idea and involvement in the device development
- Trained to operate an Alkylation unit and LPG Loading facility
- Selected for temporary assignments in Holland, Scotland and various North American BP Refinery sites

SOHIO Central Engineering Unit – Cleveland, Ohio
Corporate Technical Welding Specialist, 1980 - 1985

- Performed QA/QC role for the construction of an Acrylonitrile Plant in Victoria, Texas; welding quality was maintained to extraordinarily low level, <2% rejection rate
- Responsible for fabrication site (Alameda, CA) welding quality for Process Modular Construction Project – modules destined for the Prudhoe Bay Oilfields – North Slope Alaska; project completed satisfactorily and on schedule
- Assisted in QA/QC role for welding quality and commissioning of Coker Unit for the BP – Toledo Refinery; piping and fixed equipment
- Trained refinery inspectors to weld and operate cutting torches and arc gouge equipment

Owens Technical College – Perrysburg, Ohio
Instructor of Cutting and Welding – Diesel Mechanics Program, 1979 – 1980 (nights)

- Developed curriculum and instructed students in theory and hands-on training

SOHIO Toledo Refinery – Oregon, Ohio
Area Inspector, 1974 - 1980

- Performed inspector duties (PT, UT, MT, RT - radiographic interpretation) for assigned refinery process areas
- Selected for temporary assignment to perform radiographic interpretation for the Trans-Alaskan Pipeline Project
- Provided temporary inspection support for various SOHIO North American Refineries during refinery turnarounds/shutdowns

Education
Terra Technical College – Fremont, Ohio, 1990 – 1992, **AAS Degree - Welding and NDT**; Summa cum Laude (4.0 GPA)

University of Toledo Community College – Toledo, Ohio, 1974 – 1975, Mechanical Engineering/Physics, 4.0 GPA
Bowling Green State University, Bowling Green, Ohio, 1970 – 1971, Computer Science, 2.8 GPA

Certifications
AWS-CWI, 1977 – 2006
Certified Welder, SMAW, GTAW and GMAW, 1976 – 2003
NBIC Commissioned Inspector, #415 – IS and A Commissions
Certificates of Competency: VA #1094R; MD #1257; D.C. #BIC0000009;
API 510 #764, API 570 #94 and API 653 #21126 (lapsed in 2011)
Previously certified in PT, MT, UTT and UTSW, RT – film interpretation

Other Training and Areas of Expertise and Knowledge
Lean Thinking and Performance Coaching
ASME Codes, I, II, V, VIII-Div.1, IX; ANSI Codes B31.1, B31.3, B31.4, B16.5 and various API Codes
CPR, Basic Corrosion, Basic Metallurgy, Guest Speaker at Toledo Chamber of Commerce
NACE Member; API-CRI member; former ASNT member

References: Available upon request

ATTACHMENT 2

National Board of Boiler and Pressure Vessel Inspectors

National Board Inspection Code

Submission of Public Review Comment
2013 Draft Edition

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

Comments Must be Received No Later Than: December 17, 2012

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

Date: DEC 6, 2012

Commenter Name: J. ALTON COX

Commenter Address: 213 PARK VIEW DRIVE
BELMONT, NC 28012

Commenter Phone: 704-301-8532

Commenter Fax: 704-820-8408

Commenter Email: alton@jaltoncox.com

Section/Subsection Referenced: PART 3, Para. 4.5.3 (c)

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

(Second Sentence)

This qualification shall be documented and provisions made to retain such documentation for a period of at least five years after the lift device is retired. Documentation of this qualification shall include but not be limited to:

We should add "assist" or delete "lift" for consistency, i.e. Lift Assist Device or just plain device rather than Lift Device. It is called Lift Assist Device everywhere else in the Document.

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: PR13-03

Comment No. Issued: 01

Committee Referred To:
SC Repair and Alteration

1/1

(1)

National Board of Boiler and Pressure Vessel Inspectors

National Board Inspection Code

Submission of Public Review Comment
2013 Draft Edition

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Comments Must be Received No Later Than: December 17, 2012

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

Date: December 7, 2012

Commenter Name: Brandon Nutter

Commenter Address: 5401 Jefferson Davis Hwy - SPOT 611
Richmond, VA 23234

Commenter Phone: (804) 383-3835

Commenter Fax: (804) 383-4206

Commenter Email: Brandon.K.Nutter-1@dupont.com

Section/Subsection Referenced: NBIC Part 3, Para S7.10.5

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

Only external adjustments to restore the set pressure shown on the repair nameplate or unmodified original nameplate or stamping and/or performance of a pressure relief valve shall be made under the provisions of NBIC Part 3, S7.10.1 and Part 2, 2.5.7.

Reasoning: Clarification to ensure that the adjustment is made only to return the valve to its current set pressure. If the valve previously underwent a set pressure change properly executed under a "VR" repair, the adjustment should be to the set pressure marked on the repair nameplate, not the original nameplate set.

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

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NB Use Only

Commenter No. Issued: PR13-04

Comment No. Issued: 01

Committee Referred To:
SC Repair and Alteration

11
(2)

National Board of Boiler and Pressure Vessel Inspectors

National Board Inspection Code

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Section/Subsection Referenced: NBIC Part 3, Para 1.7.3 - 1.7.8

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

Do not remove these sections. Leave existing text. These are requirements related to the "VR" program and should remain in the NBIC. If the intention is to move these requirements to another document other than the NBIC, I would also oppose that action as all aspects of the "VR" program should be subject to the oversight of the consensus NBIC committee and subcommittees. Additionally, such action would likely require "VR" programs to obtain and track an additional National Board document, creating additional and unnecessary burden.

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

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NB Use Only

Commenter No. Issued: PR13-04

Comment No. Issued: 02

Committee Referred To:
SC Repair and Alteration

(3)

National Board of Boiler and Pressure Vessel Inspectors

National Board Inspection Code

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Section/Subsection Referenced: NBIC Part 3, Para 1.8.2 - 1.8.4 and 1.8.6

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

Do not remove these sections. Leave existing text. These are requirements related to the "NR" program and should remain in the NBIC. If the intention is to move these requirements to another document other than the NBIC, I would also oppose that action since all aspects of the "NR" program should be subject to the oversight of the consensus NBIC committees and subcommittees. Additionally, such action would likely require "NR" programs to obtain and track an additional National Board document, creating additional and unnecessary burden.

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: PR13-04

Comment No. Issued: 03

Committee Referred To:
SC Repair and Alteration

1/1 (4)

National Board of Boiler and Pressure Vessel Inspectors

National Board Inspection Code

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Comments Must be Received No Later Than: December 17, 2012

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

Date: December 7, 2012

Commenter Name: Brandon Nutter

Commenter Address: 5401 Jefferson Davis Hwy - SPOT 611
Richmond, VA 23234

Commenter Phone: (804) 383-3835

Commenter Fax: (804) 383-4206

Commenter Email: Brandon.K.Nutter-1@dupont.com

Section/Subsection Referenced: NBIC Part 3, Para 5.12.4

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

Where a valve has been tested and adjusted to restore the set pressure shown on the repair nameplate or unmodified original nameplate or stamping, as permitted by NBIC Part 3, S7.10.1, but not otherwise repaired, a "Test Only" nameplate shall be applied that contains the following information:

Reasoning: Clarification to ensure that the adjustment is made only to return the valve to its current set pressure. If the valve previously underwent a set pressure change properly executed under a "VR" repair, the adjustment should be to the set pressure marked on the repair nameplate, not the original nameplate set.

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

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Commenter No. Issued: PR13-04

Comment No. Issued: 04

Committee Referred To:
SC Repair and Alteration

1/1
(5)

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Commenter Fax: (804) 383-4206

Commenter Email: Brandon.K.Nutter-1@dupont.com

Section/Subsection Referenced: NBIC Part 3, Para S7.10.1

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

The Jurisdiction may authorize properly trained and qualified employees of boiler and pressure vessel owners/users or their designees to confirm or restore the set pressure shown on the repair nameplate or unmodified original nameplate or stamping and/or performance of pressure relief valves. ...

Reasoning: Clarification to ensure that the adjustment is made only to return the valve to its current set pressure. If the valve previously underwent a set pressure change properly executed under a "VR" repair, the adjustment should be to the set pressure marked on the repair nameplate, not the original nameplate set.

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

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Commenter No. Issued: PR13-04

Comment No. Issued: 05

Committee Referred To: SC Repair and Alteration

11/
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Comments Must be Received No Later Than: December 17, 2012

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

Date: 12/17/12

Commenter Name: Francis Brown

Commenter Address: 1055 Crupper Avenue

Columbus, OH 43229

Commenter Phone: 614-431-3226

Commenter Fax: 614-431-3208

Commenter Email: fbrown@nationalboard.org

Section/Subsection Referenced: Part 3: 2.5.3.2d)

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

Please revise the text. The paragraph as written is confusing.

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

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Commenter No. Issued: PR13-02

Comment No. Issued: 18

Committee Referred To: SC Repair and Alteration

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Commenter Address: 1055 Crupper Avenue

Columbus, OH 43229

Commenter Phone: 614-431-3226

Commenter Fax: 614-431-3208

Commenter Email: fbrown@nationalboard.org

Section/Subsection Referenced: Part 3: 4.4.1.4

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

Pre-warming? That is the temperature of the liquid before it is warmed. Revise to read: "... and Table 4.4.1.4 may be used in lieu of notch toughness testes. Table 4.4.1.4 contains minimum liquid temperatures based on metal thickness of the pressure retaining part."

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

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Commenter No. Issued: PR13-02

Comment No. Issued: 19

Committee Referred To: SC Repair and Alteration

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Commenter Address: 1055 Crupper Avenue

Columbus, OH 43229

Commenter Phone: 614-431-3226

Commenter Fax: 614-431-3208

Commenter Email: fbrown@nationalboard.org

Section/Subsection Referenced: Part 3: Table 4.4.1.4

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

Revise the math symbol. The correct symbol for less than or equal is: <=

There is no slash.

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

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Commenter No. Issued: PR13-02

Comment No. Issued: 20

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Commenter Email: fbrown@nationalboard.org

Section/Subsection Referenced: Part 3: Table 4.4.2

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

Delete this table. It should be identical to Table 4.4.1.4. Also the math symbols in Table 4.4.2 need corrected. The slash through the equal sign means not equal. The correct symbol for less than or equal is <=. There is no slash in the symbol.

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

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Comment No. Issued: 21

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Date: 12/17/12

Commenter Name: Francis Brown

Commenter Address: 1055 Crupper Avenue
Columbus, OH 43229

Commenter Phone: 614-431-3226

Commenter Fax: 614-431-3208

Commenter Email: fbrown@nationalboard.org

Section/Subsection Referenced: Part 3: 4.4.1.3.4

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

Delete grade70 from the SA-515 reference. There are grades 55, 60, and 65 in addition to grade 70. The table should apply to all.

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

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Commenter No. Issued: PR13-02

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Commenter Name: Francis Brown

Commenter Address: 1055 Crupper Avenue
Columbus, OH 43229

Commenter Phone: 614-431-3226

Commenter Fax: 614-431-3208

Commenter Email: fbrown@nationalboard.org

Section/Subsection Referenced: Part 3: 5.5a)

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

~~Why are R forms exempt from registration? It is expected and many~~ jurisdictions require registration of pressure vessels. It is not logical to register other organizations paper, but not your own. Registration is also a safety issue. There should be cradle to grave ~~documentation for vessels. There is a considerable market in used~~ vessels, and the documentation does not go with the vessels. All repairs and alterations should be registered.

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

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Commenter No. Issued: PR13-02

Comment No. Issued: 23

Committee Referred To:
SC Repair and Alteration

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ATTACHMENT 3

IN13-0201

November 8, 2012

Secretary, NBIC Committee
The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Ave.
Columbus, OH 43229

Please accept this letter as a request for interpretation of NBIC Part 3, 5.7.2c) and 5.7.3 regarding attachment of a nameplate for repairs and alterations.

Question 1:
In accordance with Part 3, 5.7.2c), is the attachment of a repair nameplate to be by a method such as welding, brazing, soldering, or tamper-resistant mechanical fasteners which will not allow easy removal of the nameplate?

Proposed Reply 1:
Yes.

Question 2:
In accordance with Part 3, 5.7.3, is the attachment of an alteration nameplate to be by a method such as welding, brazing, soldering, or tamper-resistant mechanical fasteners which will not allow easy removal of the nameplate?

Proposed Reply 2:
Yes.

Background:
The NBIC does not appear to establish requirements for nameplate attachment methods. This has led to nameplates being attached by non-permanent methods such as screws or bolts. To remain consistent with construction codes such as the ASME Boiler and Pressure Vessel Code, a nameplate should be attached by a method which will require the willful destruction of the nameplate or its attachment system.

Respectfully submitted,

John Hoh
Senior Staff Engineer

Attachment: Photograph of nameplate with screws

THE NATIONAL BOARD
OF BOILER AND
PRESSURE VESSEL
INSPECTORS

1055 CRUPPER AVE.
COLUMBUS, OHIO
43229-1183
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TECHNICAL
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PRESSURE RELIEF DEPT.
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ORDER DEPARTMENT
Fax 614.847.1147

TRAINING DEPARTMENT
Fax 614.847.5542

EMAIL
information@nationalboard.org

WEB SITE
nationalboard.org

1/3

(1)

PROPOSED INTERPRETATION

Inquiry No.	IN13-0201				
Source	John Hoh				
Subject	Part 3, 5.7.2 c) and 5.7.3				
Edition	2011 Edition				
Question	Q1 In accordance with Part3, 5.7.2 c) , is the attachment of a repair nameplate to be by a method such as welding, brazing, soldering, or tamper-resistant mechanical fasteners which will not allow easy removal of the nameplate? Q2: In accordance with Part 3, 5.7.3, is the attachment of an alteration nameplate to be by a method such as welding, brazing, soldering, or tamper-resistant mechanical fasteners which will allow easy removal of the nameplate?				
Reply	A1: Yes A2: Yes				
Committee's Question					
Committee's Reply					
Rationale					
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					

IN13-0301

To: Secretary NBIC Committee
The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229

Background

Interpretation 98-28 states that replacement parts requiring inspection by an AI must be fabricated by an organization holding the appropriate Code Certificate of Authorization. Since a repair organization can replace a shell by making circumferential seams, it would seem logical that they can roll and weld a longitudinal seam in a shell if they have the capability.

Question 1

Does Part 3, Section 3, Paragraph 3.2.2(c) prevent an "R" Certificate Holder with the capabilities within his shop from rolling and welding a shell or other such items as headers, nozzles (flange to pipe) for replacement in a vessel or boiler he is repairing or altering?

Proposed answer: No

Question 2

If the answer is No to the above question, if the same Certificate Holder could not fabricate the replacement items within his capabilities and received these parts from an outside source then these items would have to be fabricated by an organization holding the appropriate Code Certificate of Authorization.

Proposed answer: Yes

Patrick J. Hennessey
Senior Director
OneCIS Insurance Company
A Bureau Veritas Company
390 Benmar Drive, Suite 100
Houston, TX 77060
Phone: (281) 986-1364
patrick.hennessey@onecis.com

PROPOSED INTERPRETATION

Inquiry No.	IN13-0301				
Source	William Tillman				
Subject	Part 3, 3.2.2 c)				
Edition	2011 Edition				
Question	1: Does Part 3, 3.2.2 c) prevent an "R" Certificate Holder with the capabilities within his shop from rolling and welding a shell or other such items as headers, nozzles,(flange to pipe) for replacement in a vessel or boiler he is repairing or altering? Q2: If the answer is No to the above question, if the same Certificate Holder could not fabricate the replacement items within his capabilities and received these parts from an outside source then these items would have to be fabricated by an organization holding the appropriate Code Certificate of Authorization.				
Reply	A1: No A2: Yes				
Committee's Question					
Committee's Reply					
Rationale					
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					

IN13-0401

A Koch Chemical Technology Group, LLC Company

KOCH SPECIALTY PLANT SERVICES INC

August 10, 2012

Secretary, NBIC Committee
The National Board of Boiler
and Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229

Re: Interpretation of NBIC (2011 Edition) Part 3, Paragraph 3.2.5

Gentlemen:

I would like to request an interpretation of paragraph 3.2.5 of Part 3 of the National Board Inspection Code.

Question: Is it the intent of the requirements in paragraph 3.2.5 that calculations be both completed and also made available to the Inspector for review *prior* to the start of any physical work?

Proposed Reply: Yes

Question: Does the requirement in paragraph 3.2.5 that calculations be completed prior to the start of any physical work, also mean that the calculations must be completed prior to the start of any physical work related to fabrication of replacement parts (as defined in paragraph 3.2.2c) that will be used in the alteration?

Proposed Reply: No

Question: Is it the intent that the organization that completes the design calculations as required by paragraph 3.2.5 be an "R" Certificate holder?

Proposed Reply: No; however, the R-Certificate holder responsible for executing the "Design Certification" portion of the R-2 Form, must assure himself that the design complies with the NBIC and by signing the Design Certification accepts responsibility for the design.

12221 East Sam Houston Parkway North • Houston, Texas 77044
Phone 713-427-7700 • Fax 713-427-7747

(b) 1 1/4

Alternate Proposed Reply: Yes; "the organization" in paragraph 3.2.5 refers to the "R" Certificate holder responsible for preparing and executing the "Design Certification" portion of the R-2 Form. This does not preclude the "R" Certificate holder from having the calculations prepared or otherwise obtaining the calculations from others, but the "R" Certificate holder must assure himself that the design complies with the NBIC and by signing the Design Certification accepts responsibility for the design.

Question: If an alteration involves the installation of a replacement part (as defined in paragraph 3.2.2c) that has been designed, fabricated, inspected, and stamped in accordance with the original code of construction and for which the part fabricator has documented on the partial data report that they have certified the design of the part for a specific set of design conditions (MAWP, MAWT, MDMT, corrosion allowance, etc.), must the "R" Certificate holder responsible for executing the Design Certification on the R-2 Form obtain the calculations from the part fabricator and make available for review by the Inspector?

Proposed Reply: No, however, the "R" Certificate holder responsible for executing the Design Certification must assure that the design conditions certified for the new part are consistent with the original vessel design conditions. Additionally, the "R" Certificate holder would be responsible for assessing whether the installation of the new part impacted in any manner the existing components in the overall vessel design and for completing any calculations that might be required to address such impact.

I sincerely appreciate your consideration of this request for interpretation and look forward to a reply, which can be sent to my attention at the email or physical address shown below.

Regards,

Jeremy Napier, P.E.(TX)
Engineering / QC Manager
Jeremy.Napier@KochSpecialty.com

(7) 2/14

PROPOSED INTERPRETATION

Inquiry No.	IN13-0401
Source	Jeremy Napier
Subject	Part 3, 3.2.5
Edition	2011 Edition
Question	Q1: Is it the intent of the requirements in paragraph 3.2.5 that calculations be both completed and also made available to the Inspector for review prior to the start of any physical work? Q2: Does the requirement in paragraph 3.2.5 that calculations be completed and also mean that the calculations as required by paragraph 3.2.5 be an "R" Certificate Holder? Q3: If an alteration involves the installation of a replacement part (as defined in Paragraph 3.2.2 c) that has been designed, fabricated, inspected and stamped in accordance with the original code of construction and for which the part fabricator has documented on the partial data report that they have certified the design of the part for a specific set of design conditions (MAWP,MAWT, MDMT, corrosion allowance, etc.), must the "R" Certificate Holder responsible for executing the Design Certification on the R-2 Form obtain the calculations from the part fabricator and make available for review by the Inspector?
Reply	A1: Yes A2: No: However the R-Certificate holder responsible for executing the "Design Certification" portion of the R-2 Form, must assure himself that the design complies with the NBIC and by signing the Design Certification accepts responsibility for the design. Alternate Proposed Reply Q2: Yes; "the organization" in paragraph 3.2.5 refers to the "R" Certificate holder responsible for preparing and executing "Design Certification" portion of the R-2 Form. This does not preclude the "R" Certificate Holder from having the calculations prepared or otherwise obtaining the calculations from others, but the "R" Certificate holder must assure himself that the design complies with the NBIC and by signing the Design Certification accepts responsibility for the design. A3: No, however the "R" Certificate holder responsible for executing the Design Certification must assure that the design conditions certified for the new part are consistent with the original vessel design conditions.

	Additionally the R Certificate holder would be responsible for assessing whether the installation of the new part impacted in any manner the existing components in the overall vessel design and for completing any calculations that might be required to address such impact.				
Committee's Question					
Committee's Reply					
Rationale					
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					

Attachment 4

Supplement 9

Requirements for Change of Service

S9.1 Scope:

This Supplement provides requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.

Whenever there is a change of service, the local jurisdiction where the pressure retaining item is to be operated shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

S9.2 Classification of Service Changes

S9.2.1 Service Contents

A change in service contents is considered to be any modification to the commodity or contents that the pressure retaining item was originally intended to contain when the pressure retaining item was constructed.

For example, a change:

a) From LP gas service to ammonia service.
b) From lethal to non lethal service or vice versa

S9.2.2 Service Type or Change of Usage

A change in service type is considered to be a change of how the pressure retaining item is being used.

For example, a change:

a) From above ground service to underground service for LP gas tanks.
b) From mobile or transport use to stationary use

S9.3 Factors to Consider

Before a change of service is to be made, the owner or user shall consider and evaluate the effects of the new operating conditions or environment on the existing condition and suitability for service of the

(1)

pressure retaining item. Various factors will have an impact on the reliability of the pressure retaining item in its new service environment. Changes can be successfully adopted providing there is an understanding of the effect on the pressure retaining item. However, there are some cases where changes are detrimental to the existing pressure retaining item. The owner or user should seek technical guidance of experienced personnel in appropriate areas affected by the change of service (e.g. design, metallurgy, or operations of the pressure retaining item).

The following is a listing of criteria that should be evaluated as appropriate. The criterion is not limited to that listed herein. Other factors may be considered as necessary;

1) Design Consideration:
   a) Thickness of existing vessel material
   b) Vessel or system flow rate or pressure
   c) Weight of vessel with new contents
   d) Existing or additional loads imposed on nozzles and highly stressed areas
   e) Change in pressure or temperature cycling
   f) Compliance to product or industry standards, such as ANSI K61, API 579, or NFPA 58

2) Material Consideration:
   a) Chemical and mechanical properties of existing material or any new material to be added or replaced to assure it has the required strength and toughness to withstand the pressure and temperature effects of the new environment.
   b) Effects of erosion or corrosion
   c) Time dependent effects on service life - creep or fatigue.

3) Environment -
   a) Physical condition of the pressure retaining item
   b) Overpressure protection needs
   c) Regulatory environment - Verification of compliance to new or existing jurisdictional rules or regulations.

4) Operational History
   a) A review of current and past operational logs or records should be made to assure that no conditions existed where any further use would render the pressure retaining item hazardous or otherwise unsafe.
   b) Records to be obtained and reviewed would include Data Reports, Repair and Alteration Forms, Inspection reports.

5) Repairs and Alterations Made:

a) A review of any repairs, alterations, reratings, or reconfigurations that have been performed on the pressure retaining item, so as to assure that they will not have a detrimental impact on the intended use.

6) Proposed rework
   a) Any physical work to be performed to restore the material to the existing or intended state or to meet any requirements for the new operating conditions.
   b) Repairs and alterations shall be performed in accordance with NBIC, Part 3.
   c) The effects of heat applied as a result of welding or heat treatment on the material or shaped parts.
   d) The method and extent of any physical or non destructive examination should be considered.
   e) Any physical testing or pressure testing to be performed to determine of verify leak tightness or structural integrity of the pressure retaining item.
   f) The pressure retaining item shall meet the Code requirements for the new environment at the time of change.

7) Documentation
   a) Review existing records that are required to satisfy customer, user, or legal requirements.
   b) Review the need for any marking, stamping, or labeling required for the intended service.

S9.4 Some Examples for Change of Service

The following is a typical list of examples of what constitutes a change in service and some factors to consider. Note: This list is not all inclusive. There may other service changes not mentioned.

Also, the listing of "Factors to Consider" is also not all inclusive. There may be other there are other elements that can influence the safe and reliable operation.

The Owner, the Jurisdiction where the pressure retaining item is to operate in the new environment, and local building Codes, laws, and regulations should be reviewed for additional requirements or prohibitions against a change of service.

Change	Some Factors to Consider
LP gas to ammonia	• PWHT of vessel during construction • Wet-fluorescent magnetic particle testing (WFMT) on all internal surfaces • Internal access of vessel is necessary. May need to install manhole.

Change	Some Factors to Consider
Ammonia to LP gas	• NFPA-58 should be consulted. i.e. restriction on maximum volume • Wet-fluorescent magnetic particle testing (WFMT) on all internal surfaces • Internal access of vessel is necessary. May need to install manhole. • Also see, NBIC Part 2, 2.3.6.4
LP gas service: from above ground to underground	• Requires alterations (additional nozzles). • Corrosion protection • See NFPA 58
LP gas to air receiver	• Assurance of vessel cleanliness. i.e. removal of mercaptan. • Appropriateness and number of inspection and drain openings. • Corrosion allowance
Boiler service: Steam to Hot Water	• May require replacement of smaller steam outlet nozzle with larger nozzle to accommodate condensate carryover
Sulfur dioxide service. Sweet to sour gas service.	• Concern over hydrogen cracking
Lethal service to non-lethal	• Design conditions and suitability for service
DOT railcars or ICC transport tanks to stationary service	• Prohibited by DOT regulations (49 CFR 180) for permanent service. • Temporary stationary service permitted as per NFPA 58 • Inspection for damage mechanisms that may be present from previous service life that is detrimental to the vessel in the new environment.

S9.5 Documentation of Change of Service

Any records, forms, or reports required documenting the change of service event that may be required by contract or the jurisdiction where the pressure retaining item operates shall be completed as specified.

NBIC Part 2

Add new paragraph:

1.6 Change of Service

Supplement 9 provides requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.

Whenever there is a change of service, the local jurisdiction where the pressure retaining item is to be operated, shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

NBIC Part 1

Add new paragraph:

1.5 Change of Service

See NBIC Part 2, Supplement 9 for requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.

Whenever there is a change of service, the local jurisdiction where the pressure retaining item is to be operated, shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

NBIC Part 3

Add new paragraph:

1.9 Change of Service

See NBIC Part 2, Supplement 9 for requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.

Whenever there is a change of service, the local jurisdiction where the pressure retaining item is to be operated, shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

NB 10-0110

S6.14 GENERAL STAMPING REQUIREMENTS

The stamping of or attaching of a nameplate to a pressure-retaining item shall indicate that the work was performed in accordance with the requirements of this Code and any requirements of the Competent Authority. Such stamping or attaching of a nameplate shall be done only with the knowledge and authorization of the Inspector and Competent Authority. The "TR" Certificate Holder responsible for the repair or the construction portion of the modification/alteration shall apply the stamping. For a re-rating where no physical changes are made to the pressure-retaining item, the "TR" Certificate Holder responsible for the design shall apply the stamping. Requirements for stamping and nameplate information are shown in NBIC Part 3, Section 5.

S6.14.1 SPECIFIC "TR" STAMPING AND NAMEPLATE REQUIREMENTS C

The holder of a "TR" *Certificate of Authorization* is required to affix a stamping or nameplate on the Transport Tank that indicates, as appropriate, that the repair, alteration, or modification has been performed in accordance with the requirements of NBIC Part 3, Supplement 6 and the additional requirements of the code of construction. All repairs, alterations, and modifications, after acceptance by the Registered Inspector, shall have the "TR"
Symbol affixed to the stamping or the nameplate.
The stamping or nameplate information shall satisfy the requirements of (a) thru (g) below:

a) The required data shall be in characters at least 4 mm (5/32 in.) high;

b) The markings may be produced by casting, etching, embossing, debossing, stamping, or engraving;

c) The selected method shall not result in any harmful contamination or sharp discontinuities to the pressure- retaining boundary of the Transport Tank;

d) Stamping directly on the Transport Tank, when used, shall be done with blunt-nose continuous or blunt- nose interrupted dot die stamps. If direct stamping would be detrimental to the item, required markings may appear on a nameplate affixed to the Transport Tank;

e) The "TR" Certificate Holder shall use its full name as shown on the *Certificate of Authorization* or an ab- breviation acceptable to the National Board;

f) The stamping, when directly 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;

g) The date of each repair, alteration, or modification corresponding with the date on the Form TR-1 shall be stamped on the nameplate.

S6.14.12 REMOVAL OF ORIGINAL STAMPING OR NAMEPLATE

If it becomes necessary to remove the original stamping, the Inspector shall, subject to the approval of the Competent Authority, witness the making of a facsimile of the stamping, the obliteration of the old stamp-

ing, and the transfer of the stamping. When the stamping is on a nameplate, the Inspector shall witness the transfer of the nameplate to the new location. Any relocation shall be described on the applicable NBIC "TR" Form. The restamping or replacement of a code symbol stamp shall be performed only as permitted by the governing code of construction.

S6.15 "TR" FORMS

~~S6.17.3~~15.1 DOCUMENTATION

Repairs, alterations, or modifications that have been performed in accordance with the NBIC shall be docu- mented on Form TR-1, *Report of Repair, Alteration, or Modification*, as shown in NBIC Part 3, Section 5. Form TR-2, *Report Supplementary Sheet*, shall be used to record additional data when space is insufficient on Form TR-1.

~~S6.18~~15.2 PREPARATION OF TR FORMS

Preparation of "TR" Forms shall be the responsibility of the "TR" Certificate Holder performing the repairs,
alterations, or modifications. An Inspector shall indicate acceptance by signing the appropriate "TR" form.

~~S6.18.1~~15.3 DISTRIBUTION

a) Legible copies of the completed Form TR-1 together with attachments shall be distributed to the owner or user, the Inspector, and the Competent Authority, as required, and the Authorized Inspection Agency responsible for the inspection.

b) Distribution of the Form TR-1 and attachments shall be the responsibility of the organization performing the repair.

~~S6.18.2~~ ~~REGISTRATION~~

~~Form, TR-1 and TR-2 shall be registered with the National Board.~~

~~S6.19.1~~15.4 REGISTRATION OF FORM TR-1 AND FORM TR-2

a) Organizations performing repairs, alterations, or modifications under the "TR" program must register such
repairs, alterations, or modifications with the National Board.
~~It is required by DOT that the Form TR-1 and, if applicable, Form TR-2 be registered with the National Board.~~

b) The repair organization shall maintain a sequential Form "TR" Log that shall identify the following:

1) Form number assigned for Form TR-1;

2) Identify if the activity was a repair, alteration, or modification; and

3) Date sent to the National Board

(8)

~~S6.15.1 REGISTRATION OF "TR" FORMS~~

~~Organizations performing repairs, alterations, or modifications under the "TR" program must register such repairs, alterations, or modifications with the National Board.~~

~~S6.15.2 FORM 'TR" LOG~~

~~The "TR" Certificate Holder shall maintain a single, sequential log of "TR"; form numbers assigned for NBIC forms (i.e., TR-1) that are registered with the National Board~~.

S6.16 ADDITIONAL REQUIREMENTS FOR REPAIRS, ALTERATIONS, OR MODIFICATIONS

S6.16.1 SCOPE

This section provides additional requirements for repairs, alterations, or modifications to DOT Transport Tank pressure-retaining items and shall be used in conjunction with NBIC Part 3.

S6.16.2 REPAIRS OF DEFECTS

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. This information shall be made available to the Inspector.

S6.16.3 MODIFICATIONS

All modifications to the pressure-retaining item shall meet the requirements of NBIC Part 3, Section 6.

S6.16.4 DRAWINGS

Drawings or instructions shall be prepared to describe the repair, alterations, or modification. Drawings shall include sufficient information to satisfactorily perform the activity.

S6.16.5 AUTHORIZATION

Repairs, alterations, or modifications to a pressure-retaining item shall not be initiated without the authorization of the Inspector, who shall determine that the repair methods are acceptable and subject to acceptance of the Competent Authority.

S6.17 EXAMINATION AND TEST

The following requirements shall apply to all repairs, alterations, or modifications to DOT Transport Tank pressure-retaining items:

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

b) The "TR" Certificate Holder is responsible for all activities relating to examination and test of repair, alterations, or modifications;

c) Examination and tests to be used shall be subject to acceptance of the Inspector and the Competent Authority.

S6.17.1 METHODS

One, or a combination of the following examination and methods, shall be applied to DOT Transport Tank pressure retaining itmes with the concurrence of the Inspector and the Competent Authority.

a) Liquid Pressure Test
Pressure testing of repairs shall meet the following requirements:

1) Pressure tests shall be conducted using water or other suitable liquid. The test pressure shall be the minimum required to verify the leak tightness integrity of the repair, but not more than 150% of the maximum allowable working pressure (MAWP) stamped on the pressure-retaining item, as adjusted for temperature. When original test pressure included consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance;

2) During a pressure test where the test pressure will exceed 90% of the set pressure of the pressure relief device, the device shall be removed whenever possible. If not possible, a test gag should be used using the valve manufacturer's instructions and recommendations;

3) Hold time for the pressure test shall be a minimum of 10 minutes prior to examination by the Inspec- tor. Where the test pressure exceeds the MAWP of the item, the test pressure shall be reduced to the MAWP for close examination by the Inspector. Hold time for close examination shall be as necessary for the Inspector to conduct the examination;

b) Pneumatic Test
A pneumatic test may be conducted. Concurrence of the owner shall be obtained in addition to that of the Inspector and the Competent Authority where required. The test pressure shall be the minimum required to verify leak tightness integrity of the repair, but shall not exceed the maximum pneumatic test pressure of the original code of construction. Precautionary requirements of the original code of construction shall be followed;

c) Nondestructive Examination
Nondestructive examination (NDE) may be conducted. NDE methods shall be suitable for providing meaningful results to verify the integrity of the repair.

~~**S6.17.2 STAMPING**~~

~~DOT Transport Tanks repaired in accordance with the NBIC shall be stamped as required by NBIC Part 3, Section 5.~~

~~**S6.17.3**~~
~~**DOCUMENTATION**~~

~~Repairs, alterations, or modifications that have been performed in accordance with the NBIC shall be documented on Form TR 1, *Report of Repair, Alteration, or Modification*, as shown in NBIC Part 3, Section 5. Form TR 2, *Report Supplementary Sheet*, shall be used to record additional data when space is insufficient on Form TR 1.~~

~~**S6.18 PREPARATION OF TR FORMS**~~

~~Preparation of "TR" Forms shall be the responsibility of the "TR" Certificate Holder performing the repairs,~~
~~alterations, or modifications. An Inspector shall indicate acceptance by signing the appropriate "TR" form.~~

~~S6.18.1~~
~~DISTRIBUTION~~

~~a) Legible copies of the completed Form TR-1 together with attachments shall be distributed to the owner or user, the Inspector, and the Competent Authority, as required, and the Authorized Inspection Agency responsible for the inspection.~~

~~b) Distribution of the Form TR-1 and attachments shall be the responsibility of the organization performing the repair.~~

~~S6.18.2~~
~~REGISTRATION~~

~~Form, TR-1 and TR-2 shall be registered with the National Board.~~

S6.19~~8~~ REPAIRS, ALTERATIONS, OR MODIFICATION REPORTS

a) If repairs, alterations, or modifications are performed on a Transport Tank, i.e., cargo tank, portable tank, or ton tank, the Owner or User shall have the activity performed by a Repair Organization that has a valid "TR" *Certificate of Authorization* issued by the National Board.

b) The repair, alteration, or modification shall be recorded on the Form TR-1. If additional space is needed to properly record the repair, alteration, or modification, Form TR-2 shall be used.

c) It is the responsibility of the "TR" Symbol Stamp Holder to prepare, distribute, and maintain the Form TR-1 and, if required, Form TR-2. The Form(s) shall be distributed as follows:

1) Owner-User;

2) Registered Inspector;
3) Competent Authority (DOT); and
4) National Board.

d) The Form TR-1 shall be signed by a Registered Inspector as defined in NBIC Part 3, S6.7.1.

~~S6.19.1 REGISTRATION OF FORM TR-1 AND FORM TR-2~~

~~a) It is required by DOT that the Form TR-1 and, if applicable, Form TR-2 be registered with the National Board.~~

~~b) The repair organization shall maintain a sequential Form "TR" Log that shall identify the following:~~

~~1) Form number assigned for Form TR-1;~~

~~2) Identify if the activity was a repair, alteration, or modification; and~~

~~3) Date sent to the National Board~~.

~~S6.19.2 GENERAL REQUIREMENTS "TR" STAMPING AND NAMEPLATES~~

~~The holder of a "TR" *Certificate of Authorization* is required to affix a stamping or nameplate on the Transport Tank that indicates, as appropriate, that the repair, alteration, or modification has been performed in accordance with the requirements of NBIC Part 3, Supplement 6 and the additional requirements of the code of construction. All repairs, alterations, and modifications, after acceptance by the Registered Inspector, shall have the "TR"~~

~~Symbol affixed to the stamping or the nameplate.~~
~~The stamping or nameplate information shall satisfy the requirements of (a) thru (g) below:~~

~~a) The required data shall be in characters at least 4 mm (5/32 in.) high;~~

~~b) The markings may be produced by casting, etching, embossing, debossing, stamping, or engraving;~~

~~c) The selected method shall not result in any harmful contamination or sharp discontinuities to the pressure-retaining boundary of the Transport Tank;~~

~~d) Stamping directly on the Transport Tank, when used, shall be done with blunt-nose continuous or blunt-nose interrupted dot die stamps. If direct stamping would be detrimental to the item, required markings may appear on a nameplate affixed to the Transport Tank;~~

~~e) The "TR" Certificate Holder shall use its full name as shown on the *Certificate of Authorization* or an abbreviation acceptable to the National Board;~~

~~f) The stamping, when directly 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;~~

~~g) The date of each repair, alteration, or modification corresponding with the date on the Form TR-1 shall be stamped on the nameplate.~~

~~S6.19.3 STAMPING OF THE "TR" SYMBOL~~

~~All repairs, alterations, and modifications, after acceptance by the Registered Inspector, shall have the "TR" Symbol affixed to the stamping or the nameplate.~~

(12)

Part 3 – Repairs and Alterations Page 75

1) Engineering evaluation of the defect in the pressure-retaining item shall be conducted using one or more fitness-for-service condition assessment method(s) as described in NBIC, Part 2, 4.4. Engineering evaluation of the condition assessment results shall be performed by an organization that has demonstrated industry experience in evaluating pressure-retaining items as referenced in NBIC, Part 2, S5.3.

2) If engineering evaluation indicates a defect can remain in the pressure-retaining item, a risk-based inspection program shall be developed and implemented based on review and acceptance by the Inspector and, when required, the Jurisdiction. The risk-based inspection program shall be in accordance with the requirements in NBIC, Part 2, 4.4.

3) The fitness-for-service condition assessment and risk-based inspection programs shall remain in effect for the pressure-retaining item until such time that the defect can be completely removed and the item repaired. The fitness-for-service condition assessment method, results of assessment, and method of weld repair shall be based inspection program developed and implemented as required by Paragraph 3.3.4.8. The inspection interval shall not exceed the remaining life of the item, and shall be documented on the FFSA Form and in the remarks section of the Form R-1. The FFSA Form shall be affixed to the Form R-1 when weld repairs are performed in 3.3.4.8. A07

6) A copy of the completed Form R-1 with the completed FFSA Form attached may be registered with the National Board, and when required, filed with the Jurisdiction where the item was installed.

Insert New Para. Here

3.3.5 REPAIR OF ASME SECTION VIII, DIVISION 2 OR 3, PRESSURE VESSELS

3.3.5.1 SCOPE

The following requirements shall apply for the repair of pressure vessels constructed to the requirements of Section VIII, Division 2 or 3, of the ASME Code.

3.3.5.2 REPAIR PLAN

Rational: An effort to address many jurisdictions and repair organizations concerns with the tube plugging of firetube boilers and procedures that are performed on a continuous basis and to assist in unifying basic requirements following guidelines of the NBIC.
Tube plugging is presently being performed using various processes such as welding, and mechanical methods such as driving and expanding to existing tubes (sleeved or un-sleeved) or tube sheet holes when tubes are removed.
The Task Group considered the scope of the NBIC should only address the repairs that pertain to replacement of tubing or when tubing involves welding in its repair method. The task group felt that the plugging of a tube or tubes in a firetube boiler is a deviation from its original operating parameters and the manufacturer's original design. The NBIC should not address mechanical repair methods, and could not safely determine a repair procedure or process when the various effects on the pressure boundaries, heat transfer and byproducts of combustion are unknown. The Task Group endorse the use of should vs. shall as documented so cases where it is not necessary to consult the manufacturer, particularly if you have an experienced and knowledgeable R stamp holder who can make the necessary design considerations (both structural and performance related). The original Manufacturer may not even exist in some cases.

Proposed Changes
NB11-1001

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Section 3.3.4.9 TUBE PLUGGING IN FIRETUBE BOILERS

When tube plugging in a firetube boiler is performed, the following requirements should be met:

1. If tube replacement is not practical at the time the defect is found, plugging of tubes in a firetube boiler may be considered and only conducted after notification of an Authorized Inspector or the jurisdiction.

2. The manufacturer should be consulted and repair procedure evaluated to determine the scope of repair and address operating or safety concerns.

3. If welded repairs or replacement of pressure retaining parts are conducted, all welding and material shall be in accordance to the original code of construction or as noted in the applicable sections of the NBIC.

4. Plugged tubes impact the pressure boundary and the safe and efficient process of combustion in the boiler unit. Thus, when practical, plugs should be removed and the tube replaced.

1.8 "NR" ACCREDITATION REQUIREMENTS

1.8.1 SCOPE

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

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

1.8.2 APPLICATION

a) ASME Section XI requires the Owner or an outside organization perform repair/replacement activities in accordance with an acceptable Quality System Program. Quality System Program requirements are established in ASME Sections III and XI for ASME Certificate of Authorization Holders for the Owner and outside organizations, as applicable. The requirements specified in this section for Quality System Programs to be written, maintained and implemented by the "NR" Certificate of Authorization Holder are in accord with the requirements specified in ASME Section III and XI for Quality System Programs.

b) Prior to the completion of installation activities, an item that meets all of the requirements of ASME Section III may have repair/replacement activities performed using the rules set forth in ASME Section III or ASME Section XI, as determined by the Owner.

c) After the completion of installation activities, repair/replacement activities shall meet the requirements of the Owner, with acceptance of the Regulatory Authority, Jurisdiction, and the Authorized Inspection Agency, as applicable.

d) Organizations in possession of an "NR" *Certificate of Authorization* may perform repair/replacement activities to items certified as complying with ASME Section III either prior, during or after installation.

1.8.3 QUALITY SYSTEM PROGRAM

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

1.8.3.1 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM PROGRAM ~~FOR~~ TO QUALIFICATION~~Y~~ FOR THE NATIONAL BOARD "NR" ~~SYMBOL STAMP~~ CERTIFICATE OF AUTHORIZATION

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

a) Organization

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

a. Identify quality problems;

b. Initiate action which results in solutions;

c. Verify implementation of solutions to those problems; and

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

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

b) Quality System Program

1) Before becoming a holder of an "NR" *Certificate of Authorization*, the applicant shall establish a Quality System Program for the control of the quality of work to be performed. The program shall define the organizational structure within which the

Quality System Program is to be implemented and shall clearly delineate the responsibilities, levels of authority, and lines of communication for the various individuals involved. The program shall be documented in detail in a Quality System Manual that shall be a major basis for ~~demonstration of~~ demonstrating compliance with the NBIC. The applicant's Quality System Program shall be documented by written policies, procedures, and instructions and shall be based on the organization's scope of work to be performed.

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

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

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

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

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

NBIC Subcommittee R&A Action Block

Subject Alternative Repair Option for CSEF Steel, Grade 91

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

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

Explanation

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

Project Manager Galanes/EPRI

Task Group **TG Meeting Date**

Negatives

Temper Bead Repair of T91 Using EPRI P87 Filler Metal

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Temper bead Repair of T91 Using EPRI P87 Filler Metal

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Abstract

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

Introduction

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

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

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

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

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

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

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

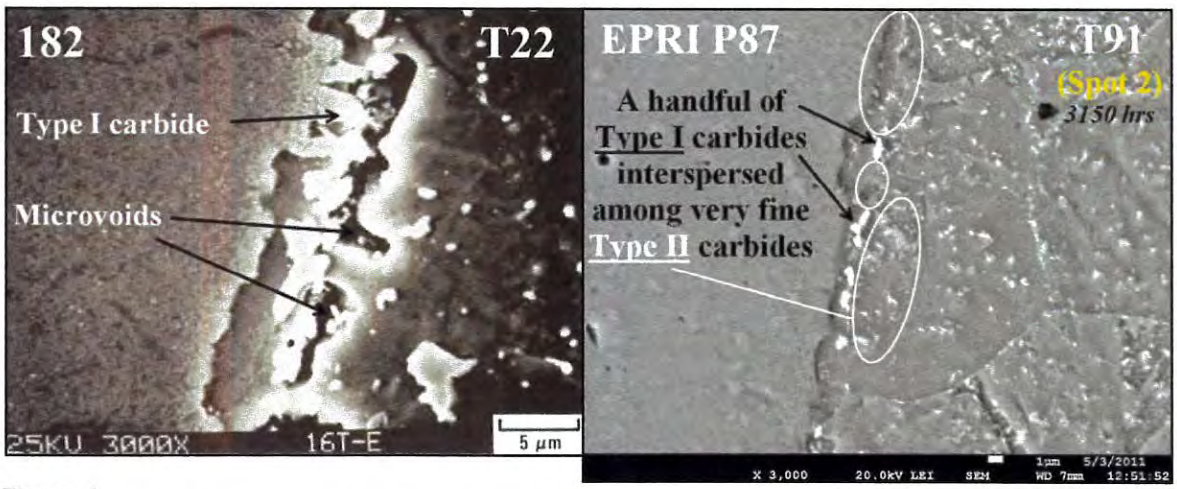

Figure 1
IN182 and EPRI P87 Thermal Stability Comparison
IN182 was exposed for 77,000hrs between 1100-1155F, LMP = 21560-22320 (as determined by oxide scale measurements) [5]. EPRI P87 was exposed for 3,150hrs at 1200F, LMP = 21665 [6].
Note: Figures were sized to match the micron bars for comparison.

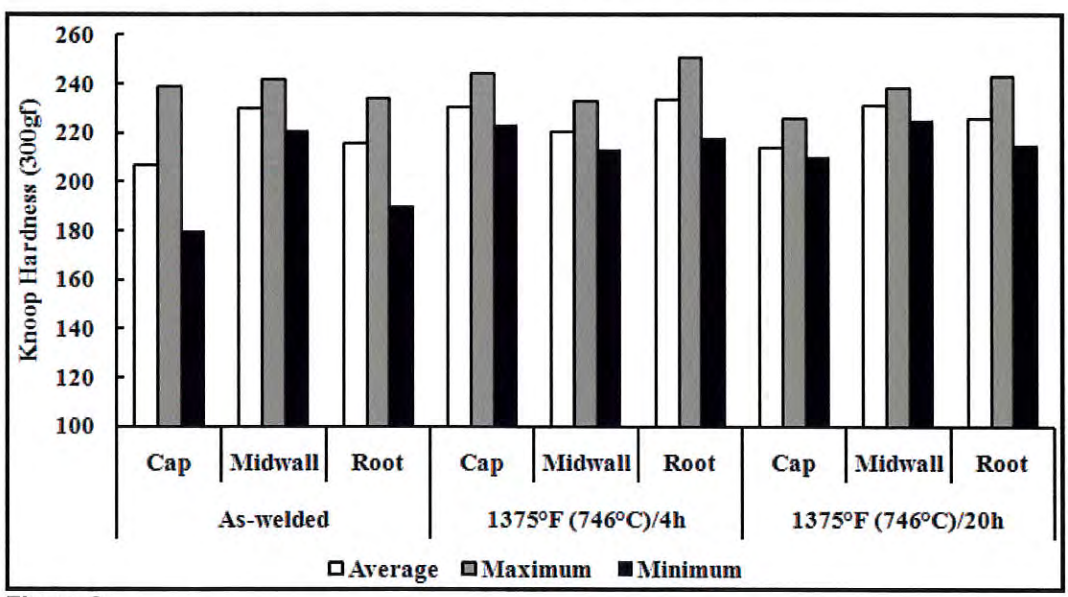

Figure 2
EPRI P87 Weld Metal Hardness Comparison [6]

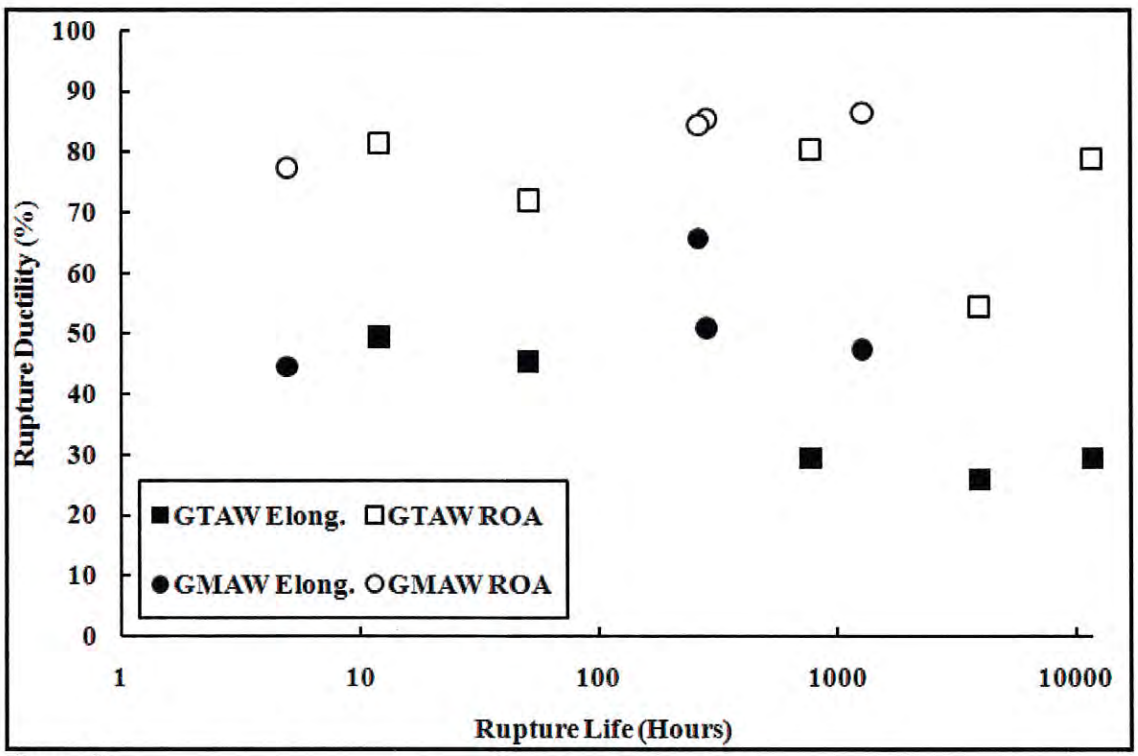

Figure 3
Creep Ductility, GTAW and GMAW All Weld Metal Creep Tests [6]

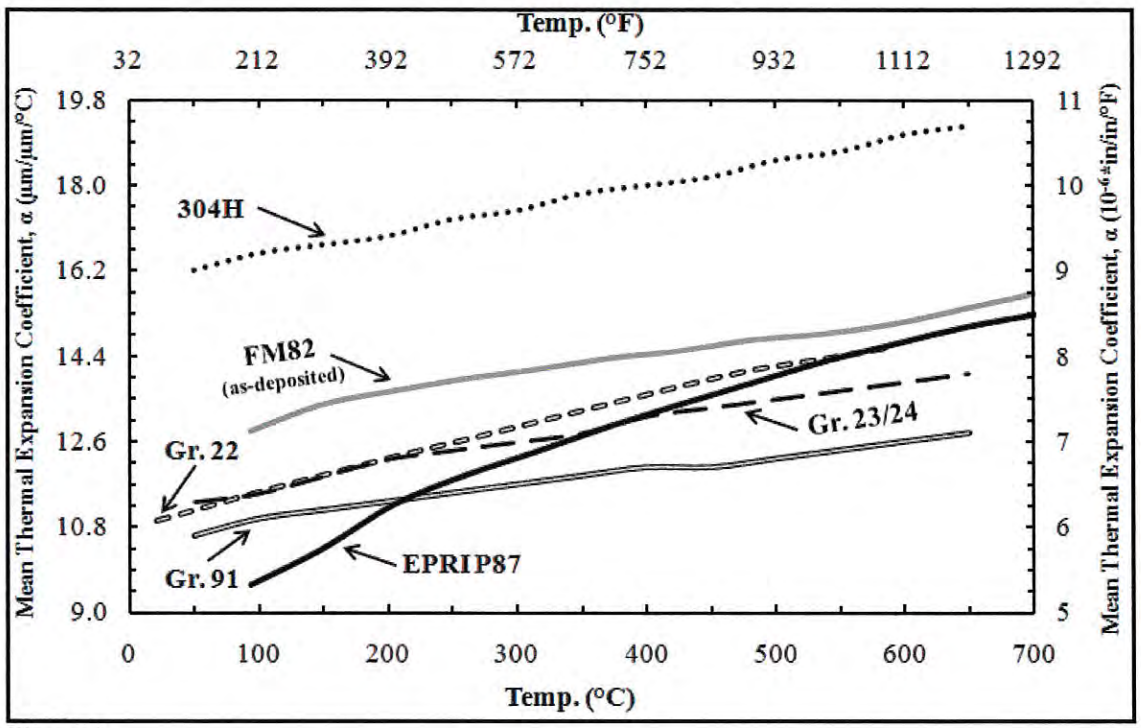

Figure 4
Mean Thermal Expansion Coefficient Comparison [6]

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

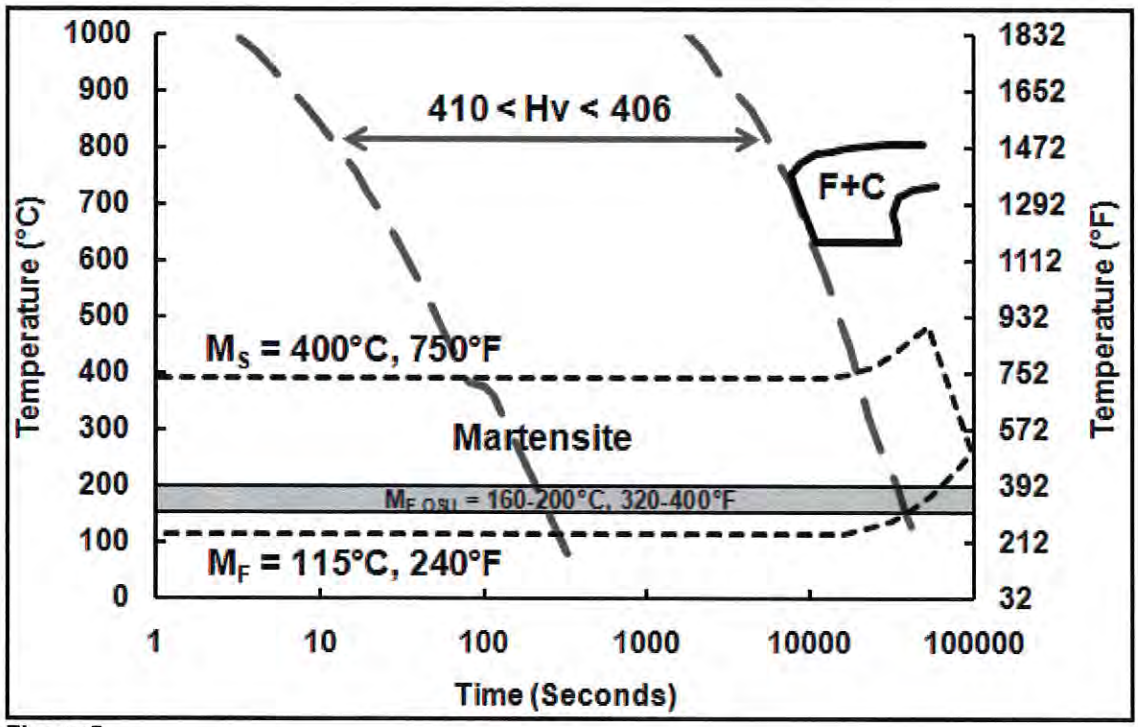

Figure 5
CCT Curve for Grade 91 Adapted from [7,8]

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

Experimental Procedure

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

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

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

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

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

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

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

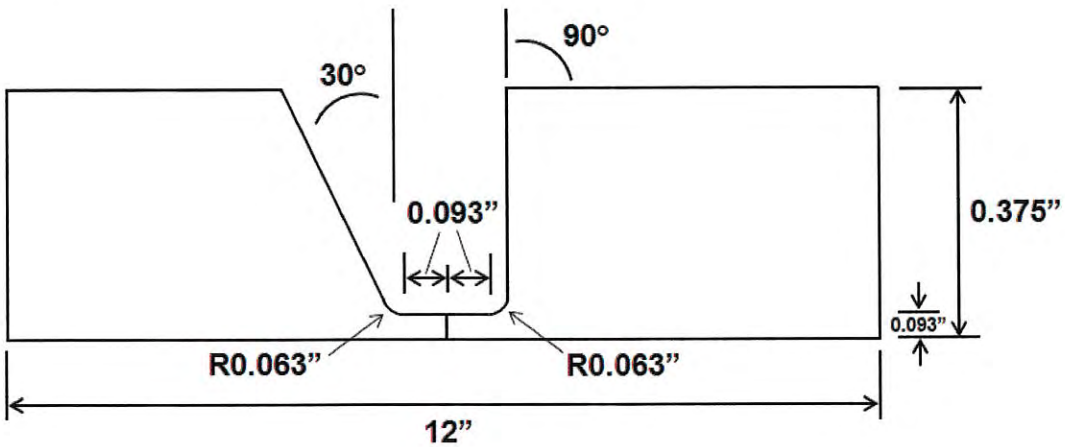

Figure 6
Weldment Dimensions

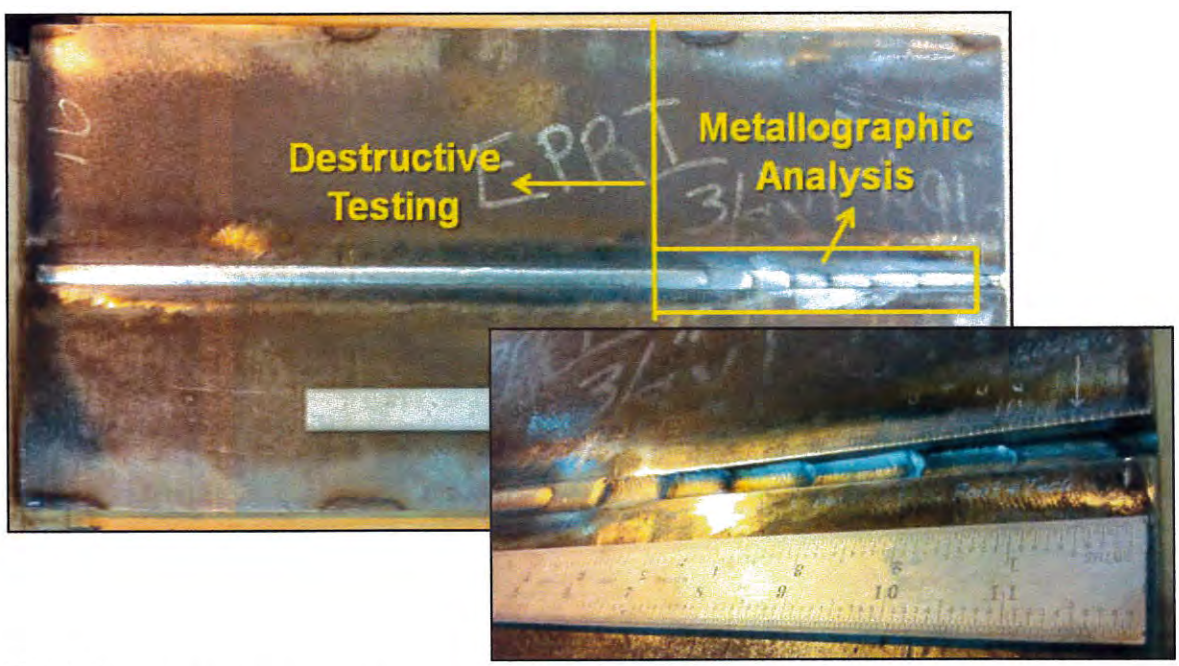

Figure 7
Example of Welded Plate and Sectioning

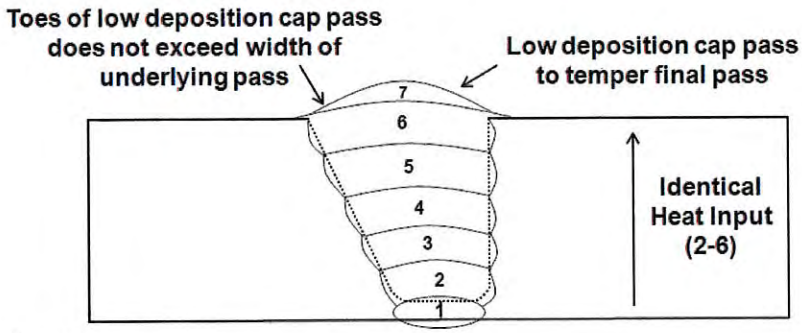

Figure 8
Consistent Layer Weldment Fill Layout

Table 2
Consistent Layer Weldment Parameters

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

[1]TS = Travel Speed

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

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

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

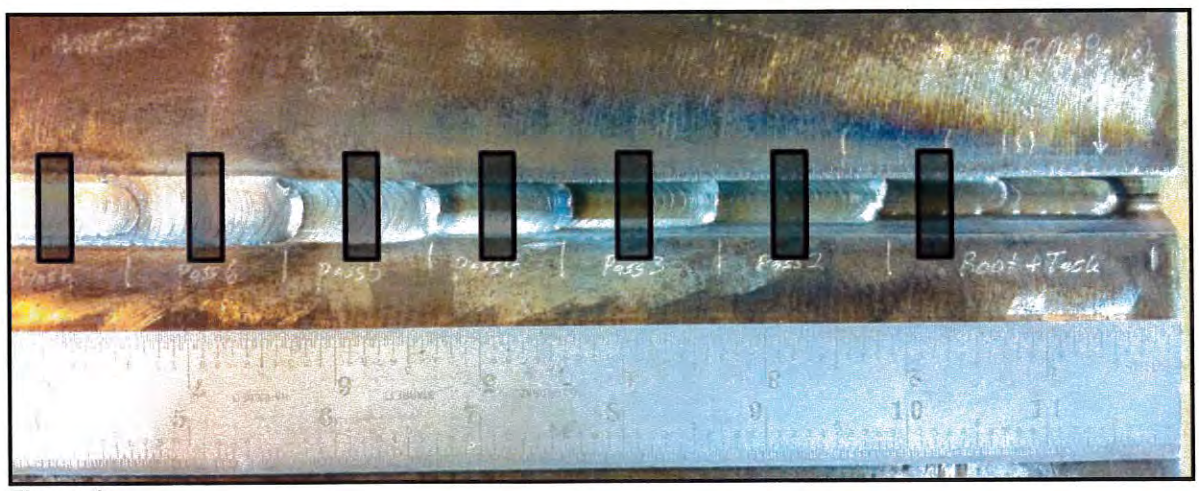

Figure 9
Consistent Layer Metallographic Sample Locations

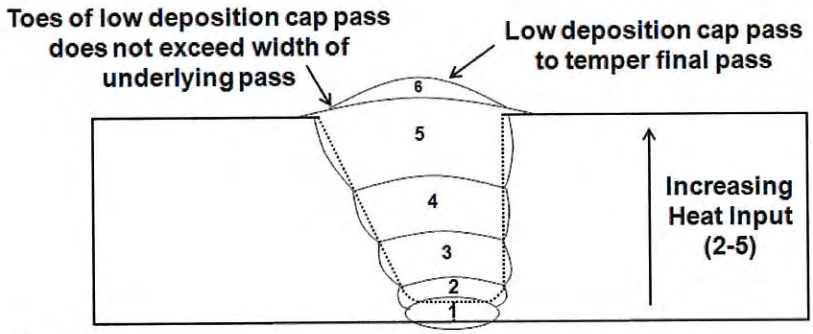

Figure 10
Controlled Deposition Weldment Fill Layout

Table 3
Controlled Deposition Weldment Parameters

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

[1]TS = Travel Speed

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

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

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

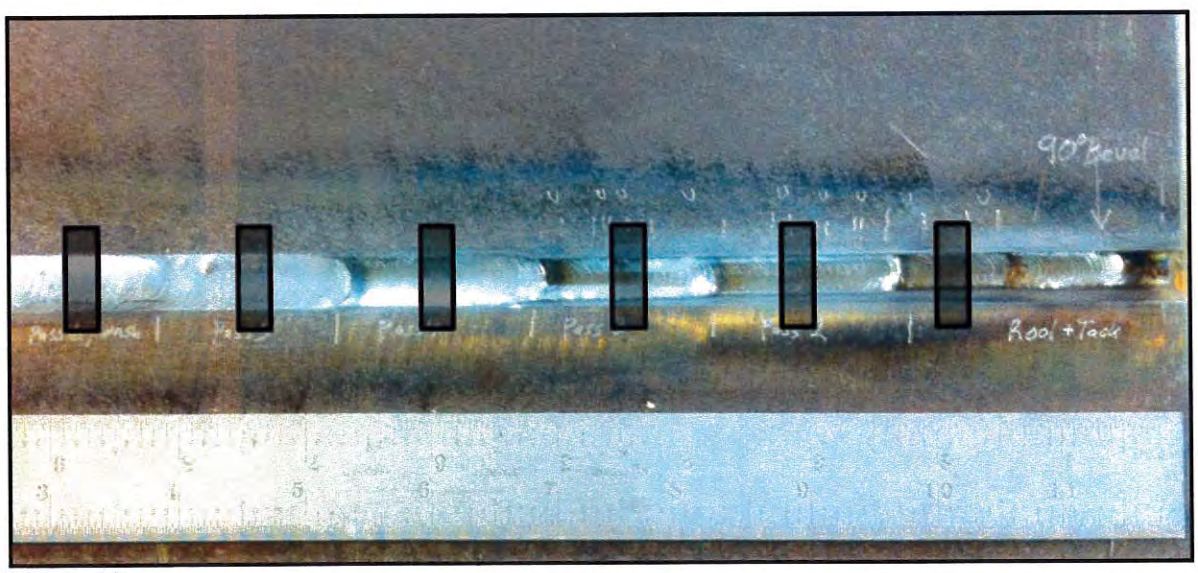

Figure 11
Controlled Deposition Metallographic Sample Locations

Results

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

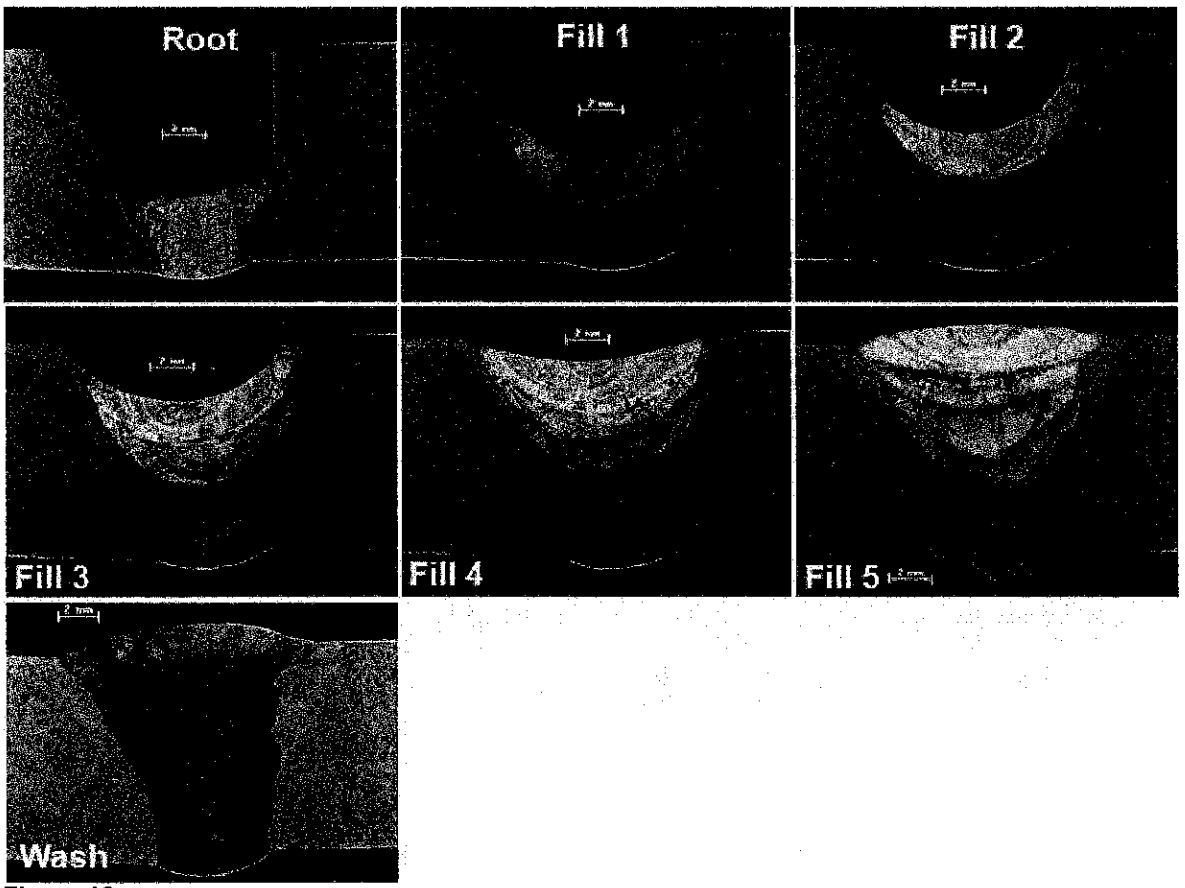

Figure 12
Consistent Layer Weld Passes

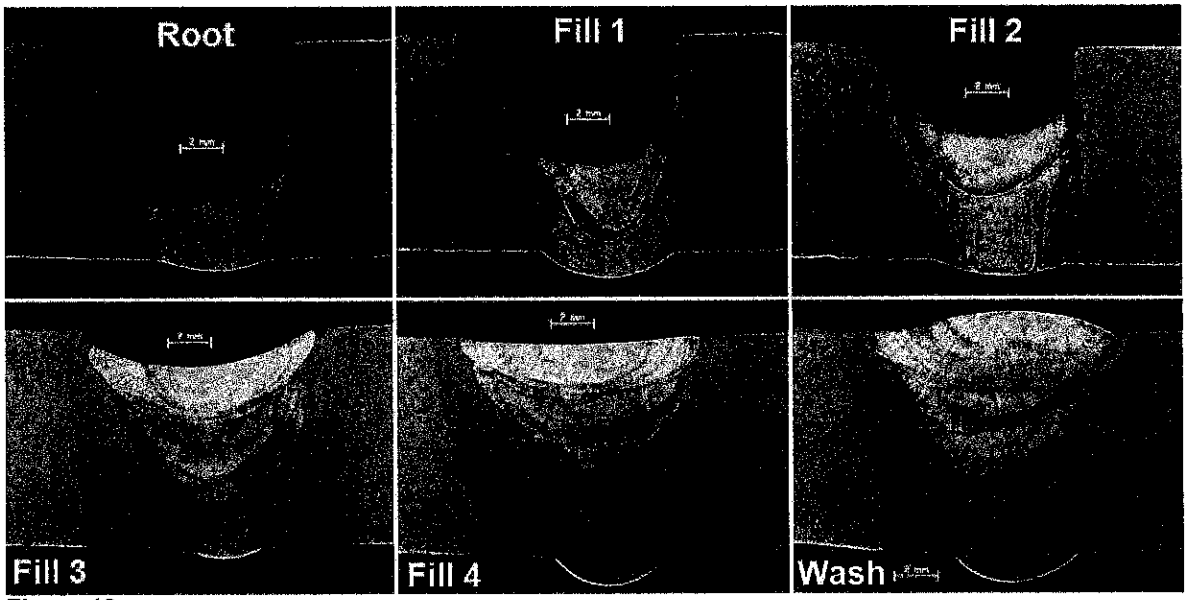

Figure 13
Controlled Deposition Weld Layers

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

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

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

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

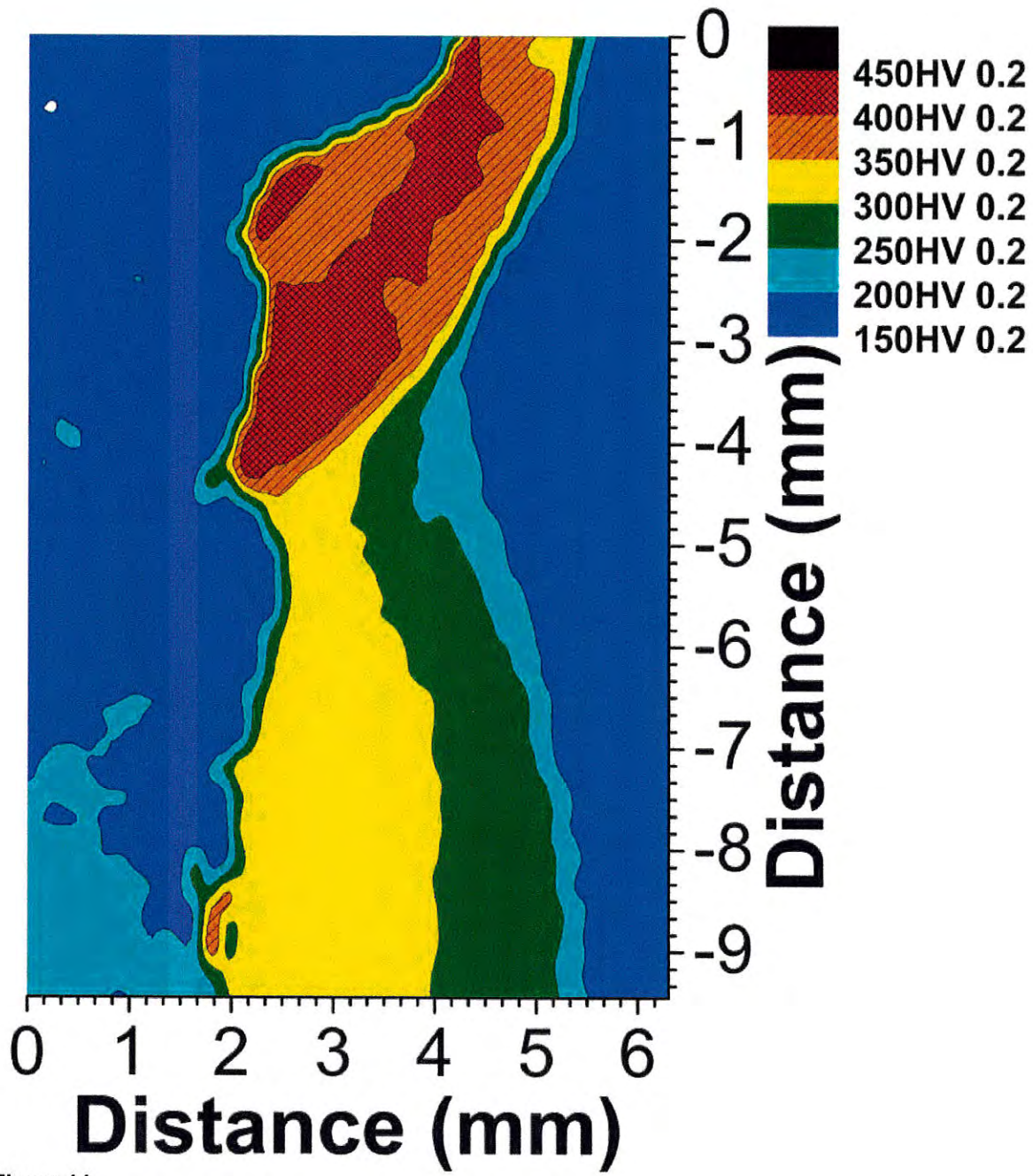

Figure 14
Consistent Layer Technique Hardness Map, 0° Bevel

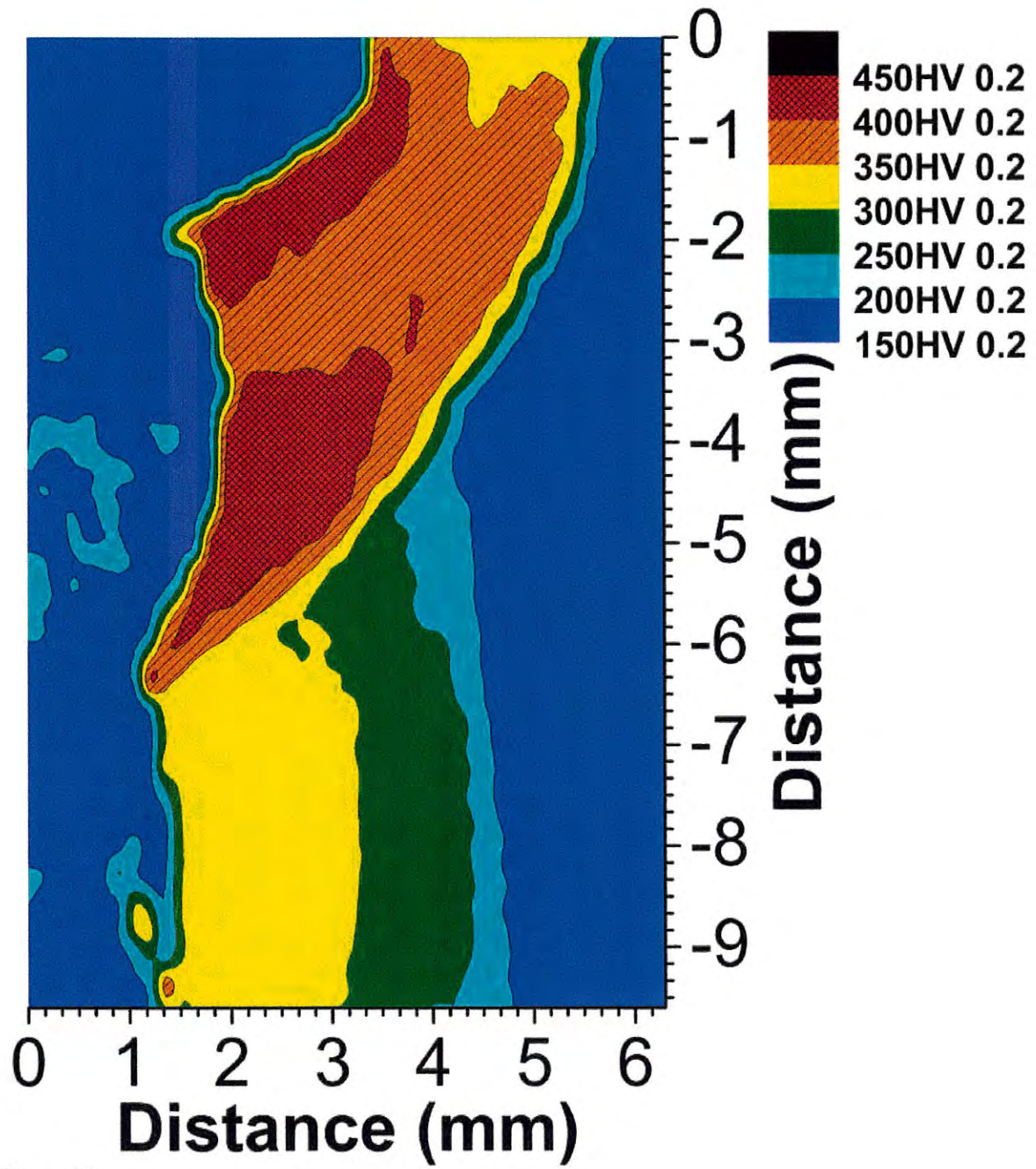

Figure 15
Controlled Deposition Technique, 0° Bevel

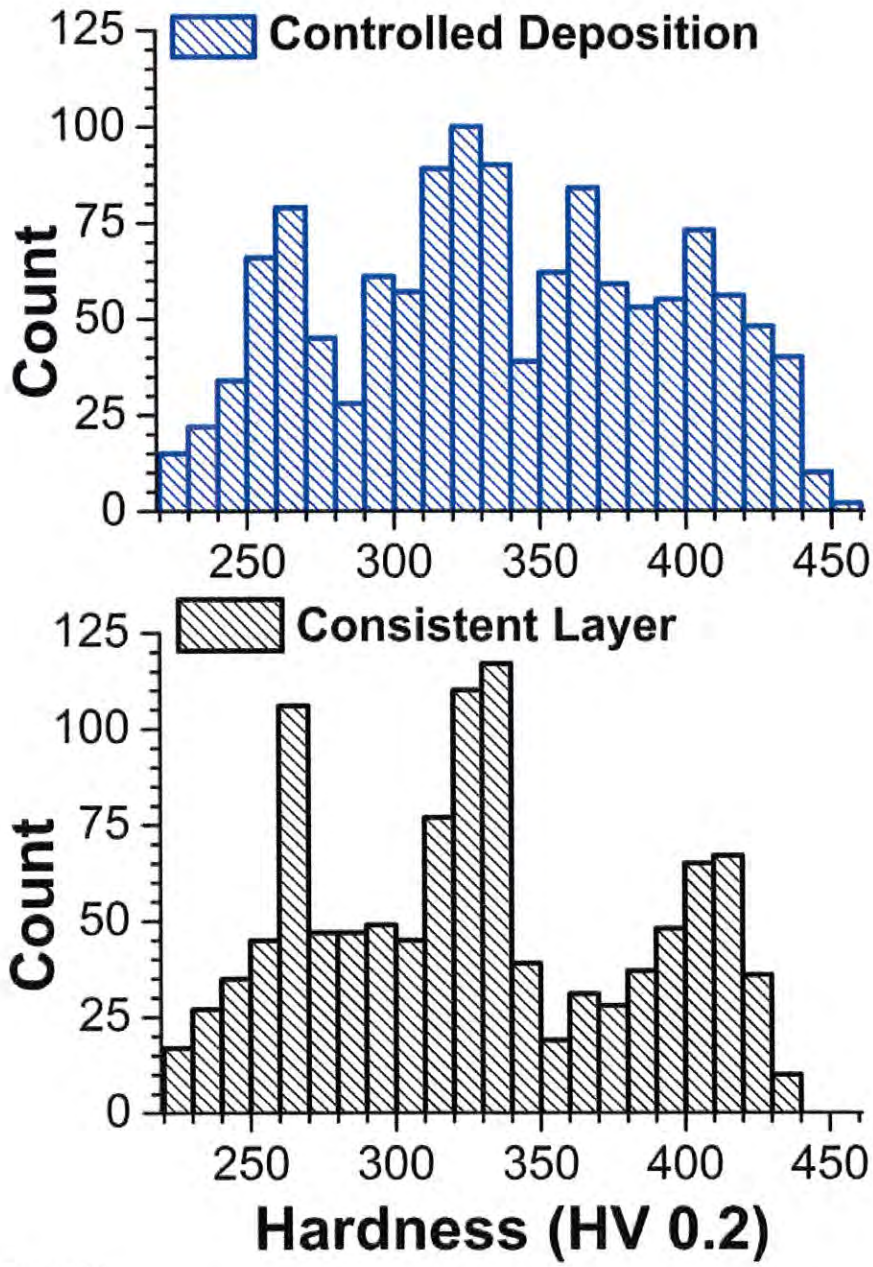

Figure 16
Histogram Comparison for Values above HV>225

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

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

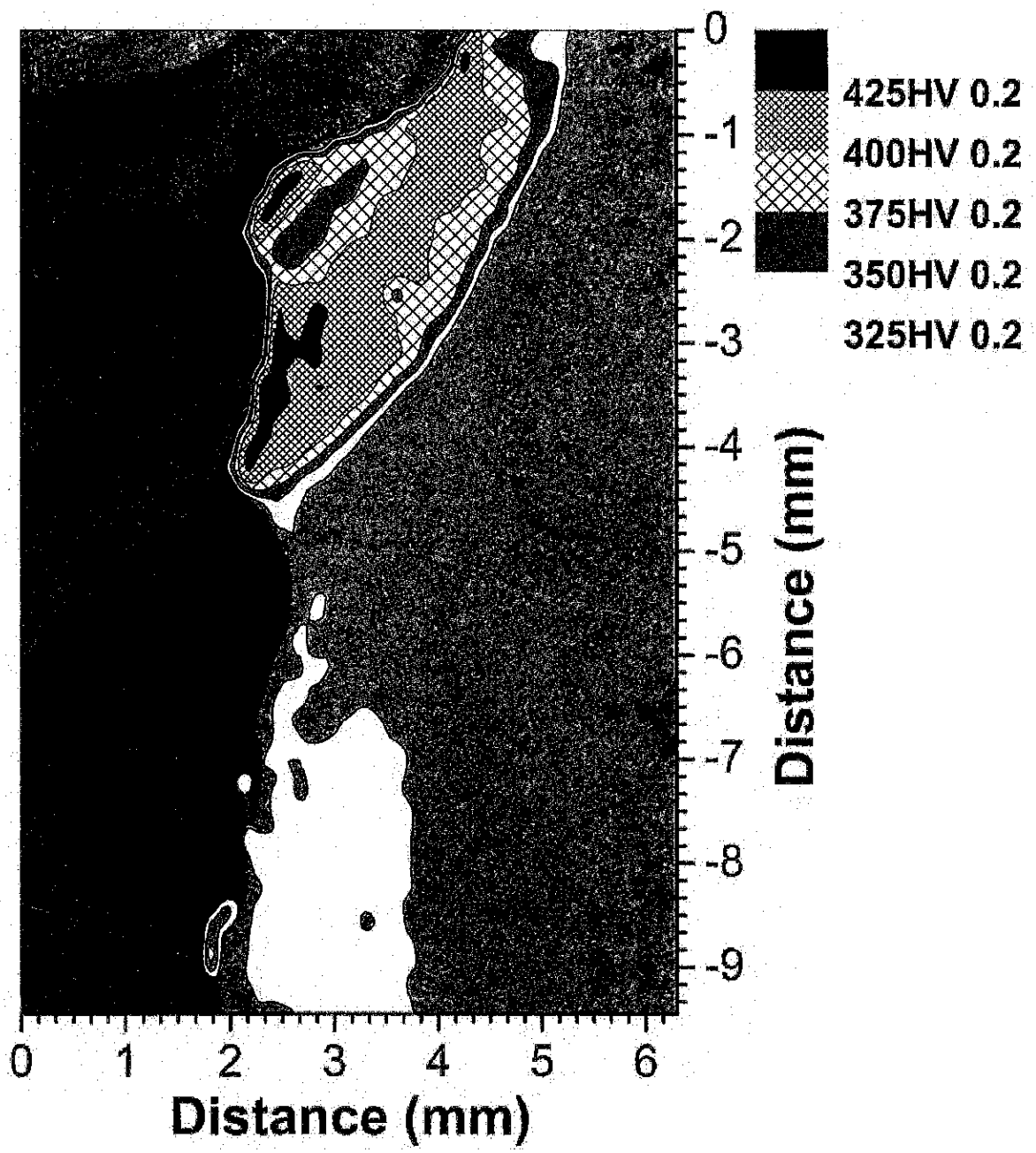

Figure 17
Location of Highest hardness Regions in the Consistent Layer Weldment

Discussion

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

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

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

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

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

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

Conclusions & Future Plans

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

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

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

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

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11. Private Correspondence, 10/25/11.

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Novel Approaches to Repair of Grade 91 Using Temperbead Welding Procedures

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Electric Power Research Institute

George Galanes
National Board Inspection Code

Introduction

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

Temperbead Concept for Tubing Applications

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

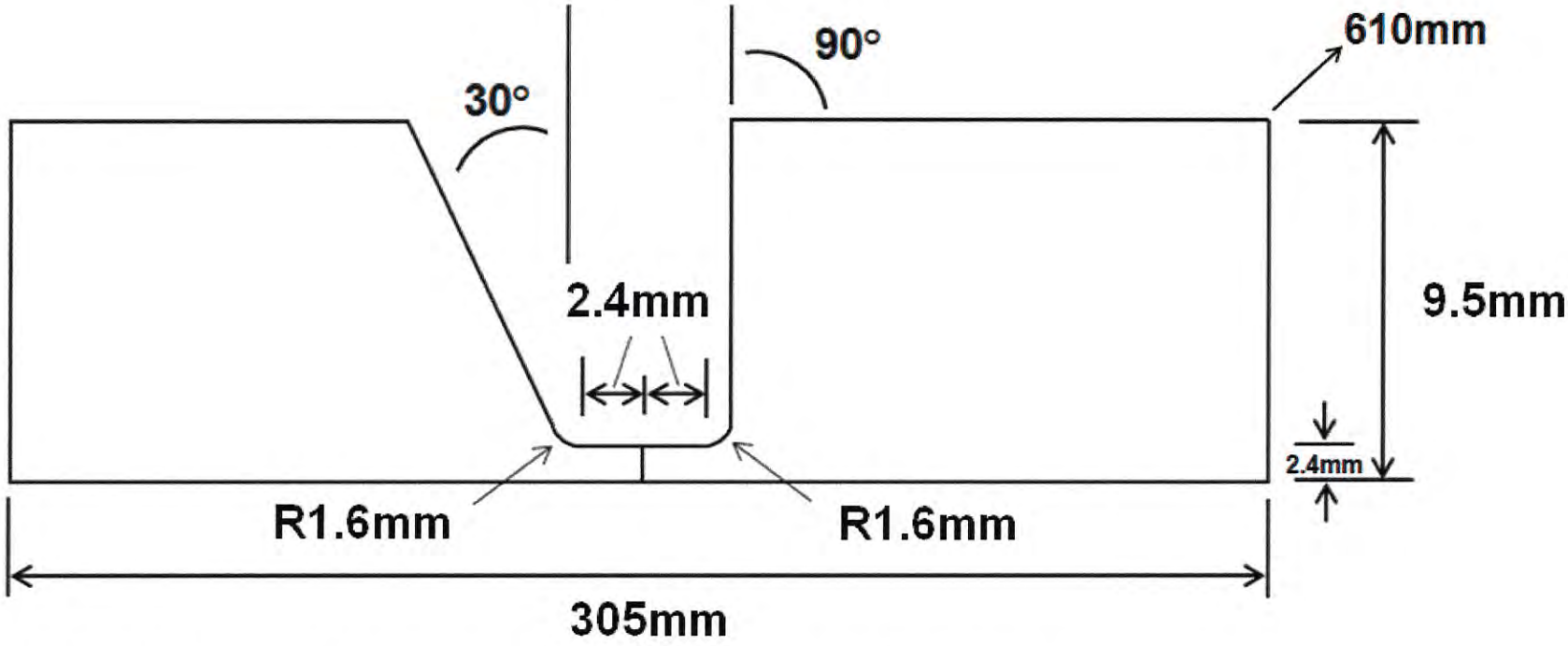
Approach

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

Procedure Validation and Testing

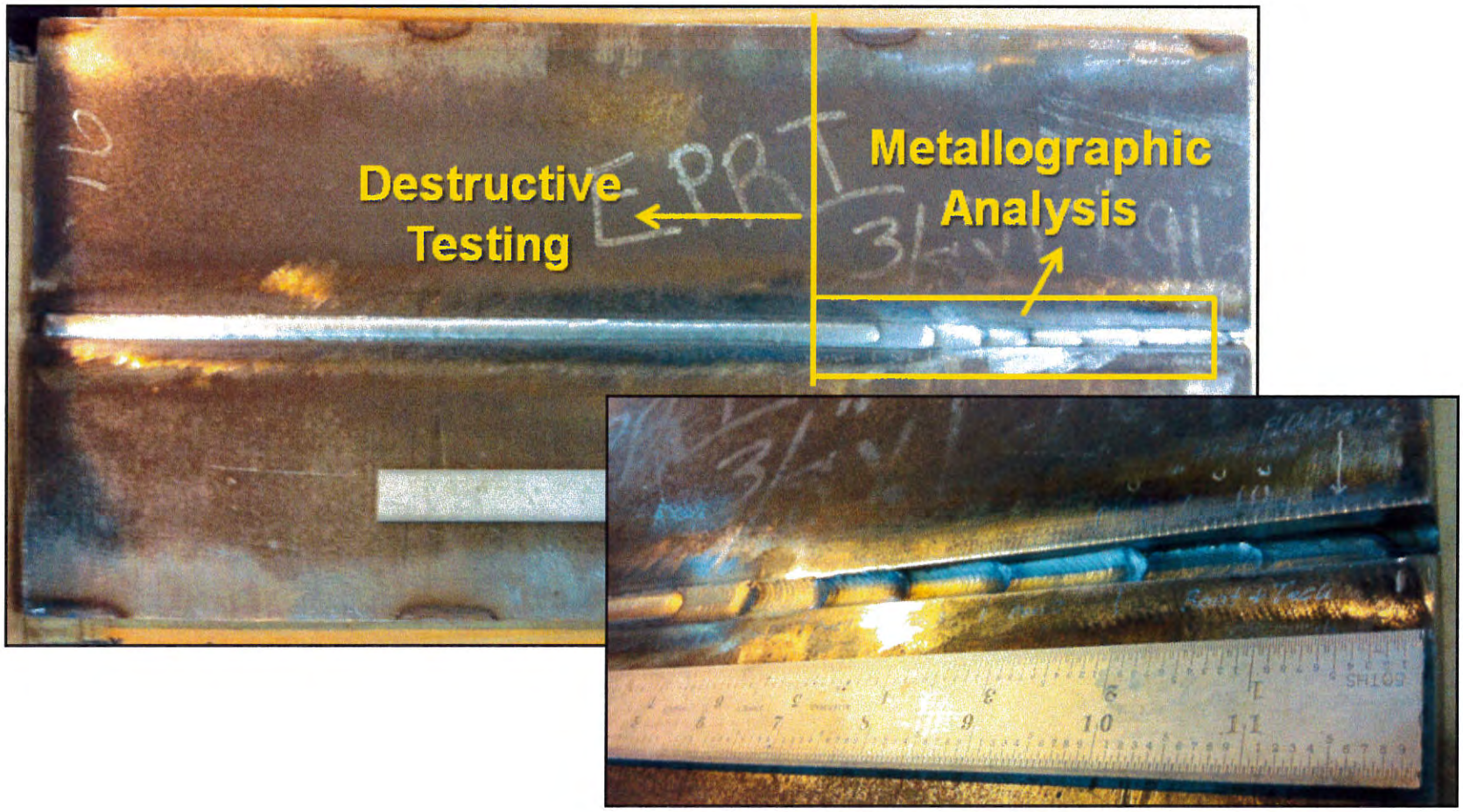
- Metallography
- Hardness (per procedure)
  - 200g Hardness Maps
  - 0.15mm spatial spacing
  - ~2800 indents per map on each side of the weld
- Mechanical Testing (per procedure)
  - Room temperature impact testing (10mm square)
  - ASME Section IX qualification (4 side bends + 2 RTTs)
  - Elevated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

Welding Geometry



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

Finished Weldment



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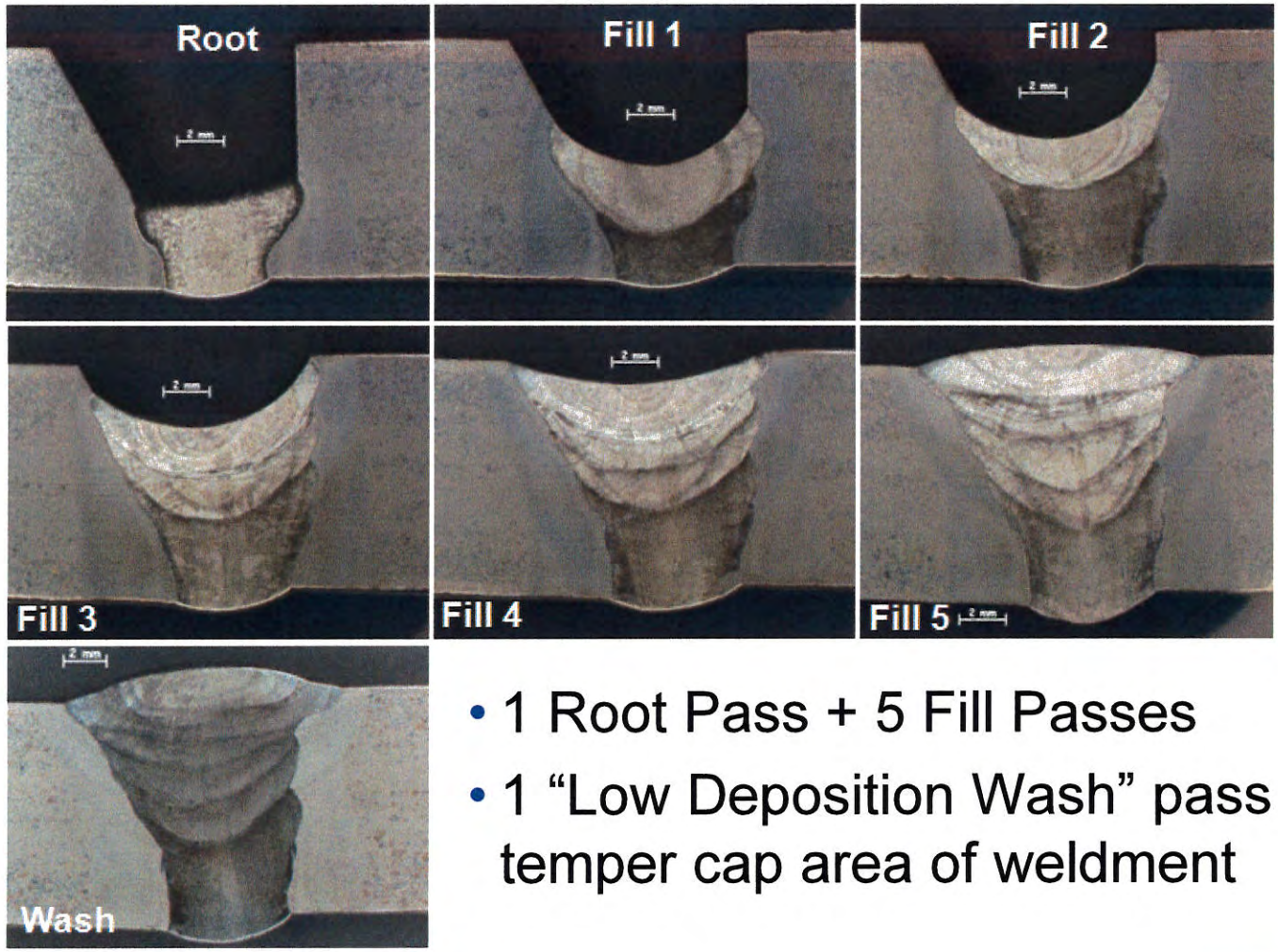
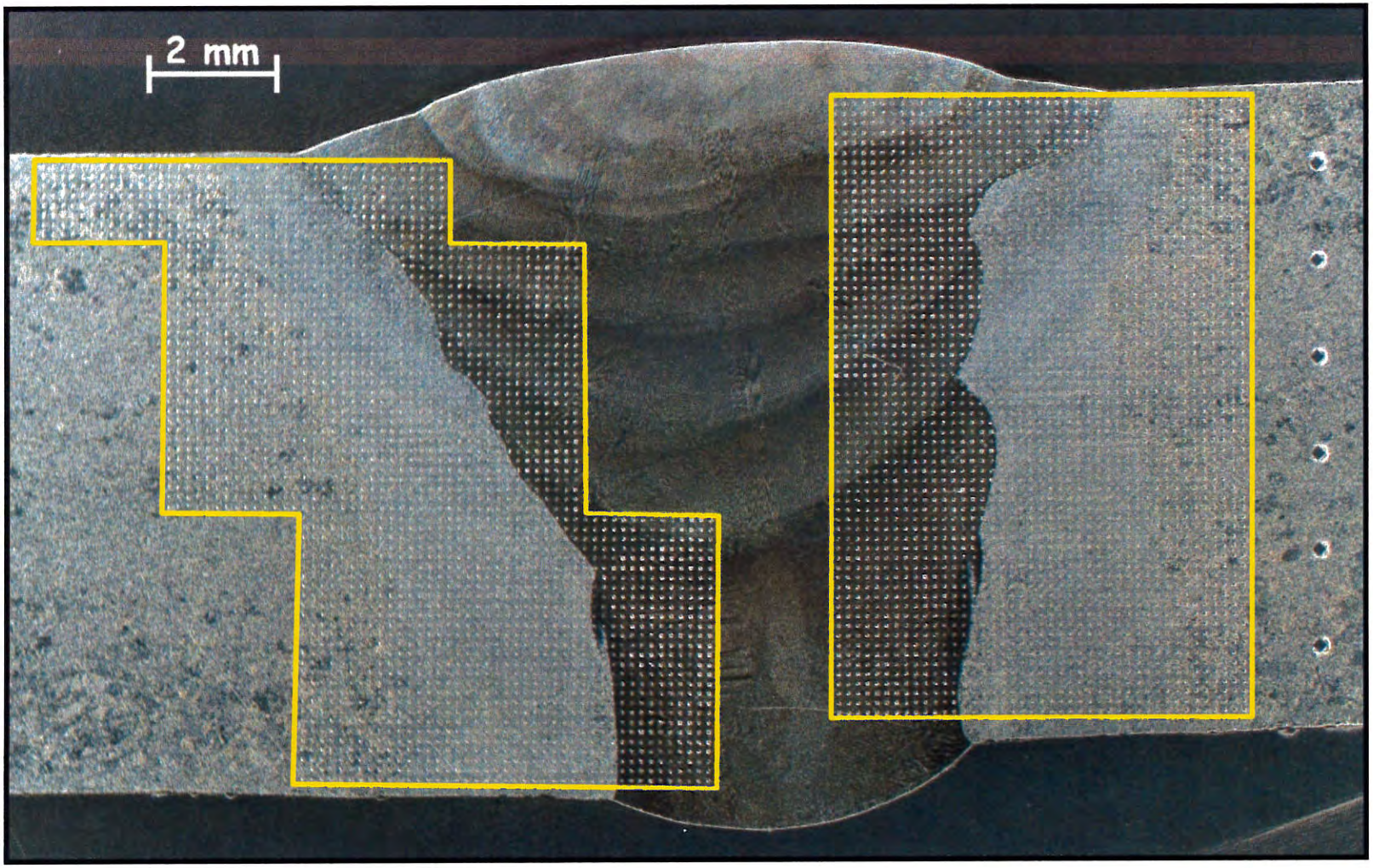
Consistent Layer Macro Images



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

Consistent Layer Hardness Maps in Completed Weldment



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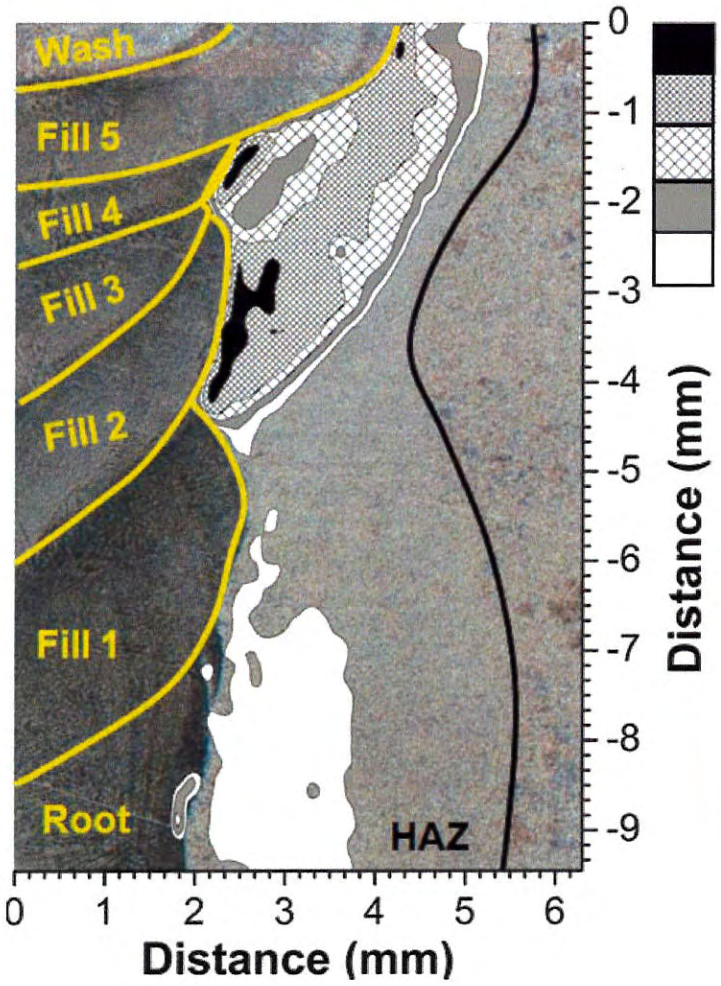
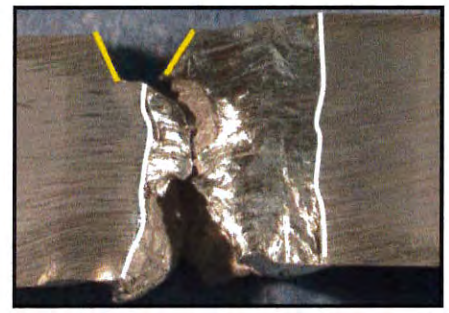
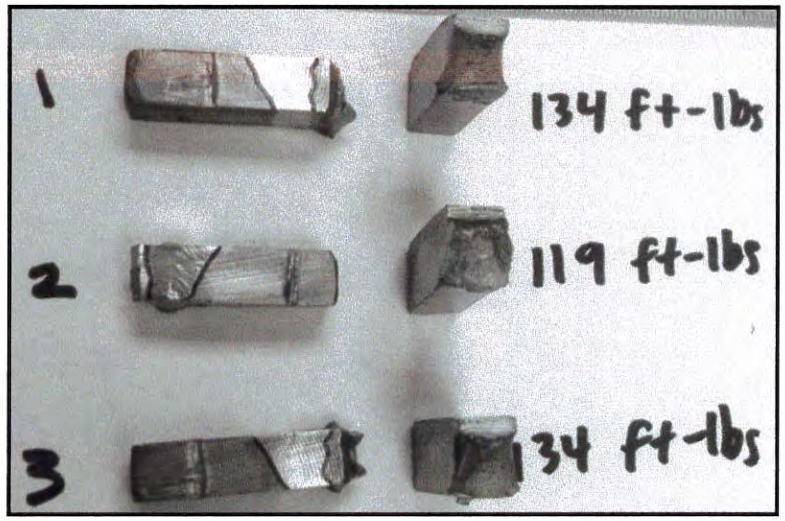
Consistent Layer – Example of Data Analysis







425HV 0.2
400HV 0.2
375HV 0.2
350HV 0.2
325HV 0.2

Conclusions to Date and Future Work

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

Future Work:

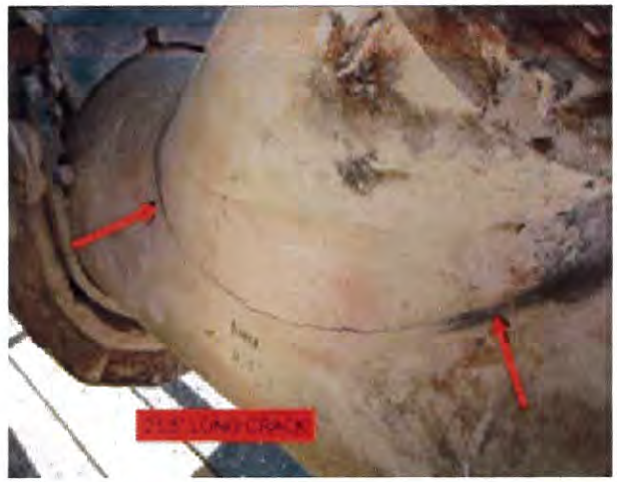
- Application manual GTAW
- Application to manual GTAW root + SMAW fill
- Metallographic, hardness and destructive evaluation

- **Questions or comments ?**

Weld Repair of Grade 91 Piping and Components

Objectives and Scope

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



Value

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

Details and Contact

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

Jonathan Parker

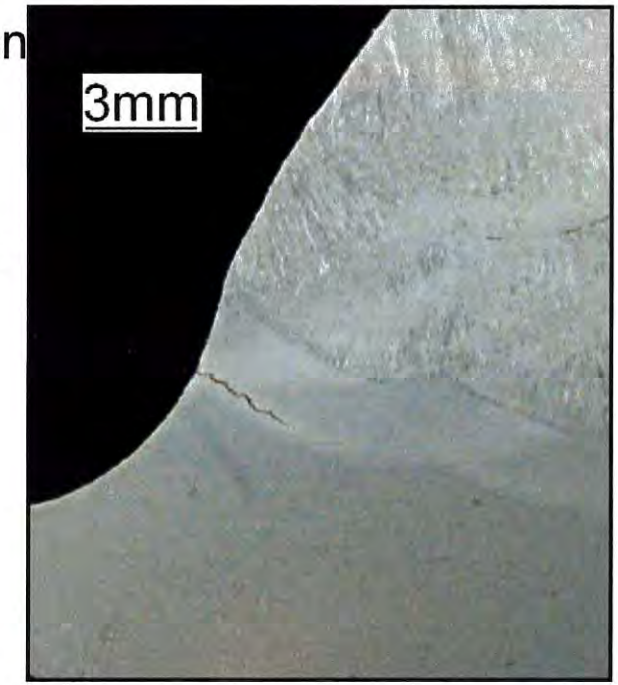
- jparker@epri.com, (704) 595-2791

SPN Number: 1022801

Have confidence that repair methods will be effective

Phase 1 – Ranking of Repair Performance

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



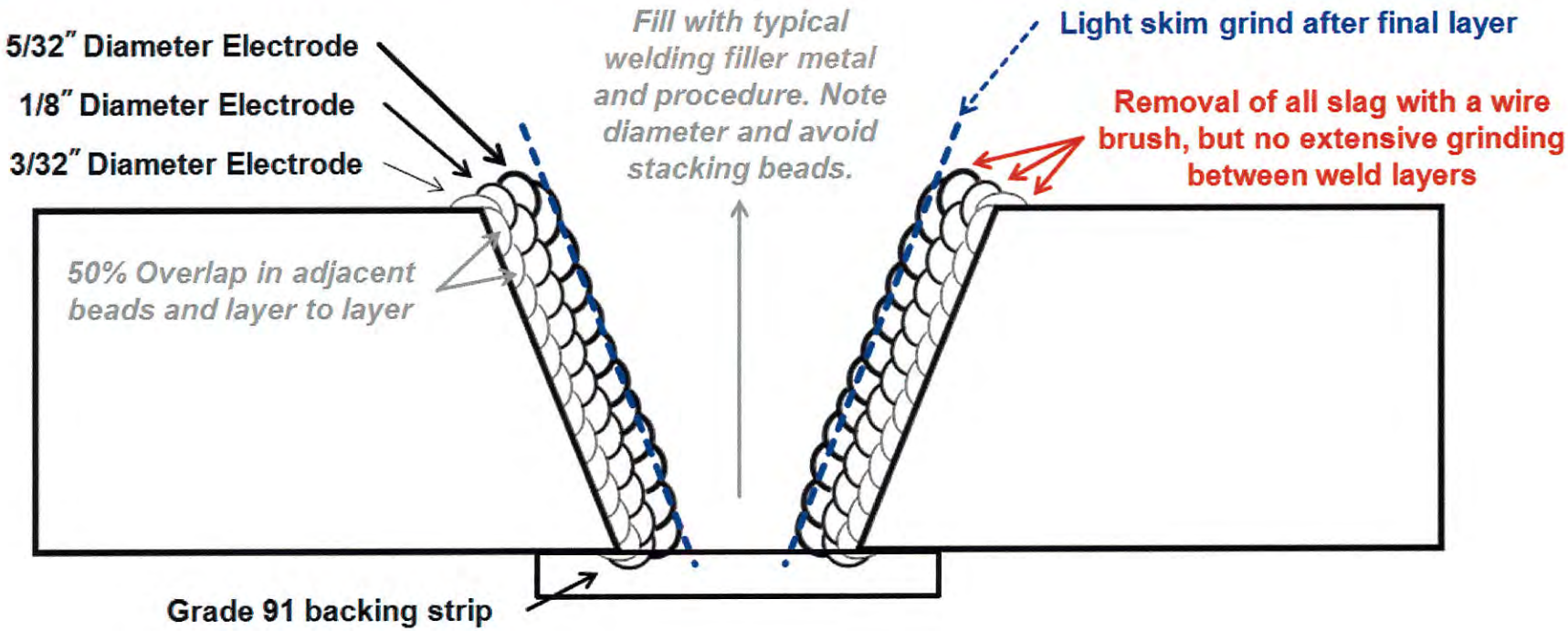
Analysis to identify best option repairs – generate ranking table

Phase 1 Welding Matrix – All Welds Completed

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

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

Welding Procedure for Three Layer Approach

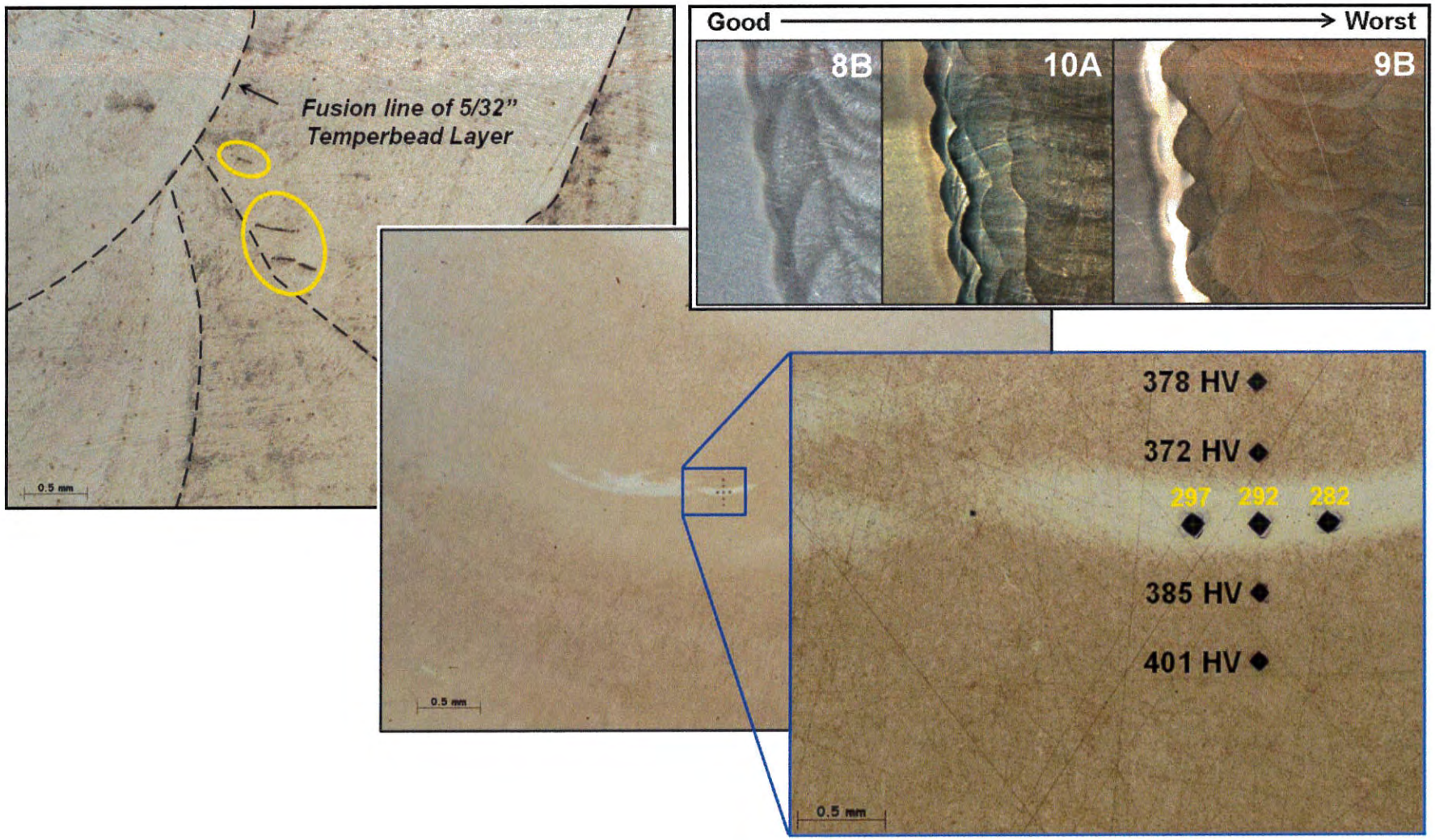


- SMAW Process
- 300°F (149°C) Preheat, 600°F (316°C) Interpass

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

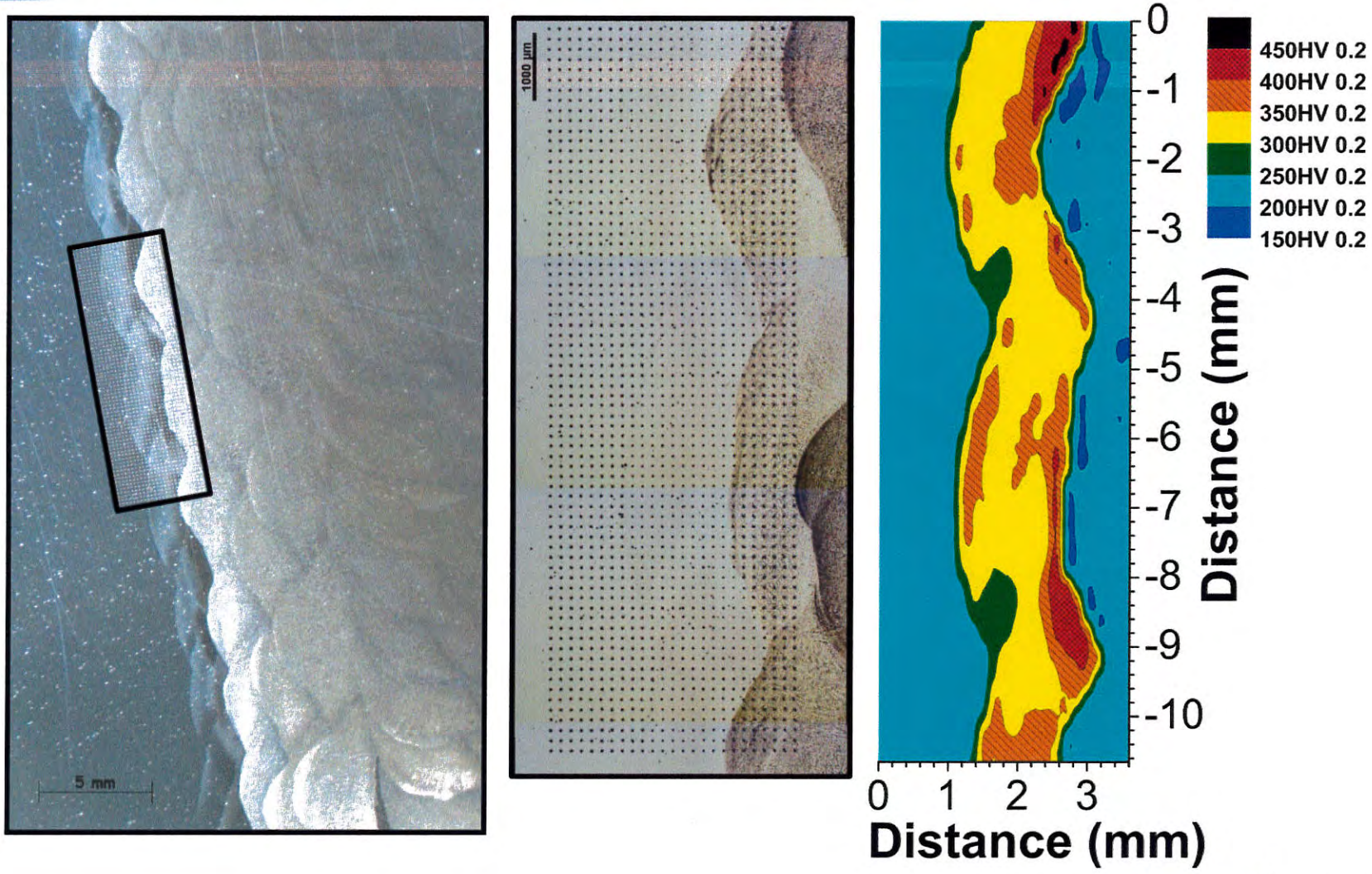
Welding Assessment – Completed Weldment

Metallographic Assessment



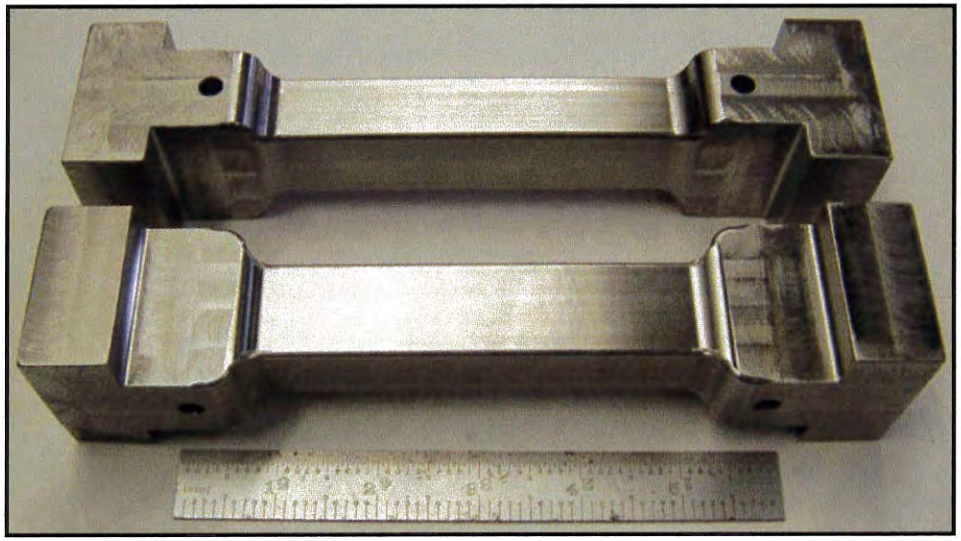
Weldment 10B [ENiCrFe-2, TBW]

Hardness Assessment – HAZ Hardness Map



Machined and Tested Creep Samples

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



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

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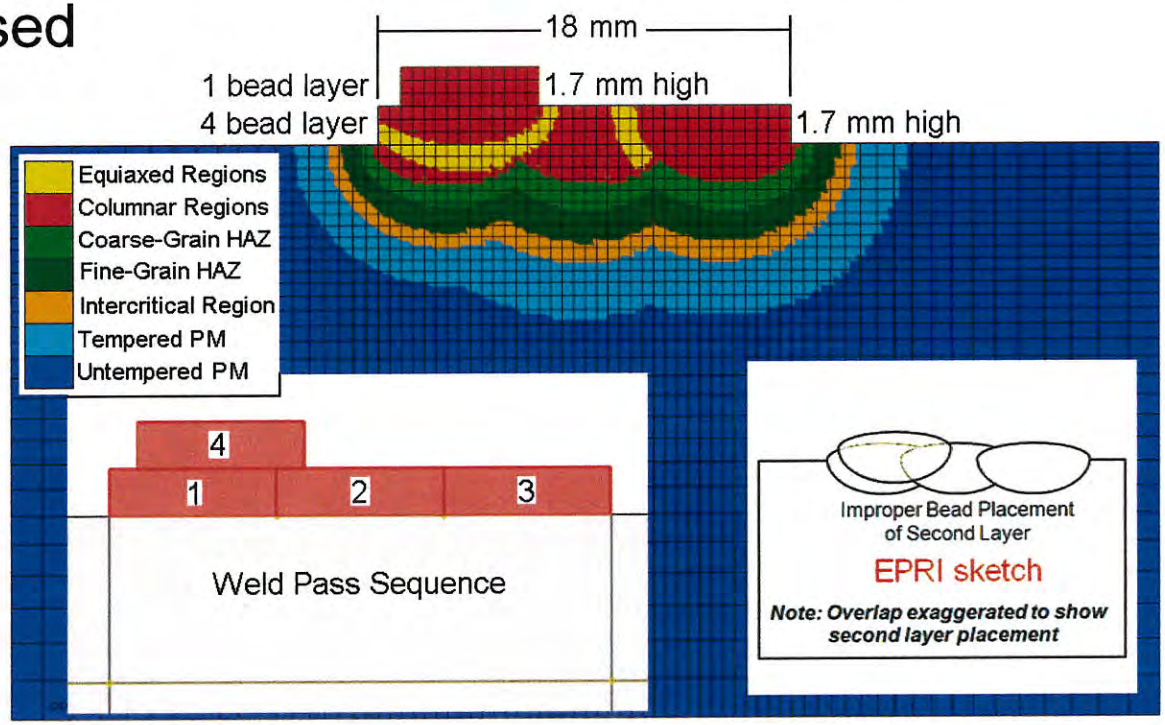
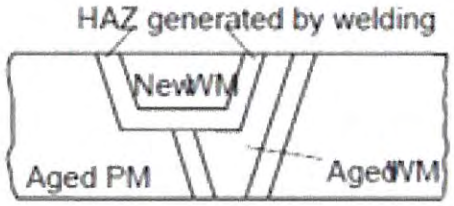
Modeling

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

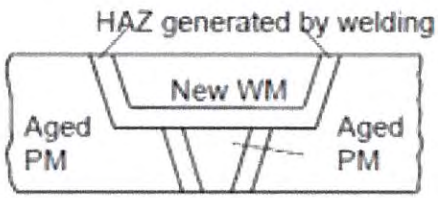


Phase 2 – Application of Best Option Repair Method(s) to Ex-service Header

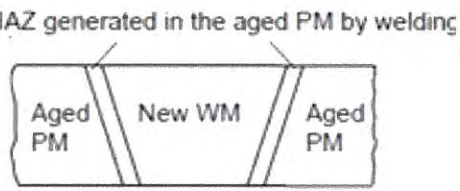
- Discussion of methods and extent of excavation



Minor

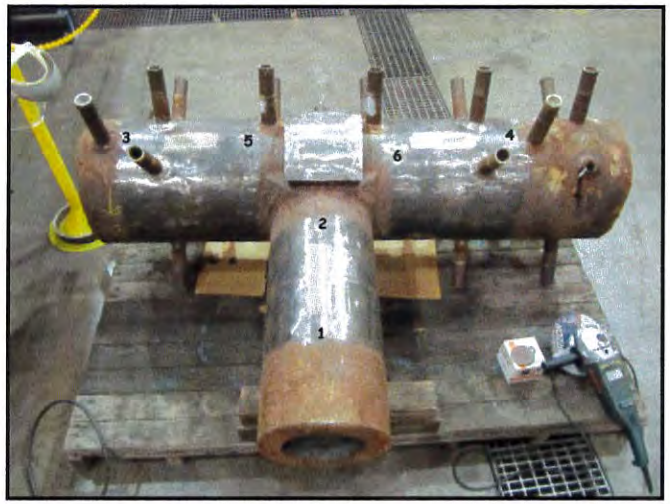


Partial



Full

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



Conclusions

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

Contact Information

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NBIC Subcommittee R&A Action Block

Subject Part 3, Section 3, 3.2.2 Replacement Parts – Pressure Test Requirements Prior to Installation for Pressure Parts Used in Repairs and Alterations

File Number NB12-0501 **Prop. on Pg.**

Proposal Add new paragraph 3.2.2.e. – see following page.

Explanation There are numerous occasions when ASME boiler and pressure vessel replacement parts to be used in repairs or alterations have not been pressure tested prior to installation at the test pressure required by the original code of construction. This happens for a number of reasons [e.g., impracticable to test the part in the shop (large replacement heads, shop pressure test capabilities limited), original code of construction allows shipping without test, misunderstanding of code requirements, etc]. In any case, this causes a great deal of problems for the owner, the R Certificate Holder, the Inspector and the Jurisdiction. While the data available is not well documented, it is generally agreed that there have been numerous occasions when replacement parts have been installed and the pressure retaining item allowed to operate without the part having been pressure tested at a pressure required by the original code of construction. The reasoning has generally been that the part now falls under the jurisdiction of the NBIC which, therefore, provides the owner, Inspector and Jurisdiction options not afforded under the original code of construction.

This proposal is not intended to be a "one size fits all". For example, it may not be appropriate for rerating to a different pressure or temperature. That is why it requires concurrence by the owner, the Inspector and, when required, the Jurisdiction. It does, however, clarify the options available to the owner, the Inspector and the Jurisdiction when an ASME part has not been pressure tested prior to installation at a pressure required by the original code of construction.

Project Manager J. Pillow

Task Group **TG Meeting Date**

Negatives

NBIC Subcommittee R&A Action Block

ITEM NB12-0501

Proposal: Add new paragraph:

Part 3, Section 3
Add new paragraph 3.2.2.e

e) When ASME is the original code of construction, replacement parts to be used in repairs or alterations that have not been pressure tested at the pressure required by the original code of construction prior to installation may be installed without performing the pressure test provided the owner, the Inspector and, when required, the Jurisdiction accepts the use of one or a combination of the examination and test methods shown in Part 3, Section 4, paragraph 4.4.1 (for repairs) or 4.4.2 (for alterations). The R Certificate Holder responsible for completing the R Form shall note in the Remarks section of the R Form the examination(s) and test(s) performed.

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NBIC Subcommittee R&A Action Block

b) Replacement parts that will be subject to internal or external pressure that are preassembled by attachment welds shall have the welding performed in accordance with the original code of construction. The supplier or manufacturer shall certify that the material and fabrication are in accordance with the original code of construction. This certification shall be supplied in the form of bills of material and drawings with statement of certification. Examples include boiler furnace wall or floor panel assemblies, prefabricated openings in boiler furnace walls, such as burner openings, air ports, inspection openings, or sootblower openings;

c) When ASME is the original code of construction, replacement parts subject to internal or external pressure fabricated by welding, which require inspection by an Authorized Inspector shall be fabricated by an organization having an appropriate ASME *Certificate of Authorization*. The item shall be inspected and stamped as required by the applicable section of the ASME Code. A completed ASME *Manufacturer's Partial Data Report* shall be supplied by the manufacturer;

The "R" Certificate Holder, using replacement parts fabricated and certified to an ASME Code edition and addenda different from that used for the original construction, shall consider and seek technical advice, where appropriate, for change or conflicts in design, materials, welding, heat treatment, examinations and tests to ensure a safe repair/alteration is performed. Note that work once classified as a repair could now be considered an alteration;

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 shall have a National Board "R" *Certificate of Authorization*; replacement parts shall be documented on Form R-3 and the "R" Symbol Stamp applied as described in NBIC Part 3, Section 5.

Insert new 3.2.2.e here

3.2.3 DRAWINGS

As appropriate, drawings shall be prepared to describe the repair or alteration. Drawings shall include sufficient information to satisfactorily perform the repair or alteration.

3.2.4 DESIGN REQUIREMENTS FOR REPAIRS AND ALTERATIONS

a) Many repairs may not require drawings or design calculations when the original code of construction is known and drawings and/or a Manufacturer's Data Report is available;

b) The "R" Certificate Holder performing repairs and alterations shall establish the construction standard or code and sufficient controls to ensure that all required design information, applicable drawings, design calculations, specifications, and instructions are prepared, obtained, controlled, and interpreted to provide the basis for a repair or an alteration in accordance with the original code of construction. When a *Manufacturer's Data Report* is required by the original construction standard, a copy of the original data report shall be obtained, where available, for use in the design of the repair or alteration. When the original *Manufacturer's Data Report* cannot be obtained, agreements on the method of establishing design basis for the repair or alteration shall be obtained from the Inspector and the Jurisdiction, when required.

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NB12-0801

Repairs and Alterations of Gasketed PHE's in the Field

By Mike Pischke

Introduction

This is intended to describe the current common industry practices of Plate Heat Exchanger (PHE) users regarding their operation, routine repairs and alterations. Because of the unique design of the PHE, the current ASME Pressure Vessel or NBIC Codes do not specifically address the design of PHE's, nor the potential alterations. The typical industries include, but not limited to the Power, Petrochemical, Maritime, HVAC, Bio-Pharmaceutical , and Food production.

Expansion and Contraction of Plate Packs

One of the primary benefits of the gasketed PHE is that the heating surface can be expanded or contracted in response to changes in fluid flow, process parameters, and/or ambient temperature variations. The plate packs are expanded or reduced due to the increase or decrease in heat transfer requirements, respectively. Also, because turbulence is necessary for effective heat transfer, the quantity of heat transfer plates are critical to ensure the proper flow rates and pressure drops during operation. This is adjusted by adding or subtracting the number of heat transfer plates. Users will often also add plates gradually as production demands are incrementally increased. This avoids the need for repeated and costly replacement of entire heat exchangers. They will also adjust the number based on seasonal temperature variations.

Code Implications: Although the Code does not specifically address the addition or removal of heat transfer plates, this has indirect Code implications. Adding or subtracting plates in no way affects the specific design parameters of Pressure and Temperature, but does change the volume of the heat exchanger and the heat transfer surface area. Unless someone counts every single plate in a PHE and compares it to the number listed on the Data Report, it would not be obvious that a change was made.

Gasket Replacement

The expected life of gaskets within a PHE plate pack may vary from one year to decades; based upon the gasket material selection, process fluid(s), operating parameters, and environmental conditions. Ideally, the gasket replacement coincides with the routine cleaning of the heat transfer plates. At this time, the entire plate pack is removed from the frame, the gaskets removed from the plates, then the plates are mechanically and/or chemically cleaned. The cleaned plates are then re-gasketed using new gaskets. Glued gaskets are typically removed using liquid nitrogen prior to cleaning. After re-gasketing, the plate pack is returned to the frame and typically hydrostatically or pneumatically tested at the MAWP.

Code Implications: Although the ASME Code does not directly address gaskets or gasket materials, the practical operating parameters are typically limited by the gasket material. Maximum operating temperatures are determined by the degradation rate of the gasket material, and the MAWP set by an adjusted test pressure when the particular gasket-heat transfer plate combination will begin to leak.

Heat Transfer Plate Replacement

Under normal operating conditions, heat transfer plates should last for decades in service. Heat transfer plates typically need to be replaced due to deformation from opening and closing, corrosion, fatigue, and/or fouling. When being replaced, they may be replaced using plates from a different manufacturer and even a different material from the original Code stamped unit. For example, if the original plates were made from 0.4mm thick, 304 stainless steel and they corroded over time due to chloride attacks, the user may choose to replace the corroded plates with something more resistant. Perhaps they would replace these plates with 316L plates and even increase the thickness to 0.5mm. This is a common practice.

Another common practice is to have multiple, identical PHE's in a chemical production facility and rotate out spare plate packs as the glued gaskets break down and need to be replaced over time. Spare plate packs with glued gaskets are kept in stock at the facility, waiting to be swapped out with the plates in production. This allows the chemical company's maintenance personnel to swap out a plate pack during a brief shut down period. The removed plate pack is re-conditioned by cleaning, removing the gaskets and gluing on new gaskets. These plate packs now become the new spares. This allows them to re-use the heat transfer plates which are often made from expensive materials such as nickel alloys, or titanium.

Code Implications: Heat Transfer plates and laser welded cassettes are considered UG-11 "Standard Pressure Parts" per Interpretations VIII-1-89-236 and VIII-1-95-21. There is also an Interpretation (VIII-81-89R) that allows the heat transfer plates to be made from non-Code material. Beyond these Interpretations, there are no rules regarding the material of the heat transfer plates. Because the heat transfer plates are contained between the frame plates, the strength of the PHE relies on the bolts and frame plates and never the strength of the heat transfer plates.

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NB13-0501

November 8, 2012

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Secretary, NBIC Committee
The National Board of Boiler and Pressure Vessel Inspectors
1055 Crupper Ave.
Columbus, OH 43229

Please accept this letter as a request for an addition to an existing figure in NBIC Part 3, Section 3.

Part 3, Figure 3.3.4.6-b addresses the tube window patching method. I would suggest adding a cautionary or informational note to the existing text in the figure such as – "Note: Air currents within the tube (i.e. a chimney effect) may affect the retention of the shielding gas at the welding arc when using the gas tungsten-arc welding process on the inside of the tube."

Statement of need and background:
Users of the NBIC should benefit from the experience of others, when possible. Someone performing the tube window patch for the first time should be made aware of the possibility of air currents within the tube. They can then take the necessary steps to eliminate or diminish those effects so as to avoid porosity or other defects in the weld.

Respectfully submitted,

John Hoh
Senior Staff Engineer

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