Date Distributed: February 2 **, 2016**

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD SUBCOMMITTEE REPAIRS AND ALTERATIONS

MINUTES

Meeting of January 13th, 2016
Corpus Christi, TX

These minutes are subject to approval and are for committee use only. They are not to be duplicated or quoted for other than committee use.

The National Board of Boiler & Pressure Vessel Inspectors
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1. **Call to Order**
   Chairman George Galanes called the meeting to order at 8AM.
2. **Introduction of Members and Visitors**
   Members and visitors introduced themselves to the meeting attendees.
3. **Announcements**
   Chairman George Galanes presented the announcements for the remainder of the week.
4. **Adoption of the Agenda**
   A motion was made and unanimously approved to adopt the agenda as amended.
5. **Approval of the Minutes of July 15, 2015 Meeting**
   The minutes from the July 15, 2015 meeting are posted on the National Board website.
   A motion was made and unanimously approved to accept the minutes from the July 15, 2015 meeting.
6. **Review of Rosters**
   The attendees are identified on Attendance sign in sheet (**Attachment Page 1**). With the attached attendance listing, a quorum was established

a. Membership Nominations

- Mr. Ben Schaefer, Mr. Linn Moedinger, and Mr. Marty Toth would like to become members of SC Repairs and Alterations.
  A motion was made for Mr. Ben Schaefer, Linn Moedinger, and Marty Toth to become members of the SC on Repairs and Alterations. The motion was unanimously passed.
  Final approval for their membership will be given by the NBIC Committee, subject to the acceptance of the Chair of the Board of Trustees.

- Ms. Deb McCauley, Mr. Christophe Maqua, and Mr. Francis Brown would like to become members of SG Fiber Reinforced Plastics.
  A motion was made for Ms. Deb McCauley, Mr. Christophe Maqua, and Mr. Francis Brown to become members of the SG Fiber Reinforced Plastics. The motion was unanimously passed.

- Mr. Tracy Rudy and Mr. Francis Brown would like to become members of SG Graphite.
  A motion was made for Mr. Tracy Rudy and Mr. Francis Brown to become members of the SG Graphite. The motion was unanimously passed.

b. Membership Reappointments

- Mr. Angelo Bramucci and Mr. Craig Hopkins are eligible for reappointment to SG Repairs and Alterations.
  A motion was made to reappoint Mr. Angelo Bramucci and Mr. Craig Hopkins to SG Repairs and Alterations. The motion was unanimously passed.

- Mr. Mark Ray is eligible for reappointment to SG Locomotive Boilers.
  A motion was made to reappoint Mr. Mark Ray to SG Locomotive Boilers. The motion was unanimously passed.

c. Officer Selection

- Nominations were taken to determine the Chair of SG Repairs and Alterations. Mr. Angelo Bramucci is eligible for reappointment to the position.
  A motion was made to reappoint Mr. Angelo Bramucci as Chair of the SG Repairs and Alterations. The motion was unanimously passed. Final approval for appointment will be given by the NBIC Committee, subject to the acceptance of the Chair of the Board of Trustees.

7. Old Business

i. Interpretations

Item Number: IN15-0201	**NBIC Location: Part 3**	**Attachment Bundle**

General Description: Interpretation question regarding "R" Symbol Stamp quality system.

Subgroup: Repairs and Alterations

Task Group: R. Wielgoszinski, B. Schaefer, R. Troutt

History:

July 2015
Mr. Galanes gave a progress report. A task group has been assigned of R. Wielgoszinski, B. Schaefer, and R. Troutt.

Committee Action:
January 2016: Mr. R. Wielgoszinski presented the proposed committee question and reply to the interpretation request. A motion was made and unanimously approved to accept the committee question and reply and move this onto the Main Committee for consideration.

Item Number: IN15-0401	**NBIC Location: Part 3, 4.2, 4.4**	**Attachment Bundle**

General Description: May Phased Array UT (PAUT) examination be used for verification of final circumferential weld repair integrity in lieu of pressure testing or other typical NDE methods (MT/PT/RT)involving boiler tubes where the thickness is below ½ inch, with NPS of 4 inch and less?

Subgroup: Repairs and Alterations

Task Group: George Galanes (PM), Frank Johnson, Jim Sekely, and Warren Taylor

History:

July 2015
Mr. Galanes gave a progress report. Mr. Galanes has been assigned as project manager. The interpretation requester, Mr. Jamie Walker, presented on the purpose of this interpretation question.

Committee Action:
January 2016: Mr. Jamie Walker has discussed with the member jurisdiction and the Authorized Inspection Agency to accept each other's authority for inspection of a repair and they have agreed the

interpretation being withdrawn. A motion was made and unanimously approved to close the action item with no action.

ii. Action Items

Item Number: NB11-0204B	**NBIC Location: Part 3, S2**	**Attachment Bundle**

General Description: Review NDE requirements of stayed areas for historical boilers

Subgroup: Historical

Task Group: M. Wahl (PM), J. Larson, F. Johnson

History:

July 2015
Mr. Galanes gave a progress report. No action was taken.
Committee Action:
January 2016: Mr. Joel Amato and Mr. Bob Underwood resented proposed revisions to Supplement 2 of Part 3. Suggestions were made to improve the format of the revision document. A motion was made and unanimously approved to send an up or down letter ballot to the Sub Committee R/A for a vote.

Item Number: NB12-0801	**NBIC Location: Part 3**	**No Attachment**

General Description: Add requirements for repair and alteration of gasketed PHEs in the field

Subgroup: Repairs and Alterations

Task Group: R. Cauthon (PM), B. Wielgoszinski, N. Carter

History:

July 2015
Mr. Galanes invited Mr. Randy Cauthon to give a report on the status of this item. Mr. Cauthon explained this item is being developed in accordance with ASME Section VIII, and there will be coordination with the ASME committees as this item is worked on.
Committee Action:
January 2016: Mr. Nathan Carter presented a proposed document to show work is continuing on the task groups' part for information to be added to Part 3 for PHE vessels. The Task Group is waiting for ASME Section VIII Div-1changes to finalize the Task Groups document. Progress Report.

Item Number: NB13-0902	**NBIC Location: Part 3, S2**	**Attachment Bundle**

General Description: Review alternate methods of tube sheet repair

Subgroup: Historical

Task Group: F. Johnson, T. Dillon, M. Wahl

History:

July 2015
Mr. Galanes gave a progress report. There is no action to report.
Committee Action:
January 2016: Mr. Joel Amato presented proposed revisions to Supplement 2 of Part 3. Suggestions were made to improve the documents format. A motion was made and unanimously approved to send an up or down letter ballot to the Sub Committee R/A for a vote.

Item Number: NB13-1401	**NBIC Location: Part 3, S1.9.2**	**No Attachment**

General Description: Add wording in this section regarding boiler tube welding

Subgroup: Locomotive

Task Group: R. Stone (PM)

History:

July 2015
This item was sent to letter ballot at the July 2015 meeting. This item failed a letter ballot to SC Repairs and Alterations due to five disapprovals (see attachment).
Committee Action:
January 2016: Mr. Jim Pillow discussed the item. It was returned to SG Locomotive, Mr. Stone to consider the five ballot disapprovals and the Committee is awaiting a response from Mr. Stone.

Item Number: NB13-1405	**NBIC Location: Part 3, S1.2.9**	**No Attachment**

General Description: Add requirements for throttle pipes, dry pipes, superheater headers, and front end steam pipes

Subgroup: Locomotive

Task Group: R. Stone (PM)

History:

July 2015
Mr. Galanes gave a progress report. No action was taken.
Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB13-1407	**NBIC Location: Part 3, S1**	**No Attachment**

General Description: Add requirements for repair and alteration of bolts, nuts, and studs in locomotive boilers

Subgroup: Locomotive

Task Group: R. Stone (PM)

History:

July 2015
Mr. Galanes gave a progress report. A proposal was prepared by SG Locomotive Boilers. SC Repairs and Alterations sent this item to letter ballot at the July 2015 meeting. This item failed the letter ballot due to disapprovals.
Committee Action:
January 2016: Mr. Galanes gave a progress report. We are awaiting responses to negatives and comments noted on the Letter Ballot.

Item Number: NB13-1408	NBIC Location: Part 3, S1	No Attachment

General Description: Add requirements for repair and alteration of locomotive boilers with threaded boiler studs of the taper thread and straight thread varieties

Subgroup: Locomotive

Task Group: R. Stone (PM)

History:

July 2015
Mr. Galanes gave a progress report. This item was sent back to SG Locomotive Boilers for further work.
Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB14-0203	NBIC Location: Part 3	Attachment Bundle

General Description: Review Part 3 for any changes needed to be made to "R" accreditation requirements

Subgroup: Repairs and Alterations

Task Group: R. Trout, N. Carter, R. Cauthon

History:

July 2015
Mr. Galanes gave a progress report. SC Repairs and Alterations addressed negatives from a previous letter ballot. SC Repairs and Alterations approved the revised text unanimously. Mr. Galanes suggested this item be sent to letter ballot for approval. This item was sent to letter ballot by a unanimous vote of the NBIC Committee. This item failed the letter ballot due to lack of voter participation.
Committee Action:
January 2016: Mr. Nathan Carter presented NB Staff additions to the accreditation section of Part 3.The original document vote failed due to lack of participation. A motion was made and unanimously

approved to accept the NB Staff additions and move this onto the Main Committee for consideration.

Item Number: NB14-0301	NBIC Location: Part 3	Attachment Bundle

General Description: Add requirements for encapsulation

Subgroup: Repairs and Alterations

Task Group: B. Boseo, F. Johnson, K. Moore

History:

July 2015

Mr. Galanes invited Mr. Robert Wielgoszinski to give a progress report. Mr. Wielgoszinski summarized the discussion at the SC Repairs and Alterations meeting, and notified that Mr. Frank Johnson and Ms. Kathy Moore have been added to the task group.

Committee Action:

January 2016: Mr. Boseo presented a final document. There was much discussion on the task groups proposal and ASME PCC- 2. A motion was made and unanimously approved to send an up or down letter ballot to the Sub Committee R/A for a vote.

Item Number: NB14-0302	NBIC Location: Part 3, S6	Attachment Bundle

General Description: Develop additional "TR" forms to include in Part 3

Subgroup: Repairs and Alterations

Task Group: C. Withers (PM), B. Underwood, K. Moore, B. Vallance

History:

July 2015

Mr. Galanes invited Mr. Chuck Withers to give a progress report. Mr. Withers explained the history of the item and current progress.

Committee Action:

January 2016: Mr. Chuck Withers explained the need for a separate type of repair box on line 7, DOT, of the R-1 form due to the requirements for the Inspector and Certificate Holder to be registered with DOT. Mr. Marty Toth indicated he will retract the negative vote on this item from the Sub-Group meeting. A motion was made and unanimously approved to send to the Main Committee for consideration.

Item Number: NB14-2401	NBIC Location: Part 3, S6.5	Attachment Bundle

General Description: Replace the referenced TR-1 form with a TR-3 form

Subgroup: Repairs and Alterations

Task Group: C. Withers (PM), B. Underwood, K. Moore, B. Vallance

History:

July 2015
Mr. Galanes gave a progress report. No action has been taken.
Committee Action:
January 2016: Bill Vallance recommended to the Committee to close this item as the TR stamp program will be removed from Supplement 6. The DOT has accepted the use of the R Certificate of Authorization Program which will be addressed in new action item NB15-1202. A motion was made to unanimously approve the closing of this Item with no action.

Item Number: NB14-2402	**NBIC Location: Part 3, S6.3**	**Attachment Bundle**

General Description: Remove "TR" accreditation requirements from the NBIC because "TR" accreditation requirements will be addressed in a separate National Board "TR" document

Subgroup: Repairs and Alterations

Task Group: C. Withers (PM), B. Underwood, K. Moore, B. Vallance

History:

July 2015
Mr. Galanes gave a progress report. Work is continuing.
Committee Action:
January 2016: Bill Vallance recommended to the Committee to close this item as the TR stamp program will be removed from Supplement 6. The DOT has accepted the use of the R Certificate of Authorization Program which will be addressed in new action item NB15-1202. A motion was made to unanimously approve the closing of this Item with no action.

Item Number: NB15-0511	**NBIC Location: Part 3, 5.13.5.1**	**No Attachment**

General Description: Result of PR15-0120, how does one fill out "NR" paperwork if the repairs or alterations were performed to an international code other than Section III or Section XI?

Subgroup: Repairs and Alterations

Task Group: P. Edwards (PM), B. Schafer, B. Wielgoszinski, C. Withers

History:

July 2015
Mr. Galanes invited Mr. Chuck Withers to give a report on this item. Mr. Withers discussed the activities of the "NR" Task Group meeting on Monday, July 13th.
Committee Action:
January 2016: Mr. Paul Edwards presented a progress report on the NR task groups' actions for this item.

Item Number: NB15-0512	**NBIC Location: Part 3, S3.5.5 b)**	**No Attachment**

General Description: Result of PR15-0121, should UIG-79 and UIG-80 be referenced in their entirety in this section?

Subgroup: Graphite

Task Group: E. Soltow (PM)

History:

July 2015
Mr. Galanes gave a progress report. No action has been taken.
Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-1003	**NBIC Location: Part 3**	**Attachment Bundle**

General Description: Update "stamp" vs. "certification" language to maintain consistency with ASME code

Subgroup: Repairs and Alterations

Task Group: R. Troutt (PM), J. Amato, J. Pillow

History:

July 2015
Mr. Galanes gave a progress report. The item is being reviewed for further work.
Committee Action:
January 2016: Mr. Rob Trout presented a document with a paragraph to add within the Introduction of all the Parts of the NBIC. A motion was made and unanimously approved to accept the text and move this onto the Main Committee for consideration.

Item Number: NB15-1101	**NBIC Location: Part 3**	**No Attachment**

General Description: Investigate code addition for carbon fiber wrap reinforcement of high pressure metal pressure vessels

Subgroup: Repairs and Alterations

Task Group: R. Trout, J. Amato, J. Pillow

History:

July 2015
Mr. Galanes gave a progress report. A presentation was given by HJ3 Composite Technologies to SG Repairs and Alterations. A task group was formed to investigate fiber wrap reinforcement.
Committee Action:
January 2016: The Sub Group R/A committee have considered the presented information and felt

insertion into the NBIC is not required. A motion was made and unanimously approved to close the action item and have the Secretary send a letter or email to HJ3 Technology stating the Sub Committee R/A considered their request but decided not to incorporate into the NBIC.

Item Number: NB15-1201	NBIC Location: Part 3, 5.6	Attachment Bundle

General Description: Expand requirements for form logs in Section 5 to include not only "R" program, but also "VR" and "NR"

Subgroup: Repairs and Alterations

Task Group: C. Withers

History:

July 2015
Mr. Galanes gave a progress report. More information from National Board staff needs to be obtained before work can continue.

Committee Action:
January 2016: Mr. Paul Edwards presented revisions to Section 5 of Part 3 to have R form registration logs and log information apply for NR, VR, and NVR certificate holders besides the current R certificate holders. A motion was made and approved to accept the text and move this onto the Main Committee for consideration.

Item Number: NB15-1401	NBIC Location: Part 3, Section 3	Attachment Bundle

General Description: Investigate new requirements for weld buildup of thin walled tubes

Subgroup: Repairs and Alterations

Task Group: W. Sperko (PM), G. Galanes, J. Siefert

History:

July 2015
Mr. Galanes reported that no progress has been made on this item.

Committee Action:
January 2016: The Sub Group R/A committee have considered the presented information good guidance but felt insertion into the NBIC is not required. A motion was made and unanimously approved to close the action item with no action.

Item Number: NB15-1403	NBIC Location: Part 3	Attachment Bundle

General Description: Create a new supplement on weld repair to CSEF Grade 91 steel

Subgroup: Repairs and Alterations

Task Group: G. Galanes (PM), J. Siefert

History:

July 2015

Mr. Galanes gave a progress report. Mr. Galanes explained the purpose of the item, and presented a rough draft document for the proposed supplement. SC Repairs and Alterations approved this item by letter ballot with one negative.

Committee Action:

January 2016: Mr. George Galanes presented a document titled, Weld and Post Repair Inspection of Creep Strength Enhanced Ferritic Steels rev-10 for a new supplement in Part 3. Mr. John Siefert from EPRI also provided an update on this repair method and answers to comments from the Sub Committee letter ballot. It was discussed to add a new Action Item for Part 2 to develop inspection guidance for this type of repair method. A vote was made, with **one negative**, Mr. Milletti, to move this onto the Main Committee for consideration.

Item Number: NB15-1404 **NBIC Location: Part 3, 1.6.1, 3.2.1** **Attachment Bundle**

General Description: Define "existing material" as used in 1.6.1 and 3.2.1

Subgroup: Repairs and Alterations

Task Group: W. Jones (PM), M. Toth, J. Amato, R. Troutt

History:

July 2015

Mr. Galanes invited Mr. Wayne Jones to give a progress report. Mr. Jones reported that a proposal should be ready for the January 2016 meeting.

Committee Action:

January 2016: Mr. Jones presented a definition for Existing Materials to be included in the Glossary of Part 3. A motion was made and unanimously approved to move this to the Main Committee for consideration.

Item Number: NB15-1410 **NBIC Location: Part 3, S6.14** **Attachment Bundle**

General Description: Result of PR15-0122, add requirements for the number of repairs or alterations allowed under a single nameplate/stamping

Subgroup: Repairs and Alterations

Task Group: C. Withers (PM), B. Underwood, K. Moore, B. Vallance

History:

July 2015

Mr. Galanes stated there is nothing to report on this item.

Committee Action:

January 2016: Bill Vallance recommended to the Committee to close this item as the TR stamp program will be removed from Supplement 6. The DOT has accepted the use of the R Certificate of Authorization Program which will be addressed in new action item NB15-1202. A motion was made to

unanimously approve the closing of this Item with no action.

Item Number: NB15-1602	NBIC Location: Part 3, S2.7.1	No Attachment

General Description: Revise material list for historical boiler reports to include bolts, studs, nuts and formed pressure parts

Subgroup: Historical

Task Group: T. Dillon (PM), M. Wahl, G. Galanes

History:

July 2015
Mr. Galanes stated there is nothing to report on this item.
Committee Action:
January 2016: Mr. Amato gave a progress report.

Item Number: NB15-1703	NBIC Location: Part 3	No Attachment

General Description: Welded staybolt procedures

Subgroup: Locomotive

Task Group: None assigned

History:

July 2015
Mr. Galanes reported that no action has been taken.
Committee Action
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-1801	NBIC Location: Part 3	Attachment Bundle

General Description: Assuring leak tightness by seal welding

Subgroup: Repairs and Alterations

Task Group: M. Webb (PM)

History:

July 2015
This item was sent to letter ballot at the July 2016 meeting. This item failed a letter ballot to the NBIC Committee due to insufficient response.
Committee Action:
January 2016: Mr. Webb presented the action item. A motion was made and approved to reaffirm this item and move it to the Main Committee for a letter ballot. There were two abstentions and one negative

from Jim Larson.

Item Number: NB15-1901	NBIC Location: Part 3	Attachment

General Description: Address the performance of postweld heat treatment on PRIs that were not previously postweld heat treated

Subgroup: Repairs and Alterations

Task Group: B. Wielgoszinski (PM)

History:

July 2015

Mr. Galanes invited Mr. Wielgoszinski to give a progress report. Mr. Wielgoszinski reported that no action has been taken.

Committee Action:

January 2016: Mr. Bob Wielgoszinski presented a document to add an additional item j) to the list of Examples of Alterations for conducting PWHT when it was not originally done on a PRI. The Committee agreed to open an action item to address providing a guide on what to do if PWHT was applied to a PRI when PWHT that was not originally performed. Bob Wielgoszinski PM and Jim Pillow. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number: NB15-2305	NBIC Location: Part 3	No Attachment

General Description: Review NBIC footnotes; remove footnotes that are code language or definitions

Subgroup: Repairs and Alterations

Task Group: R. Troutt, J. Pillow, J. Amato

History:

July 2015

Mr. Galanes gave a progress report on footnote review for NBIC Part 3. Mr. Rob Troutt and Mr. Jim Pillow were assigned to the task group.

Committee Action:

January 2016: Mr. Troutt gave a progress report on possible elimination of all the NBIC footnotes in Part-3.

Item Number: NB15-2502	NBIC Location: Part 3, Section 3	Attachment Bundle

General Description: Guidelines for Installation of Boiler Tubes in Watertube Boilers

Subgroup: Repairs and Alterations

Task Group: R Trout(PM), J. Pillow, J. Amato

History:

July 2015

Mr. Galanes gave a progress report. SC Repairs and Alterations will address this item in accordance with NB15-2503. A task group was assigned to investigate the applicability of this item to the NBIC.

Committee Action:

January 2016: At the Sub Group R/A it was determined to close this action item. A letter should to be sent to the inquirer that at this time the committee has considered the presented information but it is felt insertion into the NBIC is not required. It was of the committee's opinion that this items information could be good for a National Board Bulletin Article. A motion was made and approved to close the action item with no action and follow up with a letter to Mr. Stone indicating this was good work and should be published in the National Board Bulletin rather than the NBIC.

Item Number: NB15-2503	**NBIC Location: Part 3, Section 3**	**Attachment Bundle**

General Description: Calculating Tube Expansion by Wall Thickness Reduction

Subgroup: Repairs and Alterations

Task Group: F. Johnson (PM), J. Sekely, W. Taylor

History:

July 2015

Mr. Galanes gave a progress report. SC Repairs and Alterations will address this item in accordance with NB15-2502. A task group was assigned to investigate the applicability of this item to the NBIC.

Committee Action:

January 2016: Mr. Frank Johnson presented that information was already available in ASME Sections I and VIII Div-1. A letter needs to be sent to the inquirer that at this time the committee has considered the presented information but it is felt insertion into the NBIC is not required. A motion was made and approved to close the action item with no action.

Item Number: NB15-2601	**NBIC Location: Part 3**	**Attachment Bundle**

General Description: Provide minimum radius dimensions of flush patches

Subgroup: Repairs and Alterations

Task Group: R. Wielgoszinski (PM)

History:

July 2015

This item failed a letter ballot to the NBIC Committee due to insufficient response, with a comment registered by Mr. Webb.

Committee Action:

January 2016: Mr. Bob Wielgoszinski presented text to add to paragraph 3.3.4.6 a)2) to give sizes for the corner radiuses of flush patches. A motion was made and unanimously approved to move this onto

the Main-Committee for consideration.

Item Number: NB15-2801	NBIC Location: Part 3, 4.2 b)	No Attachment

General Description: Change reference standard, "ACCP-189" to "ANSI/ASNT CP-189" and also included reference to the ACCP Program.

Subgroup: Repairs and Alterations

Task Group: N. Carter (PM)

History:

July 2015
Mr Galanes invited Mr. Nathan Carter to present on this item. Mr. Carter presented about ASNT Central Certification Program (ACCP) and the rationale for removing the revision date from the text of the code. SC Repairs and Alterations sent this item to review and comment letter ballot.

Committee Action:
January 2016: Mr. Nathan Carter gave a progress report on the Task Groups efforts to get revisions drafted to be incorporated into Part 3. Progress Report.

8. New Business

i. Interpretations

Item Number: IN15-0601	NBIC Location: Part 3, Section 3	No Attachment

General Description: Use of backing strips to install flush patches repair/alteration classification

Subgroup: Repairs and Alterations

Task Group: George Galanes, Bran Morelock, Mike Webb, Marty Bost

History:

July 2015
Interpretation request submitted by Mr. Nate Manzon of PMC Engineering Solutions. Mr. Galanes, Mr. Edwards, Mr. Morelock, Mr. Pillow, and Mr. Milletti reviewed the request, but did not develop a proposed response.

Committee Action:
January 2016: A task group has been assigned. The interpretation was reviewed and discussed at the Sub Group level and given to the task group to work on.

Item Number: IN15-0701	NBIC Location: Part 3, 4.4	Attachment Bundle

General Description: Using liquid penetrant testing to verify full penetration weld on a tube

Subgroup: Repairs and Alterations

Task Group: J. Pillow

History:

July 2015
Interpretation request submitted by Mr. Stephen Williams of Arise Inc.

Committee Action:
January 2016: Mr. Pillow presented the proposed committee questions and reply to the interpretation request and discussion commenced. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number: IN15-0901	**NBIC Location: Part 3**	**No Attachment**

General Description: Installation of nozzle to the outside of a blind flange repair/alteration classification

Subgroup: Repairs and Alterations

Task Group: Marty Toth, PM, Bob Underwood, Craig Hopkins, Jamie Walker

History:

July 2015
Interpretation request submitted by Mr. Michael Goolsby of Austin Industrial.

Committee Action:
January 2016: Task Group assigned. The Sub Groups task group will evaluate and develop committee responses to be presented at the next meeting. Progress Report

Item Number: IN15-1001	**NBIC Location: Part 3**	**Attachment Bundle**

General Description: Using newest code of construction for alterations to several similar vessels built to different code editions

Subgroup: Repairs and Alterations

Task Group: R. Troutt PM

History:

July 2015
Interpretation request submitted by Mr. Liu Xi of Nantong CIMC Tank Equipment.

Committee Action:
January 2016: Task Group member assigned. After discussion of the submittal a motion was made and unanimously approved to close this item as it is considered consulting. A letter should be sent to the submitter letting him know the committee feels the Code has sufficiently explained what a routine repair is.

Item Number: IN15-1101	NBIC Location: Part 3	No Attachment

General Description: Is the use of ASME PCC-2, Article 2.12 fillet welded patches an alteration?

Subgroup: Repairs and Alterations

Task Group: Jim Pillow PM, Paul Edwards, Nathan Carter, and Dan Marek

History:

July 2015
Interpretation request submitted by Mr. Earl Tullis of Dow Inc.

Committee Action:
January 2016: Task Group was assigned at the Sub Group. Progress Report given.

Item Number: IN15-1201	NBIC Location: Part 3	Attachment Bundle

General Description: What qualifies as a routine repair?

Subgroup: Repairs and Alterations

Task Group: None assigned

History:

July 2015
Interpretation request submitted by Mr. Mario Rivas of JCI.

Committee Action:
January 2016: After discussion of the submittal at the Sub Group R/A the vote was to unanimously close this item. The committee needs more background information and from the submitter and to resubmit with proper formatting. A motion was made and unanimously approved to close this item. A letter should be sent to the submitter letting him know of the Committee's request.

ii. Action Items

Item Number: NB15-1202	NBIC Location: Part 3, S6	Attachment Bundle

General Description: Review of Part 3 S6 for completeness and accuracy

Subgroup: Repairs and Alterations

Task Group: C. Withers, S. Staniszewski

Committee Action:
January 2016: C. Withers presented the proposed revisions to Supplement 6. He explained he worked closely with Mr. Staniszewski to ensure the DOT items are addressed in this Supplement revision. A motion was made and unanimously approved to move this to the Main Committee for consideration.

Item Number: NB15-2106	NBIC Location: Part 3, Section 1	Attachment Bundle

General Description: Update NBIC to correspond to changes in National Board Commissioning

program

Subgroup: Repairs and Alterations

Task Group: Bill Vallance

Committee Action:
January 2016: Bill Vallance presented the document of code and R form changes. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number: NB15-2205	**NBIC Location: Part 3, S3.2 i)**	**No Attachment**

General Description: Remove allowance for reimpregnation of graphite pressure equipment as repair method

Subgroup: Graphite

Task Group: Greg Becherer (PM)

Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-2206B	**NBIC Location: Part 3, S3**	**No Attachment**

General Description: Review Part 3 graphite supplement to ensure proper use of "shall", "should", "may"

Subgroup: Graphite

Task Group: Tracy Rudy (PM)

Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-2207	**NBIC Location: Part 3, S3**	**No Attachment**

General Description: Revise requirements for amount plugs needed when tapered plugs are used

Subgroup: Graphite

Task Group: Aaron Viet (PM)

Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-2208	**NBIC Location: Part 3, S3**	**No Attachment**

General Description: Investigate repair options for graphite block heat exchangers

Subgroup: Graphite

Task Group: Greg Becherer (PM)

Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-2210	NBIC Location: Part 3	No Attachment

General Description: Reduce cementing requirements for plugging of tubes

Subgroup: Graphite

Task Group: C. Cary (PM)
Committee Action:
January 2016: Mr. Galanes gave a progress report. No report was presented.

Item Number: NB15-2306	NBIC Location: Part 3, S10	Attachment Bundle

General Description: ~~Proposed edits to S10 from SC Inspection based on NB15-0501,~~ LPG Tanks, Above Ground to Underground

Subgroup: Repairs and Alterations

Task Group: Bill Vallance

Committee Action:
January 2016: Title corrected. The Committee reviewed the submitted action. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number: NB15-2901	NBIC Location: Part 3, S2	No Attachment

General Description: Review references to 1971 ASME Section I code edition with the recent additions of Part PL and Part PR in the 2015 ASME Section I

Subgroup: Historical

Task Group: Mike Wahl PM, Tom Dillon
Committee Action:
January 2016: Task Group Assigned. Progress Report given.

Item Number: NB15-3401	NBIC Location: Part 3	Attachment Bundle

General Description: Revise Welding Method 2 with updated technical information

Subgroup: Repairs and Alterations

Task Group: G. Galanes PM
Committee Action:

January 2016: Mr. Galanes separated welding processes FCAW and SMAW in welding methods 2, 3, &4 as processes associated diffusible-hydrogen designator of H8 or lower. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number: NB15-1203	NBIC Location: Part 3	Attachment Bundle

General Description: Supplement 9-NV-PRD's

Subgroup: Repairs and Alterations

Task Group: Paul Edwards PM

Committee Action:

January 2016: Mr. Edwards present the NR task groups code revisions to supplement 9 related to NV PRD repairs. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number: NB15-1204	NBIC Location: Part 3	Attachment Bundle

General Description: 1.8.2 for PRD's

Subgroup: Repairs and Alterations

Task Group: Paul Edwards PM

Committee Action:

January 2016: Mr. Edwards present the NR task groups code revisions paragraph 1.8.2. requiring repair organizations conducting repairs of pressure relief devices in nuclear service to meet the requirements of Supplements 7 and 9. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

Item Number:IN16-0101	NBIC Location: Part 3	No Attachment

General Description: Explosion Welding for Plugging Tubes

Subgroup: Repairs and Alterations

Task Group: Jim Selkey PM**,** Bob Underwood, and Eric Cutlip

Committee Action:

January 2016: Discussion was conducted at the Sub Group to give the task group information to help them present a response at the next meeting. Progress report on this new item.

Item Number:IN16-0102	NBIC Location: Part 3	No Attachment

General Description: Sequence for Stamping and R Report Signing

Subgroup: Repairs and Alterations

Task Group: Nathan Carter PM, Monty Bost, and Ray Millet

Committee Action:
January 2016: Discussion was conducted to give the task group information to help them present a response at the next meeting. Progress report on this new item.

Item Number: NB16-0501	**NBIC Location: Part 3, S2**	**Attachment Bundle**

General Description: To clarify when telltale holes are required to be installed in staybolts 8 inches or less in length.

Task Group: R. Underwood (PM)

Committee Action:
January 2016: Mr. Underwood presented a revision the Supplement 2. A motion was made to and unanimously approved to move this onto the Main Committee for consideration.

Item Number: NB16-0604	**NBIC Location: Part 3**	**Attachment Bundle**

General Description: 1.8.2.1 revised definition opening paragraph

Subgroup: Repairs and Alterations

Task Group: Paul Edwards PM
Committee Action:
January 2016: Mr. Edwards presented the NR task groups code revisions to 1.8.2.1 removing the categories 1, 2 , & 3 and be supplemented by ASME Sections III, XI and NQA-I or other regulatory authority standards. A motion was made and unanimously approved to move this onto the Main Committee for consideration.

9. Future Meetings

July 18-21, 2016 – Columbus, Ohio
January 9-12, 2017 – San Diego, California

10. Adjournment

Respectfully submitted,

Bill Vallance
Secretary of Sub Committee R/A

SC Repairs and Alterations Attendance Sheet - 1/13/16

Name	Company	Phone Number	Email	Signature	Attend Rec.?	Guest?
George Galanes	Diamond Technical Services	(815) 634-2727	ggalanes@diamondtechnicalservices.com		✓	
James Pillow	Common Arc	(860) 688-2531	jpillow@commonarc.com		✓	
William Vallance	National Board	(614) 888-8320	bvallance@nationalboard.org		?	
Joel Amato	State of Minnesota	(651) 284-5137	joel.amato@state.mn.us		✓	
Brian Boseo	Graycor Industrial Constructors	(630) 684-7300	brian_boseo@graycor.com		✓	
Angelo Bramucci	Alstom Power	(860) 285-9176	Angelo.Bramucci@ge.com ~~angelo.c.bramucci@power.alstom.com~~		✓	
Paul Edwards	WECTEC ~~CBI~~	5690 (617) 589-~~5677~~	EDWARZPD @ ~~paul.edwards@cbi.com~~ WESTINGHOUSE.COM		✓	
Craig Hopkins	Seattle Boiler Works	(206) 762-0737	chopkins@seattleboiler.com			
Wayne Jones	Arise	(251) 895-8826	wayne.jones@ariseinc.com		✓	
James Larson	OneCIS	6128631192 ~~(781) 584-1104~~	jmloghome@earthlink.net		✓	
Larry McManamon	Boilermakers National Apprenticeship Program	(708) 636-6656	lmac@glabap.com			
Ray Milletti	Babcock & Wilcox	(330) 860-2589	rlmiletti@babcock.com		✓	
Kathy Moore	Joe Moore & Company	(919) 832-1665	kathymoore@joemoorecompany.com		✓	
Brian Morelock	Eastman Chemical Company	(423) 229-1205	morelock@eastman.com		✓	
Bryan Schulte	NRG Energy	(713) 795-1456	bryan.schulte@nrgenergy.com			
James Sekely	Consultant	(412) 389-5567	jsekely@comcast.net		✓	
Rob Troutt	State of Texas	(512) 638-2727	rob.troutt@tdlr.texas.gov		✓	
Michael Webb	Public Service Company of Colorado ~~Xcel Energy~~	(303) 885-9398	mike.webb@xcelenergy.com		✓	
RON PULLIAM						✓
Marty Toth	Boiler Supply Co.	(615) 501-9004	mtoth@boisco.com		✓	
Eric Cutlip	Babcock + Wilcox	216 3370037	ercutlip@babcock.com			✓

Name	Company	Phone Number	Email	Signature	Attend Rec.?	Guest?
PAT BECKER	B&W	(330) 860-2807	pabecker@babcock.com	Patricia Becker	✓	✓
DAWN HOLT	B&W	(330) 860-1080	drholt@babcock.com	Dawn Holt	✓	
JOHN SIEFERT	EPRI	704 595 2886	jsiefert@epri.com		✓	
CHARLES WITHERS	MB				✓	
BRYAN TOTH	WESTEC	980.321.8638	TOTHBM@WESTINGHOUSE.COM		✓	
Frank Johnson	PBF Energy	419-786-8[illegible]	Frank.Johnson@PBFEnergy.com		✓	
Monte Bost	HSB GS	937-620 3676	Monte_bost@hsbct.com		✓	
JON SEIBEL	ARISE	(281) 832-4426	JON.SEIBEL@ARISEINC.com		✓	
Nathan Carter	HSB GS	860-722-5750	nathan_carter@hsbct.com		✓	
David Martinez	FM GLOBAL	703-262-6311	david.martinez@fmglobal.com	David Martinez	✓	
RICK VALDEZ	ARB, INC.	661.331.6024	rvaldez@arbinc.com	Rick Valdez	✓	
BOB WIELGOSZINSKI	HSB GS	860 670-0779			✓	
John Burpee	State ME	207-624 8546	john.h.burpee@maine.gov			
Darrell Wisner	Duke Energy	317-838 6926	darrell.wisner@duke-energy.com	Darrell Wisner		✓
Bob Underwood	HSB	661 593 6231	robert_underwood@hsbct.com		✓	

Inquiry	**IN15-0201**
Source	**We Energies**
Subject	Quality Control System responsibilities, Part 3, 1.6.1
Edition	2013
Inquirer's Question	**Question 1**; Is it permissible to amend or revise the content or implementation of the Quality System, including the written Quality System Manual, without the direct involvement of the titled individual designated as responsible to ensure compliance as given in the Statement of Authority and Responsibility? **Question 2**; Is it permissible for a single immediate supervisor to manage both quality and non-quality related work assigned to the titled individual designated as responsible for Quality System?
Inquirer's Reply	**Reply 1**; No – The titled individual designated as responsible for Quality System shall be fully involved in the preparation, planning and implementation of any and all amendments or revisions to the Quality System, including the written Quality System Manual. The Statement of Authority and Responsibility is required to grant the freedom and authority to carry out this responsibility. **Reply 2**; No – Quality related functions shall follow the administrative relationship structure between the titled individual designated as responsible for Quality System and the officer of the organization who signed the Statement of Authority and Responsibility. The structure of the quality related system shall follow the Quality System organization chart, which addresses functions that affect quality. A single immediate supervisor managing both quality and non-quality related work details performed by the titled individual may be viewed as a conflict of interest.
Committee's Question	**Question 1: In an "R" Certificate Holder's Quality Control system, is it permissible for one individual to have dual responsibilities for management functions, such as Quality control functions and non-quality control functions, such as production?** **Question 2: Is approval of revisions to the Quality Control Manual permitted to be made by someone other than the individual designated in the manual as responsible for approval of the revisions?**
Committee's Reply	**Reply 1: Yes, provided there is no conflict in enforcement of the quality control system and the functional responsibilities and duties are clearly described in the quality control manual.** **Reply 2: No.**
Rationale	
Prepared by:	R. V. Wielgoszinski
Revised by:	

Task Group	
NBIC	

Interpretation IN15-0401

Proposed Interpretation

Inquiry:	IN15-0401
Source:	Mr. Jamie Walker, Hayes Mechanical
Subject:	NBIC Part 3 Section 4
Edition:	2013
Question 1:	May Phased Array UT (PAUT) examination be used for verification of final circumferential weld repair integrity in lieu of pressure testing or other typical NDE methods (MT/PT/RT) involving boiler tubes where the thickness is below ½ inch, with NPS of 4 inch and less?
Reply 1:	Reply: Yes
Committee's Question:	
Committee's Reply:	
Rationale:	
SC Vote	
NBIC Vote	

File Number: NB11-0204B
Task Group Mike Wahl (PM) J. Larson, F. Johnson
Subject: Part 3 Supplement 2
Pages: See Below
Proposal: Several areas in the repair section need updating for NDE examination.

1. In Part 3, Supplement 2, S2.11 (page 140) add the following text the existing statement:

The nondestructive examination (NDE) requirements, including technique, extent of coverage, procedures, personnel qualification, and acceptance criteria, shall be in accordance with the original code of construction for the pressure-retaining item. Weld repairs and alterations shall be subjected to the same nondestructive examination requirements as the original welds.

Where the original code of construction is unknown or the NDE method is not possible or practicable, alternative NDE methods may be used. These methods shall be acceptable to the owner, the Inspector and where required, the Jurisdiction of the pressure-retaining item.

NDE methods used shall be suitable for providing meaningful results to verify the integrity of the repair and or alteration.

Exclusive use of visual examination (VT) for repair inspection is only permitted when following the requirements of Part 3, 4.4.1 e).

S2.11 NONDESTRUCTIVE EXAMINATION

The Inspector may require nondestructive examination (RT, PT, MT, UT, and VT) as necessary to ensure satisfactory welded repairs have been accomplished.

Add the text from above here

2. In Part 3, Supplement 2, S2.13 (c) (page 140) replace (c) with statement currently used in Part 3, 3.3.4.1 and Supplement 1, S1.2.10. This changes the paragraph by:
    a. Adding a reference to Part 3,3.3.4.8,
    b. Adding the inspector and jurisdiction acceptance of other corrective measures
    c. Removes the last two sentences that are covered in detail in Supplement 2.

    "Except as provided in NBIC Part 3, 3.3.4.8, a repair of a defect in a welded joint or base material shall not be made until the defect has been removed. A suitable nondestructive examination (NDE) method, such as magnetic particle (MT) or liquid penetrant (PT), may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required, by the Jurisdiction."

S2.13 REPAIR METHODS

a) Before performing any welding activity, consideration shall be given to ensure the weldability of historical boiler materials. Materials used for patches shall be made from material that is at least equal in quality and strength to the original material.

b) 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.

c) A repair of a defect, such as a crack in a welded joint or base material, shall not be made until the defect has been removed. A suitable nondestructive examination method such as magnetic particle (MT) or liquid penetrant (PT) may be necessary to assure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a complete penetration weld such as a double buttweld or a single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other acceptable, corrective measures. A repair of a bulge or blister shall be made if a bulge or blister will affect the pressure retaining capability of the plate or tube or when evidence of leakage is noted. Defects such as cracks, grooving, and wastage may be repaired by weld buildup, welded repair, a welded flush patch, or a riveted patch as appropriate.

Replace current text in c) with the text from above

d) Welded repairs at or near riveted seams requiring preheating or postweld heat treatment shall be carefully made to prevent loosening in the riveted seams, especially when localized heating is used. Where necessary to control expansion or to gain access for welding, rivets at the defective section and to each side of it may be removed. Reuse of rivets is prohibited.

3. In Part 3, Supplement 2, In S.2.13.9.2 (c) (page150) change "be radiographed" to "have Volumetric NDE performed"

S2.13.9.2 WELDED REPAIR OF CRACKS IN UNSTAYED AREAS

Replace "be radiographed" to "have Volumetric NDE performed"

a) Prior to repairing cracks, the plate shall be NDE examined for other defects. All affected sections shall be repaired.

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

c) Cracks in unstayed areas may be repaired by welding, providing the cracks do not extend between rivet holes in a longitudinal seam or parallel to a longitudinal seam within 2 in. (50 mm) from the center line of the outer most row of rivets. Minimum 175°F (79°C) preheat shall be used. The completed repair must ~~be radiographed~~ and stress relieved. Alternative methods in lieu of postweld heat treatment identified in NBIC Part 3, 2.5.3 may be used. (See NBIC Part 3, Figure S2.13.9.2).

d) Cracks radiating from a common point (star cracking) shall not be repaired; installation of a flush patch is required. Cracks radiating from a rivet hole in a circumferential seam may be repaired if the plate is not seriously damaged. (See NBIC Part 3, Figure S2.13.9.2).

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

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

g) Rivets holes should be reamed after welding.

h) Welding shall not cover rivet heads.

4. In Part 3, Supplement 2, In S.2.13.9.3 (a) (page150) change "be radiographically examined" to "have Volumetric NDE performed"

S2.13.9.3 WELDED FLUSH PATCHES IN UNSTAYED AREAS

Replace "be radiographed examined" to "have Volumetric NDE performed"

a) Welded repairs to boiler unstayed areas shall ~~be radiographically examined~~ in accordance with the approved code of construction or ASME Section I, when the size of the repaired area is greater than 3 in. (75 mm) in diameter. The completed repair must be stress relieved. Alternative Methods without Postweld Heat Treatment identified in NBIC Part 3, 2.5.3 may be used.

b) The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush. Examples of flush welded patches are shown in Figure NBIC Part 3, S2.13.9.3.

5. In Part 3, Supplement 2, S.2.13.10.2 (page 153) add (c) stating:

   If the load on repair area is carried by other forms of construction, such as staybolts, rivets or tubes, volumetric NDE of the welds is not required.

S2.13.10.2 WELDED REPAIR OF CRACKS IN STAYED AREAS

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

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

b) Threaded staybots shall be retapped after welding.

Add the text from c) from above here

6. In Part 3, Supplement 2, S.2.13.10.3 b) (page 153) change "radiographically examined" to "Volumetric NDE"

S2.13.10.3 WELDED FLUSH PATCHES IN STAYED AREAS

The requirements identified in NBIC Part 3, S2.13.9.3 shall apply with the additional requirements specified below:

a) Patches may be any shape provided they are adequately supported by staybolts, rivets, tubes, or other forms of construction. Patches on stayed surfaces should be designed so weld seams pass between staybolt rows. (See NBIC Part 3, Figure S2.13.10.3-a);

Replace 'radiographed examination" to 'Volumetric NDE"

b) Patches are to be flush type, using full penetration welds. If the load on the patch is carried by other forms of construction, such as staybolts, rivets, or tubes, ~~radiographic examination~~ of the welds is not required;

c) Staybolts and rivets should be installed after welding of patch is completed. Reuse of staybolts and rivets is prohibited; and

d) Weld seams parallel to a knuckle shall be located no closer to the knuckle than the point of tangency of the knuckle unless the weld is radiographically examined. Weld seams not located in the knuckle are preferred. (See NBIC Part 3, Figure S2.13.10.3-b).

7. In Part 3, Supplement 2, S.2.13.10.3 d) (page 153) remove current statement redundant with information in S2.13.11.3 and reference S2.13.11.3 Welded Flush Patches in Firebox and Tubesheet Knuckles. Text for d) would change to :

   For welded flush patches in stayed areas that include a knuckle area see S2.13.11.3 Welded Flush Patches in Firebox and Tubesheet Knuckles.

S2.13.10.3 WELDED FLUSH PATCHES IN STAYED AREAS

The requirements identified in NBIC Part 3, S2.13.9.3 shall apply with the additional requirements specified below:

a) Patches may be any shape provided they are adequately supported by staybolts, rivets, tubes, or other forms of construction. Patches on stayed surfaces should be designed so weld seams pass between staybolt rows. (See NBIC Part 3, Figure S2.13.10.3-a);

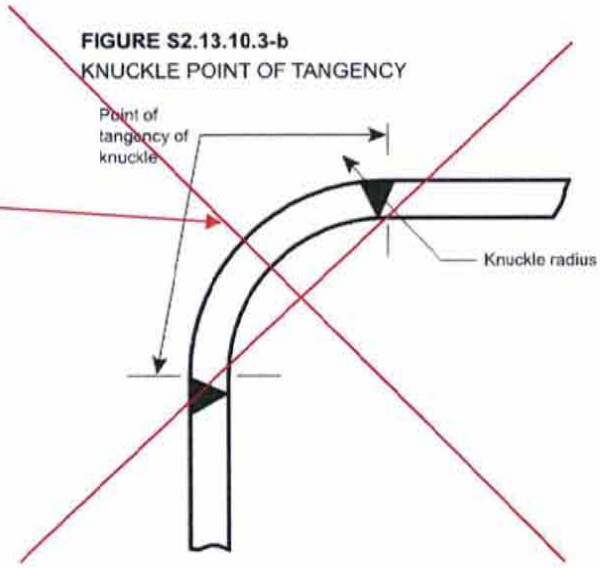
b) Patches are to be flush type, using full penetration welds. If the load on the patch is carried by other forms of construction, such as staybolts, rivets, or tubes, radiographic examination of the welds is not required;

c) Staybolts and rivets should be installed after welding of patch is completed. Reuse of staybolts and rivets is prohibited; and

d) ~~Weld seams parallel to a knuckle shall be located no closer to the knuckle than the point of tangency of the knuckle unless the weld is radiographically examined. Weld seams not located in the knuckle are preferred. (See NBIC Part 3, Figure S2.13.10.3-b).~~

Replace current text in d) with the text from above

8. In Part 3, Supplement 2, Figure S2.13.10.3-a (page 154) Remove figure S2.13.10.3-b Figure will be added to S2.13.11.3 to have all knuckle patch information in one area.



Remove This Figure

9. In Part3, Supplement 2, S.2.13.11.2 (b) (page 156) replace (b) with the following text:

Welded repair of cracks within the points of tangency of a knuckle are permitted. All welds within the points of tangency of the knuckle shall have volumetric NDE performed.

Replace current text in b) with the text from above

S2.13.11.2 WELDED REPAIR OF CRACKS IN FIREBOX AND TUBESHEET KNUCKLES

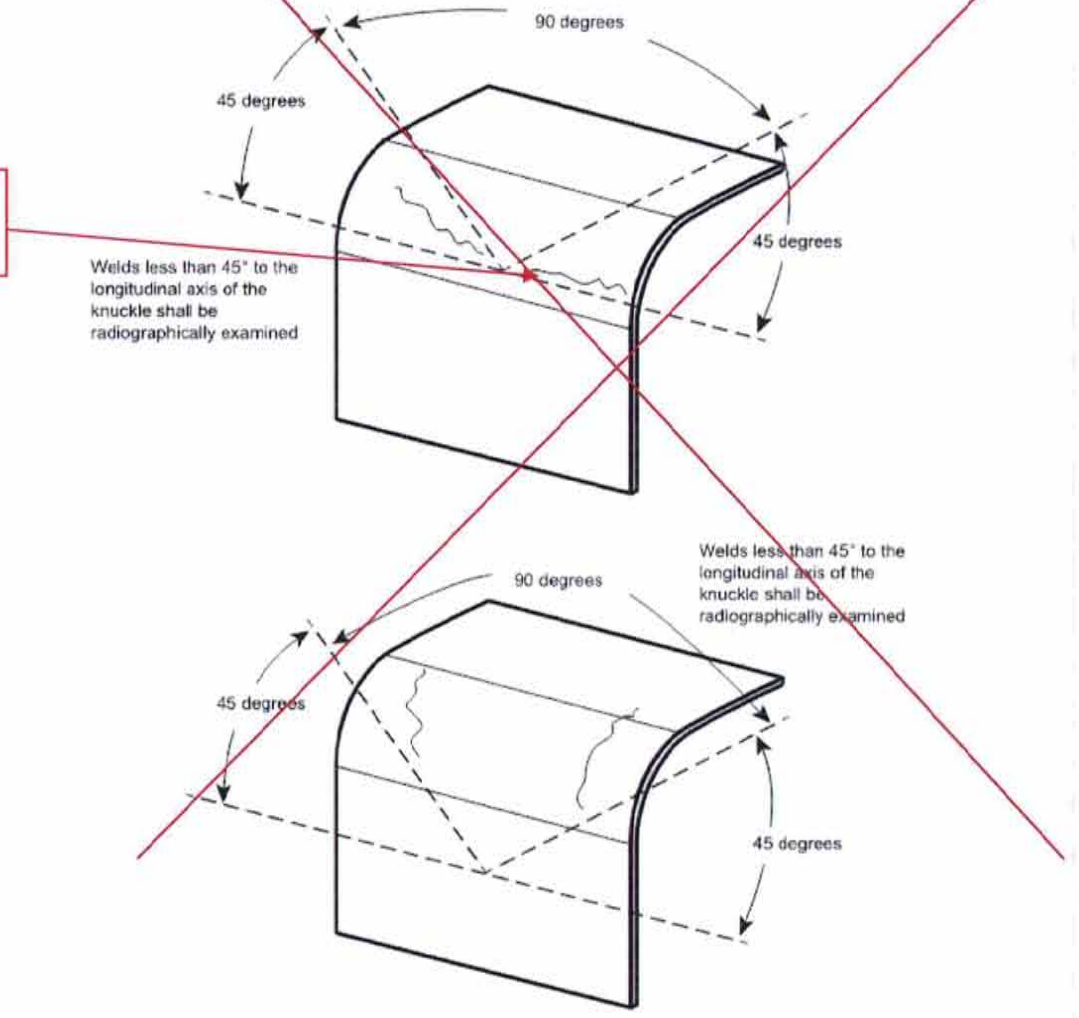
a) Prior to repairing cracks, the plate shall be NDE examined for other defects. All affected sections shall be repaired.

b) ~~Welds within the points of tangency of a knuckle are permitted. Welds with angles of less than 45 degrees to the longitudinal axis of the knuckle shall be radiographically examined (See NBIC Part 3, Figure S2.13.11.2).~~

c) Cracks radiating from a common point (star cracking) shall not be repaired; installation of a flush patch is required.

10. In Part 3, Supplement 2, Figure S2.13.11.2 (page 157) Remove figure because all welded repair of cracks in knuckle areas require nondestructive examination to be performed from the changes to S.2.13.11.2 (b

FIGURE S2.13.11.2
KNUCKLE WELD ANGLES



Remove This Figure

11. In Part 3, Supplement 2, S2.13.11.3 (page 157) Replace current text with a), b), & c) to have all knuckle information in one area (information moved from S S.2.13.10.3) and give more information. New text would state:

    a) Any patch not supported by means other than the weld, such as rivets, staybolts, tubes, or other forms of construction, shall have volumetric NDE performed on the weld seams. (See NBIC Part 3, Figure S2.13.11.3-b).

    b) Weld seams parallel to a knuckle shall be located no closer to the knuckle than the knuckle point of tangency. (See NBIC Part 3, Figure S2.13.11.3-a).

    c) All other requirements specified in NBIC Part 3, S2.13.9.3, S2.13.10.3 and S2.13.12.3 shall be followed

Replace current text with a), b), c), from above

S2.13.11.3 WELDED FLUSH PATCHES IN FIREBOX AND TUBESHEET KNUCKLES

~~Any patch not supported by means other than the weld, such as rivets, staybolts, tubes, or other forms of construction, shall have all weld seams radiographically examined. (See NBIC Part 3, Figure S2.13.11.3). All other requirements specified in NBIC Part 3, S2.13.9.3 shall be followed.~~

File Number: NB13-0902
Task Group Mike Wahl (PM) J. Larson, F. Johnson
Subject: Part 3, Supplement 2, Update to Section S2.13.12.3
Page: 160
Proposal:

1. Add new text, 2) & 3) to better explain tube sheet repairs involving the knuckle area.
2. Update Figure S2.13.12.3
3. Add Figure S2.13.12.3A

Explanation:

Currently there is little to no information in supplement 2 on the repair of flanged tube sheets. This would add information to better define the use of welded repairs and alternatives for tube sheet repairs involving the knuckle area.

1. Add New Text

2) A flush patch repair can be welded through tube holes or around tube holes. (See NBIC Part 3, Figure S2.13.12.3)

3) If the Flush Patch repair extends through the tube sheet radius either the sheet should be flanged to match the original tube sheet flange or a welded alternative may be used as shown in NBIC Part 3, Figure S2.13.12.3.A

S2.13.12.3 WELDED FLUSH PATCHES IN TUBESHEETS

a) The method of repair shall follow the same requirements identified in S2.13.10.3 with the following requirement as noted below:

1) Tubes, staybolts, and rivets should be installed after welding of the patch is completed. (See NBIC Part 3, Figure S2.13.12.3).

Add #2) and #3) in this area.

2. Update Figure S2.13.12.3

Add a 4th diagram to figure S2.13.12.3 to show a tube sheet repair, which encompasses the hand hole opening area, however doesn't extend through the tube area.

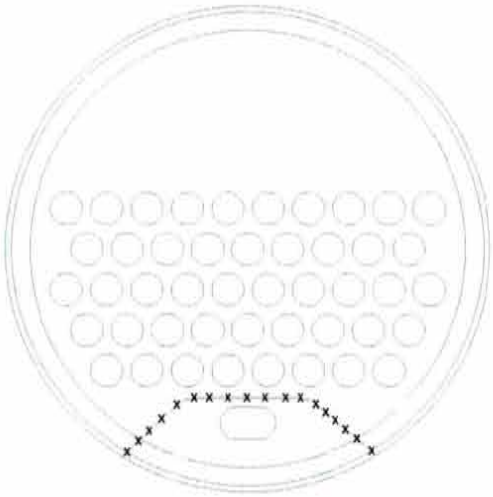
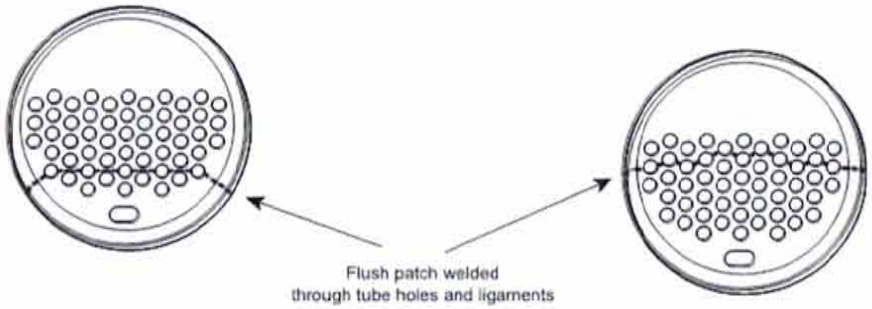
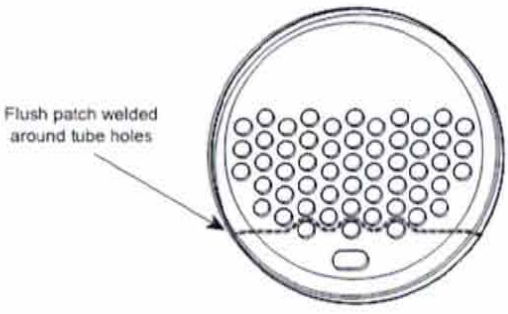


FIGURE S2.13.12.3
TUBESHEET FLUSH PATCH





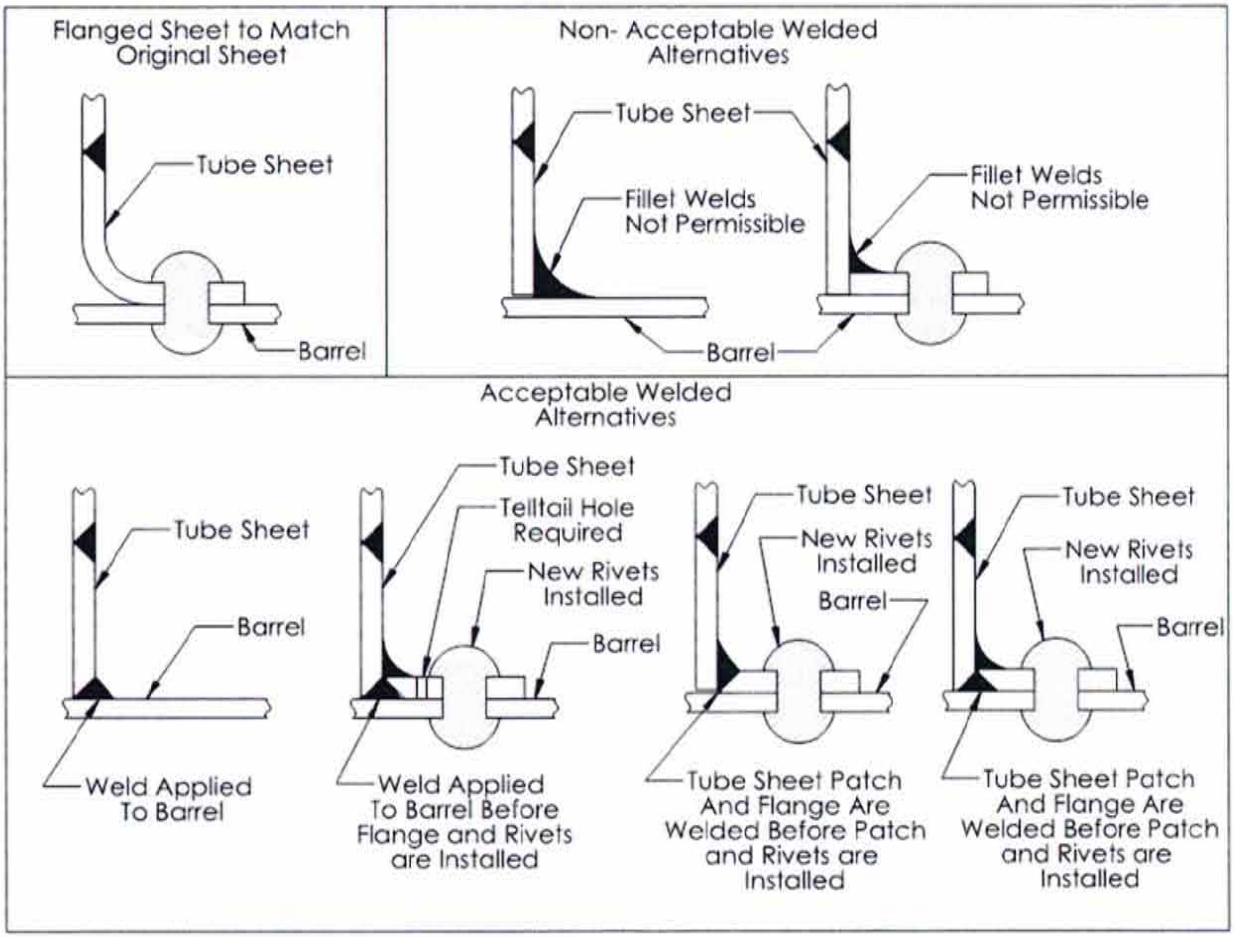
Add 4th diagram here

3. Add Figure S2.13.12.3A

Add figure S2.13.12.3a to show acceptable and non-acceptable tube sheet repair methods.

Note: Figure S2.13.12.3A has been created in Solid Works and can be exported to a several different file formats. Please e-mail mikew@midstal.com and I can send requested format.

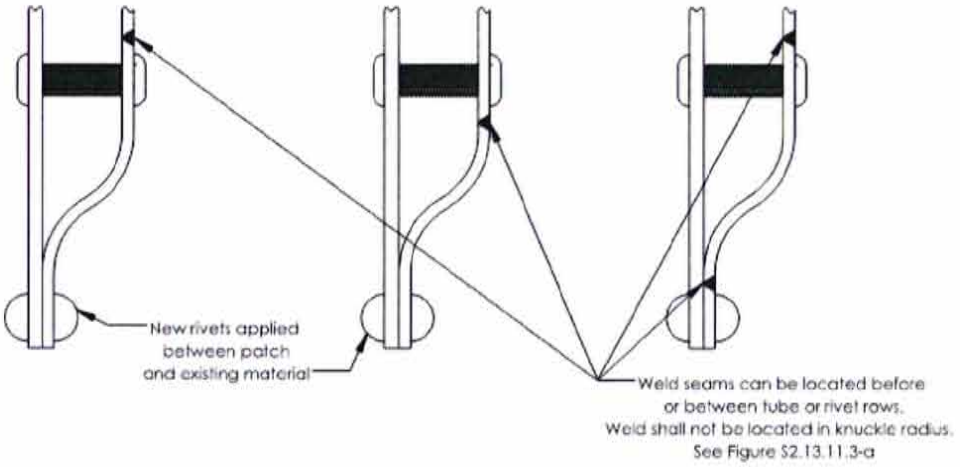
FIGURE S2.13.12.3.A
Front Tubesheet Repair



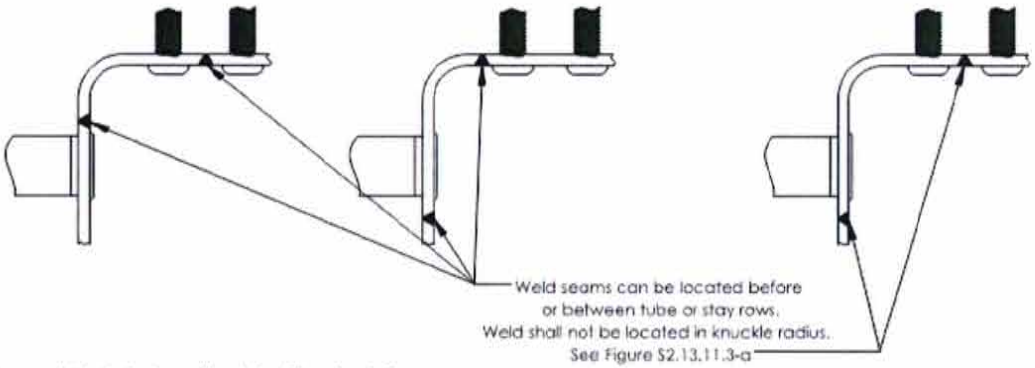
Add This Figure

FIGURE S2.13.11.3-b
KNUCKLE FLUSH PATCH

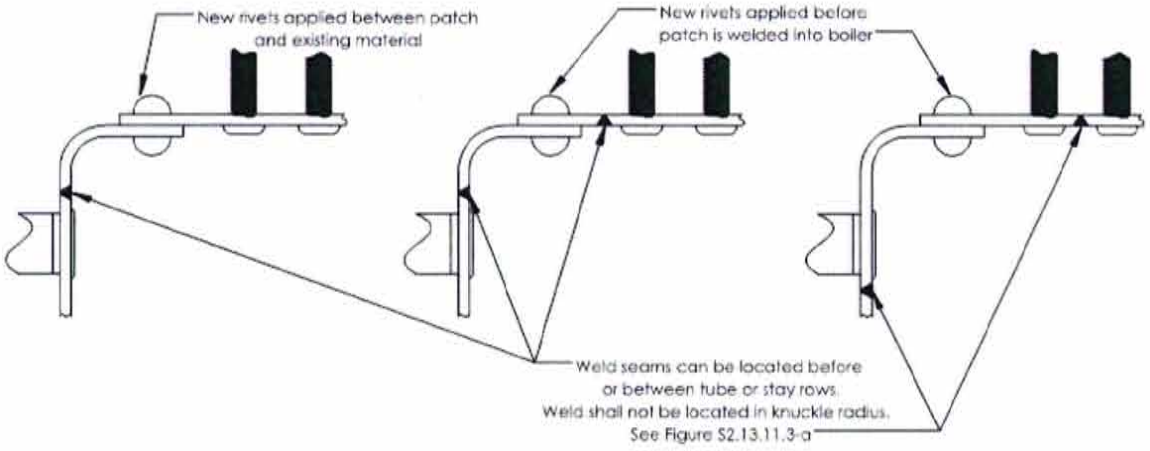
Stayed Patch Applied to Riveted Ogee Knuckle Seam



Stayed Patch Applied to Buttwelded Seam



Stayed Patch Applied to Riveted Seam

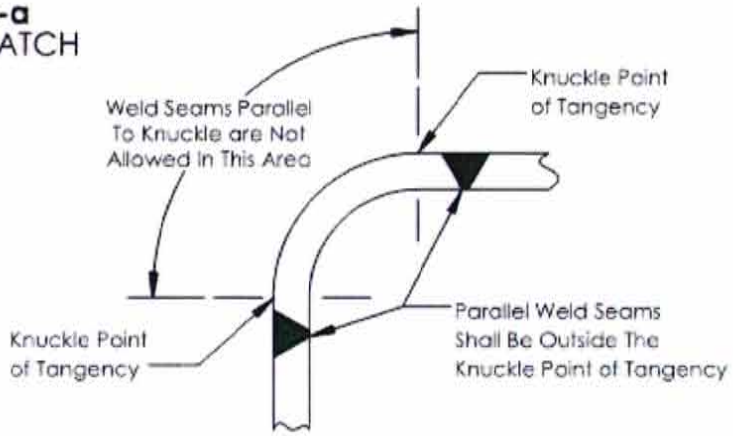


12. In Part 3, Supplement 2, Figure S2.13.11.3 (page 158) replace current figure S2.13.11.3 with two new ones showing the changes in S2.13.11.3.

Note: Figure S2.13.11.3-a and Figure S2.13.11.3-b have been created in Solid Works and can be exported to a several different file formats. Please e-mail mikew@midstal.com and I can send requested format.

FIGURE S2.13.11.3-a
KNUCKLE FLUSH PATCH

Add This Figure



NB14-0203

1.2 CONSTRUCTION STANDARDS FOR PRESSURE RETAINING ITEMS

b) If the pressure-retaining item was not constructed to a construction code or standard, or when the standard governing the original construction is not the ASME Code or ASME RTP-1, repairs or alterations
shall conform, insofar as possible, to the edition of the construction standard or specification most applicable to the work. Where this is not possible or practicable, it is permissible to use other codes, standards, or specifications, including the ASME Code or ASME RTP-1, provided the "R" or "NR" Certificate Holder has the concurrence of the Inspector and the Jurisdiction where the pressure-retaining item is installed.

1.4 ACCREDITATION

a) Organizations performing repairs or alterations to pressure-retaining items shall be accredited as described in this section, as appropriate for the scope of work to be performed.

b) Organizations performing repairs outside the scope of the NBIC may be accredited and shall meet any additional requirements of the Jurisdiction where the work is performed.

1.5.1 ACCREDITATION PROCESS

a) The National Board administers accreditation programs for authorization of organizations performing repairs and alterations to pressure-retaining items in accordance with NB-415, Accreditation of "R" Repair Organizations ~~and/or pressure relief valves in accordance with NB-514~~

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

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

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

~~or shop and field. Repairs and/or alterations to metallic and non-metallic pressure- retaining items are made by welding, bonding and/or mechanical assembly.~~

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

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

g)f) The Jurisdiction[2] ~~m~~, as defined in Part 3, Section 9, may audit the Quality System and activities of an organization upon a valid request from

~~2 Jurisdiction: The National Board member jurisdiction where the organization is located. Alternatively, where the Jurisdiction elects not to~~

an owner, user, inspection agency, or the National Board.

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

1.5.2 NATIONAL BOARD "R" SYMBOL STAMP

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

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

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

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

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

c) Additional requirements shall be met in accordance with NB-415 Accreditation of "R" Repair Organizations. ~~and/or NB-514 as applicable.~~

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1.6 QUALITY SYSTEM

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

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

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

a) **Title Page**

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

b) **Contents Page**

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

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

c) **Scope of Work**

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

d) **Statement of Authority and Responsibility**

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

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

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

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

e) **Manual Control**

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

f) **Organization**

An organizational chart shall be included in the manual. It shall include the title of the heads of all depart- ments or divisions that perform functions that can affect the quality of the repair or alteration, and it shall show the relationship between each department or division.

The manual shall identify the title of those individuals responsible for preparation, implementation, or veri- fication of the Quality System. The responsibilities shall be clearly defined and the individuals shall have the organizational freedom and authority to fulfill those responsibilities.

g) **Drawings, Design and Specifications**

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

h) **Repair and Alteration Methods**

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

i) **Materials**

The manual shall describe the method used to ensure that only acceptable materials (including welding material) are used for repairs and alterations. The

manual shall include a description of how existing material is identified and new material is ordered, verified, and identified. The manual shall identify the title of the individual(s) responsible for each function and a brief description of how the function is to be performed.

j) **Method of Performing Work**

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

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

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

l) **Examinations and Tests**

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

m) **Calibration**

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

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

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

The manual shall specifically address allowance for acceptance of the inspector for application of the "R" symbol stamp to a pressure retaining item.

The manual shall provide for adequate control of the "R" Symbol Stamp.

o) **Inspections**

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

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

The manual shall indicate the title of the individuals responsible for preparing, signing, and presenting the

NBIC Report Forms to the Inspector. The distribution of the NBIC Report Forms[3] shall be described in the manual.

q) **Exhibits**

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

r) **Construction Code**

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

s) **Nonconforming Items**

There shall be a system acceptable to the Inspector for the correction of nonconformities. A nonconfor- mance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system. Nonconformance must be corrected or eliminated before the repaired or altered component can be considered in compliance with the NBIC.

t) **Records Retention**

The quality manual shall describe a system for filing, maintaining, and easily retrieving records support- ing or substantiating the administration of the Quality System within the scope of the "R" Certificate of Authorization.

1) Records may represent any information used to further substantiate the statements used to describe the scope of work completed to a pressure-retaining item (PRI), and documented on a Form "R" report.

2) Records are not limited to those depicting or calculating an acceptable design, material compliance or certifications, NDE-reports, PWHT-charts, a WPS used, a welder, bonder, or cementing technician's process continuity records, drawings,

sketches, or photographs.

3) The record retention schedule described in the Quality System Manual is to follow the instructions
identified in NBIC Part 3, Table 1.6.5.1.

Table 1.6.5.1

Form "R" Reports, Records, or Documents	Instructions	Minimum Retention Period
a) Form "R" Reports and supporting records and documentation	The organization performing repairs and alterations shall retain a copy of the completed "R" Form report on file, and all records substantiating the summary of work described in NBIC Part 3, 5.13.4.1, Item 12, for a minimum of 5 years. When the method of repair described in NBIC Part 3, 3.3.4.8 is used, the record retention period shall be described in b)	5 years
b) Form "R" Report with REPORT OF FITNESS FOR SERVICE ASSESSMENT FORM (NB-403) attached.	When the method of repair described in NBIC Part 3,3.3.4.8 is used, the record retention period shall be for the duration described on the FITNESS FOR SERVICE ASSESSMENT (FFSA) Form required by the repair method and as described in NBIC Part 2, 4.4 Notes: 1. The "R" Certificate Holder should be aware that when used, some of the referenced codes and standards identified in NBIC Part 2,, 1.3 describe requirements for permanent record retention throughout the service life of each equipment item. 2. When the "R" Certificate Holder is not the owner or user of the equipment, the record retention period is limited to the FFSA-results described on line 8 of the Report of Fitness for Service Assessment Form (NB-403)	5 years or as described on line 8 as reported on Form NB-403; whichever period is longer

82 NBIC Report Form: National Board Form R-1 for Repair, Form R-2 for Alterations, Form R-3 for Fabricated Parts, or Form R-4 Report Supplementary Sheet.

c) Continuity records for a welder, welding operator, bonder, or cementing technician	Minimally, continuity records for a welder, bonder, or cementing technician within the Certificate Holder's quality system shall be described and established at the time of the applicant's initial certificate review and demonstrated at each triennial review required thereafter.	As applicable to the scope of work identified on the Certificate of Authorization, the continuity records are subject to review during each National Board triennial certificate review.
d) Administrative record review of the "R" Certificate Holder's administrative processes.	Records supporting completed administrative reviews or audits of procedures or processes required by the "R" Certificate Holder's Quality System Manual, or in combination with the applicable part of the NBIC Part 3, Supplementary Section 6 as it applies to the identified scope listed on the "R" Certificate of Authorization.	Subject to review during the triennial evaluation of the certificate holder's Quality System.

1.7 ACCREDITATION OF "VR" REPAIR ORGANIZATIONS

1.7.1 Scope

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

a) This section provides requirements that must be met for an organization to obtain a National Board *Certificate of Authorization* to use the "VR" Symbol Stamp for repair activates of pressure relief devices constructed in accordance with the requirements of the ASME Code.

b) For administrative requirements to obtain or renew a National Board "VR" Certificate of Authorization and "VR" Symbol Stamp, refer to National Board Procedure NB-514, Accreditation of "VR" Repair Organizations.

Footnote: Requirements for Accreditation of "VR" Repair Organizations NB-514, may be found on the NB website www.nationalboard.org under the "Stamps and Marks" tab.

Item NB14-0301

New Section

3.4.3 ENCAPSULATION

Encapsulation is used to restore the pressure retaining capability of an item (with the exception of fire tube boilers) by building a new pressure containing boundary over the item in the form of a welded leak box.

a) Welded Leak Box

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

a. A leak box can take a variety of shapes (e.g., cylindrical, rectangular, with either flat or formed heads), often following the contour of the component being encapsulated. Leak boxes may be fabricated by welding split pipe, pipe caps, or plates to encapsulate a pressure retaining item. Consideration should be given to add centering guides to aid with the installation. An example of a Welded Leak Box is shown in NBIC Part 3, Figure 3.4.3.

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

~~2) A Welded Leak Box shall not be used to encapsulate a crack.~~

2) The "R" Certificate Holder responsible for the design of the encapsulation shall ensure a Fitness for Service Assessment (FFSA) has been performed on the part being encapsulated in accordance with NBIC, Part 2, 4.4.1, supporting the continued service of the item. The leak box shall not remain in place beyond the calculated life of the pressure retaining item.

a. The remaining life of the encapsulated pressure retaining item shall be documented on the Report of FFSA in the Remarks section. The Report of FFSA Form shall be affixed to the Form R-2.

3) Design of the box and fabrication welds shall be in accordance with the original code of construction, when practicable or the basis of design shall be acceptable to the inspector and when required, the jurisdiction.

a. Design of the encapsulation shall consider original design conditions, taking into account current service conditions and corrosion mechanisms.

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

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

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

b. The leak box shall fully encapsulate the thinned or leaking area, as specified in the FFSA, to the distance where the minimum required metal thickness is verified.

1. Wall thickness shall be verified in the vicinity of the area to be welded.

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

d. The WPS followed shall be qualified in accordance with ASME Section IX. When the code of construction requires post weld heat treatment (PWHT) or the encapsulated component required PWHT, the WPS followed shall be qualified with PWHT. As an alternative and with

concurrence of the inspector an Alternate Welding Method may be used in accordance with NBIC Part 3, 2.5.3.

1. Hazards associated with welding on degraded components should be addressed with the Owner-User by the use of engineering controls, administrative controls and personal protective equipment.

    a. API RP-2201, "Safe Hot Tapping Practices in the Petroleum and Petrochemical Industries" may be used as a guideline for identifying hazards associated with welding to a component that is under pressure, including service restrictions.

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

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

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

5. When welding to a component that is under pressure, the following shall be considered in developing the WPS: preheat temperature, exposure to moisture, the effect of process fluid flow on weld cooling rate, the effects of the welding temperature on the strength of the metal under service conditions and the risk of burn through.

    a. Every measure shall be taken to remove the moisture from the weld environment.

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

    a. Visual examination attributes shall be in accordance with the NBIC, Part 3, Paragraph 4.4.1 e).

    b. The "R" Stamp Holder performing the alteration shall provide detailed information on the Form R-2, describing the extent of the alteration and include the specific location the work was performed on the item. A copy of the completed Form R-2 with the completed FFSA Form attached shall be registered with the National Board, and when required, filed with the jurisdiction where the item was installed.

Renumber

3.4.4 EXAMPLES OF ALTERATIONS

j) The installation of a welded leak box.

3.4.5 ALTERATIONS OF ASME CODE SECTION VIII, DIVISION 2 or #, PRESSURE VESSELS

3.4.5.1 ALTERATION PLAN

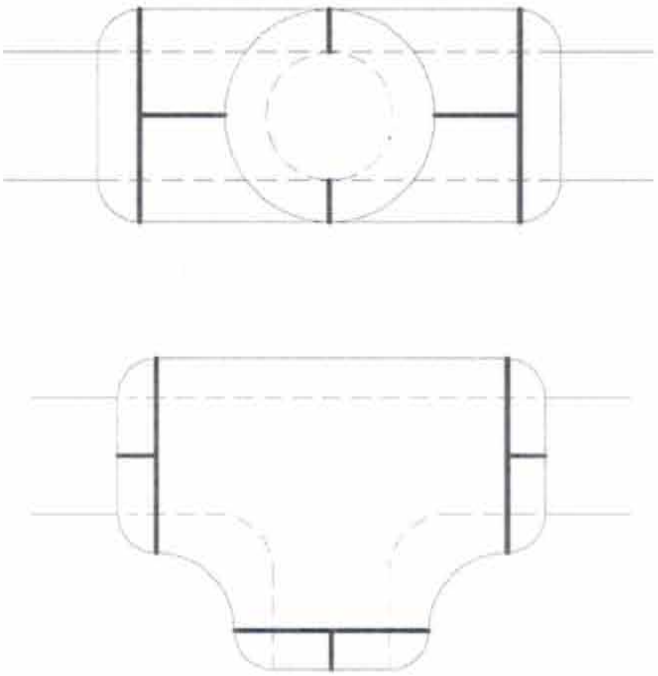
DEFINITIONS

Alteration — A change in the item described on the original Manufacturer's Data Report or depicted on the drawing when the original code of construction is other than ASME, which affects the pressure containing capability of the pressure-retaining item. (See NBIC Part 3, 3.4.3, EXAMPLES OF ALTERATION) Nonphysical changes such as an increase in the maximum allowable working pressure

(internal or external), increase in design temperature, or a reduction in minimum temperature of a pressure-retaining item shall be considered an alteration.

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

FIGURE 3.4.3
Welded Leak Box



SECTION 5

Page 2 of the Form R-2 will need to be revised to indicate a FFSA Form (NB-403) is attached.

DESIGN REPORT SHEET 2 OF 2

1. Design performed by (1) _____ (2) _____
(name of "R" organization responsible for construction design) (Form "R" Registration No.)

_____ _____
(address) (PO No., Job No., etc.)

2. Owner (3) _____
(name)

_____
(address)

3. Location of installation (4) _____
(name)

_____
(address)

4. Item identification (5) _____ Name of original manufacturer (6) _____
(boiler, pressure vessel, or piping)

5. Identifying nos.: (7) _____ (8) _____ (8) _____ (8) _____ (9) _____
(mfg. serial no.) (National Board No.) (jurisdiction no.) (other) (year built)

6. NBIC Edition / Addenda: (10) _____ (10) _____
(edition) (addenda)

Original Code of Construction for Item: (11) _____ (11) _____
(name / section / division) (edition / addenda)

Construction Code to be used for Alteration Performed: (11) _____ (11) _____
(name / section / division) (edition / addenda)

7. Description of Design Scope: (12) ☐ FFSA Form (NB-403) is attached

(use supplemental sheet, Form R-4 if necessary) ☐ Form R-4, Report Supplementary Sheet is attached

_____

_____

FORM R-1 REPORT OF REPAIR

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

(Authorized Rep. initials)

(Inspectors initials)

(Form "R" Registration no.)

(P.O. no., job no., etc.)

1. WORK PERFORMED BY: _____
(name of repair organization)

_____
(address)

2. OWNER: _____
(name)

_____
(address)

3. LOCATION OF INSTALLATION: _____
(name)

_____
(address)

4. ITEM IDENTIFICATION: _____ NAME OF ORIGINAL MANUFACTURER: _____
(boiler, pressure vessel, or piping)

5. IDENTIFYING NOS: _____ _____ _____ _____ _____
(mfg. serial no.) (National Board no.) (jurisdiction no.) (other) (year built)

6. NBIC EDITION/ADDENDA: _____ _____
(edition) (addenda)

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

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

7. REPAIR TYPE: ☐ welded ☐ graphite pressure equipment ☐ FRP pressure equipment ☐ DOT

8. DESCRIPTION OF WORK: ☐ Form R-4, Report Supplementary Sheet is attached ☐ FFSA Form (NB-403) is attached
(use Form R-4, of neccessary))

_____ Pressure Test, if applied _____ psi MAWP _____ psi

9. REPLACEMENT PARTS: (Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report):
(name of part, item number, data report type or certificate of Compliance, mfg's. name and identifying stamp)

10. REMARKS:

_____
(Form "R" Registration no.)

_____
(P.O. no., job no., etc.)

CERTIFICATE OF COMPLIANCE

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

CERTIFICATE OF INSPECTION

I, _____, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of _____ and employed by _____ of _____ have inspected the work described in this report on _____, _____ and state that to the best of my knowledge and belief, this work complies with the applicable requirements of the National Board Inspection Code. By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage, or loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ _____
(inspector) (National Board and Jurisdiction no.)

NB14-2401

Action Item Request Form

8.3 CODE REVISIONS OR ADDITIONS

Request for Code revisions or additions shall provide the following:

a) Proposed Revisions or Additions

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

Existing Text:

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

b) Statement of Need

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

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

c) Background Information

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

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

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

Paragraph S6.5 would be affected.

NB14-2402

Action Item Request Form

8.3 CODE REVISIONS OR ADDITIONS

Request for Code revisions or additions shall provide the following:

a) Proposed Revisions or Additions

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

Existing Text:

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

b) Statement of Need

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

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

c) Background Information

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

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

S6.3 ACCREDITATION

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

CERTIFICATES OF AUTHORIZATION FOR ACCREDITATION PROGRAMS

Any organization seeking an accredited program may apply to the National Board to obtain a Certificate of Authorization for the requested scope of activities. A confidential review shall be conducted to evaluate the organization's quality system. Upon completion of the evaluation, a recommendation will be made to the National Board regarding issuance of a Certificate of Authorization.

Certificate of Authorization scope, issuance, and revisions for National Board accreditation programs are specified in the applicable National Board procedures. When the quality system requirements of the appropriate accreditation program have been met, a Certificate of Authorization and appropriate National Board symbol stamp shall be issued.

Insert NB15-1003 text here

1 Caution, some Jurisdictions may independently administer a program of authorization for organizations to perform repairs and alterations within that Jurisdiction.

NB15-1001; NB15-1002; NB15-1003; NB15-1004

Include the following text in the Introduction under the heading "Stamping"

STAMPING

ASME Code "Stamping" referenced throughout the NBIC includes the ASME Boiler and Pressure Vessel Code Symbol Stamps used for conformity assessment prior to the 2010 edition/2011 addendum and the equivalent ASME Certification Mark with Designator required to meet the later editions of the ASME Boiler and Pressure Vessel Code Sections. When other construction codes or standards are utilized for repairs or alterations, stamping shall mean the identification symbol stamp required by that code or standard to indicate conformity assessment.

NB15-1201

Part 3, Paragraph 5.6

5.5 REGISTRATION OF ~~"R"~~ FORMS — GENERAL

a) When registration of the ~~f~~Forms ~~"R" Report~~ is required, the ~~"R"~~ Certificate Holder performing a repair or alteration shall submit the completed ~~Form "R" Report~~form, meeting the requirements of the ~~code~~NBIC, to the National Board.

b) When registration of the ~~Form "R" Report~~forms is not required ~~by the code~~, the ~~"R"~~ Certificate Holder may register the completed ~~Form "R" Report~~ form, meeting the requirements of the ~~code~~NBIC, with the National Board.

c) The "R", "NR", and "VR Certificate Holder should be aware that some Jurisdictions may require registration of repairs and alterations with the National Board.

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5.5.4 REGISTRATION FOR NUCLEAR REPAIR/REPLACEMENT ACTIVITIES

Organizations performing repair/replacement activities under the "NR" or "NVR" stamp program shall register forms with the National Board.

5.6 ~~FORM "R" LOG~~FORM REGISTRATION LOG

~~The~~ "R", "NR", and "VR" Certificate Holders shall maintain a ~~single~~ log or multiple logs documenting unique and sequentially numbered Form "R" Reports ~~(e.g., R-1, R-2, and R-3)~~ that are registered with the National Board. The logs shall include, as a minimum, form type (R-1, R-2, NR-1, etc.), description of work performed, date completed, and date report sent to the National Board.

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

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

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

Best Regards,

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

NATIONAL BOILER SERVICE, INC.

Weld Build Up Research

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

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

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

The Following Welding Processes were used:

- GTAW (TIG) - 3/32" Filler Metal
- SMAW (Stick) - 3/32" Filler Metal
- GMAW (MIG) (Hard Wire) - .035" Bare Wire Filler Metal

Note: The tubes must be cleaned thoroughly before welding.

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

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

Welding Terms:

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

Base Metal Designations and Terms:

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

Conclusion

From this research, It is our opinion, the GTAW (TIG) process, is not recommended to perform Weld Build Up on P1, P3, P4 or P5 base metals that are below .100" thick. Burn-thru and melt-thru is virtually inevitable.

The GMAW (MIG) process (downhill progression with .035 Wire Size) can be used to Perform Weld Build Up on Tubes as thin as .080" thick, with minimal melt-thru or burn thru.

For stainless base metals (P8), it is not good practice or recommended to perform Weld Build Up on base metals that are below .120" thick. Extreme oxidization (Sugaring) virtually cannot be avoided on the Inside diameter of the tube where no backing or shielding gas is utilized.

Steve Harville
Corporate Quality Control Manager

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

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

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

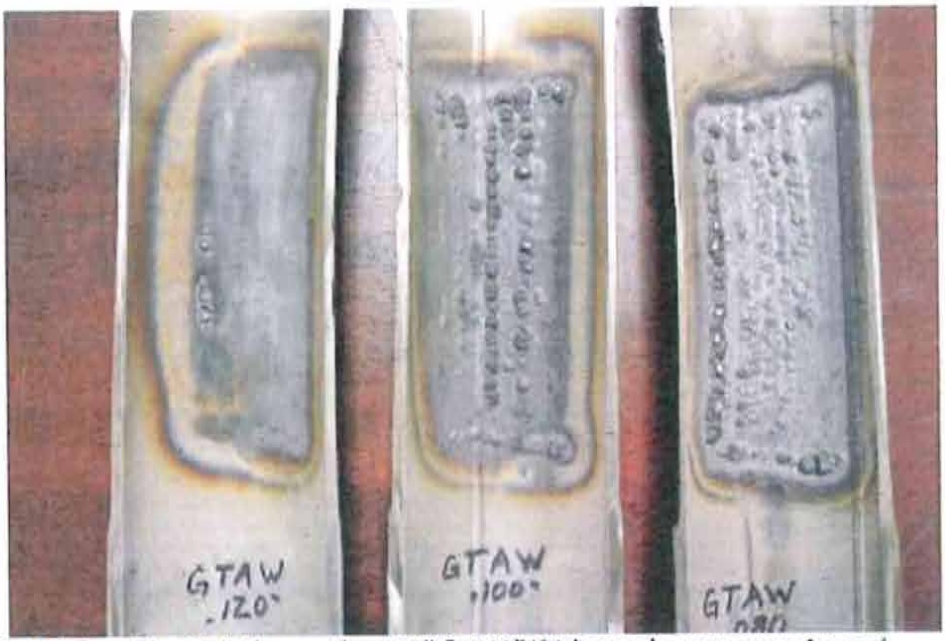
OD: Carbon Steel (P1), *GTAW (TIG) process with E 70 S2 - 3/32"* was used on these samples. The Weld Progression was Uphill. On all 4 of these samples the Welder Melted-thru the base metal, as the samples got thinner, the Melt-thru was more frequent and excessive.

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

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

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

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



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

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

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

Item NB15-1403 Rev 10

NBIC Part 3 PROPOSED SUPPLEMENT

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Supplement X

WELD AND POST REPAIR INSPECTION OF CREEP STRENGTH ENHANCED FERRITIC STEELS

SX.1 SCOPE

The technical information provided in this supplement pertains to weld repair and post repair inspection of ~~heavy wall~~ creep strength enhanced ferritic steel (CSEF) pressure retaining items. This Supplement provides guidance for full penetration and partial penetration weld repairs not covered under Welding Method 6 (2.5.3.6).

Creep Strength Enhanced Ferritic alloys (CSEF's) are a collection of ferritic steels whose creep strength is enhanced by the creation of a precise condition of micro-structure, specifically martensite or bainite, which is stabilized during tempering by controlled precipitation of temper-resistant carbides, carbo-nitrides, or other stable and/or meta-stable phases. Careful consideration shall be given to pressure-retaining items that are fabricated from CSEF's. The behavior of these materials in low temperature (i.e. fracture toughness and/or fatigue) and in high temperature (i.e. creep and/or creep-fatigue) components can be degraded by not adhering to the welding procedures and improper application of post-weld heat treatment (PWHT).

Post Construction access and in-service operation may not allow the practicable application of PWHT following original construction fabrication requirements and repair weld joint design. This supplement provides guidelines for weld repair options and post repair inspection using a well-engineered approach for CSEF steels. The user is cautioned to seek technical guidance for welding and selection of heat treating requirements.

SX.2 WELD REPAIR OF GRADE 91 STEEL

SX.2.1 Weld Repair Options

SX.2.1.1 9Cr-1Mo-VNbN Filler Metal (i.e. matching to Grade 91) + Controlled Fill + Low PWHT (Minimum temperature is 1250°F, 675°C). Acceptable filler materials are referenced in Table 1. The minimum time and maximum heat treatment temperature shall be in accordance with the original code of construction. For reference, where the Ni+Mn content of the filler metal *is not*

known, the maximum PWHT temperature shall be 1425°F (775°C). As general best practice, this maximum should be enforced to avoid over-tempering or exceeding the absolute maximum PWHT temperature. PWHT hold times at temperature shall be as follows;

a. Minimum holding time at PWHT temperature is specified as 1 hour per 1.0 inch (25 mm) of thickness, 30 minute minimum provided the component < 0.5 inches (12.5 mm) in thickness;

b. Minimum holding time at PWHT temperature is specified as 5 hours plus 15 minutes for each additional 1.0 inch (25 mm) over 5.0 inches (125 mm);

SX.2.1.2 9Cr-1Mo Filler Metal + Controlled Fill and No PWHT. Acceptable filler materials are detailed in Table 1.

SX.2.1.3 Ni-base Filler Metal + Controlled Fill and No PWHT. Acceptable nickel base consumables include selected ASME F No. 43 filler metals as detailed in Table 1.

Table 1. Alternative Weld Repair Methods, Filler Metals and Welding Processes for Grade 91 Steel.

Acceptable Weld Repair Method		Welding Process and Filler Metal AWS Classification
Filler Metal	**Welding Procedure**	
Matching (9Cr-1Mo-VNbN)	Controlled Fill + Low PWHT	• SMAW – E9015-B9, E9016-B9, E9018-B9 or E9015-B91[Δ], E9016-B91[Δ] or E9018-B91[A] • FCAW – E91T1-B9 or E91T1-B91[Δ] • GTAW – ER90S-B9 or ER90S-B91[A]
9Cr-1Mo	Controlled Fill	• SMAW – E8015-B8, E8016-B8 or E8018-B8 • FCAW – E81T1-B8 • GTAW – ER80S-B8
Ni-base	Controlled Fill	• SMAW – EPRI P87[B], ENiCrFe-2, ENiCrFe-3 • FCAW – None available • GTAW – EPRI P87[C], ERNiCr-3

[A] –B91 AWS classification is pending for the various Grade 91 filler metal product forms (currently –B9)
[B] Incorporated by ASME B&PV Code as Code Case 2734 for classification as an F No. 43 filler material
[C] Incorporated by ASME B&PV Code as Code Case 2733 for classification as an F No. 43 filler material

SX.2.2 Application of Controlled Fill Welding Procedure

SX.2.2.1 The minimum preheat for the repair procedure shall be 300 °F (150 °C). The preheat temperature shall be checked to ensure the minimum preheat temperature is maintained during all welding and until welding is completed. The maximum interpass temperature shall be 550 °F (290 °C). At the completion of welding, a post weld hydrogen bake-out is not required nor prohibited.

SX.2.2.2 In general, to control heat input, it is recommended to weld the repair groove using a "controlled fill" technique. In this technique, the first layer in contact with the repair groove can be identical or smaller in diameter than the fill passes, as shown in Figure 1.

SA2.2.3 Figures 2 through 4 illustrate the various types of recommended weld joint details using the controlled fill technique for full penetration weld repairs.

SX.2.2.43 The bead-to-bead overlap should be ~50% or greater. The fill passes should be deposited working from the bevel towards the center of the excavation with a minimum overlap of 25% and ideally 50%. As a rule of thumb, if the welder aims for the toe of the previously deposited weld bead, an overlap of at least 40% will be achieved.

SX.2.2.54 When the SMAW process is specified using ferrous filler metals for an initial fill pass layer as a controlled fill welding technique, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm), as shown in Figure 1. The remaining passes to fill this excavation using this technique and SMAW process are limited to an electrode diameter of 5/32 in. (4.0mm). When the GTAW process is specified, any limits for filler metal size shall be reflected in the qualified PQR and WPS.

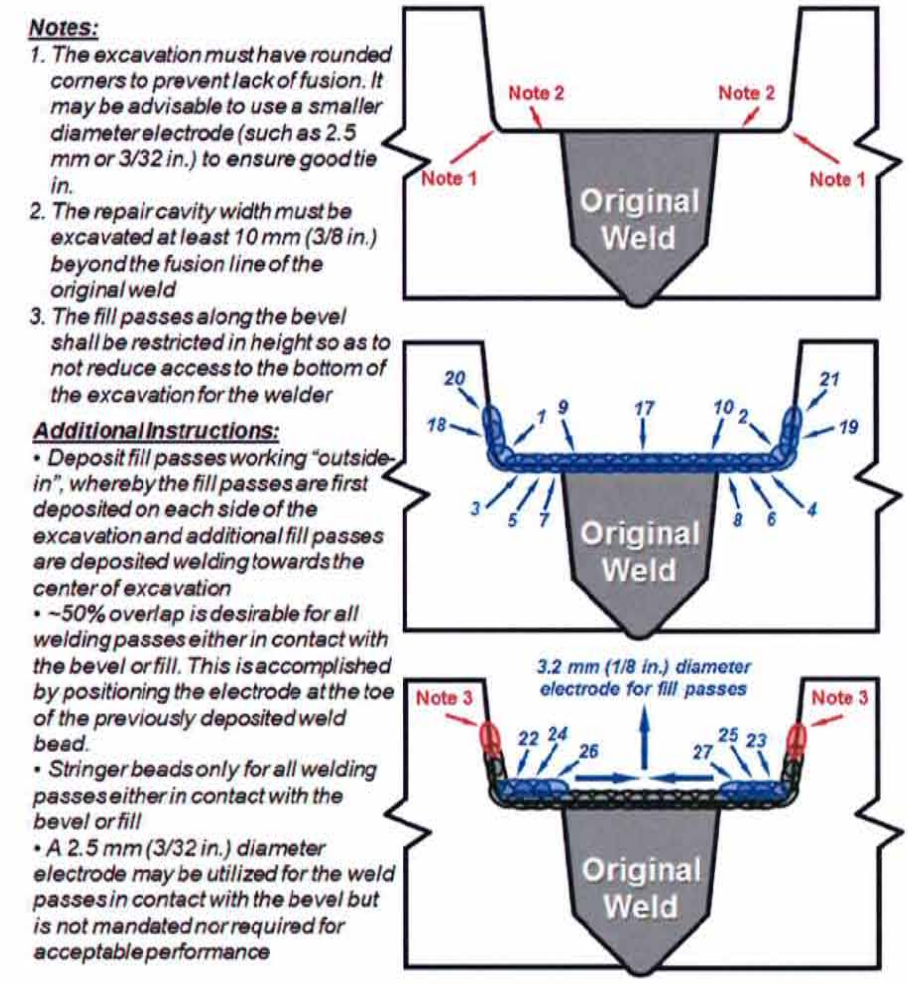
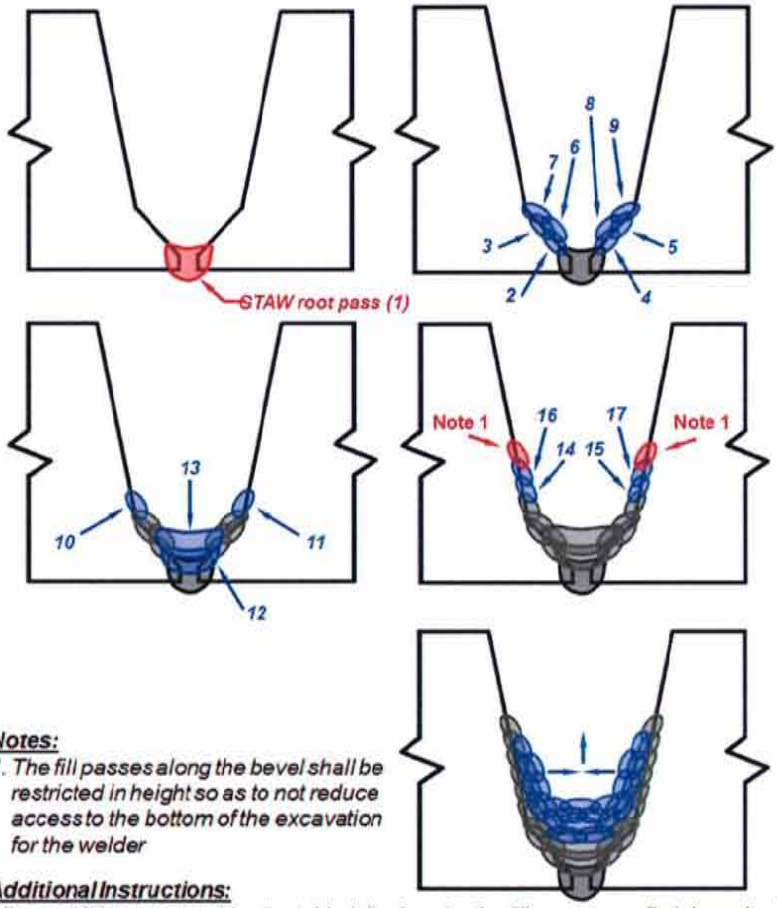


Figure 1. Schematic of the Controlled Fill Welding Procedure for Grade 91 Steel for a Partial Penetration Weld Repair ~~of a Circumferential Girth Weld~~.



Notes:

1. *The fill passes along the bevel shall be restricted in height so as to not reduce access to the bottom of the excavation for the welder*

Additional Instructions:

- *Deposit fill passes working "outside-in", whereby the fill passes are first deposited on each side of the excavation and additional fill passes are deposited welding towards the center of excavation*
- *~50% overlap is desirable for all welding passes either in contact with the bevel or fill. This is accomplished by positioning the electrode at the toe of the previously deposited weld bead.*
- *Stringer beads only for all welding passes either in contact with the bevel or fill*
- *A 2.5 mm (3/32 in.) diameter electrode may be utilized for the weld passes in contact with the bevel but is not mandated nor required for acceptable performance*

Figure 2. Schematic of the Controlled Fill Welding Procedure for Grade 91 Steel for a Full Penetration Weld Repair Using a Compound Bevel.

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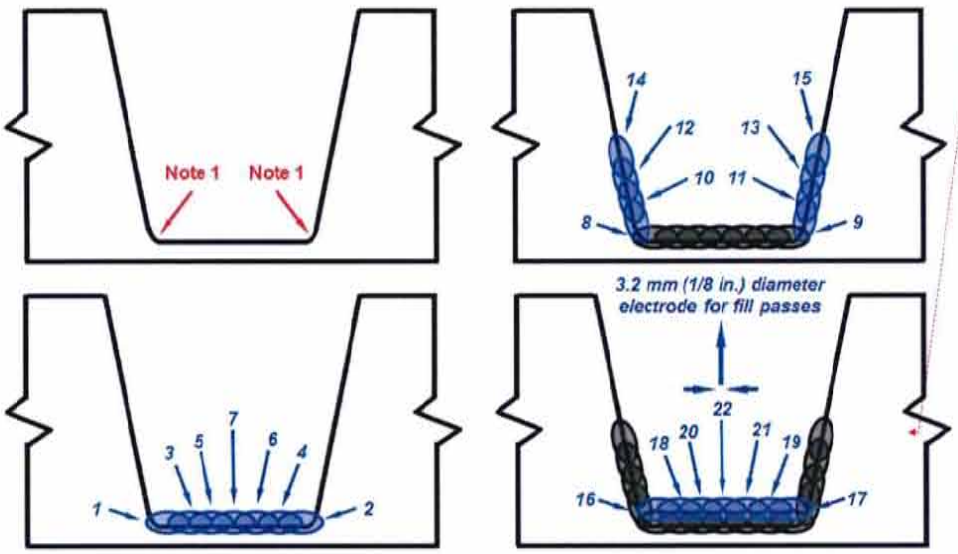

Notes:

1. The excavation must have rounded corners to prevent lack of fusion. It may be advisable to use a smaller diameter electrode (such as 2.5 mm or 3/32 in.) to ensure good tie in.

Additional Instructions:

• Deposit fill passes working "outside-in", whereby the fill passes are first deposited on each side of the excavation and additional fill passes are deposited welding towards the center of excavation

• ~50% overlap is desirable for all welding passes either in contact with the bevel or fill. This is accomplished by positioning the electrode at the toe of the previously deposited weld bead.

• Stringer beads only for all welding passes either in contact with the bevel or fill

• A 2.5 mm (3/32 in.) diameter electrode may be utilized for the weld passes in contact with the bevel but is not mandated nor required for acceptable performance

Figure 3. Schematic of the Controlled Fill Welding Procedure for Grade 91 Steel for Full Penetration Weld Repair Using a Land.

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Notes:

1. *The excavation must have rounded corners to prevent lack of fusion. It may be advisable to use a smaller diameter electrode (such as 2.5 mm or 3/32 in.) to ensure good tie in.*
2. *The repair cavity width must be excavated at least 10 mm (3/8 in.) beyond the fusion line of the original weld*
3. *The fill passes along the bevel shall be restricted in height so as to not reduce access to the bottom of the excavation for the welder*

Additional Instructions:

- *Deposit fill passes working "outside-in", whereby the fill passes are first deposited on each side of the excavation and additional fill passes are deposited welding towards the center of excavation*
- *~50% overlap is desirable for all welding passes either in contact with the bevel or fill. This is accomplished by positioning the electrode at the toe of the previously deposited weld bead.*
- *Stringer beads only for all welding passes either in contact with the bevel or fill*
- *A 2.5 mm (3/32 in.) diameter electrode may be utilized for the weld passes in contact with the bevel but is not mandated nor required for acceptable performance*

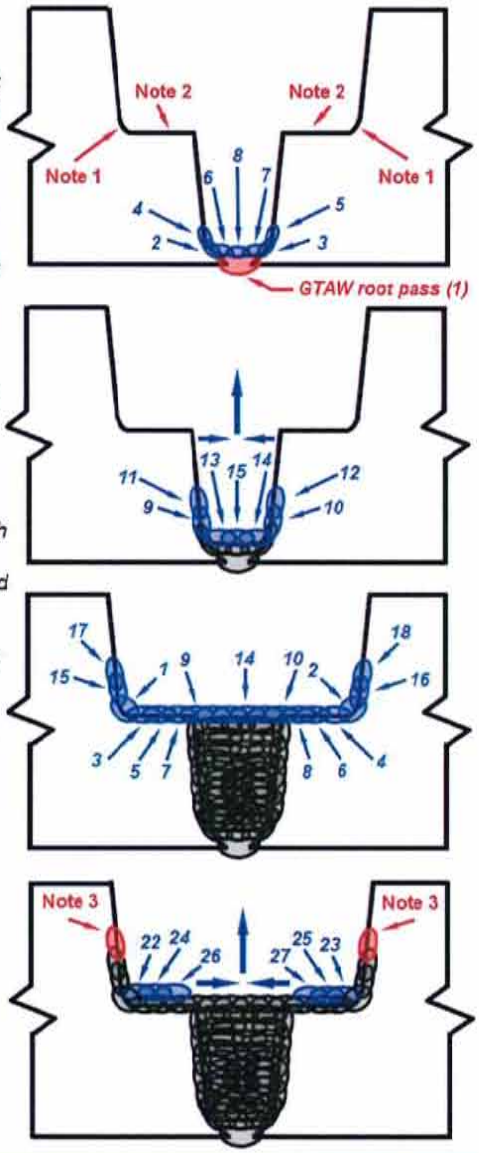

Figure 4. Schematic of the Controlled Fill Welding Procedure for Grade 91 Steel for a Full Penetration Weld repair Using a Step Weld Preparation.

SX.2.3 Qualification of Controlled Fill Welding Procedure

SX.2.3.1 The test material for the welding procedure qualification shall be P-No 15E, Group 1, Grade 91.

SX.2.3.2 Qualification thickness for the test plates and repair groove depths shall be in accordance with ASME Section IX.

SX.2.3.3 The Welding Procedure Specification (WPS) shall be qualified in accordance with requirements of ASME Section IX. If qualifying the WPS with PWHT, the PWHT is to be low temperature PWHT, i.e., a minimum temperature of 1250 deg F (675 deg C) and a maximum temperature of 1445 deg F(785 deg C).

SX.2.3.4 For qualification of weld repair procedures using 9Cr-1Mo filler metal and in the as-welded condition, the requirements for the bend test shall be performed using a bend radius which achieves a minimum of 14% elongation in the outer fibers.

SX.3 POST REPAIR INSPECTION

X.3.1 After the completion of weld repairs to CSEF steels, post inspection requirements shall be developed and implemented based on acceptance from the Inspector, and if applicable, the Jurisdiction.

X.3.2 Post-repair i~~I~~nspection ~~method and~~ intervals and methods of examination shall be implemented to ensure safe operation and margin to locate and monitor defect growth in the weld repair~~ed~~ area~~s~~. The selected non-destructive examination method ~~evaluation method~~ shall provide meaningful results and shall follow NBIC Part 3, Section 4.~~concerning the integrity of the repair weld~~.

X.3.3 Post repair inspection shall be on-going until the component reaches end of life or is replaced. A recommended re-inspection interval is every other planned major outage or six years, whichever is less. The Owner/User may revise the re-inspection interval based on inspection results from previous inspections.

For NBIC Committee use only

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Update on On-going EPRI Research Supporting the Proposed Welding Supplement, Item 15-1403

John A. Siefert
Senior Technical Leader

National Board Inspection Code Meetings
January 12-14th, 2016, Corpus Christi, TX

Outstanding Reservations Regarding the Approval of Alternative Weld Repair Techniques for Grade 91 Steel

- Qualification of procedures
- End-use application to provide reasonable case studies and "weld repair exemplars"
- Comments from an involved NBIC participant and member

Alternative Weld Repair Method		Welding Process and AWS Classification for Acceptable Filler Metals
Filler Metal	Procedure	
Matching (9Cr-1Mo-VNbN)	Controlled Fill + Low PWHT	• SMAW – E9015-B9 or E9015-B91[A] • FCAW – E91T1-B9 • GTAW – ER90S-B9 or ER90S-B91[A]
9Cr-1Mo	Controlled Fill	• SMAW – E8015-B8 • FCAW – E81T1-B8 • GTAW – ER80S-B8
Ni-base	Controlled Fill	• SMAW – EPRI P87[B], ENiCrFe-2[C], ENiCrFe-3[D] • GTAW – EPRI P87[E], ERNiCr-3[F]

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A Summary of Recent Group Qualifications for Alternative Weld Repair Procedures in Grade 91 Steel

Composition of Welding Consumables

Material	C	Mn	P	S	Si	Ni	Cr	Mo	Others
E9015-B9 ER90S-B9	0.090	0.61	0.008	0.005	0.20	0.31	8.50	1.06	N, Nb, N
E8015-B8 ER80S-B8	0.056	0.77	0.006	0.003	0.35	0.26	9.56	1.02	
Ni-base[1] (e.g. ENiCrFe-3)	0.053	6.36	0.009	0.004	0.44	66.0	16.4		Fe, Nb, Ti

[1]Note: Ni-base may include other filler materials such as ERNiCr-3, ERNiFeCr-4, ENiCrFe-2 or ENiFeCr-4. There are subtle details in the composition for each of these filler materials and they should not always be regarded as "equivalent"

Recent Welding Qualifications

- During the week of October 25th, 40 project members witnessed a total of **20 weld procedures** in Grade 91 steel using **alternative weld procedures** outlined by **Welding Method 6** and by the **proposed Welding Supplement**
- **All procedures** were **qualified** in the **as-welded** condition
- There were **no defects** (bends or tensile tests) **which failed a single procedure**. Thus, all procedures were qualified to the language in ASME B&PV Code Section IX and the revision for bend testing thick-section coupons manufactured from procedures welded with ER80S-B8 or E8015-B8
  - In the case of **thick-section qualifications for ER80S-B8 and E8015-B8** the **bend test radius** was **reduced to 14%** (from 20%) and per guidance in the proposed Welding Supplement

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Recently Qualified Procedures – Thin Section (3/8 inch plate and No PWHT)

P15E = Grade 91, P5A = Grade 22, P8 = SS304H

PQR No.	Material 1	Material 2	Filler Metal (Process)	Qualified Thickness
PQ15-0390	P15E	P15E	ER80S-B8 (GTAW)	1/16 to 3/4 inches
PQ15-0391	P15E	P5A		
PQ15-0392	P15E	P8		
PQ15-0393	P15E	P15E	E8015-B8 (SMAW)	
PQ15-0394	P15E	P5A		
PQ15-0395	P15E	P8		
PQ15-0400	P15E	P15E	ERNiCr-3 (GTAW)	
PQ15-0401	P15E	P5A		
PQ15-0402	P15E	P8		
PQ15-0403	P15E	P15E	ENiCrFe-2 (SMAW)	
PQ15-0404	P15E	P5A		
PQ15-0405	P15E	P8		

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EPRI ELECTRIC POWER RESEARCH INSTITUTE

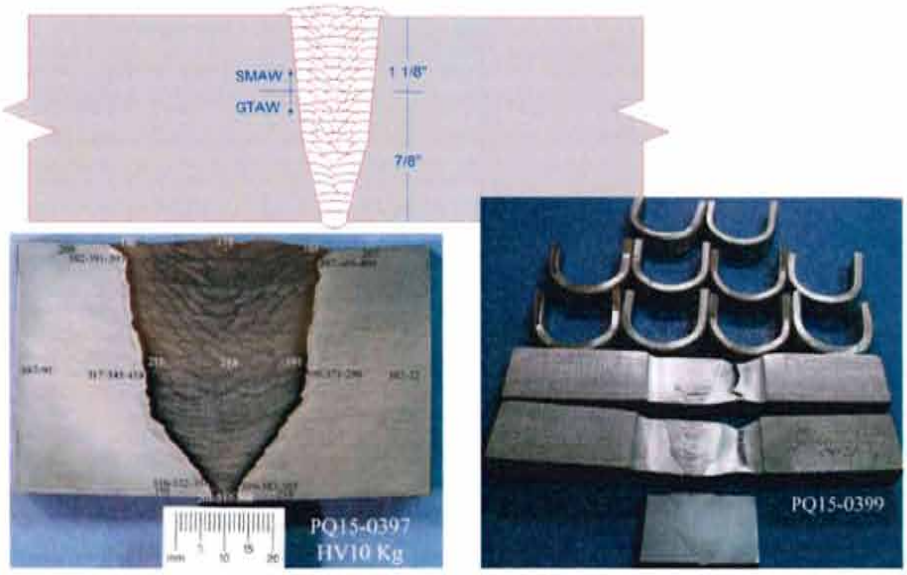
Recently Qualified Procedures – Thick Section (2 inch plate and No PWHT)[1]

P15E = Grade 91, P5A = Grade 22, P8 = SS304H

PQR No.	Material 1	Material 2	Filler Metal	Process	Qualified Thickness
PQ15-0396	P15E	P15E	ERNiCr-3	GTAW	3/16 to 8 inches
			ENiCrFe-2	SMAW	
PQ15-0397	P15E	P5A	ERNiCr-3	GTAW	
			ENiCrFe-2	SMAW	
PQ15-0398	P15E	P15E	ER80S-B8	GTAW	
			E8015-B8	SMAW	
PQ15-0399	P15E	P5A	ER80S-B8	GTAW	
			E8015-B8	SMAW	

[1]Note: Thick-section qualifications to stainless were omitted because there is not *yet* a widespread application of thick-section application of Grade 91 pipe to stainless steel pipe in the power generation industry

Evaluation of Thick-section Qualification



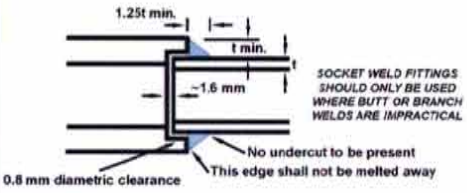
A Summary of Applications of Alternative Weld Repair Procedures for Grade 91 Steel

There is Continuing Support for Well-Engineered, Alternative Weld Repairs in Gr. 91 Steel – One End-User's Application within the Last 6 Months

- **Thermowell replacement** (1.5 inch); threaded connection; with **seal weld** using both **Ni-base and –B8 (no PWHT)**
  - *For <1020°F (550°C), -B8 only*
- **HRSG drain value** replacements (≤ 2 inch); **socket weld** connection; repairs using both **Ni-base and –B8**
  - *For <1020°F (550°C), -B8 only*
- **Temperature element weld pad attachment**; pad attached to the OD of pipe; **fillet weld** repair using **–B8**
- **HRSG superheater stub tube** replacement (2 inch OD); **tube to tube** and **tube to header** with **Ni-base**
- **Drain pot level control** instrument adapter **fitting** (1.5 inch); **socket weld** with **Ni-base**
  - *For <1020°F (550°C), -B8 only*

A Second Example of a Small Bore Repair (previously discussed)

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



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

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A Third Example of a Small Bore Repair (previously discussed)

- 24" Reheat valve drain line failure in an HRSG unit (1000°F, 600 psi); 304H drain line welded to Grade 91 valve body
- Specific issues with existing repair approach:
  - Use of a "bullet" PWHT is NOT a good idea
  - PWHT of the valve and/or band around the area can compromise the internals, or more time to remove the internals and hope you don't fry the seat....
  - PWHT is time consuming, perhaps technically inadvisable, and expensive.
- Approach, local repair with GTAW and ENiCr-3 (Filler Metal 82) using a socket/fillet weld and left in as-welded condition
  - Goal: bridge gap to "permanent fix" in 2016 when all SS lines will be replaced with Grade 91
  - Very similar to RWE approach detailed previously

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And a Well-Publicized Through-thickness Repair

- *TVA used EPRI guidelines (3002003833) for alternative weld repairs for Gr. 91 steel*
- Inspection at first outage did not find defects associated with weld repair and the weld continues to operate
  - Eliminated PWHT (risk of over-tempering, mal-PWHT and damage to the valve)
  - Eliminated the cost of PWHT (~$5k USD savings)
  - Reduced outage time (3 days)
  - **Estimated cost savings from outage time alone is ~$1 million USD**

For more information: *TVA Applies an Alternative Well-Engineered Weld Repair Method for Grade 91 Steel*. EPRI. Palo Alto, CA: 2014. 3002006394.

World's first application of an alternative weld repair procedure in Gr. 91 steel using E8015-B8 filler metal

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And the World's First Documented use of Welding Method 6 (AEP Cardinal Unit 1)

- State of Ohio approved application of WM6 in February 2015
- Initial issues with qualification of welders (added requirements imposed by State included RT and bend tests)
- Specific issues with existing repair approach:
  - Weld with matching filler metal
  - Perform PWHT
  - Perform Radiography
  - Move to next tube
- 7 total applications in SA-213 T91 reheater tube (2.0 inch X 0.165 inch) yielding 14 total WM6 repairs, operating at 550°C (1020°F) and 6.5 MPa (950 psi); all repairs performed in month of May
  - Goal: Bridge the gap to component replacement in Fall 2015
- **Days of outage time were avoided**
- Tubes at EPRI for analysis

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EPRI

Weld Repair Tracking Sheet – Page 1

Unit Name (Note: will not be issued in the report – for tracking only)		
Unit Type/Size		
Unit Operation Details	**Hours (at time of repair)**	
	Starts (at time of repair)	
	Operating Pressure *(nearest measured value)*	
	Operating Temperature *(nearest measured value)*	
Component Details (specifically the one being repaired)	**Type of Component** *(valve, casing, pipe, etc.)*	
	Approximate metal thickness near damage	
	Material	
	Specification	

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Weld Repair Tracking Sheet – Page 1

Damage Details	**What type of damage?** (image available?)	
	Damage detection? *(NDE, boat sample, etc.)*	
	Was it decided to excavate and repair the damage?	
	What was the magnitude of the damage? *(length, depth)*	
	How was damage excavated? *(arc-gouging, machining, grinding, etc.)*	
	Was the chemistry of the base material verified? *(If so, can this be provided?)*	
Welding Procedure	**How was the repair tracked and/or documented?**	
	Welding Process *(SMAW, GTAW, FCAW, etc.)*	
	Filler Material *(AWS specification, if known)*	
	Preheat/Interpass	
	What Welding Method was used?	

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Weld Repair Tracking Sheet – Page 2

Post Weld Heat Treatment	**Was PWHT conducted?**	
	What standard was invoked? *(AWS D10.10, D10.22 or similar)*	
	Temperature or Range	
	Heating rate	
	Cooling Rate	
NDE and Acceptance	**Was NDE conducted during Welding?** *(What methods and after which layer(s) or thickness(es))?*	
	What method was utilized for final NDE inspection?	

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EPRI

Weld Repair Tracking Sheet – Page 2

Describe any issues reported during or following the weld repair and other pertinent information:		
Post Repair	**Did re-cracking occur in the weld repair?**	
	If re-cracking did occur, after how many hours of operation?	
	How was (or is) re-cracking being addressed?	
	Were any operational changes made, such as a decrease in the operating temperature?	

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Tracking of Innovative Repairs once Implemented is a Key, on-going Exercise

- The importance of databases and sharing information cannot be understated
- There have been ~dozen known applications of Alternative Weld Repair of Grade 91 Steel and these end-users are being asked to track and fill out the database form
- EPRI will then monitor and track these repairs for the foreseeable future and when opportunity arises examine ex-service repairs

A Summary of Recent Comments for Negative Ballot on the Welding Supplemental – Examples of Continued Feedback

Comment 1 (Integrity of Alternative Repairs)

- *"When is it not possible to perform PWHT on thick section pipe welds?*
- *Why allow non-PWHT repairs for pipe welds?*
- *Allowing these repairs in pressure parts that are external to the boiler enclosure moves them to where subsequent leakage and failure present a personnel hazard and thus a heightened safety concern compared to the repair Method 6. This is further complicated by the fact that no one knows what effect an unstress relieved repair has on remaining creep life of the component, especially when the repair is made in material that has had some of its creep life already exhausted. Does NBIC really want to take on that risk? It is reasonable to assume that thicker welds like addressed here can be subjected to a PWHT after repair."*

EPRI Response to Comment 1

- *"When is it not possible to perform PWHT?"*
- **EPRI Response:**
  - **There are practical limitations;** complex components, thick to thin transitions; inability to use a preferred vendor
  - **There are commercial limitations;** unexpected identification of damage late in an outage, a forced outage in peak season, etc.
- To the second part of the question generally questioning the integrity of the approach, **EPRI Response:**
  - The use of alternative weld repair procedures is not a mandatory requirement. Thus, there are cases where end-users or vendors may elect to not use these procedures.
  - In cases where end-users do elect to perform alternative weld repair:
    - Well-engineered approach (i.e. familiarity with 3002003833)
    - Case by case, component-specific
    - Recognition of the importance to database repairs

EPRI Response to Comment 1

- *"Allowing these repairs in pressure parts that are external to the boiler enclosure moves them to where subsequent leakage and failure present a personnel hazard and thus a heightened safety concern compared to the repair Method 6… Does NBIC really want to take on that risk?"*
- **EPRI Response:**
  - The commenter has raised a concern regarding "Damage Tolerance"
  - **Damage tolerance is not a function of PWHT.** In fact, PWHT does not "magically" induce damage tolerance in a component
  - Damage tolerance is function of:
    - Base metal risk factors
    - Design of the component (i.e. mechanical notches)
    - Design of the weldment (i.e. aligned metallurgical notch in the form of a HAZ)
  - As detailed in 3002003833, a well-engineered repair can actually promote a degree of damage tolerance in the repair that is not inherent to as-fabricated welds and regardless of the applied PWHT

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Comment 2 (Structure of Supplement)

- *"The proposal should be incorporated as an Alternative Welding Method. The title of paragraph 2.5.3 would need to be modified since it states "Without Postweld Heat Treatment" and SX.2.1 of this proposal requires a low temperature PWHT. These should this be split into two separate Methods. Or best only allow the low PWHT method as the less risky of the two."*
- **EPRI Response:** Again, PWHT has nothing to do with "risk." Risk, as defined by the susceptibility to catastrophic failure in operation, is a function of factors which contribute to the "damage tolerance" of the structure.

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Comparison of Conventional Weld Geometry and Welding Procedures

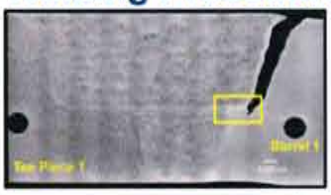
E9015-B9 Filler
PWHT = 1250°F/2h
Aligned failure in Gr. 91 HAZ

E8015-B8 Filler
PWHT = None
Aligned failure in Gr. 91 HAZ

Ni-base Filler
PWHT = None
Aligned failure in Gr. 91 HAZ

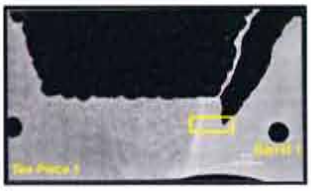
- As shown in the series of cross-weld tests to the left, failure occurred through a rapid linking of micro-damage in the Grade 91 HAZ and independent of whether PWHT was applied. This is because a susceptible region is created in the Grade 91 HAZ by the **welding thermal cycle.** This region is relatively unaffected by a subsequent PWHT resulting in identical behavior for each of the provided examples. **This series of images presents an example for potential safety risk because each examples possesses a weld geometry which does NOT have inherent damage tolerance.**

Comparison of Repair Weld Geometry and Welding Procedures



E9015-B9 Filler
PWHT = 1250°F/2h
Defect in HAZ being propagated through parent material

E8015-B8 Filler
PWHT = None
Defect in HAZ being propagated through parent material

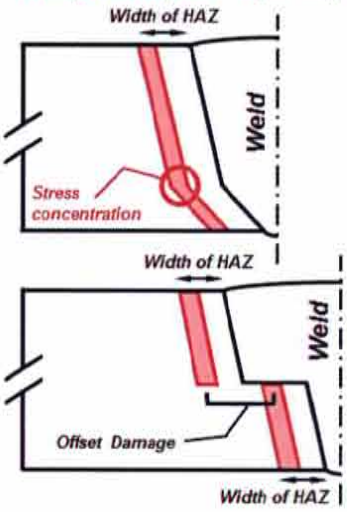


Ni-base Filler
PWHT = None
Defect in HAZ being propagated through parent material

- As shown in the series of cross-weld tests to the left, an initial macro-defect has formed in the HAZ of the repair. However, and unlike the previous examples this defect is being forced to propagate through stronger, more ductile and undamaged parent material. **This series of examples provides an inherent level of safety and promotes the potential for leak-before-break (i.e. damage tolerance).**

Example of Damage Intolerant versus Damage Tolerant Weld Geometries; Independent of the Applied PWHT

Damage Susceptible **Region Highlighted in** *Red*



Conventional Weld Geometries; Not Damage Tolerant

Repair Weld Geometry with better approach for accommodating Damage Tolerance

TVA on Temporary Weld Repair (1985)

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

In reality, the integrity of the repair is not solely a function of PWHT, but of design, damage and procedure

Comment 3 (Additional Limitations)

- *"Consider limiting repairs w/o PWHT to circumferential welds only. This should certainly prohibit repairs w/o PWHT on longitudinal seam welds.*
- *XS.2.1 – Local PWHT at a low temperature of 1250°F with TC's on the pipe O.D. will yield an I.D. temperature of only ~1100°F for thick sections. This isn't an adequate tempering temperature for Gr. 91 PWHT. What is the basis for selecting 1250°F?*
- *How much of the original weld must remain after excavating the damage? Can the proposed repairs be completely through wall? Does this apply to tubes that are larger or thicker than permitted in Method 6?"*

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EPRI Response to Comment 3

- *"Consider limiting repairs w/o PWHT to circumferential welds only…."*
- **EPRI Response:**
  - This is not a practical consideration of the issues that present power plant owner/operators. Where a well-engineered approach is engineered, enforced and utilized there are many components, geometries and material combinations that can be repaired. However, it is imperative that the application of an alternative weld repair approach be addressed on a case-by-case basis and on a component basis.
  - Thus, it is NOT the EPRI position to disallow specific applications until sufficient evidence is present which supports this position (see previous, successful applications of alternative weld repairs in a variety of components/geometries/etc.)

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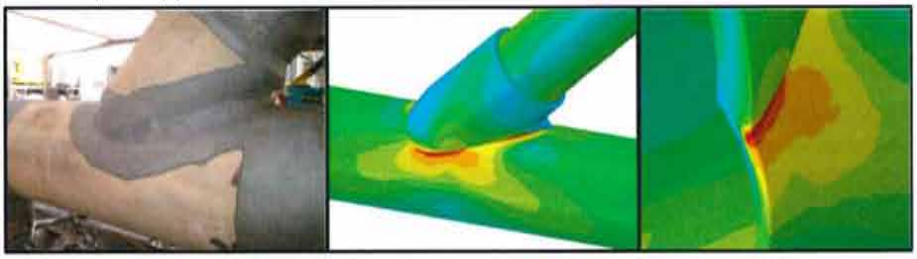
EPRI Response to Comment 3

- *"…This should certainly prohibit repairs w/o PWHT on longitudinal seam welds."*
- **EPRI Response:**
  - **Where end-users have subcritically PWHT longitudinal seam-welds or welded fittings like laterals/wyes/tees/branches the EPRI position is that these should be replaced**
  - However, lead time for replacement components is often on the order of 2 or 4 years. It is not practical to force a shutdown of the plant for this timeframe. Thus, a "temporary" repair and/or using a "minor" repair approach should be allowed



EPRI Response to Comment 3

- *"XS.2.1 – Local PWHT at a low temperature of 1250°F with TC's on the pipe O.D. will yield an I.D. temperature of only ~1100°F for thick sections. This isn't an adequate tempering temperature for Gr. 91 PWHT. What is the basis for selecting 1250°F?"*
- **EPRI Response:**
  - Please see position paper which explains this and other points:
    - *A Well-Engineered Approach for Establishing the Minimum Allowable Post Weld Heat Treatment for Power Generation Applications of Grade 91 Steel.* EPRI, Palo Alto, CA: 2015. 3002005350. **[Free]**
    - And also this report:
      - *Supporting Data for Reducing the Minimum Allowable Post Weld Heat Treatment for Power Generation Applications of Grade 91 Steel.* EPRI, Palo Alto, CA: 2015. 3002006757. **[Restricted]**

EPRI Response to Comment 3

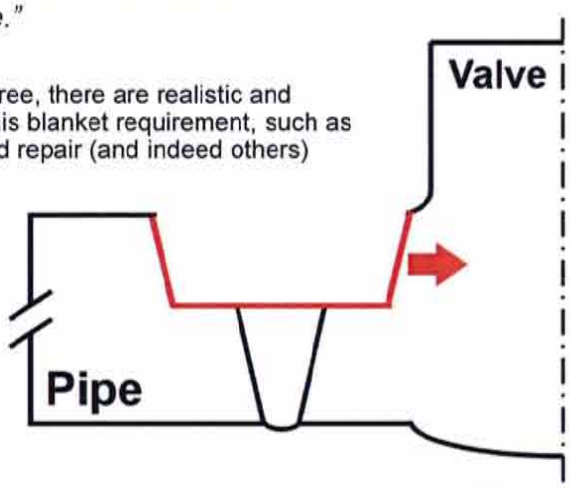
- *"How much of the original weld must remain after excavating the damage? Can the proposed repairs be completely through wall? Does this apply to tubes that are larger or thicker than permitted in Method 6?"*
- **EPRI Response:**
  - The proposed NBIC Welding Supplement should cover all excavations – full, partial or minor. The ultimate excavation needs to be left to owner/operator to engineer and/or address considerations which may or may not facilitate a particular excavation.
  - See TVA example of two full penetration repairs using E8015-B8 and no PWHT
  - To be addressed in more detail in Comment 4 response

Comment 4 (Defect Removal)

- *"Consider adding a requirement to remove the HAZ on both sides of the weld for the depth of the repair. EPRI work supports that will be beneficial to remaining weldment life.*
- *It's not clear that standard temp PWHT, Low temp PWHT, and no PWHT each require separate welding qualifications. They should be separately qualified."*

EPRI Response to Comment 4

- *"Consider adding a requirement to remove the HAZ on both sides of the weld for the depth of the repair. EPRI work supports that will be beneficial to remaining weldment life."*
- **EPRI Response:**
  - While in principle we agree, there are realistic and practical limitations to this blanket requirement, such as a pipe to valve girth weld repair (and indeed others)
  - There are scenarios where "minor" repairs can be expected to operate safely and under a reasonable expectation that these types of welds are replaced at some definite point in the future or are routinely inspected



EPRI Response to Comment 4

- *"It's not clear that standard temp PWHT, Low temp PWHT, and no PWHT each require separate welding qualifications. They should be separately qualified."*
- **EPRI Response:**
  - For no PWHT requirements this statement is absolutely correct (see previously detailed, qualified welding procedures without PWHT). For "low PWHT" procedures, these are already covered under existing PWHT qualifications. See QW-407.1 (a):
  - **"QW-407.1** A separate procedure qualification is required for each of the following:
    - *(a)* For P-Numbers 1 through 6 and 9 through 15F materials, the following postweld heat treatment conditions apply:
      - *(1)* no PWHT
      - ***(2)* PWHT below the lower transformation temperature**
      - *(3)* PWHT above the upper transformation temperature (e.g., normalizing)
      - *(4)* PWHT above the upper transformation temperature followed by heat treatment below the lower transformation temperature (e.g., normalizing or quenching followed by tempering)
      - *(5)* PWHT between the upper and lower transformation temperatures"

Comment 5 (NDE)

- *"The recommended inspection interval is too long and conflicts with NBIC Part 2 4.4.7.*
- *Consider reducing maximum inspection interval from 6 years to 3 years or every other major outage, whichever is less. No one has any quantitative idea of how remaining creep life is affected by the repair, thus NBIC guidelines on basing inspection intervals on estimated remaining life cannot be accomplished. Inspection intervals should thus be made shorter than the 5 years recommended in Part 2.*
- *Requirement to NDE excavated weld cavity and the completed repair should be made mandatory, and an acceptance criteria supplied. As a minimum, no linear indications should be allowed."*

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EPRI Response to Comment 5

- **EPRI Response:**
  - For a requirement like NDE, we will defer to the NBIC. Our preference is that the inspection means used be capable of identification of linear defects which possess lengths of at least 3.2 mm (1/8 inch) based on our damage tolerance calculations for hydro-testing.
  - Secondly, as part of best practice, we would generally recommend follow-up inspection of repair welds after the next outage following the repair to re-examine the repair location. Should the repair exhibit no damage and/or no propagation of identified defects which are <3.2 mm (1/8 inch) follow-up inspections should be left to the inspector and owner/operator. Agreement may be reach whereby the weld repair returns to the population of welds subject to random inspection and/or normal protocol specific to the owner/user for inspection of HEP repair welds.

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EPRI to Initiate a series of 2.5 Day Workshops Limited to Members and Invited Individuals

- EPRI is committed to educating its membership and the public to meet its mission statement:
  - See position papers
  - Series of workshops in 2016 (1X) and 2017 (2X) to provide cradle to grave training on life management of 9Cr CSEF steels
  - Aim is to have ~4 workshops on a regional basis (Midwest, Southeast, Texas, United Kingdom)
- First workshop to be hosted by American Electric Power on August 9 to 11 in Columbus, OH;
  - Key invitations to state chief inspectors, insurance agencies and other relevant individuals and limited to ~100 attendees
  - EPRI partnering with industry leaders with regard to inspection guidance and PWHT guidance
  - It must be emphasized that weld repair is but one part of the life management strategy for CSEF steels

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Component Life Management Strategy for Grade 91 Steel (and others)

The overall EPRI recommended approach to Life Management of Complex Components involves:

1. Facilitating **Root Cause Analysis** when problems are encountered and accurate **Technology Transfer**
2. Developing and applying **Purchase Specifications**, which are based on sound science and engineering
3. Guidance on **Quality Assurance** during **Component Manufacture** and **System Fabrication**
4. Supporting **Life Management Plan – when to look, where to look, how to look**
5. Approved procedures for **Repair** and **Replacement**

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Day 1 – ½ Day Introduction

AUGUST 9TH, 2016		
TIME	**TOPIC**	**PRESENTER**
12:45 p.m.	Open Remarks, Welcome and Introduction	***Jonathan Parker, EPRI***
1:00 p.m.	Introduction to Design and Life Management for Creep Strength Enhanced Ferritic Steels	***Jonathan Parker, EPRI***
2:30 p.m.	Break	
3:00 p.m.	Important Considerations regarding Well-Engineered Weld Repair of Creep Strength Enhanced Ferritic Steels	***John Siefert, EPRI***
4:00 p.m.	Weld Repair in AEP – Highlighting the Needs and Magnitude Specific to Creep Strength Enhanced Ferritic Steels	***Mike Crichton, AEP***
5:00 p.m.	**Adjourn**	

Day 2 – Component Specific Considerations in Root Cause, Inspection, Repair and PWHT

AUGUST 10TH, 2016		
TIME	**TOPIC**	**PRESENTER**
8:30 a.m.	Breakfast	
Topic 1 – Alternative Weld Repair Options for Tube Applications		
9:00 a.m.	Common Failure Modes and Complexities	***Jonathan Parker, EPRI***
9:30 a.m.	Proper Inspection Protocol and Techniques	***Ian Perrin, SIA***
10:00 a.m.	Alternative Weld Repair Options and Guidelines	***John Siefert, EPRI***
10:30 a.m.	Break	
11:00 a.m.	Best Practice Guidance for Post Weld Heat Treatment	***Gary Lewis, Superheat FGH***
11:30 a.m.	Technical Discussion on the Complexities Associated with Weld Repair of Tube Applications	***Led by Jonathan Parker, EPRI***
Noon	**LUNCH**	
Topic 2 – Alternative Weld Repair Options for Thick Section Girth Weld Applications		
1:00 p.m.	Common Failure Modes and Complexities	***Jonathan Parker, EPRI***
1:30 p.m.	Proper Inspection Protocol and Techniques	***Ian Perrin, SIA***
2:00 p.m.	Alternative Weld Repair Options and Guidelines	***John Siefert, EPRI***
2:30 p.m.	Break	
3:00 p.m.	Best Practice Guidance for Post Weld Heat Treatment	***Gary Lewis, Superheat FGH***
3:30 p.m.	Technical Discussion on the Complexities Associated with Weld Repair of Thick Section Girth Welds	***Led by Jonathan Parker, EPRI***
4:00 p.m.	Alternative Weld Repair of T91 at AEP Cardinal	***Mike Crichton, AEP***
4:30 p.m.	Additional Alternative Weld Repair Case Studies in CSEF Steels	***John Siefert, EPRI***
5:00 p.m.	**Adjourn**	

Day 3 – Component Specific Considerations in Root Cause, Inspection, Repair and PWHT

AUGUST 11TH, 2016		
TIME	**TOPIC**	**PRESENTER**
8:30 a.m.	Breakfast	
Topic 3 – Alternative Weld Repair Options for Welded Construction (i.e. Laterals, Tees, Wyes, Branches, etc.)		
9:00 a.m.	Common Failure Modes and Complexities	***Jonathan Parker, EPRI***
9:30 a.m.	Proper Inspection Protocol and Techniques	***Ian Perrin, SIA***
10:00 a.m.	Alternative Weld Repair Options and Guidelines	***John Siefert, EPRI***
10:30 a.m.	Break	
11:00 a.m.	Best Practice Guidance for Post Weld Heat Treatment	***Gary Lewis, Superheat FGH***
11:30 a.m.	Technical Discussion on the Complexities Associated with Welded Construction	***Led by Jonathan Parker, EPRI***
Noon	**LUNCH**	
Topic 4 – Alternative Weld Repair Options for Small Bore Applications (i.e. Stub to Header, Drain lines, etc.)		
1:00 p.m.	Common Failure Modes and Complexities	***Jonathan Parker, EPRI***
1:30 p.m.	Proper Inspection Protocol and Techniques	***Ian Perrin, SIA***
2:00 p.m.	Alternative Weld Repair Options and Guidelines	***John Siefert, EPRI***
2:30 p.m.	Break	
3:00 p.m.	Best Practice Guidance for Post Weld Heat Treatment	***Gary Lewis, Superheat FGH***
3:30 p.m.	Technical Discussion on the Complexities Associated with Small Bore Applications	***Led by Jonathan Parker, EPRI***
4:00 p.m.	Weld Repair in AEP – Corporate Strategy for Implementing Alternative Weld Repair Techniques	***Mike Crichton, AEP***
5:00 p.m.	**Adjourn**	

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Summary

- ~~Qualification of procedures~~
  - 20 procedures and in the as-welded condition for –B8 and Ni-base consumables qualified
- ~~End-use application to provide reasonable case studies and "weld repair exemplars"~~
  - EPRI actively tracking >~dozen applications across multiple components, end-users and procedures
- ~~Initial comments from an involved NBIC participant and member~~
  - EPRI has addressed these comments. Understanding this may not be sufficient to all, there is clearly an opportunity to provide additional comments in the upcoming ballot and EPRI more than willing to provide counter-comment and supporting data/examples.

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Conclusions

- EPRI supports well-engineered, alternative weld repair scenarios that address application on a case-by-case, component-specific basis for 9Cr steels and where PWHT is not mandated
- There is always risk in making welds in high energy piping, regardless of whether PWHT is applied and regardless of the chosen repair process. The goal is always to reduce this risk.

Conclusions – for the Inspector

- Reducing risk – from an inspector standpoint – can include the following guidance/questions:
  - Is the end-user/vendor familiar with Welding Method 6, the proposed NBIC Welding Supplement and EPRI Report 3002003833?
  - Has the end-user/vendor provided a reasonable approach to repair to address identified risks?
  - Is the end-user providing a filled out datasheet to help database the initial set of repairs to EPRI?
  - How has the repair vendor selected welders? And what did the welder procedure qualification entail? And especially for limited access repairs?
  - How is post-repair inspection being handled? Is 100% volumetric inspection being performed? When is the next planned inspection following operation of the repair?

Item 15-1403

Negative Vote Reasoning (The Babcock & Wilcox Company)

- Sub-Group R/A (1-12-16) members Ron Pulliam, Ray Miletti
- Sub-Committee R/A (1-13-16) member Ray Miletti
- NB Main Committee (1-14-16) member Ron Pulliam

The reasons for the negative vote by B&W are based on the respective points noted below. The first comment is what B&W considers as a high level concern, followed by comments regarding technical reasons and finally by more general comments and observations. (please pardon any redundancies, as many people contributed to this document):

1. With so many unknowns (no guidance for a repair that is 'half' excavated, no limitation to the amount of weld metal deposited, and no limitation to the thickness or even guidance for CSEFs other than Grade 91), and the "permission" to perform on a "case by case basis" B&W is concerned about the position the AI and the Jurisdiction is being put into. If these guidelines were to become a supplement, even if only intended as "guidance", it will likely become a prime consideration in every possible repair scenario due to the potential cost savings. The AI's and Jurisdictions will be faced with a difficult decision, or at least the burden of assessing the situation justifying the cost to a customer. Do the AI's and Jurisdictions have the resources and access to the kind of understanding and experience with CSEF materials to be comfortable with what could evolve into a variety of repair approvals in a number of complex situations?

2. All of the support data in the proposal is based on 'controlled fill' welding methods performed on samples welded in a laboratory environment. It seems that potential success is dependent on these controlled fill methods and therefore, should be mandatory. Controlled fill is essentially a 'temper bead' technique which is a good practice, however, the level of skill necessary to perform such a weld repair is not is going to be present in all welders available for field repairs, nor are there any requirements written to demonstrate proficiency at the technique, or to control the configuration of the welder qualification test piece (only material type is addressed). There is a special qualification required for temper bead welding in Section IX. All of the requirements of that procedure should apply here. Attention to detail in a controlled deposition method is crucial to performing an adequate repair which will exhibit the intended behavior.

3. In proposal paragraph SX.2.3, the qualification of procedures presented by EPRI only proves that procedures can be qualified, but doesn't address how the repaired weld will perform over time, nor does it address the proficiency of the welders in the field who will be asked to perform the stringent requirements of the outlined procedures in the proposal.

4. The wording throughout the proposal uses the term "recommended". This approach has no way of assuring that any contractor actually follows (and documents) the 'best practice' 'suggestions'

during the repair. Thinking of the responsibilities of the AI, how would he (she) assure themselves that "recommended" practices were actually followed prior to signing the MDR?

5. B&W believes that a separate WPQ is required for repairs done using 1250 F minimum PWHT as well. ASME is only allowing 1250 F for thin wall welds and PWHT at a lower temperature increases the chances for failure in a typical bend test. Welding without PWHT allows a greater bend radius. 1250 F should be proven as being capable of allowing the standard bend radius required by Section IX as opposed to the lesser percentage of 14% vs 20% which was used to qualify the procedure as mentioned in the EPRI presentation.

6. In proposal paragraph SX.2.1.1, B&W believes that regular 9Cr-1Mo filler metal will not possess the creep strength of grade B91 in thick sections. The only data showing B8 filler being close to T91 strength was in thin wall welds in testing done at ORNL back in the 1980's. P87 should be the only nickel filler metal allowed. EPRI developed P87 to match the expansion of B91 and Cr content to avoid carbon migration. Other nickel fillers will introduce the potential for classic DMW failure at the fusion line. The damage from DMW is almost impossible to detect using NDE techniques until failure actually occurs. Why not permit GTAW welding with EPRI P87 if a suitable wire has been developed?

7. During the EPRI presentation, a statement was made that "a repaired Gr. 91 weld was actually better than original construction". Further discussion revealed that the basis for this statement was the belief that many contractors were either unable or unwilling to perform a proper PWHT in accordance with the Code. B&W cannot support this statement, as non-compliance or non-conformance should not be a basis for change. The EPRI presentation warns of the problems of overheating during PWHT, but the creation of the prep itself could result in overheating due to the difficulty of removing the damaged material locally in challenging field locations that made the PWHT an unattractive option in the first place. The use of air arc or acetylene torches, if the material sensitivity is not well understood, can cause significant damage. If the upper critical temperature is exceeded during flame cutting, the material will become locally damaged, forcing further excavation and additional unforeseen outage time.

8. In the EPRI presentation, in support of this proposal, the statement was made, "to <u>not</u> do a PWHT makes the repair more damage tolerant?"
    a. The shape of the prep excavation has been explained as not allowing a crack to propagate if the surface change in the horizontal direction is a minimum of .4". The basis for this dimension is not clear. Further, B&W believes that not enough is known at this time about how these welds will behave over time, especially given that Welding Method 6 has not been in use long enough to gather meaningful data.
    b. An EPRI paper referenced in the presentation given by Jon Seifert (3002003362) indicated that the 'Post-Experience' inspection of a 2" manifold 'cold weld' repair was looked at approx 5 months after being placed back into service and found no cracking, but at approx 20 months cracking was found and the part was replaced. Further reading noted that

approx 75% of the repairs documented for the paper saw less than (6) years total service before being taken out of commission and were all inspected at intervals which were, at the very least, at the following outage. B&W believes (6) years is too long to specify as an inspection milestone criteria. B&W would suggest "the following outage", which seems more appropriate until more is known.

c. Also, the paper indicated that "due to the relative complexity of the repair, it was preceded by a full weld procedure approval test, simulating as much as possible the access for the welding encountered." It would seem prudent to also include this stipulation in the proposal to help assure the success of a complex repair.

9. All of the preps in Figs. 1 thru 4 show welding from the prep excavation surface inward, finishing at the center. This is not good welding practice, as it creates the potential for epitaxial grain growth through the center of the weld. That is, when you get to the center, the final cavity width will vary, with space left to lay only a 'partial bead' which requires 'weaving'. If the welder continually worked toward the center and always stopped at the center as the figures imply, a 'weak' zone of 'piled up' beads could occur at the center of the weld through which a crack may propagate. B&W has seen cracks in P22 header girth seams in Europe where cracks propagated in exactly that fashion. It would be advisable to stagger the stopping 'point' to avoid the potential for such behavior.

10. Except for the final weld fill ending at exact center for each pass, the recommended figures are good practice, although it would appear that, in EPRI's own words, to have **practical limitations on** ("complex components; thick to thin transitions; inability to use a preferred PWHT vendor" or welder). In addition, the examples show that a 'full' repair is performed (full length or circumference of a weld). What if the repair only requires a partial or localized excavation? The figures all represent a fully excavated 'new' geometry which does not seem to represent typical field repairs. The proposal does not address these likely situations, and without this guidance, would create confusion and provide no direction for the AI to follow when determining the acceptability of a proposed repair.

11. During the EPRI presentation, a statement supporting approval of the item was made - "we want to get our feet wet". Due to the unknown safety risks regarding the performance of welds retaining residual stresses following repair, these high risk welds outside of the boiler cavity where the presence of personnel cannot be controlled is far too high in B&W's opinion.

12. During the EPRI presentation, a statement was made that "PWHT does not reduce risk". B&W believes that leaving localized residual stresses in heavy wall welds actually does increase risk. Experience has shown that piping hangers and supports for longer piping runs of heavy wall pipe can unexpectedly fail in service, placing additional, unanticipated stress on the entire piping system, including repair welds containing residual stresses. In fitness for service evaluations, residual stress is a factor to consider.

13. In the first paragraph SX.1, it says that "technical info provided is for CSEF steels", but "recommendations" are specifically addressing only GR91 materials. It is unclear to B&W if the "recommendations" are intended for GR92, GR23, GR92, etc as well.

14. How is "well engineered" defined? What qualifies an individual or organization as capable of performing "well engineered" evaluations? This statement is too broad in B&W's opinion. Could the question be addressed by mandating the signature of the person who is assuming responsibility for an engineered repair on the Repair Plan, along with the AI and the Jurisdiction? The user is cautioned to seek technical guidance before using, but the term "well-engineered approach" implies that the thinking has been tested and is backed with documented engineering analysis. In B&W's opinion, the best engineering approach has not yet been determined and will need to be considered per given situation. Most field repairs will most likely be partial excavations - not like those shown, and the guidance in the proposal is not nearly inclusive enough to consider the scenarios likely in a field repair to be generically labeled, "a well-engineered approach".

15. In circumstances where it is too difficult to PWHT due to part geometry or location...how then, will the location be accessible enough to perform the weld procedures and NDE as laid out in the proposal, to ensure a sound weld?

16. The specific and complex physical cavity characteristics (following defect removal) were apparently created using satellite machining equipment, as shown in Figs. 1 thru 4, which also include the 'Damage Tolerant' or 'stepped' cavity designs. Again, if there is sufficient access to install such tooling to remove the defect, then the argument that it is too difficult to get to or set up for PWHT is not valid.

17. Again relating to the cavities shown in Figs. 1 thru 4, the cavities appear to be machined. The word "machined" is also mentioned in the proposal. Is it the intent to limit the method of defect removal to machining? If not, what other methods are recommended that in and of themselves, would not induce unwanted heat or result in hardened cavity surfaces prior to repair welding?

18. How will the Authorized Inspector verify that all the "recommended" practices were actually followed? Is there an expectation that he would be present for the installation of all weld beads or to assure that proper temperature controls were followed to assure compliance with the guidelines? If the "recommended" guidelines are NOT followed, how would the AI determine whether any deviations from Figs. 1 thru 4 are appropriate?

19. The EPRI presentation states the following... "**In reality, the integrity of the repair is not solely a function of PWHT, but of design, damage and procedure** ." B&W agrees with this statement, but sees this statement as a major point of concern rather than rationalization. The fear is that not enough may be known about the root cause of the damage or the integrity of the design to know that doing this kind of repair will be safe, that there is not a 'bigger problem'. It is imperative that the damage be clearly analyzed to insure that history won't repeat itself due to a contributing

NB15-1404

Glossary of Terms

9.1 DEFINITIONS

Emissions — The discharge of various Federal or State defined air pollutants into the surrounding atmosphere during a given time period.

Emissions Control System — An arrangement of devices, usually in series, used to capture various air pollutants and thereby reduce the amount of these materials, or gases, being admitted to the surrounding atmosphere, below Federal or State defined standards.

Examination — In process work denoting the act of performing or completing a task of interrogation of compliance. Visual observations, radiography, liquid penetrant, magnetic particle, and ultrasonic methods are recognized examples of examination techniques.

Exit — A doorway, hallway, or similar passage that will allow free, normally upright unencumbered egress from an area.

ADD

Existing Material--- The actual material of the pressure retaining item at the location where the repair or alteration is to be performed.

NB15-1410 – result of PR15-0122 – proposal dated 8/19/15

This revision addresses concerns of PR15-0122 and updates language to be consistent with NBIC Part 3, 5.7.2 c) regarding "R" stamping and nameplate requirements.

S6.14.1 SPECIFIC "TR" STAMPING AND NAMEPLATE REQUIREMENTS

The holder of a "~~T~~R" Certificate of Authorization is required to affix a stamping or nameplate on the Transport Tank that indicates, 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 "~~T~~R" Symbol affixed to the stamping or the nameplate. The stamping or nameplate information shall satisfy the requirements of a) thru f) ~~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 bluntnose interrupted dot die stamps. If direct stamping would be detrimental to the item, required markings and the embossed Code Symbol stamping 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; and

f) The non-embossed Code Symbol stamping, when directly applied on the item or when a nameplate is used shall be applied adjacent to the original manufacturer's stamping or nameplate. A single repair, alteration, or modification stamping or nameplate may be used for more than one repair to a Transport Tank, provided the repair, alteration, or modification activity is carried out by the same certificate holder. The date of each repair, alteration, or modification corresponding with the date on the "R" Form ~~TR-1~~ shall be stamped on the item or nameplate.

NBIC Sub-Group Repairs & Alterations

Subject:	Leak tightness by seal welding a designed inspection or maintenance access opening

NB-Item number:	NB15-1801

Explanation of assignment needed:	Is it reasonable to add as a routine repair activity, the replacement of a seal weld when the pressure retaining item's design and leak tightness are derived in combination from using a seal weld of limited size?

Assigned to:	M. Webb

Background:	Inspection and maintenance openings are routinely designed to allow access to assess equipment condition and exercise maintenance activities in concert with reliability and safety. By design, pressure retention is assured by mechanical interface. By design, some openings include a seal weld to assure leak tightness and the weld is not considered to add strength or to enhance the item's pressure retaining capability. Routinely, the Manufacturer provides time-proven instruction for their replacement, routinely following the governing rules from the original code of construction, exempting the seal weld and weldment from PWHT and citing VT-examination throughout the installation, both within the established parameters of a routine repair. *See the Interpretations 07-10, 01-09, PCC-2, Article 2.3 (2011) on pg-2, and an example of Instructions on pg-3 supporting this proposed action as a routine activity …*

Current Wording:	NBIC, Part 3, paragraph 3.3.2 (e) items 1-4: *Not recognized currently as a routine repair.*

Proposal: ***double underline***	New paragraph 3.3.2. (e) 5): 5) Seal welding a mechanical connection for leak tightness where by-design, the pressure retaining capability is not contingent on the weld for strength and requires no PWHT. (B. Wiegoszinski's original proposal, 1-21-15: Seal welding of mechanical connections provided postweld heat treatment is not required by the Code of construction.")

NBIC Sub-Group Repairs & Alterations

INTERPRETATION 11-01

Subject: Part 3, 3.3.2

Edition: 2011

Question: In Part 3, 3.3.2 d), is the replacement scope or the number of valves, fittings, tubes, or pipe NPS 5 in diameter and smaller, or sections thereof, a consideration when determining if the work is a routine repair?

Reply: No. The NBIC does not address the magnitude of work or scope in qualifying repairs as routine but rather addresses the exceptions representing routine repairs as noted within Part 3, 3.3.2 d) 1).

INTERPRETATION 07-10

Subject: Part 3, 3.3.2 and 3.3.3

2007 Edition with 2009 Addendum

Question: Is it the intent of the NBIC that weld build-up of a damaged gasket surface on a flange where neither PWHT no NDT is required by the code of construction considered a routine repair?

Reply: Yes, provided the "R" Certificate Holder's quality system program describes the process for identifying, controlling and implementing routine repairs.

INTERPRETATION 01-09

Subject: RC-2031(a)(1) Routine Repairs

1998 Edition with 2000 Addendum

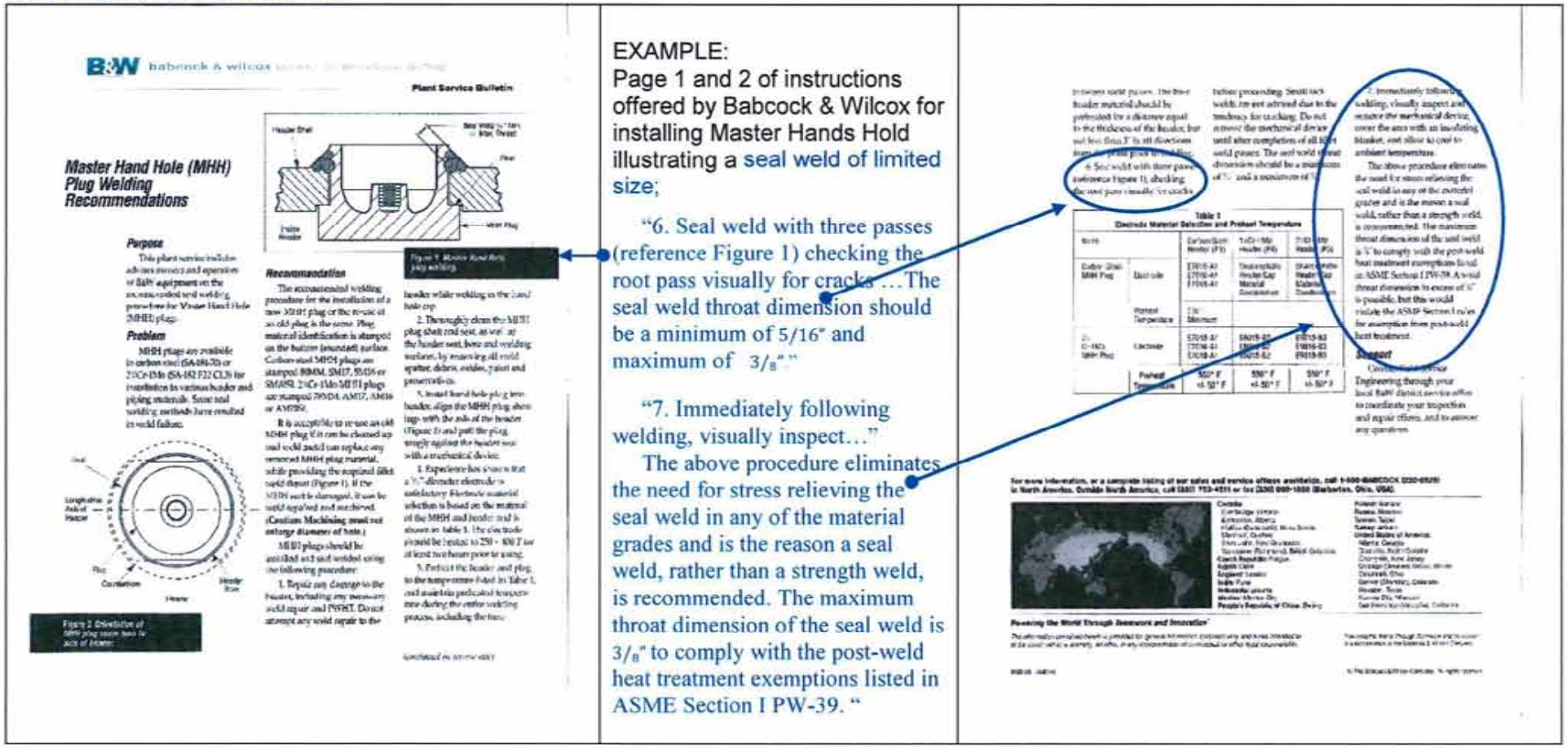
Question: Is the seal welding of tubes which are five NPS in diameter and less considered a routine repair?

Reply: Yes.

NBIC Part-3,
3.2.6 REFERENCE TO OTHER CODES AND STANDARDS (can provide useful guidance)
(c) ASME PCC-2, Repair of Pressure Equipment and Piping-

ASME PCC-2, Article 2.3, (2011)- seal welded threaded connections and seal weld repairs
3.1 (a) The seal weld shall only be used to provide the hermetic seal, not the mechanical strength to the joint.

INSTRUCTION EXAMPLE:



EXAMPLE:
Page 1 and 2 of instructions offered by Babcock & Wilcox for installing Master Hands Hold illustrating a seal weld of limited size;

"6. Seal weld with three passes (reference Figure 1) checking the root pass visually for cracks …The seal weld throat dimension should be a minimum of 5/16" and maximum of 3/8"."

"7. Immediately following welding, visually inspect…"

The above procedure eliminates the need for stress relieving the seal weld in any of the material grades and is the reason a seal weld, rather than a strength weld, is recommended. The maximum throat dimension of the seal weld is 3/8" to comply with the post-weld heat treatment exemptions listed in ASME Section I PW-39. "

NBIC Sub-Group Repairs & Alterations

Initially presented by Bob Wielgoszinski, 1-21-15:
During the inspection activity of some high pressure header type boilers, it is necessary to remove handhole covers or handhole plugs to access the inside of the header for inspection of tubes. The subsequent closure of the handholes by reinstalling the handhole covers or plugs sometimes necessitates the cover or plug being seal welded to its seat.

The seal weld is solely for the purpose of preventing leakage at the seat. The strength of the connection is based on back pressure applied to the cover or plug from boiler internal pressure. This seal welding constitutes a repair by welding as defined in the NBIC, and therefore requires inspection by a NB Commissioned Inspector, completion of an R-1 form, and attachment of a repair nameplate by the R stamp holder.

This repair activity has been interpreted as a routine repair, which would allow for the NB Inspector to waive in-process inspection and rule out the attachment of a repair nameplate by the R stamp holder (if permitted by the Inspector and the Jurisdiction). It would still, of course, require the completion of an R-1 form for the work performed. Although this seal welding process seems inconsequential to the structural integrity of the boiler, the problem here is that this type of repair is not mentioned specifically in "the list of 4" categories allowed by the NBIC, Part 3, 3.3.2(e). In fact, seal welding is not mentioned at all for routine repairs, even though interpretation 01-09 specifically addresses it for seal welding of tubes. Also, interpretation 95-35 addresses seal welding of tubes and confirms that it is a repair.

So, as a result of this, it would be helpful to the industry if the NBIC Committee could provide an interpretation of the rules to address seal welding of handhole covers or plugs as a routine repair. And if the Committee were to determine that such a repair is permitted as a routine repair, then a revision to the rules to address it would be equally as helpful to the public. Included below is a proposed question and reply for an interpretation.

IN15-0101-
Subject: Seal welding of handhole covers
Question: Is seal welding of inspection opening covers, such as handhole plates or plugs, considered a routine repair in accordance with NBIC, Part 3, paragraph 3.3.2 (e)?
Reply: No.

If the Committee feels that a repair such as described herein SHOULD be considered as a routine repair, then I will offer the following revision to the NBIC to clarify it. If the Committee does not believe it should be considered as a routine repair, then no revision would be necessary since the interpretation confirms that it is not permitted.

(Proposed 1-21-15) New paragraph 3.3.2. (e) 5):
5) Seal welding of mechanical connections provided postweld heat treatment is not required by the Code of construction."

SUBJECT: ITEM NUMBER NB15-1801 Sub-Committee Repairs and Alterations

FROM: James Larson

RE: Seal Welding

I James Larson disapprove of the wording proposed on this item because it seems to give approval for seal welding of ANY mechanical item or component that is capable of retaining pressure without benefit of a weld.

Many pressure components are designed to retain pressure without a weldment and this language gives way to seal welding anything designed in such a way.

I do not think we should give permission to virtually seal weld anything, especially as a Routine Repair.

Perhaps the paragraph should state "items, (except boiler tubes) not specifically designed or intended to be welded are excluded from Routine Repairs".

Respectfully,

James P. Larson

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

i) Use of this paragraph shall be documented in the "Remarks" section

NB15-1901
Alteration by PWHT
01/10/16

3.4.3 EXAMPLES OF ALTERATIONS

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

b) A decrease in the minimum temperature;

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

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

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

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

g) Except as permitted in NBIC Part 3, 3.3.3 s); replacement of a pressure retaining part in a pressure retaining item with a material of different allowable stress or nominal composition from that used in the original design;

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

i) The replacement of a pressure relieving device (PRD) as a result of work completed on a pressure-retaining item (PRI) that changes the resultant capacity to exceed the minimum requiredrelieving capacity (MRRC) required by the original code of construction as described on the original Manufacturer's Data Report.

3.4.4 A
V

j) performing postweld heat treatment where none was originally performed on the pressure retaining item.

3.4.4.1 ALTERATION PLAN

a) Engineer Review and Certification

Subgroup: Repair & Alteration - Section 3

National Board Item No. **NB15-2502**

Current Level: Subgroup discussion

NBIC Part 3 Section 3 Paragraph(s): 3.4.5 *(Recommended)*

Title: **Guidelines For Installation Of Boiler Tubes In Water Tube Boilers**

Date Opened: *To Be Determined By Subgroup*

Background:
To provide guidance for the inspection, repair and replacement of the tubes in water tube boilers when OEM procedures are not available.

Proposed Action:
Boiler tubes shall be installed in accordance with the directions of the original equipment manufacturer (OEM). If this information is not available, the following procedures shall be used.

a. Boiler tubes installed by the expanding method shall use either a roller-type expander, a prosser-type expander or use the hydraulic expanding method.

b. The length of the tube expander or process shall be sized to expand the tube across the width of the drum wall and into the tube body. The expander rollers, expander mandrels, or prosser segments shall have smooth surfaces with smooth rounded corners or ends to prevent cutting or damaging the tube and drum wall surfaces. Tube expanders, including the rollers and mandrels, and prossers that become worn or damaged during the work shall be replaced.

c. The method of installing, attaching, expanding and flaring the boiler tubes into the drums or tube sheets shall equal the original design method and dimensions. Changing the tube installation and attachment method of any boiler tube from the original method is an alteration. This includes adding or deleting flaring the tube end and seal welding.

   When tubes are expanded into thick wall drums the tube expansion process may be performed on the tube in one stage or in two stages by first expanding the upper or lower section and then the remaining section.

d. The thickness of boiler tubes shall equal the original design values. Changing the boiler tube thickness from the original value is an alteration.

e. The shape and arrangement of boiler tubes shall equal the original design. Changing the shape or arrangement of any boiler tube from the original design is an alteration.

f. Boiler tubes shall be cut, bent and formed to the correct length and shape required for installation when the boiler and tubes are at equal temperature. The use of heating or stretching the tube during installation to obtain the required length by thermal or mechanical expansion is prohibited.

g. Tubes that are cut too short shall not be used unless repaired by re-ending. Tubes shall be cut to the final required length by a mechanical cutting method such as sawing or by use of a roller pipe cutter. Cutting the tube to the required length by use of any torch or electric cutting process is prohibited. If tubes are to be cut to the rough length by either the torch or electric cutting process, the cut line from these process shall be located at least 1 in. (25.4 mm) from the final cutting edge length and the tube shall be cut to its finished length by use of a mechanical cutting method.

h. Tube ends that are found to be too long after expanding into the tube sheet or drum shall be cut down to their required length by milling back the tube end using a tube milling cutter tool.

i. Tube bends shall be made to create smooth surfaces and smooth curves across the entire bend length. Bending shall be performed using dies or other mechanical methods. Tubes that are bent incorrectly or formed to the wrong configuration shall not be used unless the defect is repaired by re-bending the tube to the required configuration.

j. When the ends of boiler tubes are swedged to a smaller or larger diameter as required to fit the drum wall holes ,the swedging shall create smooth surfaces, smooth curves, and a uniform diameter reduction across the entire swedged length. Swedging shall be performed using dies. Machining the tube end to a smaller diameter to obtain the required swedge diameter is prohibited. When tubes are swedged to a larger diameter, the new reduced wall thickness of the enlarged tube end shall be reviewed to confirm that upon completion of the tube expansion process the new wall thickness will be sufficient for the MAWP.

k. Prior to installing the boiler tubes all cut or damaged tube holes and retention groves shall be repaired as required. Tube sheets shall be straightened or braced in their required position to prevent flexing in the event this is necessary such as by using removable braces or strong-backs. All surfaces of the hole shall be clean, dry, and free of all grease, tube rolling lubricant and oil prior to installing the tube and expanding it. If the hole surfaces are cleaned using grinding or polishing wheels, these shall be the fine grade type to prevent cutting the surfaces. The cleaning shall be performed to prevent cutting longitudinal grooves or cuts on the hole surfaces because this type of damage can serve as a pathway for leaks.

The cleaning shall be performed in the circumferential direction whenever possible.

l. The clearance between the tube OD and the drum or tube sheet hole ID shall not exceed 0.040 in. (1.0 mm) unless the original design requires a different value be used.

m. The exterior and interior surfaces of the tube end shall be clean, dry, and free of all preservative and dirt prior to installing the tube and expanding it. If the tube surfaces are cleaned using grinding or polishing wheels, these shall be the fine grade type to prevent cutting the tube surfaces. The cleaning shall be performed to prevent cutting longitudinal grooves or cuts on the tube surfaces because this type of damage can serve as a pathway for leaks. The cleaning shall be performed in the circumferential direction whenever possible.

n. If a lubricant is used to lubricate the tube expander during use, the lubricant shall be a water soluble-type to aid its removal and surface clean up.

o. Sharp edges on both sides of each drum or tube sheet hole shall be removed prior to installing the tube unless the original design requires a different method be used. When the hole edges are required to have a radius to prevent it cutting into the tube surface upon expansion, the dimension range of the radius shall be between 1/32 in. -1/16 in. (0.794 mm - 1.59 mm) unless the original design requires that a different value be used.

p. Each tube during installation shall be placed in its required position in both drum or tube sheet walls and at the furnace exterior. The tube shall then be temporarily locked or fixed in place to prevent it from moving as it is expanded. This locking work may be performed by use of removable blocks, wedges, fixtures or gages.

q. The ends of tubes that are flared shall project through the hole not less than 1/4" (6 mm) nor more than 3/4" (19 mm) before flaring. Where tubes enter at an angle, the maximum limit of 3/4" (19 mm) shall apply only at the point of least projection.

r. Each tube shall have both ends expanded into its mating holes using the required amount of expansion or wall thickness reduction required by the design. If the original design expansion values are not known, the expansion shall be in the 8% - 12% wall reduction and not exceed 15% upon completion of all subsequent re-expansion work such as flaring the tube end. Tubes expanded in excess of 25% wall reduction are classified as "over-rolled" and shall be replaced.

The percentage of tube wall reduction shall be measured using go-no go gages, tube micrometers or ultrasonic thickness (UT) testing. To calculate the percentage of tube reduction required for a specific hole ID see "Guideline For Calculating Tube Expansion By Wall Thickness Reduction".

s. Tubes that are expanded and flared without seal welding shall be flared to an outside diameter of at least 1/8" (3.0) greater than the diameter of the tube hole and shall not exceed 3/4" (19 mm).

t. When tubes ends are flared, the flaring work shall be performed and the depth limited to prevent the bottom of the flare from contacting the surface or edges of the drum or tube sheet.

u. When tubes are to be beaded the beading shall be performed to prevent damaging the drum wall or tube sheet by cutting or grooving it. Upon completion of the beading work the bead OD shall contact the drum or tube sheet surface around the entire tube circumference. The tube shall then be lightly re-expanded to confirm the beading process has not loosened it in the drum or tube sheet hole. If the tube bead is to also be seal welded, this light re-expansion of the tube shall be performed upon completion of seal welding. Repair of a defective or incorrectly formed tube bead by welding is prohibited. Tube shall not be heated to assist forming the bead during the beading process. If ferrules are used in the drum or tube sheet hole, no part of the ferrule shall interfere with the forming of the bead.

v. When beaded tubes are to be seal welded to the drum or tube sheet, the tube shall first be expanded either partially or completely into the hole and then be beaded around its entire circumference. Next, all oil or lubricant shall be removed prior to seal welding. The drum or tube sheet temperature shall not be less than 70°F (21°C) during the seal welding process. The seal weld size shall range between 1/8 in. - 1/4 in. (3 mm - 6 mm) and be applied as a fillet weld of the equal leg or unequal leg type unless the original design requires a different weld size or weld type be used. Upon completion of seal welding the tube shall either be expanded to its final setting or re-expanded lightly to confirm that the seal welding has not loosened it in the hole. If ferrules are used, no part of the ferrule shall protrude from the bead and come into contact with the seal weld.

w. When tubes are installed by expanding straight and seal welding without beading, each tube shall first be expanded either partially or completely into the hole then all accessible oil or lubricant shall be removed prior to seal welding. The drum or tube sheet metal temperature shall not be less than 70°F (21°C) during the seal welding process. The seal weld size shall range between 1/8 in. - 1/4 in. (3 mm – 6 mm) based on the tube thickness unless the original design required different values be used. Upon completion of seal welding the tube shall either be expanded to its final setting or re-expanded lightly to confirm that the seal welding has not loosened it in the hole. If ferrules are used, no part of the ferrule shall protrude from the bead and come into contact with the seal weld.

x. If it is necessary to determine the workmanship of the tube installation prior to seal welding the tubes, the boiler shall be tested hydrostatically to either MAWP

or to a lower value. If this test is done, the boiler shall be given its required hydrostatic test to MAWP upon completion of the seal welding work.

y. Any tube that show cracks within the expanded section, the flare, the bead or the seal weld upon completion of the tube installation process shall be replaced.

z. Cracks in seal welds shall be repaired by grinding out the crack and then reapplying the seal weld. These cracks often result from oil contamination of the weld seal. The metal temperature of the drum or tube sheet shall not be less than 70°F (21°C) during the seal weld crack repair process. Upon completion of seal welding the tube shall be re-expanded lightly to confirm the seal welding has not loosened it.

Notes To Reviewers:

1. *This document is based on Technical Association Pulp & Paper Institute (TAPPI) - Technical Information Paper (TIP) #0416-08 "Guidelines For Replacement Of Generating Bank Tubes With Expanded Joints In Two Drum Boilers", dated 2002.*

2. *If this document is approved for inclusion into the NBIC I recommend that an NBIC version of ASME B&PVC Figure PWT-11 "Examples Of Acceptable Forms Of Tube Attachment" be included with it. This addition of this figure will aid inspectors to understand the different designs of rolled tube joints.*

From:	Richard Stone <richardbstone@verizon.net>
To:	"rferrell@nationalboard.org"< rferrell@nationalboard.org>
Date:	06/30/2015 06:25 PM
Subject:	NBIC: Two Proposed New Documents For Repair Sub-Group - Installing Tubes In Water Tube Boilers By The Expanding Method

NB15-2502

Hello Bob;

1) I've prepared two new documents for the NBIC Repair Sub-Group to review for addition to the NBIC Part 3, Section 3 "Repair". Both documents describe the method of expanding (rolling) boiler tubes into water tube boilers.

I recommend these new documents be added to the NBIC Part 3, Repair either as 'Recommended Procedures' or as 'Guidelines' since there are some variations in the tube rolling process for different design boilers.

Both documents can be edited by the Repair Sub-Group as they consider necessary.

2) My reason for submitting these documents to the Repair Sub-Group is to provide all NBIC inspectors, state boiler inspectors and code users a basic procedure for installing and expanding boiler tubes by rolling. The present NBIC does not have any guidelines or procedures for tube rolling and this lack of information has caused problems to inspectors and code users who are not familiar with the work. I have discussed this problem with several inspectors and decided to prepare these draft document for the Repair Sub-Group to review.

In addition, I've also encountered in the power industry a number of defective boiler repair jobs caused by poor quality tube rolling. These problems show a general lack of knowledge and understanding of the tube rolling process by many power industry staff and workers.

3) I request you assign an NBIC item number to each document and then forward both documents to the Chairman of the Repair Sub-Group.

4) My primary reference document for both documents is: Technical Association Pulp & Paper Institute (TAPPI) - Technical Information Paper (TIP) #0416-08 "Guidelines For Replacement Of Generating Bank Tubes With Expanded Joints In Two Drum Boilers", dated 2002. I've attached a scanned copy of it with my documents for the Repair Sub-Group's use during the review process. My other reference is the tube rolling practices

used by Combustion Engineering.

Thanks.

Dick Stone
NBIC Locomotive Boiler Sub-Group

From:	Richard Stone <richardbstone@verizon.net>
To:	"rferrell@nationalboard.org"< rferrell@nationalboard.org>
Date:	06/30/2015 06:25 PM
Subject:	NBIC: Two Proposed New Documents For Repair Sub-Group - Installing Tubes In Water Tube Boilers By The Expanding Method

NB15-2503

Hello Bob;

1) I've prepared two new documents for the NBIC Repair Sub-Group to review for addition to the NBIC Part 3, Section 3 "Repair". Both documents describe the method of expanding (rolling) boiler tubes into water tube boilers.

I recommend these new documents be added to the NBIC Part 3, Repair either as 'Recommended Procedures' or as 'Guidelines' since there are some variations in the tube rolling process for different design boilers.

Both documents can be edited by the Repair Sub-Group as they consider necessary.

2) My reason for submitting these documents to the Repair Sub-Group is to provide all NBIC inspectors, state boiler inspectors and code users a basic procedure for installing and expanding boiler tubes by rolling. The present NBIC does not have any guidelines or procedures for tube rolling and this lack of information has caused problems to inspectors and code users who are not familiar with the work. I have discussed this problem with several inspectors and decided to prepare these draft document for the Repair Sub-Group to review.

In addition, I've also encountered in the power industry a number of defective boiler repair jobs caused by poor quality tube rolling. These problems show a general lack of knowledge and understanding of the tube rolling process by many power industry staff and workers.

3) I request you assign an NBIC item number to each document and then forward both documents to the Chairman of the Repair Sub-Group.

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Thanks.

Dick Stone
NBIC Locomotive Boiler Sub-Group

Request for NBIC Revision

Robert V. Wielgoszinski
Hartford Steam Boiler of CT
Rev 2, 011016

Purpose	To provide minimum radius dimension for corners of a flush patch
Scope:	Repairs and alterations to pressure retaining items that contain a flush patch, 3.3.4.6 a)2).
Background	In the performance of repairs by installation a flush patch, the treatment of the corners often becomes controversial because of the lack of specificity in the NBIC. The Code (Part 3 – 3.3.4.6 a)2), says in part, simply that "... If the patch is rectangular, an adequate radius should be provided at the corners. Square corners should be avoided..." The issue is the guidance "should be provided". Usually most R stamp holders provide an ample radius at these corners. A radius helps to avoid any undue stresses at the corner by eliminating a potential stress riser of a sharp right angle weld configuration. At a recent flush patch repair, it was reported that a radius was not provided and the subsequent pressure test revealed leaks at three of the four corners of the patch. Further investigation with LP examination discovered cracks at all three corners. This situation was clearly the result of poor application of the repair method, but could have been prevented by applying a radius at the corner, which was the corrective action in this case. So, the recommendation here is to revise the NBIC by requiring a minimum radius at corners of square or rectangular flush patches. A prescribed minimum, of say ½", would not cause any hardship on an R stamp holder that performs such repairs. And it does not preclude providing a larger radius if necessary. If there is a question of measurement, I also don't think this is a problem. A US quarter has about a ½" radius. UPDATE: 07/14/15: At the SG meeting it was pointed out that Supplement 1 of Part 3 already has some criteria for a minimum radius for patches in paragraph S1.2.11.2 d). This requires a 3x the plate thickness minimum radius. This is more conservative than ½". The SG voted to accept this revision with ½" changed to 3x the plate thickness. UPDATE: 01/10/16: The MC ballot resulted in 13 approved and 12 not voting. One significant comment was received in support of the revision but with a a proposed modification to more clearly state what the expectation are. Also, to remove any restriction to plate product form. The proposal was revised to address these comments.
Proposed Revision	Revise NBIC, Part 3, Paragraph 3.3.4.6 a) 2) to require a minimum of 3 times the plate thickness radius at the corners of square or rectangular flush patches. Before installing a flush patch, the defective material should be removed until sound

	material is reached. The patch should be rolled to the proper shape or curvature. The edges should align without overlap. In stayed areas, the weld seams should come between staybolt rows or riveted seams. Patches shall be made from a material whose composition and thickness meet the intended service. Patches may be any shape or size. If the patch is rectangular, a minimum radius of not less than 3 times the material thickness shall be provided at the corners. Square corners are not permitted. The completed welds shall meet the requirements of the original code of construction.

Interpretation IN15-0701
Proposed Interpretation

Inquiry:	IN15-0701
Source:	Mr. Stephen Williams
Subject:	NBIC Part 3 Section 4
Edition:	2013
Question 1:	If the original code of construction required a hydro test and the installer chose to do NDE in lieu of hydro and chose RT and the R stamp holder doing a repair on this section said they can't do a hydro and chooses to Liquid Penetrant test full penetration welds Does that mean they have to do RT in lieu of hydro?
Reply 1:	No proposed reply given
Committee's Question:	When the Inspector and, when required, the Jurisdiction agree that penetrant examination will provide meaningful results to verify the integrity of a weld repair, may penetrant examination of the repair be performed in lieu of a hydrostatic test?
Committee's Reply:	Yes.
Rationale:	Based on the nature and scope of the repair, the NBIC Part 3, Section 4, 4.4.1(e), allows use of NDE to verify the integrity of a repair.
SC Vote	
NBIC Vote	

Interpretation IN15-1001

Proposed Interpretation

Inquiry:	IN15-1001
Source:	Mr. Liu Xi, CIMC
Subject:	NBIC Part 3, Section 1
Edition:	2013
Question 1:	Several pressure vessels are fully same, just constructed respectively as per difference edition of ASME Section VIII, Division 2. the Alteration Plan of these vessels will be reviewed and certified as per ASME Section VIII, Division2 latest edition (2013ed), question is, if this alteration plan as per VIII-2-2013ed can be applied to other construction edition (e.g. VIII-2-2010ed, VIII-2-2007ed, etc.)?
Reply 1:	No proposed reply given
Committee's Question:	
Committee's Reply:	
Rationale:	
SC Vote	
NBIC Vote	

Proposed Interpretation

Inquiry:	IN15-1201
Source:	Mr. Mario Rivas, JCI
Subject:	Routine Repair
Edition:	
Question:	Are the following repairs within the scope of a "Routine Repair", with the approval and concurrence of the Authorized Inspector? • Replacing an existing 3000# SA-105 B16.11 standard coupling (not greater than 5" diameter) to a shell • Repairing a weld (leaking) where no NDE is required • Adding a non-loading pad by welding it to the shell • Adding a non-loading bracket by welding it to the shell • Adding a fitting (non-standard) no larger than 5" diameter by welding it to the shell
Reply:	No reply
Committee's Question:	N/A
Committee's Reply:	N/A
Rationale:	The above would be considered consulting because he is asking the committee to provide a recommendation on routine repair scenarios. The NBIC is clear as to examples and applications for routine repairs.
SC Vote	
NBIC Vote	

Recommend letter back to the Inquirer stating the question is along the line of consulting seeking advice on examples of repairs. The NBIC provides specific examples for routine repairs and repairs.

NB15-1202

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SUPPLEMENT 6
REPAIR, ALTERATION, AND MODIFICATION OF DOT TRANSPORT TANKS

S6.1 SCOPE

This supplement provides general requirements that apply to the repairs, alterations, or modifications to DOT Transport Tanks used for the transportation of dangerous goods via highway, rail, air, or water.

S6.2 DEFINITIONS

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The definitions specified in NBIC Part 3, Section 9, *Glossary*, shall be used in conjunction with those specified in NBIC Part 2, S6.17. Where conflicts between definitions exist, those identified in NBIC Part 2, S6.17 shall take precedence.

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S6.32 CONSTRUCTION STANDARDS

When the standard governing the original construction is the ASME Code or other regulations of the Competent Authority, repairs, alterations, or modifications shall conform, insofar as possible, to the edition of the construction standard or specification most applicable to the work. Where this is not possible or practical, it is permissible to use other codes, standards or specifications, including the ASME Code provided the "~~T~~R" Certificate Holder has the concurrence of the Inspector and, if required, ~~or~~ the Competent Authority.

S6.43 ACCREDITATION AND REGISTRATION

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Organizations performing repairs, alterations, or modifications shall be accredited ~~as~~ in accordance with the National Board "~~T~~R" Accreditation Program. In addition repair organizations performing repairs, alterations, or modifications to transport tanks shall be registered with DOT as required by 49 CFR PART 180.

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S6.54 MATERIALS

The materials used in making repairs, alterations, or modifications shall conform to the original code of construction including the material specification requirements. Carbon or alloy steel having a carbon content of more than 0.35% (0.30% for ton tanks) shall not be welded unless permitted by the original code of construction. The "~~T~~R" Certificate Holder is responsible for verifying identification of existing materials from original data, drawings, or unit records and identification of the material to be installed. Additional material requirements are provided in NBIC Part 3, Section 3.

S6.65 REPLACEMENT PARTS

a) Replacement parts that will be subject to internal or external pressure that consist of new material which may be formed to the required shape by spinning, forging, die forming, and on which no fabrication welding is performed shall be supplied as material. Such parts shall be marked with the material and part identification and the name or trademark of the parts manufactured. In lieu of full identification marking on the material or part, the part manufacturer may use a coded marking system traceable to the original marking. Such markings shall be considered as the part

manufacturer's certification that the part complies with the original code of construction. Examples include seamless or welded tube or pipe, forged nozzles, heads or subassemblies attached mechanically.

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. This certificate shall be supplied in the form of a bill of material or drawings with statement of certification.

c) Replacement parts subject to internal or external pressure fabricated by welding that require shop 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 and DOT specification requirements. A completed ASME *Manufacturer's Partial Data Report* shall be supplied by the manufacturer.

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~~ as required by the original code of construction ~~as required by the original code of construction or equivalent~~ shall be supplied with the item. When this is not possible or practicable the organization fabricating the part may have a National Board *Certificate of Authorization*. Replacement parts fabricated by an "R" stamp holder shall be documented on Form ~~TR-1~~R-3 and the "~~T~~R" Stamp applied as described in NBIC Part 3, S6.~~14~~15.

S6.76 AUTHORIZATION

The Inspector's written authorization to perform a repair, alteration, or modification shall be obtained prior to initiation of the ~~repair or modification~~work to be performed on ~~to~~ a transport tank. Additional requirements are specified in NBIC Part 3, 1.3.1 and 1.3.2.

S6.87 INSPECTION

Inspection and certification shall be made by an Inspector holding an appropriate National Board Commission ~~employed by one of the following:~~

~~a) An organization authorized and recognized by the Competent Authority.~~

~~b) The Authorized Inspection Agency of the "TR" Certificate Holder making the repair or modification.~~as required by NBIC Part 3, 1.3 and shall be a Registered Inspector meeting the requirements of the Competent Authority.

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S6.87.1 INSPECTOR DUTIES FOR REPAIRS, ALTERATIONS, AND MODIFICATIONS

~~a) Repair Organizations that possess the National Board "TR" *Certificate of Authorization* and DOT's Cargo Tank Registration (CTR) number when applicable shall use inspection services of a Registered Inspector while performing repairs, or Modifications of Transport Tanks. The Registered Inspector must have satisfied the following requirements:~~

~~1) Has satisfied DOT requirements as a Registered Inspector.~~

2) Has successfully completed the National Board's Web-based training program for Registered Inspectors and has been issued a National Board *Certificate of Completion*.

3) Has received authorization from DOT as a Registered Inspector.

4) Has been registered by DOT for the Classification(s) of Transport Tanks to be inspected.

b)a) Inspectors performing repair, alteration, or modification inspections under the requirements of this supplement shall satisfy the requirements of S6.78.1 to be authorized to sign the Form TR-1, *Repairs or Modifications* and Form TR-2, *Alterations Supplemental Form*.

c)b) For repairs, alterations, and modifications of transport tanks, the duties of the Registered Inspector performing inspections are detailed in Part 2, S6.10 through S6.15, as required by the Competent Authority.

d)c) In addition, theThe duties of the Registered Inspector are summarized belowRegistered Inspector shall meet the rules of NB-263, RCI-1, Rules for Commissioned Inspectors. Additional duties are summarized below:

1) Verify the organization performing the repair, alteration or modification activity is properly accredited and in possession of a current valid *Certificate of Authorization* to apply the "TR" Stamp issued by the National Board and is working to an approved accepted Quality Control System;

2) Verify that the design, if required, for the modification of the vessel is approved by a Design Certifying Engineer, or Designated Approval Agency or other applicable individual;

3) Verify the materials to be used to make the repair, alteration, or modification are approved for use and comply with applicable code requirements;

4) Verify the welding procedures and welders or welding operators are properly qualified;

5) Verify that all heat treatments, if required, including PWHT have been performed in accordance with the applicable standards and that the results are acceptable;

6) Verify that all NDE, impact tests, and other tests have been performed when required, and that the results are acceptable;

7) Make a visual inspection of the work performed to confirm there are no visible defects or deviations from code requirements;

8) Perform external and internal visual inspections, if the vessel is equipped with a manway, and witness the hydrostatic or pneumatic pressure test and/or leak tightness test when they are required;

9) Verify the correct nameplate is properly attached to the vessel and that the current test and inspection markings are properly attached and displayed on the proper vessel;

10) Sign the Form TR-1 and, as appropriate, form TR-2 when work is completed.

S6.98 WELDING

a) Welding shall be performed in accordance with the requirements of the original code of construction used for the fabrication of the pressure vessel. For hydrogen control when low alloy steel filler metals are used, the filler metal classification shall include an H4 supplemental

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diffusible hydrogen designator (maximum 4 ml [H2]/100 g deposited metal) for each of the following welding processes:

1) electrodes for shielded metal arc welding (SMAW) conforming to SFA-5.5;
2) electrodes and fluxes for submerged arc welding (SAW) conforming to SFA-5.26;
3) electrodes and rods for gas shielded metal arc welding (GMAW) conforming to SFA-5.28;
4) electrodes for flux-cored arc welding (FCAW) conforming to SFA 5.29.

b) Practices used for controlling storage and exposure of filler metals shall be those developed by the "TR" Certificate Holder or those recommended by the filler metal manufacturer.

S6.98.1 WELDING PROCEDURE SPECIFICATION

Welding shall be performed in accordance with a Welding Procedure Specification (WPS) qualified in accordance with the original code of construction. When this is not possible or practicable, the WPS may be qualified in accordance with ASME Section IX.

S6.98.2 STANDARD WELDING PROCEDURE SPECIFICATIONS

A "TR" Certificate Holder may use one or more applicable *Standard Welding Procedure Specifications* shown in NBIC Part 3, 2.3 without supporting *Procedure Qualification Records* (PQRs) since SWPS are pre-qualified and the PQR will not be supplied.

S6.98.3 PERFORMANCE QUALIFICATION

Welders or welding operators shall be qualified for the welding processes that are used. Such qualification shall be in accordance with the requirements of the original code of construction or ASME Section IX. Use of Standard Welding Procedures Specification shown in NBIC Part 3, 2.3 is permitted for performance qualification testing.

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S6.98.4 WELDING RECORDS

The "TR" Certificate Holder shall maintain a record of the results obtained in welding procedure qualification, except for those qualifications for which the provisions of NBIC Part 3, S6.89.2 are used and of the results obtained in welding performance qualifications. These records shall be certified by the "TR" Certificate Holder and shall be available to the inspector.

S6.98.5 WELDERS' IDENTIFICATION

The "TR" Certificate Holder shall establish a system for the assignment of a unique identification mark to each welder/welding operator qualified in accordance with the requirements of the NBIC. The "TR" Certificate Holder shall also establish a written procedure whereby all welded joints can be identified as to the welder or welding operator who made them. This procedure shall use one or more of the following methods and be acceptable to the Inspector. The welder's or welding operator's identification mark may be stamped (low stress stamp) adjacent to all welded joints made by the individual or, in lieu of stamping, the "TR" Certificate Holder may keep a record of the welded joints and the welders or welding operators used in making the joints.

S6.98.6 WELDERS' CONTINUITY

The performance qualification of a welder or welding operator shall be affected when one of the following conditions occurs:

a) When the welder or welding operator has not welded using a specific process during a period of six months or more, their qualifications for that process shall expire;

b) When there is specific reason to question their ability to make welds that meet the specification, the qualification which supports the welding that is being performed shall be revoked. All other qualifications not questioned remain in effect.

S6.109 HEAT TREATMENT

S6.109.1 PREHEATING

Preheating may be employed during welding to assist in completion of the welded joint (see NBIC Part 3, 2.5.1). The need for and the temperature of preheat are dependent on a number of factors such as chemical analysis, degree of restraint of the items being joined, material thickness, and mechanical properties of the base metals being joined. The Welding Procedure Specification for the material being welded shall specify the preheat temperature requirements.

S6.109.2 POSTWELD HEAT TREATMENT

Postweld heat treatment may be performed as required by the original code of construction in accordance with a written procedure. The procedure shall contain the parameters for postweld heat treatment. Local PWHT that is not specified by the original code of construction may be performed in accordance with an Alternative Postweld Heat Treatment Method described in NBIC Part 3, 2.5.3 with acceptance by the Inspector and required by the Competent Authority.

S6.109.3 ALTERNATIVES TO POSTWELD HEAT TREATMENT

a) Under certain conditions, postweld heat treatment in accordance with the original code of construction may be inadvisable or impractical. In such instances, alternative methods of postweld heat treatment or special welding methods acceptable to the Inspector and Competent Authority may be used.

b) When the standard governing the original construction is the Code of Federal regulation for DOT/MC 331 cargo tanks for propane, butane, anhydrous ammonia, and other DOT permitted commodities, and the tanks are made to the ASME Code, Section VIII, Division 1, Part UHT, repairs, alterations, or modifications shall conform insofar as possible, to the edition of the construction standard or specification most applicable to the work. Where this is not possible or practicable, it is permissible to use other codes, standards, or specifications provided the "~~T~~R" Certificate Holder has the concurrence of the DOT. Shells and heads of MC 331 cargo tanks were made from quenched and tempered alloy steel plate, SA517, Grade E (originally Code Case 1298) and Grade F (originally Code Case 1204) prior to 1994.

c) The 1994 ASME Code Addenda revised UHT-5(b) to permit the joining of UHT materials to UCS or UHA materials in head and shell sections. Propane, butane, and anhydrous ammonia are the most common transported commodities and the shipper is required by DOT to comply with certain composition limitations. Propane and butane transported must have sufficiently low hydrogen

sulfide content so as not to exceed the limitations for Classification One of the ASTM D1838-74 copper strip test, and the anhydrous ammonia transported must be inhibited with a minimum water content of 0.2% by weight. In addition, such cargo tanks made for propane, butane, and anhydrous ammonia service must be postweld heat treated, unless specifically exempted by a DOT special permit that exempts PWHT.

S6.110 NONDESTRUCTIVE EXAMINATION

a) The nondestructive examination (NDE) requirements, including technique, extent of coverage, procedures, personnel qualification, and acceptance criteria, shall be in accordance with the original code of construction used for the pressure vessel, and repairs, alterations, and modifications shall be subjected to the same nondestructive examination requirements as the original welds. Where this is not possible or practicable, alternative NDE methods acceptable to the Inspector and the Competent Authority may be used on a case-by-case basis.

b) NDE personnel shall be qualified and certified in accordance with the requirements of the original code of construction. When this is not possible or practicable, NDE personnel may be qualified and certified in accordance with their employer's written practice. ASNT SNT-TC-1A, *Recommended Practice for Nondestructive Testing Personnel Qualification and Certification (2006 edition)*, or ACCP-189, *Standard for Qualification and Certification of Nondestructive Testing Personnel (2006 edition)*, may be used to fulfill the examination and demonstration requirements of SNT-TC-1A and the employer's written practice. Provisions for training, qualification, and certification of NDE personnel shall be described in the "~~T~~R" Certificate Holder's written quality system.

S6.121 COATINGS AND LININGS

When coatings or linings are to be inspected, such inspections shall be done in accordance with the Structural Steel Painting Council, SSPC publication, No. 91-12, *Coating and Lining Inspection Manual*.

S6.132 MEASUREMENT, EXAMINATION, AND TEST EQUIPMENT

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

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S6.143 ACCEPTANCE INSPECTION

The Inspector making the acceptance inspection shall be the same Inspector who authorized the repairs, alterations, or modifications. Where this is not possible or practical, another Inspector may perform the acceptance inspection; however, in all cases, the Inspector who performs the acceptance inspection shall be an employee of the same organization as the Inspector who authorized the repairs, alterations, or modifications.

S6.154 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 "~~T~~R" 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 "~~T~~R" Certificate Holder responsible for the design shall apply the stamping. Requirements for stamping and nameplate information are shown in NBIC Part 3, Section 5.

S6.154.1 SPECIFIC "~~T~~R" STAMPING AND NAMEPLATE REQUIREMENTS

The holder of a "~~T~~R" Certificate of Authorization is required to affix a stamping or nameplate on the Transport Tank that indicates, 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 "~~T~~R" 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 and the embossed Code Symbol stamping may appear on a nameplate affixed to the Transport Tank;

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

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

g) The date of each repair, alteration, or modification corresponding with the date on the applicable "R" form ~~Form TR-1~~ shall be ~~stamped on the nameplate~~applied to the exiting stamping or nameplate.

S6.154.2 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 stamping, 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 "~~T~~R" Form. The restamping or replacement of a code symbol stamp shall be performed only as permitted by the governing code of construction.

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Comment [BB2]: Change from NB15-0513

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Comment [BB3]: This change addresses NB15-1410 and PR15-0122

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S6.165 "TR" FORMS

S6.165.1 DOCUMENTATION

Repairs, alterations, or modifications that have been performed in accordance with the NBIC shall be documented on Form TR-1, *Report of Repair* or From Form R-2, *Report of Alteration, Alteration, or Modification,* as shown in NBIC Part 3, Section 5. Form TR-24, *Report Supplementary Sheet*, shall be used to record additional data when space is insufficient on Form TR-1 or R-2.

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S6.1615.2 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.

S6.165.3 DISTRIBUTION

a) Legible copies of the completed Form TR-1"R" forms 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, and the National Board for registration.

b) Distribution of the Form TR-1 "R" forms and attachments shall be the responsibility of the organization "R" Certificate Holder performing the repairwork.

S6.165.4 REGISTRATION OF FORM TR-1 AND FORM TR-2

a) Organizations performing repairs, alterations, or modifications under the "TR" programrequired by this supplement, must, shall register such repairs, alterations, or modifications with the National Board.

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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;

2)3) When the repair, alteration, or modification was completed, and and

3)4) Date sent to the National Board.

S6.176 ADDITIONAL REQUIREMENTS FOR REPAIRS, ALTERATIONS, OR MODIFICATIONS

S6.176.1 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.

S6.176.2 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.

S6.176.3 MODIFICATIONS

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

S6.176.4 DRAWINGS

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

S6.176.5 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~~.

S6.187 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 "~~T~~R" 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 when required.

S6.187.1 METHODS

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

b) Liquid Pressure Test

   1) Pressure testing of repairs shall meet the following requirements:

   2) 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;

   3) 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; and

   4) Hold time for the pressure test shall be a minimum of 10 minutes prior to examination by the Inspector. 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.

c) Pneumatic Test

1) 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.

d) Nondestructive Examination

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

S6.198 REPAIRS, ALTERATIONS, OR MODIFICATION REPORTS

a) ~~If~~ When repairs, alterations, or modifications are performed on a ~~T~~transport ~~T~~ank, 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 "~~T~~R" *Certificate of Authorization* issued by the National Board. "R" forms shall be completed and certified by the "R" Certificate Holder and received and C certified by the Inspector.

~~a)~~b) For the purposes of documentation and stamping, modification shall be considered an alteration.

~~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 or 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.~~

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NBIC Changes
"R" Endorsement

Part 1
None

Part 2
None

Part 3

1)
1.3 INSPECTOR
a) Inspection and certification shall be made by an Inspector holding ~~the appropriate commission~~ a valid commission with the appropriate endorsement, issued by the National Board and employed by an Authorized Inspection Agency (see NBIC Part 3, Section 9, *Glossary of Terms,* for definition of Authorized Inspection Agency).

2)
Table 1.8.2.1

ASME	American Society of Mechanical Engineers
Applicant	An Organization applying for "NR" *Certificate of Authorization* (new or renewal)
CFR	Code of Federal Regulations
Code	ASME Code of Construction, Section III, Division I, (NCA, NB, NC, ND, NE, NF, NG, and NH) or ASME Section XI Rules for Inservice Inspection of Nuclear Power Plant Components as applicable.
Jurisdiction	Enforcement Authority
NB	National Board of Boiler and Pressure Vessel Inspectors
NBIC	National Board Inspection Code
NB-263	Rules for National Board Inservice and New Construction Commissioned Inspectors

Replace last line show to read

~~RCI-1/~~NB-263, RCI-1 Rules for Commissioned Inspectors

3)
1.8.6.2 s)
s) Authorized Nuclear Inspector
Measures shall be taken to reference the commissioned rules for National Board Authorized Nuclear Inspector, in accordance with NB-263, RCI-1 *Rules for ~~National Board Inservice and New Construction~~ Commissioned Inspectors.* The "NR" Certificate Holder shall ensure that the latest documents including the Quality Assurance Manual, procedures and instructions are made available to the Authorized Nuclear Inspector. The Authorized Nuclear Inspector shall be consulted prior to the issuance of a repair/replacement

plan by the "NR" Certificate Holder in order that the Authorized Nuclear Inspector may select any

4)
1.8.7.2 s)
s) Authorized Nuclear Inspector
Measures shall be taken to reference the commissioned rules for National Board Authorized Nuclear Inspector, in accordance with NB-263, RCI-1 *Rules for ~~National Board~~ ~~Inservice and New Construction~~ Commissioned*
Inspectors. The "NR" Certificate Holder shall ensure that the latest documents including the Quality Assurance Manual, procedures and instructions are made available to the Authorized Nuclear Inspector. The Authorized Nuclear Inspector shall be consulted prior to the issuance of a repair/replacement
plan by the "NR" Certificate Holder in order that the Authorized Nuclear Inspector may select any in process inspection or hold points when performing repair/replacement activities. The "NR" Certificate Holder shall keep the Authorized Nuclear Inspector informed of progress of the repair/replacement activity so that inspections may be performed. The Authorized Nuclear Inspector shall not sign Form NR-1 or Form NVR-1, as applicable, unless satisfied that all work carried out is in accordance with this section. The Authorized Nuclear Inspector and Authorized Nuclear Inspector Supervisor shall have access to areas where work is being performed including subcontractors facilities in order to perform their required duties. The ANI shall be involved in dispositions and verification for nonconformances and corrective actions involving quality or code requirements.

FORM R-1 REPORT OF REPAIR

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

(Authorized Rep. Initials)

(Inspectors Initials)

(Form "R" Registration no.)

(P.O. no., Job no., etc.)

1. WORK PERFORMED BY: _____ (name of repair organization)

_____ (address)

2. OWNER: _____ (name)

_____ (address)

3. LOCATION OF INSTALLATION: _____ (name)

_____ (address)

4. ITEM IDENTIFICATION: _____ (boiler, pressure vessel, or piping) NAME OF ORIGINAL MANUFACTURER: _____

5. IDENTIFYING NOS: _____ (mfg. serial no.) _____ (National Board no.) _____ (jurisdiction no.) _____ (other) _____ (year built)

6. NBIC EDITION/ADDENDA: _____ (edition) _____ (addenda)

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

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

7. REPAIR TYPE: ☐ welded ☐ graphite pressure equipment ☐ FRP pressure equipment

8. DESCRIPTION OF WORK: ☐ Form R-4, Report Supplementary Sheet is attached ☐ FFSA Form (NB-403) is attached
(use Form R-4, of neccessary))

Fix Of to IF and para))

Liquid, Pneumatic, Vacuum, Initial

_____ Pressure Test, if applied _____ psi MAWP _____ psi

9. REPLACEMENT PARTS: (Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report):
(name of part, item number, data report type or certificate of Compliance, mfg's. name and identifying stamp)

10. REMARKS:

_____
(Form "R" Registration no.)

_____
(P.O. no., job no., etc.)

CERTIFICATE OF COMPLIANCE

I, _____, certify that to the best of my knowledge and belief the statements made in this report are correct and that all material, construction, and workmanship on this Repair conforms to the *National Board Inspection Code*. National Board "R" *Certificate of Authorization* No. _____ expires on _____, _____

Date _____, _____ Signed _____
(name of repair organization) (authorized representative)

CERTIFICATE OF INSPECTION

I, _____, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of _____ and employed by _____ of _____ have inspected the work described in this report on _____, _____ and state that to the best of my knowledge and belief, this work complies with the applicable requirements of the National Board Inspection Code. By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage, or loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ _____
(Inspector) (National Board and Jurisdiction no.)

Including Endorsement

FORM R-2 REPORT OF ALTERATION

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

(Authorized Rep. Initials)

(Inspectors Initials)

(Form "R" Registration no.)

(P.O. no., Job no., etc.)

1a. DESIGN PERFORMED BY: _____
(name of "R" organization responsible for design)

(address)

1b. CONSTRUCTION PERFORMED BY: _____
(name of "R" organization responsible for construction)

(address)

2. OWNER OF PRESSURE RETAINING ITEM: _____
(name)

(address)

3. LOCATION OF INSTALLATION: _____
(name)

(address)

4. ITEM IDENTIFICATION: _____ NAME OF ORIGINAL MANUFACTURER: _____
(boiler, pressure vessel, or piping)

5. IDENTIFYING NOS: _____ _____ _____ _____ _____
(mfg. serial no.) (National Board no.) (jurisdiction no.) (other) (year built)

6. NBIC EDITION/ADDENDA: _____ _____
(edition) (addenda)

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

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

7a. DESCRIPTION OF DESIGN SCOPE: ☐ Form R-4, Report Supplementary Sheet is attached

7b. DESCRIPTION OF CONSTRUCTION SCOPE: ☐ Form R-4, Report Supplementary Sheet is attached

_____ Pressure Test, if applied _____ psi MAWP _____ psi

(Form "R" Registration no.)

(P.O. no., job no., etc.)

8. REPLACEMENT PARTS: (Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report):
(name of part, item number, data report type or Certificate of Compliance, mfg's. name and identifying stamp)

9. REMARKS:

DESIGN CERTIFICATION

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

Date _____, _____ Signed _____
(name of design organization) (authorized representative)

CERTIFICATE OF DESIGN CHANGE REVIEW

I, _____, holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspector and certificate of competency, where required, issued by the jurisdiction of _____ and employed by _____ of _____ have reviewed the design change as described in this report and state that to the best of my knowledge and belief such change complies with the applicable requirements of the *National Board Inspection Code*.

By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ Commissions _____
(Inspector) (National Board and jurisdiction no.)

Including Endorsement

CONSTRUCTION CERTIFICATION

I, _____, certify that to the best of my knowledge and belief the statements in this report are correct and that all material, construction, and workmanship on this Alteration conforms to the National Board Inspection Code. National Board "R" Certificate of Authorization No. _____ expires on _____

Date _____, _____ Signed _____
(name of alteration organization) (authorized representative)

CERTIFICATE OF INSPECTION

I, _____, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of _____ and employed by _____ of _____ have inspected the work described in this report on _____, _____ and state that to the best of my knowledge and belief, this work complies with the applicable requirements of the National Board Inspection Code. By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage, or loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ _____
(Inspector) (National Board and jurisdiction no.)

Including Endorsement

FORM R-3 REPORT OF PARTS FABRICATED BY WELDING

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

(Authorized Rep. initials)

(Inspectors initials)

(Form "R-3" Registration no.)

(P.O. no., Job no., etc.)

1. MANUFACTURED BY: _____
(name of "NR" certificate holder)

(address)

2. MANUFACTURED FOR: _____
(name)

(address)

3. DESIGN CONDITION SPECIFIED BY: _____ CODE DESIGN BY: _____

4. DESIGN CODE: _____ _____ _____ _____

5. REPAIR/ALTERATION/MODIFICATION ACTIVITIES

Name of Part	Qty.	Line No.	Manufacturer's Identifying No.	Manufacturer's Drawing No.	MAWP	Shop Hydro PSI	Year Built

6. DESCRIPTION OF PARTS

	(a) Connections other than tubes			Heads or Ends			(b) Tubes		
Line No.	Size and Shape	Material Spec. No.	Thickness (in.)	Shape	Thickness (in.)	Material Spec. No.	Diameter (in.)	Thickness (in.)	Material Spec. No.

7. REMARKS:

_____
(Form "R-3" Registration no.)

_____
(P.O. no., job no., etc.)

CERTIFICATE OF COMPLIANCE

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

National Board "R" *Certificate of Authorization* No. _____ expires on: _____, _____

Date _____, _____ _____ Signed _____
(name of "R" Certificate holder) (Authorized Representative)

CERTIFICATE OF INSPECTION

I, _____, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of _____ and employed by _____ of _____ have inspected the part described in this report on _____, _____ and state that to the best of my knowledge and belief the parts comply with the applicable requirements of the *National Board Inspection Code*.

By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage, or loss of any kind arising from or connected with this inspection.

Date _____, _____ Signed _____ Commissions _____
(Inspector) (National Board and jurisdiction No.)

Including Endorsement

FORM R-4 REPORT SUPPLEMENT SHEET

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

(form "R" referenced)

(P.O. no., job no., etc.)

1. WORK PERFORMED BY: _____
(name)

(address)

2. OWNER: _____
(name)

(address)

3. LOCATION OF INSTALLATION: _____
(name)

(address)

REFERENCE LINE NO. CONTINUED FROM FORM R-_____

Date _____, _____ Signed _____ Name _____
(authorized representative) (Name of "R" certificate holder)

Date _____, _____ Signed _____ Commissions _____
(Inspector) (National Board and jurisdiction no.)

Including Endorsement

These edits are proposed to Part 3 due to action item from Inspection Sub-Committee associated with NB15-0501 and NB15-0502.

SUPPLEMENT 10

REPAIR AND ALTERATIONS OF PRESSURE VESSELS IN LIQUEFIED

PETROLEUM GAS SERVICE

S10.1 SCOPE

This supplement provides general and specific requirements that apply to the repairs or alterations to pressure vessels designed for storing Liquid Petroleum Gas (LPG) and fabricated in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, or the API-ASME Code for Unfired Pressure Vessels for Petroleum Liquid and Gases. When the standard governing the original construction is not the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 or the API-ASME Code for Unfired Pressure Vessels for Petroleum Liquid and Gases, the requirements of NBIC Part 3, 1.2 b, shall apply. In addition to this supplement, the applicable paragraphs of Part 3 of the NBIC shall be met. Vessels used for anhydrous ammonia service shall not be considered for repair or alteration in accordance with this supplement.

S10.2 GENERAL AND ADMINISTRATIVE REQUIREMENTS

a) Refer to NBIC Part 3, Section 1 for all applicable post construction activities pertaining to general and administrative requirements.

b) Repairs or alterations shall conform to the edition of the ASME Code or standard most applicable to the work.

S10.3 WELDING

Refer to NBIC Part 3, Section 2 for all applicable post construction activities pertaining to welding requirements.

S10.4 REQUIREMENTS FOR REPAIRS AND ALTERATIONS

a) Refer to NBIC Part 3, Section 3 for all applicable post construction activities pertaining to requirements for repairs and alterations.

Excluded is NBIC Part 3, 3.3.4.8 *Repair of Pressure-Retaining Items Without Complete Removal of Defects*.

b) Radiographic or ultrasonic examinations are considered to be suitable alternative nondestructive examination methods to ensure complete removal of the defect, as described in NBIC Part 3, 3.3.4.1.

S10.5 REQUIREMENTS FOR CHANGE OF SERVICE FROM ABOVE GROUND TO UNDERGROUND SERVICE

ASME LPG storage vessels may be altered from above ground (AG) service to underground (UG) service subject to the conditions of NBIC Part 2, S7.10.

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S10.~~5~~6 EXAMINATION AND TESTING

Refer to NBIC Part 3, Section 4 for all applicable post construction activities pertaining to examination and testing.

S10.~~6~~7 CERTIFICATION/DOCUMENTATION AND STAMPING

a) Section 5 of this part is applicable for all post construction activities pertaining to certification/documentation and stamping.

b) The "R" Certificate Holder shall assure all repairs or alterations involving a change to the following are recorded on the proper NBIC form and marked on the NBIC nameplate or stamping without changing the required format of the NBIC markings.

1) Service for which the container is designed (for example, underground, aboveground, or both).

2) Dip tube length.

3) Maximum filling limit with liquid temperature reference.

S10.~~7~~8 INSPECTION

Refer to NBIC Part 2, Supplement 7 for all applicable post construction activities pertaining to inspection.

S10.~~8~~9 COATINGS

When coatings are reapplied, the user should verify the coating is compatible with any coating that remains intact and is suited for the intended service application.

NBIC Subcommittee R&A Action Block

Subject Revision to Alternative Welding Methods
File Number NB15-3401 **Prop. on Pg.**
Page 2
Proposed Revision Statement of Need Update NBIC to reflect current welding technology.

Project Manager:
Galanes

SubGroup 0 **SG Meeting Date**
Negatives

Concept

Revise RD-1040(i), Repair Method 2, to read: "i. For the SMAW and FCAW welding process in RD-1040(c), use only electrodes and filler metals which are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower. ...".

Similar revision to RD-1060, Method 4.

NBIC Subcommittee R&A Action Block

Existing text in 2015 NBIC

2.5.3.2 WELDING METHOD 2

i) For the welding process in NBIC Part 3, 2.5.3.2(c), use of austenitic or ferritic filler metals is permitted. For ferritic filler metals, use only electrodes and filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower. When shielding gases are used with a process, the gas shall exhibit a dew point that is below -60°F (-50°C). Surfaces on which welding will be done shall be maintained in a dry condition during welding and be free of rust, mill scale, and hydrogen producing contaminants such as oil, grease, and other organic materials;

Proposed Revision (double underlined only).

i) For the welding process in NBIC Part 3, 2.5.3.2(c), use of austenitic or ferritic filler metals is permitted. For ferritic filler metals, use only electrodes and filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes.

2.5.3.3 WELDING METHOD 3

2) For the welding processes in NBIC Part 3, 2.5.3.3 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only electrodes or filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower may be used.

Proposed Revision (double underlined only)

2) For the welding processes in NBIC Part 3, 2.5.3.3 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only electrodes or filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes.

2.5.3.4 WELDING METHOD 4

2) For the welding processes in NBIC Part 3, 2.5.3.4 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only electrodes or filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower.

Proposed Revision (double underlined only)

2) For the welding processes in NBIC Part 3, 2.5.3.4 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only electrodes or filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes.

NB15-1203

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SUPPLEMENT 9

PROCEDURES ~~TO EXTEND THE "VR" CERTIFICATE OF AUTHORIZATION AND STAMP TO~~FOR REPAIRS OF ASME "NV" STAMPED PRESSURE RELIEF DEVICES

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S9.1 INTRODUCTION

~~Approval to extend the scope of the National Board "VR" *Certificate of Authorization* to the Certificate Holder to use the "VR" Stamp on~~ ASME Code "NV" Class 1, 2, or 3 stamped pressure relief devices, which have been capacity certified by the National Board~~, may be given subject to the provisions that follow.~~ may be repaired provided the following requirements are met.

S9.2 ADMINISTRATIVE PROCEDURES

a) The repair organization shall hold a valid "VR" *Certificate of Authorization*.

b) The repair organization shall obtain a National Board "NR" *Certificate of Authorization* and stamp. The requirements for said certificate and stamp include, but are not limited to, the following. The repair organization shall:

1) Maintain a documented quality assurance program that meets the applicable requirements of NBIC Part 3, 1.8. This program shall also include all the applicable requirements for the use of the "VR" stamp;

2) Have a contract or agreement with an Inspection Agency to provide inspection of repaired "NV"- stamped pressure relief devices by Inspectors who have been qualified in accordance with the requirements of ASME QAI-1, *Qualifications for Authorized Inspection*;

3) Successfully complete a survey of the quality assurance program and its implementation. This survey shall be conducted by representatives of the National Board, the Jurisdiction wherein the applicant's repair facilities are located, and the applicant's Authorized Inspection Agency. Further verification of such implementation by the survey team may not be necessary if the applicant holds a valid ASME "NV" certificate and can verify by documentation the capability of implementing the quality assurance program for repair of "NV"-stamped pressure relief devices, covered by the applicant's ASME "NV" certificate.

c) The application of the "NR" *Certificate of Authorization* and stamp shall clearly define the scope of intended activities with respect to the repair of Section III, "NV"-stamped pressure relief devices.

d) Revisions to the quality assurance program shall be acceptable to the Authorized Nuclear Inspector Supervisor and the National Board before being implemented.

e) The scope of the "VR" *Certificate of Authorization* shall include repair of "NV"-stamped pressure relief devices.

f) Verification testing of valves repaired by the applicant shall not be required provided such testing has been successfully completed under the applicant's "VR" certification program for the applicable test fluids.

g) A survey of the applicant for the "VR" *Certificate of Authorization* and endorsement of the repair of "NV"-stamped pressure relief devices may be made concurrently.

S9.3 GENERAL RULES

a) ASME Code Section III, "NV"-stamped pressure relief devices, which have been repaired in accordance with these rules, shall be stamped with both the "VR" and "NR" stamps.

b) The "VR" and "NR" stamps shall be applied only to "NV" stamped (Class 1, 2, or 3) National Board capacity certified pressure relief devices that have been disassembled, inspected, and repaired as necessary, such that the valves' condition and performance are equivalent to the standards for new valves.

c) All measuring and test equipment used in the repair of pressure relief devices shall be calibrated against certified equipment having known valid relationships to nationally recognized standards.

d) Documentation of the repair of "NV"-stamped pressure relief devices shall be recorded on the National Board Form NVR-1, *Report of Repair/ Replacement Activities for Nuclear Pressure Relief Devices*, in accordance with the requirements of NBIC Part 3, 1.8.

e) When an ASME "NV"-stamped pressure relief device requires a duplicate nameplate because the original nameplate is illegible or missing, it may be applied using the procedures of NBIC Part 3, 5.12.5 provided concurrence is obtained from the Authorized Nuclear Inspector and Jurisdiction. In this case the nameplate shall be marked "SEC. III" to indicate original ASME Code stamping.

f) Repair activities for pressure relief devices shall not include rerating of the device. Set pressure changes within the range of the valve manufacturer's capacity certification and the design pressure of the valve (see Part 3, 5.12.3) are permitted, provided the new set pressure and capacity rating are reconciled with the design of the system where the device will be used. Set pressure changes are not considered to be rerating.

g) Conversions of pressure relief devices as described in NBIC Part 3, S7.2 ba) are permitted as part of repair activities.

h) Set pressure changes or conversions of pressure relief devices shall be described in the "Remarks" section of Form NVR-1.

NB15-1204

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1.8.2 GENERAL

a) An organization applying for an "NR" *Certificate of Authorization* shall have a written Quality Assurance Program (QAP) that details the specific requirements to be met based on the intended category of activities selected by that organization as described below and shown in Table 1.8.2. Controls used, including electronic capabilities, in the Quality Assurance Program shall be documented in a Quality Assurance Manual (QAM). Controls required to be included within the QAM shall include who, what, when, where, why and how with an understanding that the how can be a reference to an implementation procedure or instruction. Quality activities to be described in the Quality Assurance Program are~~is~~ identified in Section 1.8.5 of this part. Applicants shall address all requirements in their Quality Assurance Program based on the category of activity and scope of work to be performed (organization's capabilities) to which certification is requested.

~~b~~1) Category 1

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Any ASME Code certified item or system requiring repair/replacement activities irrespective of physical location and installation status prior to fuel loading.

~~c~~2) Category 2

After fuel loading, any item or system under the scope of ASME Section XI requiring repair/replacement activities irrespective of physical location.

~~d~~3) Category 3

Items constructed to codes or standards other than ASME, requiring repair/replacement activities irrespective of physical location, installation status and fuel loading.

~~e~~b) Repair organizations performing repairs of pressure relief devices in nuclear service shall meet the additional requirements of NBIC Part 3, Supplement 7 and Supplement 9.

Request for NBIC Part 3, Supplement 2 Revision

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NB16-0501

Purpose	To clarify when telltale holes are required to be installed in staybolts 8 inches or less in length.
Scope:	To eliminate the requirement of telltale holes in staybolts when replacing staybolts 8 inches or less in length when the original Code of construction did not require them.
Background	In the performance of repairs to historical boilers by replacing/installing threaded and welded staybolts, paragraphs S2.13.2(b) and S2.13.4(c) of the NBIC Part 3, Supplement 2 require telltale holes in staybolts 8 inches or less in length. There is no reason to install telltale holes in these shorter staybolts if they weren't required by the original code of construction. Recommend revising S2.13.2(b) and S2.13.4(c) to eliminate telltale holes if the original construction code or standard did not require them. This will require telltale holes if required by the original code of construction or when replacing existing staybolts with telltale holes, but not all staybolt replacements.
Proposed Revision	**Paragraphs S2.13.2(b) shall be revised to read as follows:** **S2.13.2 INSTALLATION OF THREADED STAYBOLTS** a) Threaded staybolts shall have either 11 or 12 thread pitch. Staybolt threads shall have a close fit in sheets. Changing the staybolt thread pitch from 11 to 12 or the reverse shall be considered a repair. b) ~~When staybolts 8 in. (200 mm) or less in length are replaced, they shall be replaced with staybolts that have a telltale hole 3/16 in. (5 mm) to 7/32 in. (5.5 mm) in diameter their entire length or with ones that have a 3/16 in. (5 mm) to 7/32 in. (5.5 mm) diameter hole in each end, drilled a minimum of 1-1/4 in. (31 mm) deep. On reduced body staybolts, the telltale hole shall extend beyond the fillet and into the reduced section of the staybolt. (See NBIC Part 3, Figure S2.13.2).~~ b) Replacement of staybolts 8 inches and less in length shall have telltale holes when required by the original Code of construction or when replacing staybolts with telltale holes. Telltale hole diameter shall be 3/16 in. (5 mm) to 7/32 in. (5.5 mm) in diameter and at least 1-1/4 in. (31 mm) deep in the outer end. On reduced body staybolts, the telltale hole shall extend beyond the fillet and into the reduced section of the staybolt. Staybolts should have through telltale holes, which are preferred. (See Figure S2.13.2)

Paragraph S2.13.4(c) shall be revised to read as follows:

S2.13.4 INSTALLATION OF WELDED STAYBOLTS

a) The installation of unthreaded staybolts using full penetration welds is permissible. (See NBIC Part 3, Figure S2.13.4).

b) Threaded stays may be replaced by welded-in stays provided that, in the judgement of the Inspector, the material adjacent to the staybolt has not been materially weakened by deterioration or wasting away. If staybolt hole is threaded, the threads shall be removed prior to welding.

~~c) Staybolts shorter than 8 in. (200 mm) in length shall have telltale holes. Telltale hole diameter shall be 3/16 in. (5 mm) to 7/32 in. (5.5 mm) in diameter and at least 1-1/4 in. (31 mm) deep in the outer end. On reduced body staybolts, the telltale hole shall extend beyond the fillet and into the reduced section of the staybolt. Staybolts should have through telltale holes, which are preferred.~~

c) Replacement of staybolts 8 inches and less in length shall have telltale holes when required by the original Code of construction or when replacing staybolts with telltale holes. Telltale hole diameter shall be 3/16 in. (5 mm) to 7/32 in. (5.5 mm) in diameter and at least 1-1/4 in. (31 mm) deep in the outer end. On reduced body staybolts, the telltale hole shall extend beyond the fillet and into the reduced section of the staybolt. Staybolts should have through telltale holes, which are preferred. (See Figure S2.13.4)

TABLE 1.8.2 (15)

"NR" QUALITY ASSURANCE PROGRAM (QAP) REQUIREMENTS

Category of Activity	Owner	Organizations other than Owner
Category 1	10 CFR Part 50 Appendix B1, 2 and ASME Section III NCA-4000	10 CFR Part 50 Appendix B1, 2 and ASME Section III NCA-4000
Category 2	10 CFR Part 50, Appendix B1, 2 or NQA-1, Part 1 and ASME Section XI, IWA-4142	10 CFR Part 50, Appendix B1, 2 supplemented as needed with Owner's QA program; or ASME NQA-1, Part 1; or ASME Section III, NCA-4000
Category 3	ASME NQA-1, or Specify the Standard to which certification is desired	ASME NQA-1,or Specify the Standard to which certification is desired
Note 1: Code of Federal Regulations (CFR) – rules and regulations published by the executive departments and agencies of the federal government of the United States.		
Note 2: 10 CFR 50 Appendix B – Title 10 of the Code of Federal Regulations Part 50 Appendix B describes the quality assurance criteria for nuclear plants and fuel reprocessing plants.		

1.8.2.1 DEFINITIONS (15)

The terms and definitions ~~used within this section shall be as specified below:~~

NBIC

~~a) For Category 1 terms and definitions shall be as specified in ASME Section III~~

~~b) For Category 2 terms and definitions shall be as specified in ASME Section XI~~

~~c) For Category 3 terms and definitions shall be as specified in ASME NQA-1 and fied by the Regulatory Authority~~

shall be supplemented, as applicable, by the terms and definitions of ASME Section III, Section XI, NQA-1, or other standards specified by the Regulatory Authority,

The following terms are as defined in the NBIC Glossary of Terms Section 9:

a) Authorized Inspection Agency

b) Authorized Nuclear Inspection Agency

[*An Authorized Inspection Agency intending to perform nuclear inspection activities and employing nuclear Inspectors / Supervisors*] – NBIC Glossary

c) Jurisdiction

d) "NR" Certificate Holder