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THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE COMMITTEE

MINUTES

Meeting of July 18th, 2019
Kansas City, MO

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1. **Call to Order**
   The NBIC Main Committee Chair Mr. Bob Wielgoszinski called the meeting to order at 8:03 AM local time.

2. **Introduction of Members and Visitors**

   Mr. Wielgoszinski asked the committee members and visitors to introduce themselves.

   During committee member introductions, the following people were announced as alternates:
   - Ms. Marianne Brodeur, sitting in for Mr. Kevin Simmons;
   - Mr. Rick Sturm, sitting in for Mr. Milton Washington;
   - Mr. Joe Brockman, sitting in for Mr. Mark Mooney;
   - Mr. Ben Schaefer, sitting in for Mr. Brian Morelock; and
   - Ms. Patricia Becker, sitting in for Craig Hopkins.

   a. **Establish a Quorum**
      i. After introductions were concluded, Mr. Wielgoszinki announced that there were sixteen Main Committee members present or represented by alternates out of nineteen total Main Committee members. This is enough to establish a quorum for the meeting and take voting actions on agenda items.

3. **Announcements**

   Mr. Jonathan Ellis announced that a buffet lunch will be provided for meeting attendees at 11:30AM in the Rooftop Ballroom. Coffee breaks will be taken periodically in the morning and afternoon in meeting room.

   Mr. Gary Scribner welcomed the attendees to the meeting and gave a brief announcement that the 2019 NBIC is available to purchase on the National Board's website.

   Mr. Wielgoszinski then gave a few procedural announcements. He asked that speakers use their microphones when possible so that everyone can hear them. Subcommittee Inspection would be the first committee to present, followed by Subcommittee Repairs & Alterations, Subcommittee Pressure Relief Devices, and finally Subcommittee Installation. A brief presentation on new welding methods for Grade 91 steel would be presented after the Subcommittee Inspection briefing. It was requested that the Subcommittee Chairs sit with their secretaries at the front table when presenting their items. The National Board staff was acknowledged for their hard work and preparation to help the meetings run smoothly.

   Mr. Scribner presented Mr. Venus Newton with a five year service award for his service on the Main Committee.

4. **Adoption of the Agenda**

   Mr. Jim Getter, Chair of Subcommittee Inspection, asked to add Mr. David Rose (Interest category, User) to the list of Subcommittee Inspection nominations. He also asked that items 19-63, 19-64, and 19-65 be added to the Subcommittee Inspection portion of the agenda.

Mr. Rob Troutt asked that Mr. Rick Sturm (Interest category, Jurisdictional Authority) and Mr. Marty Toth (Interest category, NB Certificate Holder) be added to the list of Main Committee nominations.

A motion was made, seconded and approved unanimously to adopt the revised agenda with the noted changes.

5. Approval of the Minutes of the January 17th, 2019 Meeting

The minutes are available for review on the National Board website, www.nationalboard.org.

A motion was made, seconded, and approved unanimously to approve the minutes for the January 17th, 2019 meeting with no changes.

6. Review of Rosters (Attachment Page 1)

Mr. Wielgoszinski announced that discussion on membership nominations and reappointments would be handled in an executive session. He asked all visitors to leave the meeting room until all discussion and voting was completed.

a. Membership Nominations – Executive Session

Main Committee members:

- Marianne Brodeur (National Board Certificate Holders) – Main Committee
  - Ms. Brodeur is the Chair of Subcommittee Pressure Relief Devices.
- Rick Sturm (Jurisdictional Authorities) – Main Committee
- Marty Toth (National Board Certificate Holders) – Main Committee

This action would increase the MC membership from 19 to 22 members. The NB-240, rev 14 Committee procedures permit a maximum of 26 members. The result of this action would be in conformance with the membership and balance of interest requirements.

The first round of discussion was held on the Main Committee candidates listed above. After discussion, a vote was held to approve the candidates' nominations. This vote passed unanimously.

Subcommittee Members:

- Matt Downs (Manufacturers) – Subcommittee Installation
- Randy Austin (Users) – Subcommittee Installation
- James Clark (Manufacturers) – Subcommittee Inspection
- David Rose (Users) – SC Inspection
- Patricia Becker (National Board Certificate Holders) – Subcommittee Repairs & Alterations
- Michael Quisenberry (National Board Certificate Holders) – Subcommittee Repairs & Alterations
- John Siefert (General Interest) – Subcommittee Repairs & Alterations
- Timothy McBee (Authorized Inspection Agencies) – Subcommittee Repairs & Alterations
- Paul Shanks (Authorized Inspection Agencies) – Subcommittee Repairs & Alterations

The NB-240, rev 14 Committee procedures has no requirements for the maximum limit of members nor for balance of interest. Nor is there any requirement for having multiple members from a single employer on the Committee. This was discussed prior to taking a vote. After introducing the list of subcommittee

membership nominations, discussion was held, and a vote was taken to approve the subcommittee nominations. This vote passed unanimously.

b. Membership Reappointments

- Craig Hopkins – Main Committee
- Mike Richards – Main Committee
- Jim Pillow – Main Committee, SC Repairs and Alterations
- Paul Welch – Main Committee
- David Buechel – SC Inspection
- Venus Newton – SC Inspection
- Ray Miletti – SC Repairs and Alterations

Mr. Wielgoszinski introduced the list above and asked if anyone had any questions or comments about the proposed reappointments. A motion was then made and seconded to approve the list of reappointments. A vote was taken and was approved unanimously.

c. Officer Positions

There were no officer positions that required Main Committee approval at this meeting.

Mr. Wielgoszinski called an end to the executive session and the visitors were invited back into the meeting room.

7. Items Approved for 2021 NBIC

a. Part 1

i. Item 17-121 – changes to installation and discharge requirements for pressure relief valves (Part 1, 2.9.6)
ii. Item 17-125 – changes to inlet opening diameter requirements for steam heating boiler pressure relief valves (Part 1, 3.9.2)
iii. Item 17-130 – simplified definition of where pressure relief devices will discharge pressure (Part 1, 4.5.6)
iv. Item NB15-0108A – new supplement in Part 1 for High-Temperature Water Boilers

b. Part 2

i. Items 18-61 and 18-101 – additional inspection requirements for PVHOs (Part 2, 2.3.6.8)
ii. Item 18-89 – correcting the text in Part 2, S2.4 to reference Part 2, Section 3 instead of Part 3, Section 3

c. Part 3

i. Item 18-83 – clarifying when an increase in the heating surface or steaming capacity is considered an alteration (Part 3, 3.4.4 e))
ii. Item 18-88 – correcting the reference in S2.6 a) from “NBIC Part 3, 1.6” to “NBIC Part 3, 1.5”
iii. Item 18-98 – updated definition for replacement parts in S2.7.2 that refers back to Part 3, 3.2.2
iv. Item 18-88 - correcting the reference in S2.9 from “NBIC Part 3, 1.6” to “NBIC Part 3, 1.5”
v. Item 18-67 – new definitions for brazing, fusing, and welding (All Parts, 9.1)

d. Part 4

i. 17-121 – changes to installation and discharge requirements for pressure relief valves (Part 4, 2.2.10)
ii. 17-125 – changes to inlet opening diameter requirements for steam heating boiler pressure relief valves (Part 4, 2.4.2)
iii. 17-130 – simplified definition of where pressure relief devices will discharge pressure (Part 4, 2.5.6 f))
iv. NB17-1401 – requirements to remove shipping caps/plugs from pressure relief devices prior to installation (Part 4, S4.4 b) 2))

8. Report of Subcommittees

a. Subcommittee Inspection

i. Interpretations

Subcommittee Inspection had no interpretations to discuss at this meeting.

ii. Action Items – Old Business

Item Number: NB16-1401	**NBIC Location: Part 2, S10**	**Attachment Page 4**
General Description: Revise and update Supplement 10 on Inspection of CRPVs **Subgroup:** FRP **Task Group:** N. Newhouse (PM) **July 2019 Meeting Action:** Mr. Jim Getter introduced the item and announced that the subcommittee voted to send the proposal back to the FRP task group to clean up the proposal.		

Item Number: 18-6	**NBIC Location: Part 2, S1.4.2.9**	**No Attachment**
General Description: Riveted stay bolt dimensions **Subgroup:** Locomotive **Task Group:** M. Janssen (PM) **July 2019 Meeting Action:** Mr. Getter announced that work is being done to develop a proposal for this item.		

Item Number: 18-43	**NBIC Location: Part 2, Section 5**	**No Attachment**
General Description: Permanent nameplate removal from pressure vessel being removed from service **Subgroup:** Inspection **Task Group:** J. Roberts (PM), J. Burgess, J. Calvert, T. Shernisky, J. Clark, M. Sansone **July 2019 Meeting Action:** Mr. Getter announced that work is being done to develop a proposal for this item for the next meeting.		

Item Number: 18-62	NBIC Location: Part 2, S12.5	No Attachment

General Description: Remote Visual Inspection Requirements

Subgroup: Inspection
Task Group: V. Newton (PM), M. Horbaczewski, B. Wilson, J. Calvert, J. Castle, D. Graf, T. Shernisky

July 2019 Meeting Action: Mr. Getter announced that work is being done to develop a proposal for this item.

Item Number: 18-63	NBIC Location: Part 2	No Attachment

General Description: Review inspection requirements for pressure vessels designed for high pressures

Subgroup: Inspection
Task Group: T. Shernisky (PM), J. Mangas, J. Peterson, and J. Castle

July 2019 Meeting Action: Mr. Getter announced that work is being done to develop a proposal for this item.

New Items:

Item Number: 19-6	NBIC Location: Part 2, 2.3.6.8	No Attachment

General Description: PVHO 2.3.6.8 Add other types of PVHO's

Subgroup: Inspection

Task Group: D. Buechel (PM), R. Smith, S. Reimers, J. Burgess, M. Mooney & D.LeSage

Explanation of Need: Currently part 2 only covers medical PVHO's.

July 2019 Meeting Action: Mr. Getter announced that work is being done to develop a proposal for this item.

Item Number: 19-7	NBIC Location: Part 2	No Attachment

General Description: Pressure Gage Graduation

Subgroup: Inspection

Task Group: V. Newton (PM), D. Buechel, D. Rose, D. Graff, & J. Clark

Explanation of Need: This item was opened after discussion of the pressure gage for PVHO's. The SG Inspection decided they needed to look into the pressure gage graduation for other pressure retaining items beyond PVHO's.

July 2019 Meeting Action: Mr. Getter announced that work is being done to develop a proposal for this item.

Item Number: 19-8	NBIC Location: Part 2, 2.3.6.8	No Attachment

General Description: Clarification of gage requirements for PVHO

Subgroup: Inspection

Task Group: D. Buechel (PM) & R. Smith , V. Newton

Explanation of Need: Existing PVHO gages do not conform to current NBIC and ASME Standards as written.

July 2019 Meeting Action: Mr. Getter announced that work is being done to develop a proposal for this item.

Item Number: 19-9	NBIC Location: Part 2	No Attachment

General Description: Inspect shipping plug removal for PRDs

Subgroup: Inspection

Task Group: V. Scaracella (PM), J. Peterson, T. Bolden, E. Brantley

Explanation of Need: Ensuring that shipping plugs have been removed because shipping plugs have been found that are still in place on PRD's.

July 2019 Meeting Action: Mr. Getter announced that this was a relatively new item and a task group was assigned to work on this item.

Item Number: 19-22	NBIC Location: Part 2, S2	No Attachment

General Description: Review of MAWP on Return Flue Boilers.

Subgroup: SG Historical

Task Group: M. Wahl (PM), J. Amato, R. Bryce & D. Rose

Explanation of Need: From the Presentation, by Robert Bryce, the subcommittee feels this needs to be reviewed more in-depth. Continue the research and documentation on the MAWP of Return Flue Boiler. This was started with the documentation presented by Robert Bryce which is located in the NBIC cloud under January 2019 Historical Subcommittee.

July 2019 Meeting Action: Mr. Getter announced that work is being done to develop a proposal for this item.

Item Number: 19-23	NBIC Location: Part 2, S2.10.6	No Attachment

General Description: Remove Note from S2.10.6

Subgroup: SG Historical

Task Group: J. Amato (PM), D. Rose, T. Shernisky & D. Rupert

July Meeting Action: Mr. Getter introduced the item and explained that the subgroup and subcommittee voted to close the item with no action. It was decided that this should be a jurisdictional matter. A motion was made and seconded to close the item, and this motion was approved unanimously.

Item Number: 19-28	NBIC Location: Part 2, S2	No Attachment

General Description: External Pressure

Subgroup: SG Historical

Task Group: None assigned

Explanation of Need: During the January 2019 NBIC meeting, Robert Bryce presented a power point explaining his reasoning for the need of a new equation for external Pressure. Based on this presentation the Historical Subgroup decided to open this item and assign a task group for further work.

July Meeting Action: Mr. Getter introduced the item and explained that the subgroup and subcommittee voted to close the item because its scope is addressed under the scope of item 19-22. A motion was made and seconded to close the item, and this motion was approved unanimously.

Item Number: 19-29	NBIC Location: Part 2, 5.2.4	Attachment Page 24

General Description: Remove NB-136 reference in Replacement of Duplicate Nameplates

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: This paragraph needs to be updated to provide clarity on the use of the NB-136, as it currently contradicts itself.

July Meeting Action: Mr. Getter introduced a proposal for this item and announced that it was unanimously approved by the subcommittee. A motion was made and seconded to approve proposal as presented. After the motion was made, discussion was held on why the change is being made and suggestions for alternate wording were made. Further discussion on if NB-136 should be required for duplicate nameplates and if AI's should be involved with issuing the duplicates was held. As discussion continued, the original motion was withdrawn and it was suggested that the item be sent to Main Committee letter ballot to allow for more time to consider the proposal.

Item Number: 19-30	NBIC Location: Part 2, S7.9	Attachment Page 25

General Description: Temporary ASME Nameplate removal for external inspection refurbishing.

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: No reference to the necessity of removing ASME nameplates for this external inspection is currently in the code. An exemption is needed for refurbishers as a safety measure to ensure the total integrity of the tank is examined.

July Meeting Action: Mr. Getter introduced a proposal for this item and discussed the changes being made. A motion was made and seconded to approve proposal as presented. A clarification was made that the proposed changes only apply to LPG tanks. After discussion, a vote was taken and the motion was approved unanimously.

Item Number: 19-33	NBIC Location: Part 2, 1.1	Attachment Page 27

General Description: Scope of 1.1 has Redundant Statements

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: Wording needs to be revised so the first two sentences are not saying the same thing.

July Meeting Action: Mr. Getter introduced a proposal for this item and discussed the changes being made. A motion was made and seconded to approve proposal as presented. No further discussion was held after the motion was made. A vote was taken and the motion was approved unanimously.

Item Number: 19-46	NBIC Location: Part 2, S5	No Attachment

General Description: Revisions to Yankee dryer supplement in Part 2

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: Various parts of supplement 5 do not match their counterparts in Part 1, Supplement 1.

July Meeting Action: Mr. Getter announced that the scope of this has been split into multiple items. Item 19-46 will have a revised scope, and items 19-63, 19-64, and 19-65 were opened to address different parts of the original proposal.

Item Number: 19-65	NBIC Location: Part 2, S5.2.3	Attachment Page 28

General Description: Changes to Yankee Dryer supplement S5.2.3

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: the recommendation is to strike this paragraph because it is nearly identical to S5.2.1, paragraph a), which appears a few paragraphs earlier, within the Code.

July Meeting Action: Mr. Getter introduced a proposal for this item and discussed the changes being made. A motion was made, seconded, and unanimously approved to accept the proposal as presented.

At the conclusion of the Subcommittee Inspection action item report, Mr. Wielgoszinski invited Mr. John Siefert, Mr. Eric DuPont, and Mr. Chris Ferguson to present on a new welding method for Grade 91 repairs. This presentation can be found on Attachment Pages 29-64.

b. Subcommittee Repairs and Alterations

i. Interpretations

Item Number: 17-143	NBIC Location: Part 3	Attachment Page 65

General Description: Can an "R" stamp certified shop manufacture and use parts for use on the pressure boundary to complete the repair of a boiler?

Subgroup: Repairs and Alterations

Task Group: Paul Welch (PM), Linn Moedinger

July 2019 Meeting Action: Mr. Rob Troutt introduced the item and presented the proposed response to the inquiry. A motion was made and seconded to accept the presented response. Mr. Don Cook asked a clarifying question with regards to the subject of the request. Additional discussion was held on if the response should refer to a different section as replacing riveted parts with welded parts could be considered an alteration. Mr. Paul Welch clarified that the inquirer was looking to make a part to make the repairs in-house. The committee considered the wording of the question and made some changes to make to make the intent of the interpretation clear. Revisions to the committee question and response were made, and the motioner and seconder agreed to the changes. A vote was taken to approve the revised proposal, and this passed unanimously.

Item Number: 18-34	NBIC Location: Part 3, 8.4	Attachment Pages 66-69

General Description: Does an R certificate holder assume responsibility for safety/integrity of a vessel outside the scope of repair?

Subgroup: Repairs and Alterations

Task Group: Nathan Carter (PM), Michael Quisenberry

July Meeting Action: Mr. Troutt introduced the item and announced that it had been closed by the subgroup and subcommittee. After consulting with the National Board's legal services, it was determined that the NBIC Committee should not issue an interpretation for this inquiry as it is beyond scope of NBIC. A motion was made and seconded to close the item and notify the inquirer that their inquiry is beyond the scope of the NBIC. The inquirer would also be provided references to interpretations 95-14 and 95-17. This motion was approved unanimously.

Item Number: 18-53	NBIC Location: Part 3	Attachment Page 70

General Description: Is changing the corrosion allowance noted on the original Manufacturer's Data Report considered an alteration per NBIC, when this task is performed solely for the purpose of establishing minimum required thicknesses on an internal Owner / User mechanical integrity database?

Subgroup: Repairs and Alterations

Task Group: Brian Boseo (PM)

July Meeting Action: Mr. Troutt introduced the item and announced that it was closed by the subgroup and subcommittee because multiple requests for additional information from the inquirer went unanswered. A motion and a second were made to close the item with no action. This motion passed unanimously.

New Interpretation Requests:

Item Number: 19-4	NBIC Location: Part 3, 3.2	Attachment Page 71

General Description: Use of Different Editions of the Construction Code for Repair or Alteration

Subgroup: Repairs and Alterations

Task Group: M. Quisenberry (PM)

Explanation of Need: Try to resolve if there should be a restriction to different editions of the code of construction.

July Meeting Action: Mr. Troutt announced that this item was closed by the subgroup and subcommittee as the inquirer decided to withdraw their inquiry. This wa a Committee generated inquirer and the inquirer confirmed the withdrawal. A motion was made and seconded to close the item with no action, and this motion was approved unanimously.

Item Number: 19-5	NBIC Location: Part 3, 3.2.6	Attachment Page 74

General Description: Reference to Other Codes and Standards

Subgroup: Repairs and Alterations
Task Group: B. Morelock (PM)
Explanation of Need: Repair Methodology proposed by user is rejected by AI as there are no codes, standards, and practices available to support repair method.

July Meeting Action: Mr. Troutt introduced the item and the proposed committee response. A motion was made and seconded to approve the proposed questions and responses. Some discussion held on the wording of the committee questions and which to include in the official response. It was requested that the proposal be revised and letter balloted to the Main Committee. The original motion to voice vote the proposal was withdrawn.

Item Number: 19-10	NBIC Location: Part 3, Introduction, paragraph on Interpretations	Attachment Page 77

General Description: Allow interpretations to be used in any edition, provide the same wording

Subgroup: Repairs and Alterations
Task Group: K. Moore (PM)

Explanation of Need: NBIC currently limits each interpretation to the edition it was issued for. However often time the words in question do not change from one edition to another. At present a new interpretation would be needed for each edition of the NBIC to address the same issues, this is a delay to field work and a drain on NBIC committee time.

July Meeting Action: Mr. Troutt gave a progress report on the item and asked that the other subcommittees provide feedback for the proposal. The NBIC Secretary will send the proposal to the other committees as a review and comment ballot. Also, NB Staff will be consulted as the best way to send out this multi-discipline interpretation.

Item Number: 19-17	NBIC Location: Part 3, S1.2.11.3	Attachment Page 79

General Description: Wastage at Mudring: If the majority of the wastage is on the fireside, and there minimal wastage on the waterside, does this section still govern repairs?

Subgroup: Locomotive
Task Group: L. Moedinger (PM)

Explanation of Need: This question is in regards to a CFR 230, 1472 day boiler inspection on a 1927 built Baldwin 4-8-4 steam locomotive. The door sheet (aka back sheet) in the firebox has sustained wastage at the mudring on the fireside, caused by the proximity of the firebrick. In the figure S1.2.11.3, the drawing indicates a wastage on the waterside, yet the text of section S1.2.11.3 does not specify if it is referring to the waterside, the fireside, or both. Please see attached diagram of the wastage in question.

July Meeting Action: Mr. Troutt introduced the item and explained the proposed response. A motion was made and seconded to approve the proposal. Mr. Wielgoszinski asked if it matters that wastage is minimal. Mr. Linn Moedinger replied saying that “minimal” could be removed from the question because it is a subjective measurement. The proposal was modified to address this concern and to better match the language used in the NBIC. A motion was made and seconded to accept the new proposal. This motion was approved unanimously.

Item Number: 19-20	NBIC Location: Part 3, 3.3.4.2 e)	Attachment Page 81

General Description: Use of Heli-Coils for repairs and alterations of PRI's

Subgroup: Repairs and Alterations

Task Group: N. Carter (PM)

Explanation of Need: Paragraph 3.3.4.2e) states that defective bolting shall not be repaired but shall be replaced with suitable material that meets the specification of the original code of construction. When a bolt head is broken off leaving the bolt threaded in the RPI, a Heli-Coil is normally used to fix the problem. The problem with a Heli-Coil, is that there types made of different materials. NBIC requires material used to be in accordance with the Code of Construction. Also, needed to be taken into consideration would be threading calculations to verify acceptable pressure retention of the RPIs MAWP.

July Meeting Action: Mr. Troutt introduced item and explained that the subgroup and subcommittee voted to close the item with a response to the inquirer providing a reference to interpretation 04-19. A motion was made and seconded to close the item and send that response. The motion was approved unanimously.

Item Number: 19-25	NBIC Location: Part 3, 4.4.2 c)	Attachment Page 82

General Description: NDE methods to do in lieu of Hydro test

Subgroup: Repairs and Alterations

Task Group: J. Siefert (PM)

Explanation of Need: For ASME BPV Section VIII Division 2 Vessel is under Alteration with Re-rate of lowering MAWP & increasing of Design Temperature & there is no physical alteration in the Vessel but only change is in the Alteration design report because of different design stress intensity value at higher design temperature.

July Meeting Action: Mr. Troutt introduced the item and requested that the proposal be sent to the Main Committee as a letter ballot.

Item Number: 19-26	NBIC Location: Part 3, 3.3.2	Attachment Page 87

General Description: Clarification on welding repairs on appendages

Subgroup: Repairs and Alterations
Task Group: P. Shanks (PM)

Explanation of Need: The original submitter of this item will sometimes need to perform a welding repair on an appendage (not on the tank itself) in order for the complete process of refurbishment to be done for their customers' expectations. There appears to be no direct reference to these types of minor welding repairs for the refurbishment process in the NBIC code.

July Meeting Action: Mr. Troutt introduced the item and gave some additional background information. He then requested that it be sent to Main Committee letter ballot. A question was asked about whether or not nameplate removal is involved, and it was confirmed that the nameplate was not part of the inquiry. Mr. Scribner suggested that a question dealing with the nameplate be included in the proposal. The project manager agreed to amend the proposal to include a question on nameplates before sending it to the NBIC Secretary for letter ballot.

Item Number: 19-34	NBIC Location: Part 3, 3.2.2 e)	Attachment Page 89

General Description: Is it the intent of Part 3, 3.2.2 e) that the reference to the original code of construction is for determining the hydrostatic test pressure?

Subgroup: Repairs and Alterations

Task Group: None Assigned.

Explanation of Need: NBIC Part 3 Section 3 paragraph 3.2.2 e) (shown below) states that replacement parts shall receive a pressure test as required by the original code of construction. The original submitter is concerned that this clause is not being interpreted consistently by all users of the NBIC. The words in question are "…as required by the original code of construction." ASME issued interpretation I-16-1 (shown below) and revised PW-54 to clarify that Section I does not contain requirements for the hydrostatic testing of replacement parts provided for an existing unit. Based on this, the words "… as required by the original code of construction." Could be interpreted to mean that pressure testing of the parts is not required because Section I does not require testing of replacement parts. The submitter does not think that was the Committee's intent when clause e) was added to 3.2.2. Linking the words "original code of construction" to the test pressure would eliminate the potential interpretation that testing is only required when the original code of construction specifically requires testing of replacement parts.

July Meeting Action: Mr. Troutt introduced the item and provided some additional background information. A motion was made and seconded to approve the proposal. Mr. Wielgoszinski asked if a code revision will be made along with this interpretation. It was confirmed that an item will be opened to address a code revision, but nothing had been done at this time. The original motion was withdrawn to wait until a proposed revision is available to accompany the interpretation.

Item Number: 19-35	NBIC Location: Part 3, 2.5.2 and 3.4	Attachment Page 92

General Description: POST WELD HEAT TREATMENT- ALTERATION-Part 3- 3.4 & 2.5.2

Subgroup: Repairs and Alterations

Task Group: J. Pillow (PM)

Explanation of Need: An R Certificate Holder is Doing Repair Work on the Shell Side of Heat Exchanger, which was not PWHT Earlier. As per Client Request, Welded Joints are Post weld Heat Treated and Consider as Alteration, Client wants Shell Side to Under Go Full Post weld Heat Treatment Including areas not repaired. NDE is being Carried out for Complete Equipment and Client wants PWHT for Welds which are in Services and without any repairs.

July Meeting Action: Mr. Troutt introduced the item and provided some additional background information. He explained the subgroup and subcommittee unanimously approved to close the item and send a response to the inquirer stating that their question is answered by interpretation 13-06. A motion was made, seconded, approved unanimously to close the item and send the response to the inquirer.

Item Number: 19-36	NBIC Location: Part 3, 3.3.2 & 3.3.5	Attachment Page 94

General Description: Routine Repairs of VIII Div 2 and Div 3 PV

Subgroup: Repairs and Alterations

Task Group: J. Pillow (PM)

Explanation of Need: Para 3.3.2 talks about requirements for and examples of routine repairs. It does not specify any restrictions on pressure retaining items construction Code. It states that Routine repairs are repairs for which the requirements for in-process involvement by the Inspector and stamping by the "R" Certificate Holder may be waived as determined appropriate by the Jurisdiction and the Inspector. It states that all other applicable requirements of this code (NBIC) shall be met. Para 3.3.5.1 of NBIC states that the following requirements shall apply for the repair of pressure vessels constructed to the requirements of Section VIII, Division 2 or 3, of the ASME Code. This calls for properly Certified repair plan to be submitted to the Inspector who will make acceptance inspection and sign R-1 Form.

July Meeting Action: Mr. Troutt introduced the item and provided some additional background information. He then requested that this item be sent out for letter ballot to the Main Committee.

Item Number: 19-42	NBIC Location: Part 3, 3.3.3 s) & 3.4.4 g)	Attachment Page 97

General Description: 3.3.3 s design intent clarification vs 3.4.3 g

Subgroup: Repairs and Alterations

Task Group: P. Shanks (PM)

Explanation of Need: The design requirement in 3.3.3 s) is not well defined and is allowing potentially unsafe material changes to be conducted as repairs without adequate assessment.

July Meeting Action: Mr. Troutt introduced the item and said that work is still being done on the proposal.

Item Number: 19-44	NBIC Location: Part 3, 1.6.6.2,1.6.7.2, 1.6.8.2	Attachment Page 98

General Description: ISO/IEC 17025 Revision

Subgroup: Repairs and Alterations
Task Group: R. Troutt (PM)

Explanation of Need: Many, if not all calibration labs are already accredited to ISO/IEC 17025:2017 and will be required to by 2020. No lab will bother accreditation to 2005 after that, so finding a calibration house will be difficult.

July Meeting Action: Mr. Troutt introduced the item and Mr. Paul Edwards provided additional background information. This item is an intent interpretation that is accompanied by a code change proposed in item 19-43. Mr. Wielgoszinski asked if it would be appropriate to go over the proposal for 19-43 and vote on it before taking action on 19-44. The committee agreed to this suggestion. After discussing the proposed changes in item 19-43, a motion was made and seconded to approve the proposals for 19-43 and 19-44. A vote was first carried out to approve 19-43, and this vote passed unanimously. A second vote was held to approve 19-44, which was also approved unanimously.

ii. Action Items – Old Business

Item Number: NB15-1405	NBIC Location: Part 3, 1.2	Attachment Page 103

General Description: Impact testing of P-11B Material

Subgroup: Repairs and Alterations

Task Group: N. Carter (PM), P. Davis, G. Galanes, P. Shanks

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

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

General Description: Develop supplement for repairs and alterations based on international construction standards

Subgroup: Graphite

Task Group: Greg Becherer (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: NB16-1402	NBIC Location: Part 3	Attachment Page 109

General Description: Life extension for high pressure vessels above 20 years

Subgroup: FRP

Task Group: M. Gorman (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item will be sent to subcommittee letter ballot prior to the next meeting.

Item Number: NB16-1403	NBIC Location: Part 3, S4	Attachment Page 114

General Description: Add information on repair of high pressure vessels.

Subgroup: FRP

Task Group: N. Newhouse (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item will be sent to subcommittee letter ballot prior to the next meeting. He also requested that it be balloted to Main Committee for review and comment when the proposal is sent to subcommittee letter ballot.

Item Number: NB16-1502	NBIC Location: Part 3	No Attachment

General Description: Develop supplement for repairs and alterations based on international construction standards

Subgroup: SG Repairs and Alterations
Task Group: International Repair Supplement Task Group, Chuck Withers (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 17-134	NBIC Location: Part 3, Section 5	No Attachment

General Description: Proposed Revision for registration of Form R-1 with the National Board containing ASME pressure part data reports attached.

Subgroup: Repairs and Alterations

Task Group: P. Shanks (PM), Rob Troutt, Joel Amato, Kathy Moore, Paul Edwards

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 17-137	NBIC Location: Part 3, S4.18.2	Attachment Page 117

General Description: Remove "sand" blasting and replace with "abrasive" in Part 3, S4.18.2

Subgroup: FRP

Task Group: Terry Cowley

July Meeting Action: Mr. Troutt reported that the proposal for this item had the incorrect title and asked the NBIC Secretary to confirm the correct attachment with the FRP Task Group.

Item Number: 17-166	NBIC Location: Part 3, S3	Attachment Page 119

General Description: Remove nozzle replacement and tube replacement from graphite routine repair list.

Subgroup: Graphite

Task Group: Francis Brown (PM)

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to accept proposal. Mr. Monte Bost, a member of the Graphite Task Group, provided additional justification for the proposed change, in that 18 inches was too large for the intended requirement. After discussion concluded, a vote was held and unanimously approved to accept the proposed changes.

Item Number: 17-167	NBIC Location: Part 3, S3.2 d)	No Attachment

General Description: Clarify repair inspection requirements for machined only graphite parts.

Subgroup: Graphite

Task Group: Aaron Viet (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 18-12	NBIC Location: Part 3	Attachment Page 120

General Description: Adding Weld Buildup to WM #6

Subgroup: SG Repairs and Alterations
Task Group: John Siefert (PM), George Galanes

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. Some discussion was held on the proposed changes. After discussion, a vote was held and the proposal was unanimously approved.

Item Number: 18-13	NBIC Location: Part 3	Attachment Page 123

General Description: Weld Methods 7 addition for dissimilar weld metal-Gr. 91.

Subgroup: SG Repairs and Alterations

Task Group: John Siefert (PM), George Galanes

July Meeting Action: Mr. Troutt introduced the item and asked Mr. George Galanes to provide additional information. Mr. Troutt reported that the proposal for this item will be sent to subcommittee letter ballot prior to the next meeting. He also requested that it be balloted to Main Committee for review and comment when the proposal is sent to subcommittee letter ballot.

Item Number: 18-65	NBIC Location: Part 3, Section 3	No Attachment

General Description: Draft rules for "used" material in repairs and/or alterations.

Subgroup: SG Repairs and Alterations

Task Group: Jamie Walker – PM, Marty Toth, Pat Becker, Michael Quisenberry, Issac Osborn, Paul Shanks, R. Underwood

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 18-66	NBIC Location: Part 3, Section 5	No Attachment

General Description: Move Report Forms to a new Supplement.

Subgroup: SG Repairs and Alterations
Task Group: Marty Toth – PM, Ben Schaefer

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 18-75	NBIC Location: Part 3	Attachment Page 127

General Description: Flush patches in stayed and un-stayed areas of tubesheets

Subgroup: SG Repairs and Alterations
Task Group: Michael Quisenberry (PM), Kathy Moore, Marty Toth, Rick Sturm

July Meeting Action: Mr. Troutt introduced the item and asked Mr. Michael Quisenberry to speak further on the proposed changes. Mr. Troutt then requested to send this item out as a letter ballot to the Main Committee.

Item Number: 18-84	NBIC Location: Part 3, S1.2.8	Attachment Page 129

General Description: Additional subparagraph in Part 3, S1.2.8 about the use of patch bolts being in accordance with ASME BPVC

Subgroup: Locomotive
Task Group: (R. Musser – PM)

July Meeting Action: Mr. Troutt introduced the item and Mr. Rick Musser explained the proposed changes. Mr. Wielgoszinski asked about what ASME Section I says about patch bolts since the proposal references that section. Discussion was held on this topic, and a slight revision to the proposal was made to help clarify the intent of the change. A motion was made, seconded, and approved unanimously to accept the revised proposal.

Item Number: 18-85	NBIC Location: Part 3, 2.3 and Table 2.3	Attachment Page 130

General Description: For the SWPS AWS B2.1-1-233:2006, is the root or 1st pass using GTAW-S (Short Circuiting Transfer mode) allowed to be used in all positions?

Subgroup: Repairs and Alterations

Task Group: Jim Sekely (PM)

July Meeting Action: Mr. Troutt introduced the item and gave background information regarding the proposed changes. A motion was made, seconded, and approved unanimously to accept the proposal.

Item Number: 18-93	NBIC Location: Part 3, S3.2, S3.4 4.4.2 6)	No Attachment

General Description: Test Duration

Subgroup: Graphite

Task Group: J. Clements (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 18-94	NBIC Location: Part 3, S3.2 f), h); S3.4 a), b), c) etc.	No Attachment

General Description: G-mark Requirements for Various Repairs/Alteration to Graphite

Subgroup: Graphite

Task Group: C. Cary (PM)

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 18-95	NBIC Location: Part 3, S1.1.4	Attachment Page 131

General Description: Revision to Part 3, S1.1.4 to account for new rules for riveted construction

Subgroup: Locomotive

Task Group: (L. Moedinger – PM)

July Meeting Action: Mr. Troutt introduced the item and asked Mr. Linn Moedinger to explain the proposed changes. Mr. Moedinger also answered clarifying questions on the wording and the publication of ASME Section I Parts PR and PL. During discussion, some revisions were suggested to better capture the intent of the proposed change. Ms. Melissa Wadkinson suggested sending the proposal back to subcommittee for further work. Mr. Troutt withdrew the proposal and will send it back for further work.

At this time of the meeting, Mr. Paul Edwards left and appointed Ms. Kathy Moore as his alternate.

Item Number: 18-100	NBIC Location: Part 3, 3.3.2	Attachment Pages 132-142

General Description: Revision adding heat exchanger tubes with an outside diameter of ¾" or smaller to NBIC Part 3.3.2 Routine Repairs

Subgroup: Repairs and Alterations

Task Group: (David Martinez – PM), B. Schaefer, N. Carter

July Meeting Action: Mr. Troutt introduced the item and explained the proposed changes. A motion was made and seconded to approve the proposal as presented. Mr. Wielgoszinski suggested that this item be put on hold until ASME action is taken to approve a code case regarding this repair. Further discussion was held on putting the item on hold versus voting on it now. A vote was taken to approve the proposal, but the proposal failed to receive enough approval votes (9 approve, 6 disapprove, and 1 abstention). The members who cast disapprove votes did so because there are currently no rules or code cases in ASME BPVC that address this type of repair as it is a fairly new method. The item will be sent back to the subgroup for further work.

Item Number: 18-102	NBIC Location: Part 3, Table 2.3	Attachment Page 143

General Description: Revise Table 2.3 in Part 3 to add the listed SWPSs that were revised by the AWS B2 Committee in 2018

Subgroup: Repairs and Alterations

Task Group: (Jim Sekely – PM)

July Meeting Action: Mr. Troutt introduced the item and requested that it be sent out for letter ballot to the Main Committee. There are numerous new SWPS and some revision to be included in the NBIC.

New Items:

Item Number: 19-11	NBIC Location: Part 3, 9.1	Attachment Page 161

General Description: Clarify Definition of Authorized Nuclear Inspection Agency (ANIA)

Subgroup: Repairs and Alterations

Task Group: P. Edwards (PM)

Explanation of Need: An ANIA cannot be an Inservice AIA since Endorsements for nuclear inspectors are issued only to new construction AIA's. The requirements for qualified Authorized Nuclear Inspectors/Supervisors are clearly specified in NB-263, RCI-1. Therefore revision to the Glossary definition is needed to clarify this requirement for the NR Accreditation Program.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal. Mr. Scribner suggested adding language to the proposal to address authorization to make repairs and alterations. The original motion was withdrawn and a modified proposal will be sent out for letter ballot to the Main Committee prior to the next meeting.

Item Number: 19-12	NBIC Location: Part 3, 1.6.3 b)	Attachment Page 162

General Description: Paragraph 1.6.3 – revise text to clarify Quality Assurance Program reqs

Subgroup: Repairs and Alterations

Task Group: P. Edwards (PM)

Explanation of Need: Revise text to clarify Quality Assurance Program requirements for NR Cert holders.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve proposal. Mr. Scribner asked that an item be opened to define "Controls" in the glossary. A vote was held and the motion was approved unanimously.

Item Number: 19-13	NBIC Location: Part 3, 1.6.6.2 s), 1.6.7.2 s), & 1.6.8.2 s)	Attachment Page 163

General Description: Revise text to clarify responsibilities for performing audits

Subgroup: Repairs and Alterations

Task Group: P. Edwards (PM)

Explanation of Need: Revise text to clarify responsibilities for performing audits between the Certificate Holder and the AIA.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. He then requested that it be sent out to the Main Committee as a letter ballot.

Item Number: 19-15	NBIC Location: Part 3, 3.3.5.2 a)	Attachment Page 164

General Description: ASME Section VIII Division 2 Class 1/Class 2 Distinction

Subgroup: Repairs and Alterations

Task Group: P. Shanks (PM)

Explanation of Need: Engineering certification for repairs is an unnecessary cost when engineering certification is not required by the original code of construction.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. Mr. Wielgoszinski suggested a revision to the proposal, and the motioner and seconder agreed to the suggested revision. The original motion was amended to allow for revised proposal. A vote was held on the new motion which was approved unanimously.

Item Number: 19-16	NBIC Location: Part 3, 3.3.2 e)	Attachment Page 165

General Description: Reword to provide clarity; contradictory requirement Part 3; 3.2.2 e)

Subgroup: Repairs and Alterations
Task Group: T. White (PM)

Explanation of Need: This wording of this clause is causing confusion. The original submitter has had multiple instances where owners have requested to purchase welded replacement parts directly and read this clause with the belief that they can purchase a replacement part for in some cases a welded pressure part for an ASME Section I boiler and safe money by having the fabricator not Hydro test as per Section I even when it was not impractical to have the testing performed.

July Meeting Action: Mr. Troutt reported that the proposal for this item is still being developed.

Item Number: 19-19	NBIC Location: Part 3, S4.2	Attachment Page 166

General Description: Reword to provide clarity; contradictory requirement Part 3; 3.2.2 e)

Subgroup: FRP
Task Group: None assigned

Explanation of Need: The current use of the term "inspector" in S4.2 does not mean a Commissioned Inspector as defined in Section 9. Clarification is needed.

July Meeting Action: Mr. Troutt introduced the item and requested that it be sent out for letter ballot to the Main Committee. The item was approved unanimously at the subcommittee level.

Item Number: 19-21	NBIC Location: Part 3, S2.11 a)	Attachment Page 168

General Description: Additional wording to S2.11 a).
Explanation of Need: The changes in the proposal were made in a document passed by SG Historical in July 2018, and somehow left off of the document that was submitted to R&A and to MC.

Subgroup: SG Historical
Task Group: B. Underwood (PM)

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. This motion was approved unanimously.

Item Number: 19-24	NBIC Location: Part 3, S6.16.4 b) 1)	Attachment Page 169

General Description: Supplement 6 to record the "R" number assigned to either R-1 or R-2.

Subgroup: Repairs and Alterations
Task Group: K. Moore (PM)

Explanation of Need: Paragraph S6.16.4 b) 1) currently only requires "R-1" forms to be registered with the National Board, however the paragraph should be for EITHER R-1 Forms OR R-2 Forms.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. Discussion was held on the proposal, leading to minor revisions. The original motion was amended to include the revised proposal. This motion was approved unanimously.

Item Number: 19-27	NBIC Location: Part 3, S2.13.14.3-a	Attachment Page 170

General Description: Fusible Plug Repair Using Half Coupling Figure

Subgroup: SG Historical

Task Group: J. Amato (PM)

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. After discussing the proposal, the committee felt that the item should be sent to letter ballot to allow for more time to consider the proposed changes.

At this point in the meeting, Ms. Patricia Becker left the meeting and appointed Mr. Linn Moedinger as her alternate.

Item Number: 19-31	NBIC Location: Part 3, Table 2.3	Attachment Page 171

General Description: Part 3 - Table 2.3 - Thickness Range Corrections

Subgroup: Repairs and Alterations

Task Group: J. Sekely (PM)

Explanation of Need: Thickness listed in Table 2.3 had different values than the AWS Standards.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. Mr. Terrence Hellman provided further explanation. Discussion was held on which metrification policy should be used in the SWPS titles as the NBIC and AWS have slightly different policies. Mr. George Galanes mentioned that the titles should be as AWS has them as they are used as references in the NBIC. After discussion, it was decided to have the proposal be sent out for letter ballot to the Main Committee.

Item Number: 19-32	NBIC Location: Part 3, 3.3.2 & 3.4.4	Attachment Page 177

General Description: Heater treater and or re-heater fire tubes

Subgroup: Repairs and Alterations

Task Group: R. Valdez (PM)

Explanation of Need: When heater treaters and some other similar equipment is constructed in accordance with section VIII div.1 an item called a fire tube is often removable (bolted) and should be part of the code boundary. In use these items are consumables and are replaced often with items not bearing the code markings or manufactured to code practices. This practice places the users and public in jeopardy and should be curtailed.

July Meeting Action: Mr. Troutt introduced the item and explained that the item was closed by the subgroup and subcommittee because this has not yet been addressed by ASME. ASME has recently formed a TG to deal with heater-treater subject matters. A motion to close the item with no action was seconded and approved unanimously.

Item Number: 19-43	NBIC Location: Part 3, 1.6.6.2, 1.6.7.2, & 1.6.8.2	Attachment Page 180

General Description: ISO/IEC-17025 Edition referenced in NR Section of Part 3

Subgroup: Repairs and Alterations

Task Group: P. Edwards

Explanation of Need: References to "ISO/IEC-18025:2005" need to be changed to "ISO/IEC-18025:2017" to align with ASME Section III requirements in the following paragraphs: 1.6.6.2 m) 1), 1.6.6.2 m) 4) a), 1.6.6.2 m) 5) a), 1.6.7.2 m) 1), 1.6.7.2 m) 4) a), 1.6.7.2 m) 5) a), 1.6.8.2 m) 1), 1.6.8.2 m) 4) a), and 1.6.8.2 m) 5) a)

July Meeting Action: This item was discussed and approved unanimously during the discussion of item 19-44. See 19-44 for a complete description.

Item Number: 19-47	NBIC Location: Part 3, 1.5.1 k)	Attachment Page 185

General Description: Specify Welding, NDE and Heat Treatment requirements in 1.5.1 of Part 3

Subgroup: Repairs and Alterations

Task Group: R. Miletti (PM)

Explanation of Need: The Quality Control Elements of "welding, NDE, and Heat Treatment" need to have clear controls. Currently the paragraph really only references welding. NDE and Heat Treatment are only referenced by the last sentence in the paragraph, "Similar responsibility for nondestructive examination and heat treatment shall be described in the manual." Minimum controls or requirements for NDE or Heat Treatment need to be expressed in order for these elements to be auditable.

July Meeting Action: Mr. Troutt introduced the item and explained that the item was closed by the subgroup and subcommittee because its scope will be covered by new item that will revise all of paragraph 1.5.1. A motion was made, seconded, and approved unanimously to close the item.

Item Number: 19-48	NBIC Location: Part 3, 1.5.1 l) & m)	No Attachment

General Description: Calibration, Examinations and Tests - 1.5.1 of Part 3

Subgroup: Repairs and Alterations

Task Group: B. Boseo (PM), P. Davis

Explanation of Need: A review of all QC Elements in Section 1.5.1 in Part 3 of the NBIC needs to be done to verify that auditable controls and minimum requirements are understood and referenced within an "R" Cert. Holder's Quality System.

July Meeting Action: Mr. Troutt introduced the item and explained that the item was closed by the subgroup and subcommittee because its scope will be covered by new item that will revise all of paragraph 1.5.1. Similar to record 19-47. A motion was made, seconded, and approved unanimously to close the item.

Item Number: 19-50	NBIC Location: Part 3, 3.3.4.3 e) 3) l)	Attachment Page 186

General Description: Revising Part 3, 3.3.4.3 e) 3) l) to match rules of ASME PCC-2

Subgroup: Repairs and Alterations

Task Group: P. Shanks

Explanation of Need: There are a couple of typos in the paragraph as it does not match up with the rules of ASME PCC-2 for External Weld Metal Buildup. The “of” and the “or” should be switched around.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. This motion was approved unanimously.

Item Number: 19-52	NBIC Location: Part 3, 4.2 a)	Attachment Page 188

General Description: Part 3, Section 4 - 4.2 a) Alternative NDE requirements

Subgroup: Repairs and Alterations

Task Group: T. Hellman (PM)

Explanation of Need: Clarification is needed that if alternative NDE methods acceptable to the Inspector and Jurisdiction meet ALL the requirements listed elsewhere in Section 4 of Part 3. New verbiage is adding ", provided all other requirements of this section are met." to the last sentence.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. This motion was approved unanimously.

Item Number: 19-53	NBIC Location: Part 3, S2.12	Attachment Page 189

General Description: Revise S2.12 to address Historical Boiler Record Retention

Subgroup: Historical

Task Group: R. Underwood (PM)

Explanation of Need: Supplement 2 does not sufficiently address record retention as required by Part 3, 1.5.1(t). S2.12 states that owners "should" retain permanent records, but it is not mandatory. Paragraph 1.5.1(t) and Table 1.5.1 require all records be retained for 5 years.

July Meeting Action: Mr. Troutt introduced the item and explained the change being proposed. A motion was made and seconded to approve the proposal as presented. This motion was approved unanimously.

c. Subcommittee Pressure Relief Devices

i. Interpretations

Item Number: 19-1	NBIC Location: Part 4, 4.8.5.4 & 4.8.6.1	No Attachment

General Description: Develop specific content and scope of annual field audits.

Task Group: A. Donaldson (PM), D. Marek, A. Cox, P. Dhobi, M. Brodeur, T. Patel

July Meeting Action: Ms. Marianne Brodeur reported that the item was changed from an interpretation request to an action item for code revision as the subcommittee felt this request fit the definition of a code revision. The general description was revised and a task group was formed to develop a proposal.

Item Number: 19-3	NBIC Location: Part 4, 4.6.1	No Attachment

General Description: Repair of ASME Sec I Liquid Service PRVs

Background: ASME 2017 Edition, Sec I, revised PG-73.5.2 and PG-73.5.3 to add testing requirements for liquid relief valves. Also revised PG-110 to add stamping requirements for liquid relief valves.

Task Group: None

July Meeting Action: Ms. Brodeur reported that the interpretation request was withdrawn by the inquirer (who was in attendance for the SC meeting and confirmed withdrawal). A motion was made, seconded, and unanimously approved to close the item.

ii. Action Items – Old Business

Item Number: NB12-0901	NBIC Location: Part 4	No Attachment

General Description: Prepare a guide for repair of tank vents

Task Group: B. Donalson (PM), D. DeMichael, K. Simmons, K. Beise, B. Nutter, J. Little, S. Artrip

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: NB14-0602B	NBIC Location: Part 2	No Attachment

General Description: Improve index in Part 2 relating to pressure relief devices

Task Group: D. Marek (PM), B. Donalson, D. DeMichael, B. Hart

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: NB15-0108B	NBIC Location: Part 1	No Attachment

General Description: Address pressure relief devices in new supplement on high temperature hot water boilers

Task Group: D. Marek (PM), A. Renaldo , D. McHugh, B. Nutter, A. Cox, D. Schirmer

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: NB15-0305	NBIC Location: Part 4	No Attachment

General Description: Create Guidelines for Installation of Overpressure Protection by System Design.

Task Group: B. Nutter, A. Renaldo, D. Marek (PM), D. DeMichael

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: NB15-0307	NBIC Location: Part 4	No Attachment

General Description: Create Guidelines for Repair of Pin Devices.

Task Group: D. McHugh (PM), A. Renaldo, T. Tarbay, R. McCaffrey

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: NB15-0308	NBIC Location: Part 4	No Attachment

General Description: - Create Guidelines for Installation of Pressure Relief Devices for Organic Fluid Vaporizers.

Task Group: T. Patel (PM), K. Beise, B. Nutter

July Meeting Action: Ms. Brodeur reported that this item is on hold pending ASME Section I committee action on a related item.

Item Number: NB15-0315	NBIC Location: Part 4, 2.5.6 and 2.6.6 and Part 1, 4.5.6 and 5.3.6	No Attachment

General Description: Review isolation Valve Requirements, and reword to allow installation of pressure relief devices in upstream piping.

Task Group: D. DeMichael (PM), B. Nutter, A. Renaldo, D. Marek

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: NB15-0321	NBIC Location: Part 4, 3.2.5 a) and Part 2, 2.5.7 a)	Attachment Page 192

General Description: Review testing requirements for in-service testing of pressure relief devices

Task Group: A. Cox, A. Renaldo (PM), D. Marek, S. Irvin, D. DeMichael, B. Nutter, J. Ball

July Meeting Action: Ms. Brodeur reported that a proposal for this item will be balloted to the subcommittee after the meeting.

Item Number: NB15-0324	NBIC Location: Part 4	Attachment Page 196

General Description: Create Guidelines for Inspection and Testing Frequencies with respect to shelf life and storage of pressure relief valves.

Task Group: A. Rendaldo (PM), B. Nutter, K. Simmons, D. Marek, J. Little

July Meeting Action: Ms. Brodeur reported that a proposal for this item will be balloted to the subcommittee after the meeting.

Item Number: NB16-0805	NBIC Location: Part 4, 2.6.6 and Part 1, 5.3.6	Attachment Page 205

General Description: Temperature ratings for discharge piping and fittings

Task Group: A. Renaldo (PM), T. Patel, D. Marek

July Meeting Action: Ms. Brodeur reported that a proposal for this item will be balloted to the subcommittee after the meeting.

Item Number: 17-115	NBIC Location: Part 4, Section 2	No Attachment

General Description: Complete rewrite of Section 2 combining common requirements into a general requirements section for all pressure relief devices and look at combining with 2.4.3, 2.4.4.

Task Group: A. Renaldo (PM), D. McHugh, D. Marek

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: 17-119	NBIC Location: Part 4, 2.2.5 and Part 1, 2.9.1.4	No Attachment

General Description: States pressure setting may exceed 10% range. Clarify by how much.

Task Group: T. Patel (PM), D. Marek

July Meeting Action: Ms. Brodeur reported that this item is on hold pending ASME committee action on a related item.

Item Number: 17-128	NBIC Location: Part 4, 2.4.4.3 and Part 1, 3.9.4.3	No Attachment

General Description: allows Y-base to be used while 2.4.1.6 a) prohibits. This appears to be a conflict.

Task Group: B. Nutter (PM), S. Irvin

July Meeting Action: Ms. Brodeur reported that this item is on hold pending ASME committee action on a related item.

Item Number: 17-131	NBIC Location: Part 4, 2.5.7 a) and Part 1, 4.7.3 a)	Attachment Page 207

General Description: Review overpressure protection requirements for hot water storage tanks that exceed 160 psi.

Task Group: J. Ball (PM), B. Hart

July Meeting Action: Ms. Brodeur introduced the item and Mr. Tom Beirne provided additional background information. Mr. Don Cook asked about the types of potable water heaters covered by this proposal. The committee was informed that this proposal and the proposal for Installation item 17-159 are the same, and a request was made to vote on these items simultaneously. A motion was made, seconded, and unanimously approved to accept the proposed changes in 17-131 and 17-159.

Item Number: 17-132	NBIC Location: Part 4, 3.2.6 and Part 2, 2.5.8	No Attachment

General Description: Paragraph 3.2.6 can be put into tabular format. Review test frequencies.

Task Group: B. Nutter (PM), M. Brodeur, D. Marek, D. DeMichael, A. Cox, P. Dhobi, R. McCaffrey, T. Beirne

July Meeting Action: Ms. Brodeur reported that a proposal is in development for this item.

Item Number: 18-73	NBIC Location: Part 4, 2.3 and Part 1, S5.7.6	Attachment Page 209

General Description: Update installation requirements for Thermal Fluid Heaters

Task Group: T. Patel (PM), B. Nutter

January 2019 Meeting Action: A motion was made and seconded to accept the proposal. After discussion a vote was taken. The motion passed unanimously. Following the vote it was decided to send the proposal to SC Installation for review and comment prior to letter balloting Main Committee.

Update: Item was approved by both subgroup and subcommittee via letter ballot and is awaiting review by main committee.

July Meeting Action: Ms. Brodeur reported that a proposal has been made and approved by the subgroup and subcommittee. She requested that it be sent to the Main Committee as a letter ballot.

Item Number: 18-80	NBIC Location: NBIC Location: Part 4, S3.1, S4.1, S6.1	No Attachment

General Description: Addition of a "Scope" section to Part 4, S3.1, S4.1, and S6.1 to stay consistent with other sections

Task Group: T. Patel (PM), A. Renaldo, K. Simmons, P. Dhobi

July Meeting Action: Ms. Brodeur reported that the item will be balloted to the subgroup and subcommittee prior to the next meeting.

New Items:

Item Number: 19-2	NBIC Location: Part 4, 4.9.1	No Attachment

General Description: Additional Training Requirements for VR and T/O programs

Task Group: A. Donaldson (PM), A. Cox, B. Donaldson, D. Marek, J. Simms

Explanation of Need: This was discussed at the July 2018 meetings and the SG and SC both agreed that we should look to expand the training program requirements. During the Development of the T/O code language in Part 4, the task group identified a lack of training requirements included in the new section. Upon further investigation, it was determined that the T/O requirements were copied directly from the V/R requirements.

July Meeting Action: Ms. Brodeur reported that this is a newly received item and a TG has just been formed. A proposal is in development for this item.

Item Number: 19-14	NBIC Location: Part 4, 4.6.1	~~Attachment Page 151~~

General Description: Add ASME Sec I, Liquid Service PRVs to VR Scope

Task Group: None

Explanation of Need: Scope of ASME Sec I, PG-73.5.2 has been expanded to include Liquid Service PRVs at 10% Overpressure. However, there is a reference to Cold Differential Test Pressure. NBIC does not currently address the need for testing with a CDTP for Sec I Liquid Service.

July Meeting Action: Ms. Brodeur reported that the subgroup and subcommittee voted unanimously to close this item with no action. The item was closed because the committee determined that the request was administrative and does not pertain to the NBIC. A motion was made, seconded, and unanimously approved to close the item.

Item Number: 19-18	NBIC Location: Part 4, 4.8.5.4 n) 5)	No Attachment

General Description: Implementation of QC Manual Revisions

Task Group: A. Donaldson (PM)

Explanation of Need: Current wording allows for implementation of the revision once the change is merely submitted to the National Board for approval. When changes are made to a QC Manual at times other than reviews, they may be done so by submission to NB via mail, email etc. But implementation of the change should not take place until after NB acceptance of the change is received.

July Meeting Action: Ms. Brodeur reported that this is a newly received item and a TG has just been formed. A proposal is in development for this item.

Item Number: 19-37	NBIC Location: Part 4, 4.3.1 c) 4)	No Attachment

General Description: Origin of Replacement Parts for Pressure Relief Devices

Task Group: A. Cox (PM), T. Patel, P. Dhobi, J. Simms
Explanation of Need: VR Holders are required to obtain a Certificate of Compliance when they purchase Replacement Critical Parts from longtime PRV Manufacturer's Representatives. This is prevalent in the Midstream Oil & Gas Sector. Several small VR Holders in this Sector of the Energy Industry have expressed their desire to make this issue less cumbersome because the Manufacturers of the majority of PRVs they repair do not have Assemblers.

July Meeting Action: Ms. Brodeur reported that this is a newly received item and a TG has just been formed. A proposal is in development for this item.

Item Number: 19-39	NBIC Location: Part 4, S3	Attachment Page 215

General Description: Delete Supplement 3 of NBIC Part 4.

Task Group: T. Beirne (PM)
Explanation of Need: With the T/O program fully integrated into the 2019 NBIC and available for any jurisdiction to adopt, Part 4 Supplement 3 is no longer needed.

July Meeting Action: Ms. Brodeur reported that the proposal for this item was approved unanimously by the subgroup and subcommittee. After some discussion, it was decided to send this item out for letter ballot to the Main Committee.

Item Number: 19-40	NBIC Location: Part 4, Figure 4.7.2-b	No Attachment

General Description: Move Fig. 4.7.2-b to Part 4 Supplement 6.

Task Group: T. Beirne (PM)

Explanation of Need: Figure 4.7.2-b should be relocated to Supplement 6. Requirement for marking repairs of Nuclear Valves in accordance with figure 4.7.2-b also does not exist. A statement should be added to Supplement 6 regarding the requirement to mark the repaired nuclear valve in accordance with the relocated Figure 4.7.2-b.

July Meeting Action: Ms. Brodeur reported that this is a newly received item and a TG has just been formed. A proposal for this item will be balloted to the subgroup prior to the next meeting.

Item Number: 19-41	NBIC Location: Part 4, 4.7.5	No Attachment

General Description: Review Part 4, Paragraph 4.7.5 and simplify

Task Group: T. Beirne (PM), A. Cox, D. Schirmer

Explanation of Need: The requirements of adding a duplicate nameplate are the same whether the original nameplate is illegible or missing. 4.7.5 could be simplified with the three sub-paragraphs being combined into one paragraph.

July Meeting Action: Ms. Brodeur reported that this is a newly received item and a TG has just been formed. A proposal is in development for this item.

d. Subcommittee Installation

i. Interpretations

Subcommittee Installation had no interpretations to discuss for this meeting.

ii. Action Items – Old Business

Item Number: NB11-1901	NBIC Location: Part 1	Attachment Page 217

General Description: Add guidance for the safe installation of high pressure composite pressure vessels operating in close proximity to the public

Subgroup: FRP

Task Group: R. Smith (PM), M. Richards, S. Konopacki, D. Patten and E. Wiggins

July Meeting Action: Ms. Melissa Wadkinson introduced the item and asked Mr. Rex Smith to explain the changes being proposed. After MR. Smith went over the proposal, Ms. Wadkinson requested the item be sent to letter ballot for the Main Committee. Mr. Venus Newton suggested it be sent to subcommittee PRD before being sent to Main Committee as part of the proposal deals with pressure relief devices. The committee agreed with this suggestion and the item will be balloted to Subcommittee PRD before sending it to Main Committee.

Item Number: NB16-0102	NBIC Location: Part 1	Attachment Page 224

General Description: Address post installation pressure testing

Subgroup: Installation

Task Group: S. Konopacki (PM), E. Wiggins, P. Cole, R. Smith, M. Wadkinson, D. Patten

July Meeting Action: Ms. Wadkinson introduced the item and discussed updates made to the proposal since the last meeting. She then requested that it be sent out for letter ballot to the Main Committee.

Item Number: 17-159	NBIC Location: Part 1, 4.7	Attachment Page 228

General Description: Result of 17-147; review Part 1, 4.7 for references to hot water storage tanks

Subgroup: SG Installation

Task Group: J. Brockman (PM), D. Patten, and E. Wiggins

July Meeting Action: This item was approved during the presentation of Subcommittee PRD item 17-131.

Item Number: 18-1	NBIC Location: Part 1, 2.8.1 and 2.8.5	Attachment Page 230

General Description: Review 2.8.1 and 2.8.5 for potential duplication of paragraphs.

Subgroup: SG Installation

Task Group: M. Wadkinson (PM), D. Patten, S. Konopacki, T. Griffen, and R. Dalton

July Meeting Action: Ms. Wadkinson introduced the item and explained the changes being proposed. She then requested that it be sent out for letter ballot to the Main Committee.

Item Number: 18-2	NBIC Location: Part 1	No Attachment

General Description: Result of NB16-0101, add verbiage regarding commissioning fired boilers & fired pressure vessels with a calibrated combustion analyzer.

Subgroup: SG Installation

Task Group: E. Wiggins (PM), D. Patten, P. Schuelke, M. Wadkinson, and G. Halley

January 2019 Meeting Action: Progress Report – The TG continues to discuss the commissioning of new equipment for proper combustion.

July Meeting Action: Ms. Wadkinson reported that a proposal is being developed for this item.

Item Number: 18-57	NBIC Location: Part 1	No Attachment

General Description: address the use & definition of the word inspector

Subgroup: SG Installation

Task Group: Brian Moore (PM), R. Smith, T. Griffin, P. Jennings, T. Creacy and R. Spiker

July Meeting Action: Ms. Wadkinson reported that a proposal is being developed for this item.

Item Number: 18-81	NBIC Location: Part 1, 3.8.1.5	No Attachment

General Description: Should an assembled modular steam heating boiler have a single manual LWCO to protect to total assembly?

Subgroup: SG Installation

Task Group: M. Washington (PM), T. Creacy, K. Watson, M. Wadkinson, J. Downs, and B. Ahee

July Meeting Action: Ms. Wadkinson reported that the subgroup and subcommittee voted to close this item as they felt that no change needed to be made to the code. A motion was made, seconded, and unanimously approved to close the item. This motion was unanimously approved.

Item Number: 18-96	NBIC Location: Part 1, 1.6.3	Attachment Page 232

General Description: In reference to item NB16-0905, should "fired or electrically heated pressure vessels" be specified instead of stating "pressure vessels"

Subgroup: SG Installation

Task Group: E. Wiggins (PM), S. Konopacki, G. Hayley, and G. Tompkins

July Meeting Action: Ms. Wadkinson reported that the subgroup and subcommittee voted to close this item as they felt that no change needed to be made to the code. A motion was made, seconded, and unanimously approved to close the item. This motion was unanimously approved.

Item Number: 18-97	NBIC Location: Part 1, 1.6.9	Attachment Page 234

General Description: In reference to item NB16-0101, should specific fuel fired boilers and pressure vessels be listed in Part 1, 1.6.9

Subgroup: SG Installation

Task Group: R. Spiker (PM), B. Anderson and D. Patten

July Meeting Action: Ms. Wadkinson reported that the subgroup and subcommittee voted to close this item as they felt that specific boilers did not need to be listed in the referenced section. A motion was made, seconded, and unanimously approved to close the item. This motion was unanimously approved.

iii. Action Items – New Business

Item Number: 19-45	NBIC Location: Part 1, S1	No Attachment

General Description: Revisions to Yankee Dryer Supplement Wording in Part 1

Subgroup: SG Installation

Task Group: R. Spiker (PM), J. Jessick, and D. Patten

July Meeting Action: Ms. Wadkinson reported that a proposal is being developed for this item.

Item Number: 19-49	NBIC Location: Part 1, 2.9 & 3.9	Attachment Page 236

General Description: Ensure shipping plugs for PRDs are removed during the installation process

Subgroup: SG Installation

Task Group: R. Smith (PM) and S. Konopacki

Explanation of Need: From the January 2019 main committee meeting, the discussion of PRD Item NB17-0401 led to the decision to open an item to address requirements to remove any shipping caps or plugs from pressure relief devices during the installation process.

July Meeting Action: Ms. Wadkinson introduced the item and asked Mr. Rex Smith to explain the proposed changes. A motion was made and seconded to approve the proposal as presented. Mr. Getter asked about "wired shut" lifting levers being included in the list as they are also often found still attached after installation. The original motion was withdrawn and the item will be sent back for further work to address Mr. Getter's suggestion.

Item Number: 19-51	NBIC Location: Part 1, 2.9.1.1	Attachment Page 237

General Description: NBIC safety valve requirements for boilers up to 4000lb/hr generating capacity

Subgroup: SG Installation

Task Group: M. Wadkinson (PM), J. Brockman, and P. Jennings

Explanation of Need: There is a discrepancy between ASME Section I, PG-67.1 and NBIC Part 1, 2.9.1.1. ASME requires 2 or more safety valves if over 500 sq. ft. If there is combined bare tube and extended heating surface exceeding 500 sq. ft., 2 or more safety valves are required only if the boiler exceeds 4000 lbs./hr. NBIC requires 2 or more safety valves if over 500 sq. ft. It does not make allowances for extended heating surface and generating capacity up to 4000 lbs./hr.

July Meeting Action: Ms. Wadkinson introduced the item and explained changes being proposed. A motion was made and seconded to approve the proposal. No additional discussion was held on the item, and the proposal was approved unanimously.

9. Liaison Activities

a. American Society of Mechanical Engineers BPV Code (ASME BPV)

i. Mr. Paul Edwards was not present to share his liaison report in-person. The full report can be found on Attachment Page 238.

b. American Welding Society (AWS)

i. Mr. Jim Sekely was not present to share his liaison report in-person. The full report can be found on Attachment Page 242.

c. American Petroleum Institute (API)
No report

d. Department of Transportation (DOT)
No report

10. Future Meetings

January 13th -16th, 2020 – San Diego, CA, Westgate Hotel
July 13th-16th, 2020 – Louisville, KY, The Brown hotel
January 2021, Cincinnati, OH area
July 2021, Jacksonville, FL area

11. Adjournment

The Chair asked everyone to be attentive to all the upcoming letter ballots.

The meeting was adjourned at 3:42 PM local time.

Respectfully submitted,

Jonathan Ellis

Jonathan Ellis
NBIC Secretary

Contents

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Item NB16-1401

SUPPLEMENT 10
INSPECTION OF STATIONARY HIGH-PRESSURE (3,000-15,000 psi) (21-103 MPa) COMPOSITE PRESSURE VESSELS

S10.1 SCOPE

This supplement provides specific requirements and guidelines for inspection of high-pressure composite pressure vessels, hereafter referred to as vessels. This supplement is applicable to pressure vessels with a design pressure that exceeds 3,000 psi (21 MPa) but not greater than 15,000 psi (103 MPa), and is applicable to the following four types of pressure vessels:

a) Metallic vessel with a hoop Fiber Reinforced Plastic (FRP) wrap over the cylindrical part of the vessel (both load sharing).

b) Fully wrapped FRP vessel with a non-load sharing metallic liner.

c) Fully wrapped FRP vessel with a non-load sharing non-metallic liner.

d) Fully wrapped FRP vessel with load sharing metallic liner.

This supplement is intended for inspection of ASME Section X, Class III, vessels and ASME Section VIII, Division 3, Composite Reinforced Pressure Vessels (CRPVs). However, it may be used for inspection of similar vessels manufactured to other construction codes with approval of the jurisdiction in which the vessels are installed.

S10.2 GENERAL

a) High-pressure composite vessels are used for the storage of fluids at pressures up to 15,000 psi (103 MPa). Composite vessels consist of the FRP laminate with load sharing or non-load sharing metallic shells/liners, or nonmetallic liners. The FRP laminate with load sharing metallic liners form the pressure retaining system. The FRP laminate is the pressure-retaining material for composite vessels with non-load sharing metallic and nonmetallic liners. The purpose of the non-load sharing metallic and the nonmetallic liners is to minimize the permeation of fluids through the vessel wall.

b) Fluids stored in vessels are considered to be non corrosive to the materials used for vessel construction. The laminate is susceptible to damage from:

   1) External chemical attack.

   2) External mechanical damage (i.e. abrasion, impact, cuts, dents, etc.).

   3) Structural damage (i.e. over pressurization, distortion, bulging, etc.).

   4) Environmental degradation [i.e. ultraviolet (if there is no pigmented coating or protective layer), ice, etc.].

   5) Fire or excessive heat.

S10.3 INSPECTOR QUALIFICATIONS

a) The ~~The~~ Inspector referenced in this supplement is a National Board Commissioned Inspector complying with the requirements of NB-263. RCI-1 *Rules for Commissioned Inspector*.

b) The inspector shall be familiar with vessel construction and qualified by training and experience as described in NBIC Part 2, S4.5 to conduct such inspections. The inspector shall have a thorough understanding of all required inspections, tests, test apparatus, inspection procedures, and inspection

techniques and equipment applicable to the types of vessels to be inspected. The inspector shall have basic knowledge of the vessel material types and properties. Refer to Part 2, S4.2 and S4.5

S10.4 INSPECTION FREQUENCY

a) Initial Inspection

The vessel shall be given an external visual examination by the Inspector or the Authority having jurisdiction where the vessel is installed and during the initial filling operation. The examination shall check for any damage during installation prior to initial filling and for any leaks or damage during and at the conclusion of filling.

b) Subsequent Filling Inspections

Before each refilling of the vessel, the manager of the facility shall visually examine the vessel exterior for damage or leaks. Refilling operations shall be suspended if any damage or leaks are detected and the vessel shall be emptied and subsequently inspected by the Inspector to determine if the vessel shall remain in service.

c) Periodic Inspection

Within 30 days of the anniversary of the initial operation of the vessel during each year of its service life, the vessel shall be externally examined by the Inspector or the Authority having jurisdiction where the vessel is installed. Internal inspections shall only be required if any of the conditions of S10.9 a) are met. These examinations are in addition to the periodic acoustic emission examination requirements of S10.5 c).

S10.5 INSERVICE INSPECTION

a) NBIC Part 2, Section 1, of this part shall apply to inspection of high-pressure vessels, except as modified herein. This supplement covers vessels, and is not intended to cover piping and ductwork, although some of the information in this supplement may be used for the inspection of piping and ductwork.

b) The inspection and testing for exposed load sharing metallic portions of vessels shall be in accordance with NBIC Part 2, Section 2.3.

c) All composite vessels shall have an initial acoustic emission examination per S10.10 ~~after the first three years from the date of manufacture. Thereafter, vessels shall have~~ at a maximum examination interval of five years which may be more frequent based on the results of any external inspection per S10.8 or internal inspections per S10.9.

All vessels shall be subject to the periodic inspection frequency given in S10.4.

S10.6 ASSESSMENT OF INSTALLATION

a) The visual examination of the vessel requires that all exposed surfaces of the vessel are examined to identify any degradation, defects, mechanical damage, or environmental damage on the surface of the vessel.

The causes of damage to vessels are:

1) abrasion damage;

2) cut damage;

3) impact damage;

4) structural damage;

5) chemical or environmental exposure damage or degradation; and

6) heat or fire damage.

The types of damage found are:

1) cracks;

2) discolored areas;

3) gouges and impact damage;

4) leaks;

5) fiber exposure;

6) blisters;

7) delaminations;

8) surface degradation; and

9) broken supports.

b) The visual examination of the vessel requires that the identity of the vessel shall be verified. This shall include the construction code (ASME) to which the vessel was constructed, vessel serial number, maximum allowable operating pressure, date of manufacture, vessel manufacturer, date of expiration of the service life of the vessel, and any other pertinent information shown on the vessel or available from vessel documents. The overall condition of the vessel shall be noted.

S10.7 VISUAL EXAMINATION

a) Acceptable Damage

Acceptable damage or degradation is minor, normally found in service, and considered to be cosmetic. This level of damage or degradation does not reduce the structural integrity of the vessel. This level of damage or degradation should not have any adverse effect on the continued safe use of the vessel. This level of damage or degradation does not require any repair to be performed at the time of in-service inspection. When there is an external, non load bearing, sacrificial layer of filaments on the vessel, any damage or degradation should be limited to this layer. Damage or degradation of the structural wall shall not exceed the limits specified in Tables S10.7-a or S10.7-b.

b) Rejectable Damage (Condemned—Not Repairable)

Rejectable damage or degradation is so severe that structural integrity of the vessel is sufficiently reduced so that the vessel is considered unfit for continued service and shall be condemned and removed from service. No repair is authorized for vessels with rejectable damage or degradation.

c) Acceptance Criteria for Repairable Damage

Certain, specific types of damage can be identified by the external in-service visual examination. Indications of certain types and sizes may not significantly reduce the structural integrity of the vessel and may be acceptable so the vessel can be left in service. Other types and larger sizes of damages may reduce the structural integrity of the vessel and the vessel shall be condemned and removed from service. Tables S10.7-a or S10.7-b are a summary of the acceptance/rejection criteria for the indications that are found by external examination of the vessel.

d) Fitness for service

1) If a visual examination reveals that a vessel does not meet all criteria of Table S10.7-a or S10.7-b satisfactorily, it shall be taken out of service immediately, and either be condemned or a fitness for service examination be conducted by the original vessel manufacturer or legal successor who must also hold a National Board "R" certificate. When the vessel is taken out of service, its contents shall be immediately safely vented or transferred to another storage vessel per the owner's written safety procedures.

2) If a fitness for service examination is to be conducted, the original vessel manufacturer shall be contacted as soon as possible after the rejectable defects have been found. The manufacturer shall then determine the vessel fitness-for-service by applicable techniques, (e.g., acoustic emission testing, ultrasonic testing, and/or other feasible methods). The manufacturer shall have documentation that the evaluation method(s) used is satisfactory for determining the condition of the vessel. Repairs to the outer protective layer may be made by a "R" certificate holder other than the original manufacturer following the original manufacturer's instructions.

3) Determination of fitness for service is restricted to original manufacturer or legal successor[NN1].

TABLE S10.7-a

VISUAL ACCEPTANCE/REJECTION CRITERIA FOR COMPOSITE PRESSURE VESSELS (U.S. CUSTOMARY UNITS)

Type of Degradation or Damage	Description of Degradation or Damage	Acceptable Level of Degradation or Damage	Rejectable Level of Degradation or Damage
Abrasion	Abrasion is damage to the filaments caused by wearing or rubbing of the surface by friction.	Less than 0.050 in. depth in the pressure bearing thickness.	≥ 0.050 in. depth in the pressure bearing thickness.
Cuts	Linear indications flaws caused by an impact with a sharp object.	Less than 0.050 in. depth in the pressure bearing thickness.	≥ 0.050 in. depth in the pressure bearing thickness.
Impact Damage	Damage to the vessel caused by striking the vessel with an object or by being dropped. This may be indicated by discoloration of the composite or broken filaments and/or cracking.	Slight damage that causes a frosted appearance or hairline cracking of the resin in the impact area.	Any permanent deformation of the vessel or damaged filaments.
Delamination	Lifting or separation of the filaments due to impact, a cut, or fabrication error.	Minor delamination of the exterior coating less than a depth of 0.050 in.	Any loose filament ends showing on the surface at a depth ≥ 0.050 in. Any bulging due to interior delaminations.
Heat or Fire Damage	Discoloration, charring or distortion of the composite due to temperatures beyond the curing temperature of the composite.	Merely soiled by soot or other debris, such that the cylinder can be washed with no residue.	Any evidence of thermal degradation or discoloration or distortion.
Structural Damage – bulging, distortion, depressions	Change in shape of the vessel due to severe impact or dropping.	None	Any visible distortion, bulging, or depression.

Type of Degradation or Damage	Description of Degradation or Damage	Acceptable Level of Degradation or Damage	Rejectable Level of Degradation or Damage
Chemical attack	Environmental exposure that causes a change in the composite or failure of the filaments.	Any attack that can be cleaned off and that leaves no residue or evidence of permanent damage.	Any permanent discoloration or loss or softening of material under the exterior coat.
Cracks	Sharp, linear indications	None	None
Scratches/Gouges	Sharp, linear indications caused by mechanical damage.	Less than 0.050 in. depth in the pressure bearing thickness No structural fibers cut or broken.	≥ 0.050 in. depth in the pressure bearing thickness or structural fibers cut or broken.
Soot	A deposit on the composite caused by thermal or environmental exposure.	Soot that washes off and leaves no residue.	Any permanent marking that will not wash off the surface under the exterior coating.
Over pressurization	Excessive pressure due to operational malfunction.	~~None reported~~ [NN2]Pressure between MAWP and test pressure, with approval of the	Any report of pressurization beyond the ~~MAWP~~ test pressure or any indication of distortion.
Corrosion	Degradation of the composite due to exposure to specific corrosive environments.	None visible in excess of manufacturer's specification[NN3]	Any surface damage to structural material identified as corrosion beyond the manufacturer's specification. (See Note 2)
Dents	A depression in the exterior of the vessel caused by impact or dropping.	< 1/16 in. in depth	Any dents with a depth ≥ 1/16 in. Or with a diameter greater than 2 inches.
Reported collision, accident, or fire	Damage to the vessel caused by unanticipated excursion from normally expected operating conditions.	None reported	Any indication or report of impact or heat damage.
Environmental Damage or Weathering	Ultraviolet or other environmental attack under the exterior coating..	None	Any discoloration that can not be washed off. (See Note 2)
Damage to a protective or sacrificial layer	Abrasion, cuts, chemical attack, scratches/gouges, corrosion, environmental damage, or crazing that are limited only to the protective or sacrificial layer.	The depth of any damage to the protective or sacrificial layer that does not exceed the thickness of the protective or sacrificial layer plus 0.050 inch.	The depth of any damage to the protective or sacrificial layer that exceeds the thickness of the protective or sacrificial layer plus 0.050 inch.
Crazing	Hairline surface cracks only in the composite resin.	Light hairline cracks only in the resin.	Any damage to the filaments.

Note 1:

Only damage beyond the sacrificial or coated layer should be considered, and that any damage to sacrificial or coated layers should be repaired by suitable techniques (i.e. epoxy filler). Refer to Manu-

facturer's Data Report for sacrificial layer thickness.

Note 2:

Washing off UV scale will accelerate attack into lower composite layers. For this reason, if there is superficial UV damage the affected area should be cleaned and painted with a UV tolerant paint. If broken, frayed, or separated fibers to the non sacrificial layer greater than a depth of 0.050 in., are discovered during the cleaning process then the vessel shall be condemned.

TABLE S10.7-b

VISUAL ACCEPTANCE/REJECTION CRITERIA FOR COMPOSITE PRESSURE VESSELS (SI UNITS)

Type of Degradation or Damage	Description of Degradation or Damage	Acceptable Level of Degradation or Damage	Rejectable Level of Degradation or Damage
Abrasion	Abrasion is damage to the filaments caused by wearing or rubbing of the surface by friction.	Less than 1.3 mm. depth in the pressure bearing thickness.	≥ 1.3 mm depth in the pressure bearing thickness.
Cuts	Linear indications flaws caused by an impact with a sharp object.	Less than 1.3 mm. depth in the pressure bearing thickness.	≥1.3 mm depth in the pressure bearing thickness.
Impact Damage	Damage to the vessel caused by striking the vessel with an object or by being dropped. This may be indicated by discoloration of the composite or broken filaments and/or cracking.	Slight damage that causes a frosted appearance or hairline cracking of the resin in the impact area.	Any permanent deformation of the vessel or damaged filaments.
Delamination	Lifting or separation of the filaments due to impact, a cut, or fabrication error.	Minor delamination of the exterior coating less than a depth of 1.3 mm.	Any loose filament ends showing on the surface at a depth ≥ 0.050 in. Any bulging due to interior delaminations.
Heat or Fire Damage	Discoloration, charring or distortion of the composite due to temperatures beyond the curing temperature of the composite.	Merely soiled by soot or other debris, such that the cylinder can be washed with no residue.	Any evidence of thermal degradation or discoloration or distortion.
Structural Damage – bulging, distortion, depressions	Change in shape of the vessel due to sever impact or dropping.	None	Any visible distortion, bulging, or depression.
Chemical attack	Environmental exposure that causes a change in the composite or failure of the filaments.	Any attack that can be cleaned off and that leaves no residue or evidence of permanent damage.	Any permanent discoloration or loss or softening of material under the exterior coat.
Cracks	Sharp, linear indications	None	None
Scratches/Gouges	Sharp, linear indications caused by mechanical damage.	Less than 1.3 mm depth in the pressure bearing thickness No structural fibers cut or broken.	≥ 1.3 mm depth in the pressure bearing thickness or structural fibers cut or broken.

Type of Degradation or Damage	Description of Degradation or Damage	Acceptable Level of Degradation or Damage	Rejectable Level of Degradation or Damage
Soot	A deposit on the composite caused by thermal or environmental exposure.	Soot that washes off and leaves no residue.	Any permanent marking that will not wash off the surface under the exterior coating.
Over pressurization	Excessive pressure due to operational malfunction.	~~None reported~~ Pressure between MAWP and test pressure, with approval of the manufacturer	Any report of pressurization beyond the ~~MAWP~~ Test Pressure or any indication of distortion.
Corrosion	Degradation of the composite due to exposure to specific corrosive environments.	None visible in excess of manufacturer's specification	Any surface damage to structural material identified as corrosion beyond the manufactuere's specificaton.
Dents	A depression in the exterior of the vessel caused by impact or dropping.	< 1.6 mm depth	Any dents with a depth ≥ 1.6 mm Or with a diameter greater than 51 mm.
Reported collision, accident, or fire	Damage to the vessel caused by unanticipated excursion from normally expected operating conditions.	None reported	Any indication or report of impact or heat damage.
Environmental Damage or Weathering	Ultraviolet or other environmental attack under the exterior coating.	None	Any discoloration that can not be washed off. (See Note 2)
Damage to a protective or sacrificial layer	Abrasion, cuts, chemical attack, scratches/gouges, corrosion, environmental damage, or crazing that are limited only to the protective or sacrificial layer.	The depth of any damage to the protective or sacrificial layer that does not exceed the thickness of the protective or sacrificial layer plus 1.3 mm.	The depth of any damage to the protective or sacrificial layer that exceeds the thickness of the protective or sacrificial layer plus1.3 mm.
Crazing	Hairline surface cracks only in the composite resin.	Light hairline cracks only in the resin.	Any damage to the filaments.

Note 1:

Only damage beyond the sacrificial or coated layer should be considered, and that any damage to sacrificial or coated layers should be repaired by suitable techniques (e.g., epoxy filler). Refer to Manufacturer's Data Report for sacrificial layer thickness.

Note 2:

Washing off UV scale will accelerate attack into lower composite layers.. For this reason, if there is superficial UV damage the affected area should be cleaned and painted with a UV tolerant paint. If broken, frayed, or separated fibers to the non sacrificial layer greater than a depth of 1.3 mm, are discovered during the cleaning process then the vessel shall be condemned.

S10.8 EXTERNAL INSPECTION

a) Vessel Service Life

Vessels have been designed and manufactured for a limited lifetime; this is indicated on the vessel

marking. This marking shall first be checked to ensure that such vessels are within their designated service lifetime.

b) Identification of External Damage

The external surface shall be inspected for damage to the laminate. Damage is classified into two levels as shown in Table S10.7-a or Table S10.7-b of this supplement. The acceptance/rejection criteria shown in Table S10.7-a or Table S10.7-b of this supplement shall be followed, as a minimum.

The external surface of the vessel is subject to mechanical, thermal, and environmental damage. The external surface of a vessel may show damage from impacts, gouging, abrasion, scratching, temperature excursions, etc. Areas of the surface that are exposed to sunlight may be degraded by ultraviolet light which results in change in the color of the surface and may make the fibers more visible. This discoloration does not indicate a loss in physical properties of the fibers. Overheating may also cause a change in color. The size (area or length and depth) and location of all external damage shall be noted. Vessel support structures and attachments shall be examined for damage such as cracks, deformation, or structural failure.

c) Types of External Damage

1) General

Several types of damage to the exterior of vessels have been identified. Examples of specific type of damage are described below. The acceptance/rejection criteria for each type of damage are described in Table S10.7-a or Table S10.7-b of this supplement.

2) Abrasion Damage

Abrasion damage is caused by grinding or rubbing away of the exterior of the vessel. Minor abrasion damage to the protective outer coating or paint will not reduce the structural integrity of the vessel. Abrasion that results in flat spots on the surface of the vessel may indicate loss of composite fiber overwrap thickness.

3) Damage from Cuts

Cuts or gouges are caused by contact with sharp objects in such a way as to cut into the composite overwrap, reducing its thickness at that point.

4) Impact Damage

Impact damage may appear as hairline cracks in the resin, delamination, or cuts of the composite fiber overwrap.

5) Delamination[NN4]

Delamination is a separation of layers of fibers of the composite overwrap due to impact or excessive localized loading. It may also appear as a discoloration or a blister beneath the surface of the fiber.

Note: This does not apply to layers intentionally separated by the manufacturer.

6) Heat or Fire Damage

Heat or fire damage may be evident by discoloration, charring or burning of the composite fiber overwrap, labels, or paint. If there is any suspicion of damage, the vessel shall be qualified fit for service using an acoustic emission examination.

7) Structural Damage

Structural damage will be evidenced by bulging, distortion, or depressions on the surface of the vessel.

8) Chemical Attack

Some chemicals are known to cause damage to composite materials. Environmental exposure or direct contact with solvents, acids, bases, alcohols, and general corrosives can cause damage to vessels. Long-term contact with water [NN5]can also contribute to corrosive damage, although may not be a problem by itself. Chemicals can dissolve, corrode, remove, or destroy vessel materials. Chemical attack can result in a significant loss of strength in the composite material. Chemical attack can appear as discoloration and in more extreme cases the composite overwrap can feel soft when touched. If there is any suspicion of damage, the vessel shall be re-qualified using acoustic emission examination.

S10.9 INTERNAL EXAMINATION

a) Requirements for Internal Visual Examination

Internal visual examination is normally not required. When vessels have been filled only with pure fluids, corrosion of the interior of the liner should not occur. Internal visual examination of the tanks shall only be carried out when:

1) There is evidence that any commodity except a pure fluid has been introduced into the tank. In particular, any evidence that water, moisture, compressor cleaning solvents, or other corrosive agents have been introduced into the vessel shall require an internal visual examination.

2) There is evidence of structural damage to the vessel, such as denting or bulging.

3) The vessel valve is removed for maintenance or other reason. Internal examination in this case is limited to examination of the threads and sealing surface. When an internal visual examination is conducted, the following procedures shall be followed.

b) Identification of Internal Damage

1) Vessels with Metallic Liners

For vessels with metallic liners, the objective of the internal visual examination is primarily to detect the presence of any corrosion or corrosion cracks.

The internal surface of the vessel shall be examined with adequate illumination to identify any degradation or defects present. Any foreign matter or corrosion products shall be removed from the interior of the vessel to facilitate inspection. Any chemical solutions used in the interior of the vessel shall be selected to ensure that they do not adversely affect the liner or composite overwrap materials. After cleaning the vessel shall be thoroughly dried before it is examined.

All interior surfaces of the vessel shall be examined for any color differences, stains, wetness, roughness, or cracks. The location of any degradation shall be noted.

Any vessel showing significant internal corrosion, dents or cracks shall be removed from service.

2) Vessels with Non-metallic Liners or No Liners

Vessels with non-metallic liners may show corrosion on the plastic liner or metal boss ends. Vessels with non-metallic liners or no liners may also show internal degradation in the form of cracks, pitting, exposed laminate, or porosity.

The internal surface of vessels shall be examined with adequate illumination to identify any degradation or defects present. Any foreign matter or corrosion products shall be removed from the interior of the vessel to facilitate examination. Chemical solutions used in the interior of the vessel shall be selected to ensure they do not adversely affect the liner or composite overwrap materials. After cleaning the vessel shall be thoroughly dried before it is examined.

c) The Inspector shall look for cracks, porosity, indentations, exposed fibers, blisters, and any other indication of degradation of the liner and/or laminate. Deterioration of the liner may include softening of the matrix or exposed fibers.

S10.10 ACOUSTIC EMISSION EXAMINATION

S10.10.1 USE AND TEST OBJECTIVES

All high-pressure composite pressure vessels shall be subject to an acoustic emission (AE) examination to detect damage that may occur while the vessel is in service. This method may be used in conjunction with the normal filling procedure.

S10.10.2 AE TECHNICIAN REQUIREMENTS

The acoustic emission technician conducting the examination required per S10.10.1 and in accordance with S10.10 shall be certified per the guidelines of ASNT SNT-TC-1A or CP-189 AE Level II or III. A technician performing this test shall have training in and experience with measuring C_e and C_i in composites and identifying wave modes.[NN6]

S10.10.3 TEST PROCEDURE

AE transducers shall be acoustically coupled to the vessel under test and connected to waveform recording equipment. Waveforms shall be recorded and stored on digital media as the vessel is pressurized. All analysis shall be done on the waveforms. The waveforms of interest are the E (Extensional Mode) and F (Flexural Mode) plate waves.

Prior to pressurization, the velocities of the earliest arriving frequency in the E wave and the latest arriving frequency in the F wave shall be measured in the circumferential direction in order to characterize the material and set the sample time (the length of the wave window).

The E and F waves shall be digitized and stored for analysis. The test pressure shall be recorded simultaneously with the AE events. Permanent storage of the waveforms is required for the life of the vessel.

S10.10.4 EQUIPMENT

a) Testing System

A testing system shall consist of:

1) sensors;

2) preamplifiers;

3) high pass and low pass filters;

4) amplifier;

5) A/D (analog-to-digital) converters;

6) a computer program for the collection of data;

7) computer and monitor for the display of data; and

8) a computer program for analysis of data.

Examination of the waveforms event by event shall always be possible and the waveforms for each event shall correspond precisely with the pressure and time data during the test. The computer program shall be capable of detecting the first arrival channel. This is critical to the acceptance criteria below.

Sensors and recording equipment shall be checked for a current calibration sticker or a current certificate of calibration.

b) Sensor Calibration

Sensors shall have a flat frequency response from 50 kHz to 400 kHz. Deviation from flat response (signal coloration) shall be corrected by using a sensitivity curve obtained with a Michelson interferometer calibration system similar to the apparatus used by NIST (National Institute for Standards and Technology). Sensors shall have a diameter no greater than 0.5 in. (13 mm) for the active part of the sensor face. The aperture effect shall be taken into account. Sensor sensitivity shall be at least 0.1 V/nm.

c) Scaling Fiber Break Energy

The wave energy shall be computed by the formula:

$$u = \int v^2 \, dt / z$$

FIGURE S10.10.4-a
ROLLING BALL IMPACT CALIBRATION SETUP

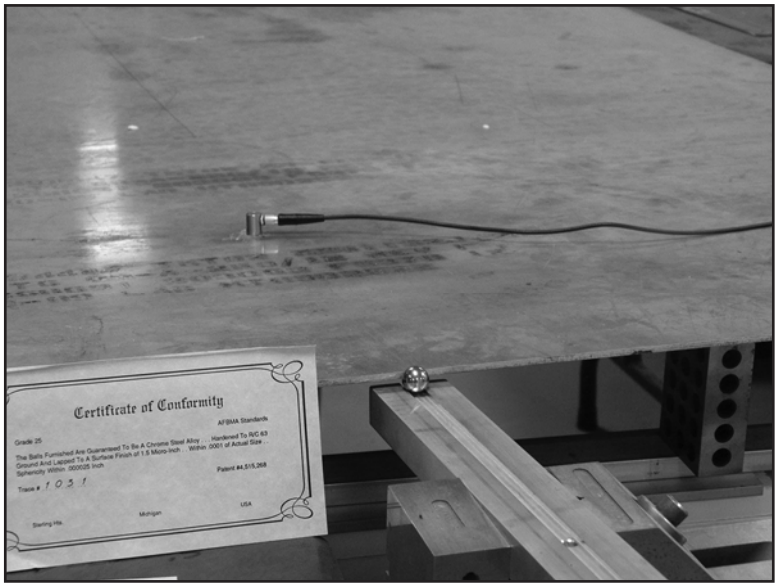

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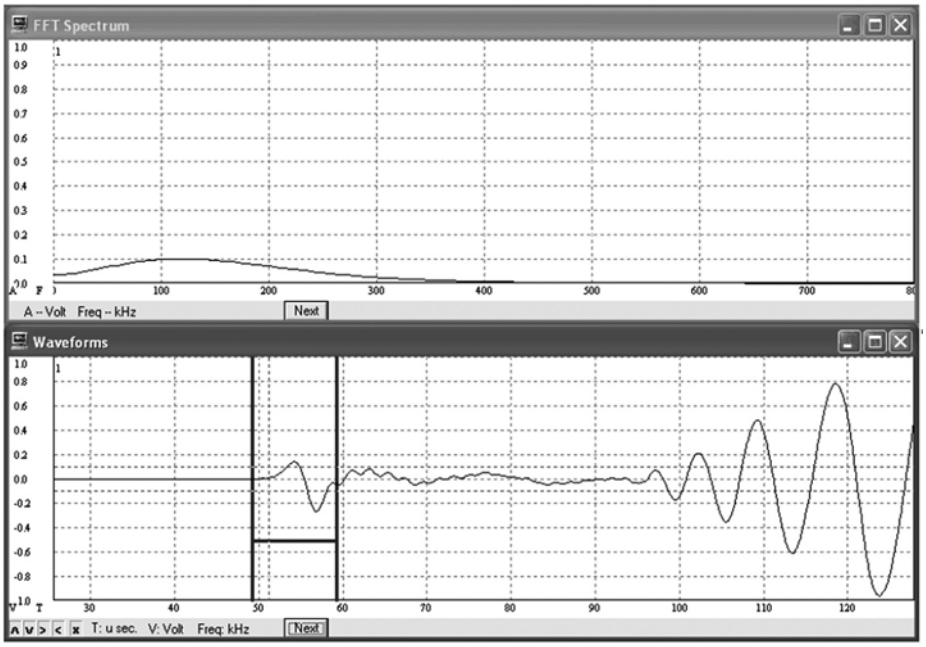
FIGURE S10.10.4-b
FRONT END WAVEFORM



which is the formula for computing energy in the AE signal, where V is the voltage in volts (V) and Z is the input impedance in ohms (Ω). A rolling ball impactor shall be used to create an acoustical impulse in an aluminum plate. The measured energy in the wave shall be used to scale the fiber break energy. This scaling is illustrated later on.

The impact setup, an example of which is shown in Figure S10.10.4-a, shall be arranged as follows. The steel ball shall be ½ inch (13 mm) in diameter. The steel ball is a type typically used in machine shops for measuring taper and is commercially available. The ball shall be made of chrome steel alloy hardened to R/C 63, ground and lapped to a surface finish of 1.5 micro-inch (0.0000381 mm), within 0.0001 inch (0.0025 mm) of actual size and sphericity within 0.000025 inch (0.00064 mm). The plate shall be made of 7075 T6 aluminum, be at least 4 ft x 4 ft (1200 mm X 1200 mm) in size, the larger the better to avoid reflections, be 1/8 inch (3.2 mm) in thickness and be simply supported by steel blocks. The inclined plane shall be aluminum with a machined square groove 3/8 inch (9.5 mm) wide which supports the ball and guides it to the impact point. The top surface of the inclined plane shall be positioned next to the edge of the plate and stationed below the lower edge of the plate such that the ball impacts with equal parts of the ball projecting above and below the plane of the plate. A mechanical release mechanism shall be used to release the ball down the plane.

The ball roll length shall be 12 inch (305 mm) and the inclined plane angle shall be 6 degrees. The impact produces an impulse that propagates to sensors coupled to the surface of the plate 12 inches (305 mm) away from the edge. The sensors shall be coupled to the plate with vacuum grease. The energy of the leading edge of the impulse, known as the wave front, shall be measured. The vertical position of the ball impact point shall be adjusted gradually in order to “peak up” the acoustical signal, much as is done in ultrasonic testing where the angle is varied slightly to peak up the response. The center frequency of the first cycle of the E wave shall be confirmed as 125 kHz ± 10 kHz. See Figure S10.10.4-b. The energy value in joules of the first half cycle of the E wave shall be used to scale the fiber break energy in criterion 2, as illustrated there. This shall be an “end to end” calibration, meaning that the energy shall be measured using the complete AE instrumentation (sensor, cables, preamplifiers, amplifiers, filters and digitizer) that are to be used in the actual testing situation.

Front end of waveform created by rolling ball impact calibration setup described herein. Fast Fourier transform (FFT) shows center frequency of first cycle is approximately 125kHz. The energy linearity of the complete AE instrumentation (sensor, cables, preamplifiers, amplifiers, filters and digitizer) shall be measured by using different roll lengths of 8, 12 and 16 inches (203, 305, and 406 mm). The start of the E wave shall be from the first cycle of the waveform recognizable as the front end of the E wave to the end of the E wave which shall be taken as 10 microsecond (μs) later. (The time was calculated from the dispersion curves for the specified aluminum plate.) A linear regression shall be applied to the energy data and a goodness of fit $R^2 > 0.9$ shall be obtained.

d) Preamplifiers and Amplifiers - See ASME Section V, Article 11.

e) Filters

A high pass filter of 20 kHz shall be used. A low pass filter shall be applied to prevent digital aliasing that occurs if frequencies higher than the Nyquist frequency (half the sampling rate) are in the signal.

f) A/D

The sampling speed and memory depth (wave window length) are dictated by the test requirements and calculated as follows: Vessel length = L inches (meters). Use C_E = 0.2 in./μs (5080 m/s) and C_F = 0.05 in./μs (1270 m/s), the speeds of the first arriving frequency in the E wave and last arriving frequency in the F wave, respectively, as a guide. The actual dispersion curves for the material shall be used if available.

L / C_E = T1 μs. This is when the first part of the direct E wave will arrive.

L / C_F = T2 μs. This is when the last part of the direct F wave will arrive.

(T2 – T1) x.1.5 is the minimum waveform window time and allows for pretrigger time.

The recording shall be quiescent before front end of the E wave arrives. This is called a “clean front end”. Clean is defined in S10.10.6 b) 2) below.

The sampling rate, or sampling speed, shall be such that aliasing does not occur.

The recording system (consisting of all amplifiers, filters and digitizers beyond the sensor) shall be calibrated by using a 20 cycle long tone burst with 0.1 V amplitude at 100, 200, 300, and 400 kHz. The system shall display an energy of $uu = \frac{vv^{!}\,NNNN}{ZZZ}$ joules at each frequency, where V=0.1 volts, N = 20, Z is the preamplifier input impedance in ohms (Ω) and T is the period of the cycle in seconds (s).

S10.10.5 SENSOR PLACEMENT

At least two sensors shall be used in any AE test regardless of vessel size so that electromagnetic interference (EMI) is easily detected by simultaneity of arrival. Sensors shall be placed at equal distances around the circumference of the vessel on the cylindrical portion of the vessel adjacent to the tangent point of the dome such that the distance between sensors does not exceed the greater of 24 in. (610 mm), or the effective sensing distance established by signal meaurement. Adjacent rings of sensors shall be offset by ½ a cycle. For example, if the first ring of sensors is placed at 0, 120, and 240 degrees, the second ring of sensors is placed at 60, 180, and 300 degrees. This pattern shall be continued along the vessel length at evenly spaced intervals, such intervals not to exceed the greater of 24 in. (610 mm), or the effective sensing distance established by signal measurement, until the other end of the vessel is reached. See Figure S10.10.4. The diameter referred to is the external diameter of a vessel.

Maximum distance between sensors in the axial and circumferential directions shall not exceed 24 inches (609 mm) unless it is demonstrated that the essential data can still be obtained using a greater distance and the authority having the jurisdiction concurs.

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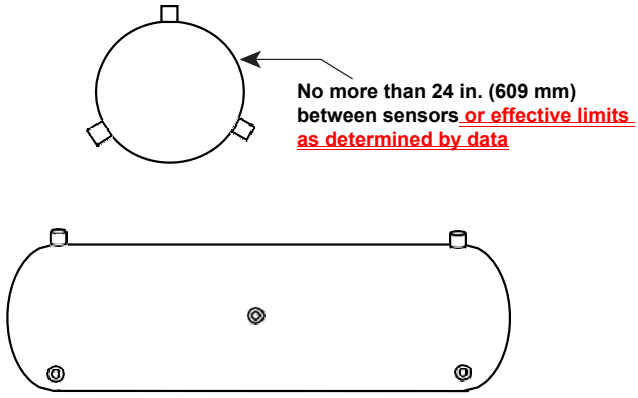
This spacing allows for capturing the higher frequency components of the acoustic emission impulses and high channel count wave recording systems are readily available.

FIGURE S10.10.5
SENSOR SPACING AND PATTERN



S10.10.6 TEST PROCEDURE

Couple sensors to vessel and connect to the testing equipment per ASME Section V Article 11. Connect pressure transducer to the recorder. Conduct sensor performance checks prior to test to verify proper operation and good coupling to the vessel. The E and F waveforms shall be observed by breaking pencil lead at approximately 8 in. (200 mm) and 16 in. (410 mm) from a sensor along the fiber direction. All calibration data shall be recorded.

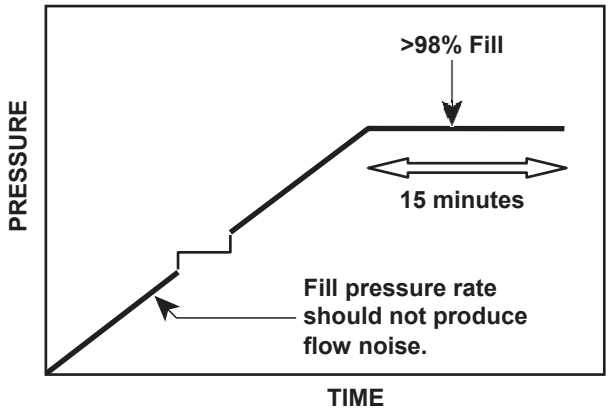
Recording threshold shall be 60 dB ref 1 μV at the transducer.

Performance checks shall be carried out by pencil lead breaks (Pentel 0.3 mm, 2H) six inches (150 mm) from each transducer in the axial direction of the cylinder and a break at the center of each group of four sensors.

Pressurize vessel to >98% of normal fill pressure and monitor AE during pressurization and for 15 minutes after fill pressure is reached. See Figure S10.10.5 for a schematic of the pressurization scheme. If at any time during fill the fill rate is too high in that it causes flow noise, decrease fill rate until flow noise disappears. Record events during pressurization and for 15 minutes after fill pressure is reached and save the data. Then conduct a post-test performance check and save data. Test temperature shall be between 50°F (10°C) and 120°F (49°C).

A threshold of 60 dBAE ref 1 μV at the sensor shall be used during all phases of testing.

FIGURE S10.10.6
TYPICAL PRESSURIZATION PLAN WHEN FILLING VESSELS



AE shall be monitored for 15 min after operating fill pressure is reached.

S10.10.7 ACCEPT/REJECT CRITERIA

a) Stability Criterion

Theory of AE Monitoring of high-pressure composite pressure vessels for stability– A stable vessel will exhibit cumulative curves with exponentially decaying curvature. The shape of the cumulative events curve is similar for pressure vessels made of fiberglass, aramid and carbon fiber that exhibit a fiber dominated failure mode. This is essentially a test that demonstrates the composite is not progressing to failure at the hold pressure.

b) Analysis Procedure

Data will include matrix splits, matrix cracks, fiber breaks, and matrix chirps due to fracture surface fretting, and fiber/matrix debonding. Extraneous noise, identified by waveform characteristics, may also be included in the data.

1) Filter data to eliminate any external noise such as electromagnetic interference (EMI), mechanical rubbing, flow noise, etc. Identify noise events by their shape, spectral characteristics, or other information known about the test such as a temporally associated disturbance due to the pressurization system or test fixturing. EMI is characterized by a lack of any mechanical wave propagation characteristics, particularly a lack of dispersion being apparent. EMI can be further identified by simultaneity of arrival on more than one channel. The two criteria shall be considered together to ensure it's not simply an event that happened to be centered between the sensors. Mechanical rubbing frequencies are usually very low and can be determined by experiment. There should be no flow noise. If the vessel, or a fitting, leaks, this will compromise the data as AE is very sensitive to leaks. Leak noise is characterized by waves that look uniform across the entire length of the waveform window. If a leak occurs during the load hold, the test must be redone. Flow noise is characterized by waves that fill the waveform window.

2) Use only events that have clean front ends and in which first arrival channel can be determined. Clean means having a pre-trigger energy of less than 0.01×10^{-10} joules. Energy is computed by the integral of the voltage squared over time.

3) Plot first arrival cumulative events versus time. Plots shall always show the pressure data.

4) Apply exponential fits by channel for pressure hold time and display both data and fit. The values are determined by the fit $y = ae^{Bt} + C$.

The B value is the shape factor of the cumulative curves. C is an intercept and A is a scale factor. The time t shall be equal intervals during the hold with events binned by time interval. Record exponents and goodness of fit (R^2). Plot energy decay curves. One third or one fourth of hold time shall be used for event energy binning (cumulative energy). The formula is $y = ae^{Bt}$.

The sequence of energy values must monotonically decrease.

This is similar to using other energy criteria, such as Historic Index. A sequence that is not properly decreasing will be indicated by a low R^2 value.

5) Save all plots (all channels) to report document.

6) Record exponents and R^2 values.

7) Vessel B Values

a. Vessel B values shall be tracked and compiled in order to develop a statistically significant database.

b. B is the critical value that measures the frequency of occurrence of events during pressure hold.

c. Not every vessel will have the exact same B value.

d. Data on B values should cluster.

S10.10.7.1 THE CRITERIA GIVEN BELOW APPLY TO EACH INDIVIDUAL SENSOR ON THE VESSEL

a) The stability criteria as described above shall be met. (Also see ASME Section X Mandatory Appendix 8.) Any vessel that does not meet the stability criteria must be removed from service. The criteria are:

1) Cumulative Event Decay Rate $-0.1 < B < -0.0001$, $R^2 \geq 0.80$

2) Cumulative Energy Decay Rate $-0.2 < B < -0.001$, $R^2 \geq 0.80$

If these criteria are not met, the vessel does not pass. The vessel may be retested. An AE Level III examiner must review the data from the initial testing and the subsequent loading test before the vessel can be passed. Retest loadings shall follow the original pressurization rates and pressures and use a threshold of 60 dBAE. If the vessel fails the criteria again, the vessel shall not be certified by the Inspector as meeting the provisions of this section.

b) Events that occur at the higher loads during pressurization having significant energy in the frequency band f > 300 kHz are due to fiber bundle, or partial bundle, breaks. These should not be present at operating pressure in a vessel that has been tested to a much higher pressures and is now operated at the much lower service pressure. For fiber bundles to break in the upper twenty percent of load during the test cycle or while holding at operating pressure, the vessel has a severe stress concentration and shall be removed from service.

S10.10.8 FIBER BREAKAGE CRITERION

a) Analysis Procedure

In order to determine if fiber bundle breakage has occurred during the filling operation the frequency

spectra of the direct E and F waves shall be examined and the energies in certain frequency ranges shall be computed as given below.

b) Definitions

Energies (U) in the ranges are defined as:

50 – 400 kHz: U_0

100 – 200 kHz: U_1

250 – 400 kHz: U_2

The criteria for determining if high frequency spectrum events have occurred is given by the following formulas:

$U_0/(UF_{BB)} \geq 10\%$

$U_2/(U_1 + U_2) \geq 15\%$

$U_2/U_0 \geq 10\%$

U_{FBB} is the energy of a fiber bundle break calculated using the average breaking strength from the manufacturer's data or independent test data. The manufacturer's data shall be used if available. The formula that shall be used for calculating average fiber break energy in joules (J) is

$$UU_{!\cdot\cdot} = \frac{EE * AA * ll * \varepsilon\varepsilon^{!}}{2}$$

where E is the Young's modulus of the fiber in pascals (Pa), ε is the strain to failure of the fiber, A is area of the fiber in square meters (m^2), and l is the ineffective fiber length in meters (m) for the fiber and matrix combination. If the ineffective length is not readily available, four times the fiber diameter shall be used. Set $U_{FBB} = 100 \times U_{FB}$, where U_{FB} has been calculated and scaled by the rolling ball impact energy as in the examples below. If these criteria are met, fiber bundle break damage has occurred during the test and the vessel shall be removed from service.

c) Example of Fiber Break Energy Calculation Suppose d = 7 μm, *E* = 69.6 GPa and ε = 0.01 (average breaking strain) for some carbon fiber. Using $A = \pi d^2/4$ and $l = 4d$,

$$UU_{!\cdot\cdot} = \frac{EE * AA * ll * \varepsilon\varepsilon^{!}}{2}$$

$$UU_{!\cdot\cdot} = \frac{EE69.6 * 10^{!} PPPP * \pi\pi * \frac{(7 * 10^{!!} mm)^{!}}{4} * 2.8 * 10^{!!} mm * (0.01)^{!}}{2}$$

$$UU_{!\cdot\cdot} = 3.75 * 10^{!!} jj$$

d) Example of Scaling Calculation

Suppose that the rolling ball impact (RBI) acoustical energy measured by a particular high fidelity AE transducer is $U^{AE}_{RBI} = 5 \times 10^{-10}$ J and the impact energy $U_{RBI} = 1.9 \times 10^{-3}$ J (due to gravity). Suppose d = 7 μm, *E* = 69.6 GPa and ε = 0.01 (average breaking strain) for some carbon fiber. Using $A = \pi d^2/4$ and $l = 4d$, $U_{FB} = 3x10^{-8}$ J. A carbon fiber with a break energy of $U_{FB} = 3x10^{-8}$ J would correspond to a wave energy.

$$U^{AE}{}_{FB} = U_{FB} \, x \, U_{AE_{RBI}} / U_{RBI}$$

$$U^{AE}{}_{FB} = 3x10^{-8} J \times 5 \times 10^{-10} J / 1.9 \times 10^{-3} J$$

$$U^{AE}{}_{FB} = 7.9 \times 10^{-15} J.$$

This is the number that is used to calculate the value of U_{FBB} that is used in the fiber break criterion in the second acceptance criterion and the energy acceptance criterion in the third criterion below.

e) Amplifier Gain Correction

All energies shall be corrected for gain. (20 dB gain increases apparent energy 100 times and 40 dB gain 10,000 times.)

Fiber break waves may look similar to matrix event waves in time space but in frequency space the difference is clear. A fiber break is a very fast source, while a matrix crack evolves much more slowly due to greater than ten to one difference in their tensile moduli. The speed of the fiber break produces the high frequencies, much higher than a matrix crack event can produce. Frequencies higher than 2 MHz have been observed in proximity to a fiber break, however these very high frequencies are attenuated rapidly as the wave propagates. Practically speaking, the observation of frequencies above 300 kHz, combined with certain other characteristics of the frequency spectrum and pressure level, is enough to confirm a fiber break. It should also be noted that it is fiber bundle breaks that are usually detected in structural testing and not the breaking of individual fibers. The energies of individual fiber breaks are very small, about $3x10^{-8}$ Joules for T-300 carbon fibers for example.

S10.10.9 FRICTION BETWEEN FRACTURE SURFACES

SUPPL. 10

Friction between fracture surfaces plays a very important role in understanding AE in fatigue testing. It is an indicator of the presence of damage because it is produced by the frictional rubbing between existing and newly created fracture surfaces. Even the presence of fiber bundle breakage can be detected by examining the waveforms produced by frictional acoustic emission or FRAE. Increasing FRAE intensity throughout a pressure cycle means more and more damage has occurred.

Therefore, for a vessel to be acceptable no AE event shall have an energy greater than (F) x U_{FB} at anytime during the test. F is the acoustic emission allowance factor. The smaller the allowance factor, the more conservative the test. An $F = 10^4$ shall be used in this testing. It is the equivalent of three plus fiber tows, each tow consisting of 3,000 fibers, breaking simultaneously near a given transducer.

S10.10.10 BACKGROUND ENERGY

Background energy of any channel shall not exceed 10 times the quiescent background energy of that channel. After fill pressure is reached, any oscillation in background energy with a factor of two excursions between minima and maxima shows that the vessel is struggling to handle the pressure. Pressure shall be reduced immediately and the vessel removed from service.

S10.11 DOCUMENT RETENTION

a) The vessel owner shall retain a copy of the Manufacturer's Data Report for the life of the vessel.

b) After satisfactory completion of the periodic in-service inspection, vessels shall be permanently marked or labeled with date of the inspection, signature of the Inspector, and date of the next periodic in-service inspection.

c) The vessel owner shall retain a copy of the in-service inspection report for the life of the vessel.

Date: April 9, 2019
Item Number: 19-29
Part 2, 5.2.4
Proposed change

***Background Information**: This paragraph needs to be updated to provide clarity on the use of the NB-136, as it currently contradicts itself. NB-136 is not typically used for replacement of duplicate nameplates.*

5.2.~~4~~ 3 REPLACEMENT OF DUPLICATE NAMEPLATES

Replacement or re-attachment of duplicate nameplates is exempt from meeting the requirements ~~above~~ in Part 2, 5.2.1, provided the information on the nameplate is identical to the original data existing on the pressure-retaining item. The duplicate nameplate shall be marked duplicate. The jurisdiction where the pressure-retaining item is located and the original manufacturer of the item shall be contacted for additional guidance and direction. ~~When the Code symbol stamp cannot be applied, Form NB-136 shall be completed, signed by a National Board Commissioned Inspector, retained and a copy submitted to the National Board by the owner or user as described in 5.2.1 a).~~

Item 19-30: Part 2, S7.9
Temporary ASME Nameplate removal for external inspection refurbishing.
Submitted by: Doug Biggar <doug@ditechtesting.com>

Explanation of Need: No reference to the necessity of removing ASME nameplates for this external inspection is currently in the code. An exemption is needed for refurbishers as a safety measure to ensure the total integrity of the tank is examined. NBIC Section 2, S7.9 bullets 1-3 does not make an exception/exemption for refurbishers to be able to temporarily remove the nameplate for inspection of tank integrity under this one area. The code refers only to removal of the nameplate for replacement and/or stamping which is something we don't do. We refurbish thousands of 125g to 2000g horizontal bulk LPG pressure vessels each year and the current code of having an inspector present for each tank that the raised plate is temporarily removed is not a feasible solution.

Background Information: According to our internal studies and accumulated data, 25-30% of all pitting/corrosion that fails an ASME pressure vessel (LPG) occurs in this one area of tanks that are fitted with a raised nameplate. NOTE: We will submit examples to the secretary to substantiate our request (see below).

Proposed text addition: Refurbishers may need to temporarily physically remove the nameplate of ASME pressure vessels (LPG) that are mounted on a bracket and raised from the vessels surface to remove all coatings and to inspect and measure for corrosion under them.

NBIC Section for Reference:

S7.9 ASME LPG PRESSURE VESSELS LESS THAN 2000 GALLONS BEING REFURBISHED BY A COMMERCIAL SOURCE.

Commercially refurbished pressure vessels are used pressure vessels that are temporarily taken out of service for repair and or renewal and sent to a company which specializes in this type of work. Because the history of some of these pressure vessels is unknown, special attention shall be given to inspection and repair before returning any of these pressure vessels back to service. ASME LPG pressure vessels less than 2,000 gal. (7,570 l) may be refurbished subject to the following conditions:

a) A complete external inspection shall be completed under the guidelines of this supplement. If any defects are found, as defined in S7.8.1 through S7.8.5, the defect shall be repaired under NBIC Part 3, Repairs and Alterations, by qualified personnel or permanently removed from service;

b) Pressure vessels of this size that have been previously used in anhydrous ammonia service shall not be converted to LPG service. See NBIC Part 2, S7.8.6;

c) The coating on the outside of the pressure vessel shall be removed down to bare metal so that an inspection can be performed under the guidelines of this supplement; and

d) Verify that there is no internal corrosion if the pressure vessel has had its valves removed or is known to have been out of service for an extended period.

e) Removal and re-attachment of the original manufacturer's nameplate shall only be done in accordance with NBIC Part 3, 5.11.

Item # 19-33
Metzmaier
April 26, 2019

CURRENT WORDING:

1.1 SCOPE

This part provides requirements and guidelines for conducting inservice inspection of pressure-retaining items.

This section provides general requirements and guidelines for inservice inspection. This section includes precautions for the safety of inspection personnel. The safety of the public and the Inspector is the most important aspect of any inspection activity.

Proposed CHANGES:

1.1 SCOPE

This ~~part~~ section provides general requirements and guidelines for conducting inservice inspection of pressure-retaining items~~.~~

~~This section provides general requirements and guidelines for inservice inspection. This section~~ and includes precautions for the safety of inspection personnel. The safety of the public and the Inspector is the most important aspect of any inspection activity.

PROPOSED TEXT:

1.1 SCOPE

This section provides general requirements and guidelines for conducting inservice inspection of pressure-retaining items and includes precautions for the safety of inspection personnel. The safety of the public and the Inspector is the most important aspect of any inspection activity.

Item 19-65
Date: July 16, 2019

PURPOSE: Revision of present (2017) NB-23 Code

BACKGROUND INFORMATION: Suggested revisions are supported by the contributor's 30yr industry experience within large corporate owner/user environments including purchase and design, manufacturing, installation, inspection and repair.

Contributor's Note: the recommendation is to strike this paragraph because it is nearly identical to S5.2.1, paragraph a), which appears a few paragraphs earlier, within the Code.

Part 2

INSPECTION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S5.2.1 DETERMINATION OF ALLOWABLE OPERATING PARAMETERS

a) A Yankee dryer is designed and intended to have its shell thickness reduced over the life of the vessel through routine wear and grinding. The Yankee dryer shell is ground on the outside surface to restore the quality or shape of the papermaking surface, essential to the manufacturing of tissue or other paper products.

S5.2.3 DOCUMENTATION OF SHELL THICKNESS AND ADJUSTED MAXIMUM ALLOWABLE OPERATING PARAMETERS

~~a) Yankee dryers are designed and intended to have the shell thickness reduced over the life of the vessel as a result of routine wear and grinding. Yankee shell grinding is routinely performed to restore the quality or shape of the papermaking surface.~~

~~b)~~a) Design documentation, a De-rate Curve, is required, which dictates the maximum allowable operating parameters, based on imposed loads over a range of shell thickness. The documentation shall be obtained from the original dryer manufacturer or from another qualified source acceptable to the Inspector.

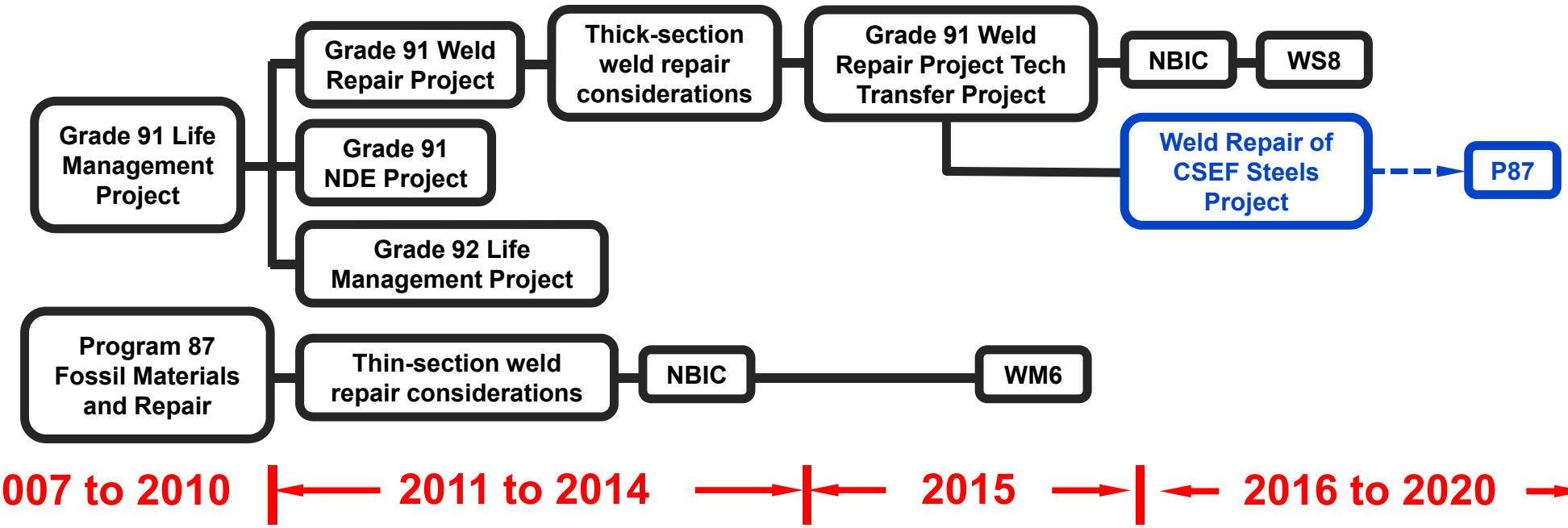
~~c)~~b) Yankee dryer shell grinding requires accurate shell thickness measurements in conjunction with the De-rate Curve in order to set load-limiting devices. The resulting shell thickness and maximum allowable operating parameters after grinding shall be documented, and the Inspector notified that load-limiting device settings have changed.

Update of On-going Alternative Weld Repair Research Studies

John A. Siefert
Program Manager, Materials and Repair

NBIC Main Committee Meeting
July 18, 2019

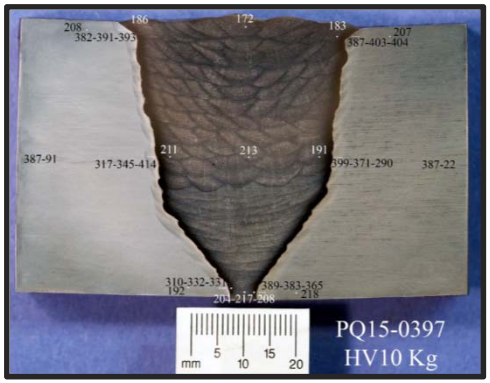
Evolution of Weld Repair for Creep Strength Enhanced Ferritic Steels Projects in EPRI

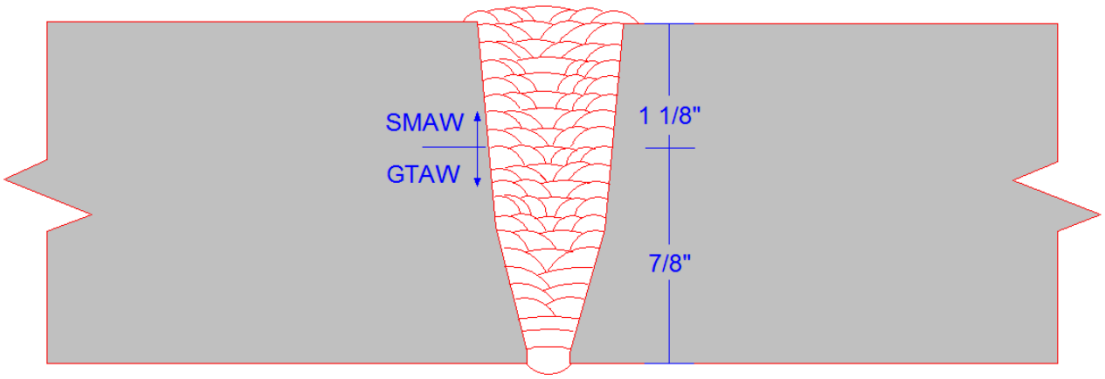


Research continues today through a series of well-funded projects. Since 2011, stakeholders in the power generation industry have committed >$7 million to fund this effort including worldwide participation

Summary of 2015 Procedures w/o PWHT [20 total]

- 12 thin-section procedures qualified ($^{1}/_{16}$ to $^{3}/_{4}$ inches)
  - Gr. 91 to Gr. 91; Gr. 91 to Gr. 22; Gr. 91 to SS304H
  - GTAW and SMAW processes
  - Ni-base and AWS type –B8 filler materials
- 8 thick-section procedures qualified ($^{3}/_{16}$ to 8 inches)
  - Gr. 91 to Gr. 91; Gr. 91 to Gr. 22
  - AWS type –B8 filler metal using GTAW and SMAW processes





Summary of 2018 Procedures w/o PWHT [14 total]

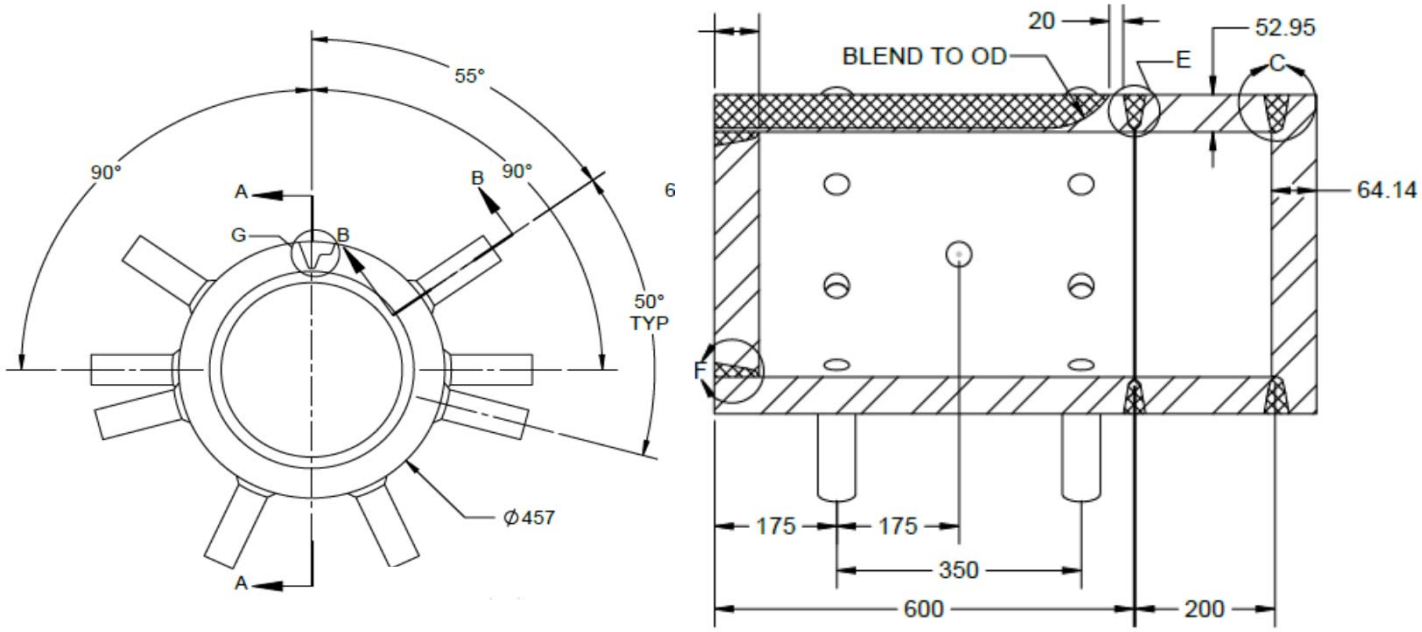
- 8 procedures qualified with ($^{1}/_{16}$ to $^{3}/_{4}$ inches)
  - Gr. 91 to Gr. 91; Gr. 91 to Gr. 22; T91 to T23; Gr. 91 to 304H
  - ER80S-B2 GTAW for root pass
  - Ni-base GTAW and SMAW processes for fill passes (F. No. 43)
- 2 procedures qualified for Gr. 91 to SS304H ($^{3}/_{16}$ to 8 inches)
  - Ni-base GTAW and SMAW processes for fill passes (F. No. 43)
- 2 procedures qualified ($^{3}/_{16}$ to 8 inches)
  - Gr. 91 to Gr. 22 and Gr. 91 to Gr. 91
  - ER80S-B8 Waveform controlled GMAW-S (no back purge)
  - ER80S-B8 GMAW-P for fill
- 2 procedures qualified for P23 to P23 ($^{3}/_{16}$ to 8 inches)
  - SMAW and GTAW processes for ER90S-B23 and E9015-B23

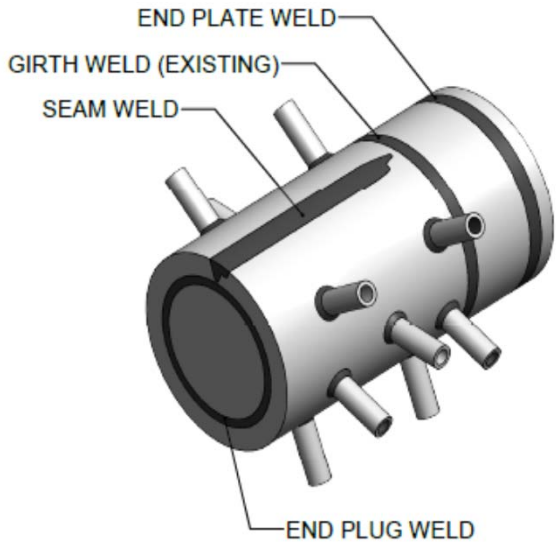
Extent of Known Application of WM6 or WS8

- Estimated total number of repairs to WM6 now >2,000 welds
  - Not aware of a failure
- Estimated total number of repairs to WS8 now >500 welds
  - 1 reported failure in a drain line to tee fitting (failure caused, in part, by an undersized fillet weld)
- It is impossible to know the total extent; reporting of repairs to EPRI is not a mandatory requirement nor is it routinely done
- Representative examples of weld repair to be detailed in 2019 summary report available to the public
  - *Alternative Weld-Engineered Weld Repair Options for Grade 91 Steel – A Review of Service Experience*. EPRI, Palo Alto, CA: 2019. 3002012183. ***(to be finalized by December)***

Full Size Pressure Vessel Test with *Relevant* Weld Repair Geometries

- Develop realistic, service related, creep damage in a typical component
- **Weld repair**: partial circumferential repair of girth weld, tube stub repairs, new full section and through-thickness repairs using –B8 weld metal and no PWHT
- Vessel >8,000 hours (1,155˚F)
  - Equivalent to ~400,000 hours at 1,050°F or 60,000 hours at 1,100°F





Following Presentations

- In January 2019 NBIC Meetings, EPRI was requested to update the Main Committee on the application of Welding Method 6 and Welding Supplement 8
- End-user presentations will be provided from two, large US utilities
  - Eric Dupont, on behalf of Xcel Energy
    - To provide examples consistent with methodology in Welding Supplement 8
  - Chris Ferguson, on behalf of Evergy, Inc.
    - To provide examples consistent with methodology in Welding Method 6
- The following case studies are representative of the larger end-user experience which will be detailed more extensively in a 2019 service experience report

Together…Shaping the Future of Electricity

Alternative Weld Repairs to the NBIC Part 3 Repairs and Alterations Welding Method 6

A Summary of Xcel Energy Experience

Eric Dupont
Principal Production Engineer
Xcel Energy

NBIC Main Committee Meeting
July 18, 2019

Alternative Weld Repair Applications prior to Adoption of Welding Supplement 8

Date	Method	Description	Process	Concerns Regarding PWHT
Mar. 2016	Suppl. 8	24 inch C12A HRH Stop Check Valve- warming, balance line replacement, socket welds.	SMAW, E8015-B8, no PWHT	Excessive softening of Grade 91 valve bodies after multiple PWHT'ed repairs.
Mar. 2017	Suppl. 8	14 inch C12A MS Stop Check Valve- warming, balance line replacement, socket welds.	GTAW, ER80S-B8, no PWHT	Excessive softening of Grade 91 valve bodies after multiple PWHT'ed repairs.

Alternative Weld Repair Applications to Welding Supplement 8 or Welding Method 6

Date	Method	Description	Process	Concerns Regarding PWHT
Jan. 2018	Suppl. 8	1 inch F91 socket welded valves, Fillet welds.	GTAW, ER80S-B8, no PWHT	Overheating of small Grade 91 valve bodies, some limited by OEM to 1100°F max.
April 2018	Suppl. 8	1.75 inch OD T91 superheat tubes within furnace, fillet welds and weld build-up	GTAW, ER80S-B8, no PWHT	Prior overheating damage within Superheat section.
April 2018	Method 6	1.75 inch OD T91 superheat tubes within furnace, butt welds.	GTAW, ER80S-B8, no PWHT	Prior overheating damage within Superheat section.
Mar. 2019	Suppl. 8	1 inch F91 socket welded valves, fillet welds.	GTAW, ER80S-B8, no PWHT	Overheating of small Grade 91 valve bodies, some limited by OEM to 1100°F max.
Mar. 2019	Suppl. 8	2 inch P91 socket welded elbow, fillet welds.	SMAW, E8015-B8, no PWHT	Drain line isolated but unit needed to remain on-line.
April 2019	Suppl. 8	2 inch F91 socket welded valve, fillet welds.	SMAW, E8015-B8, no PWHT	Overheating of small Grade 91 valve bodies, some limited by OEM to 1100°F max.

Case Study 1 – Repair of HRH Warming/ Balance Lines

EPRI Supplemental Project "Application of Well Engineered Weld Repairs for CSEF Steels"

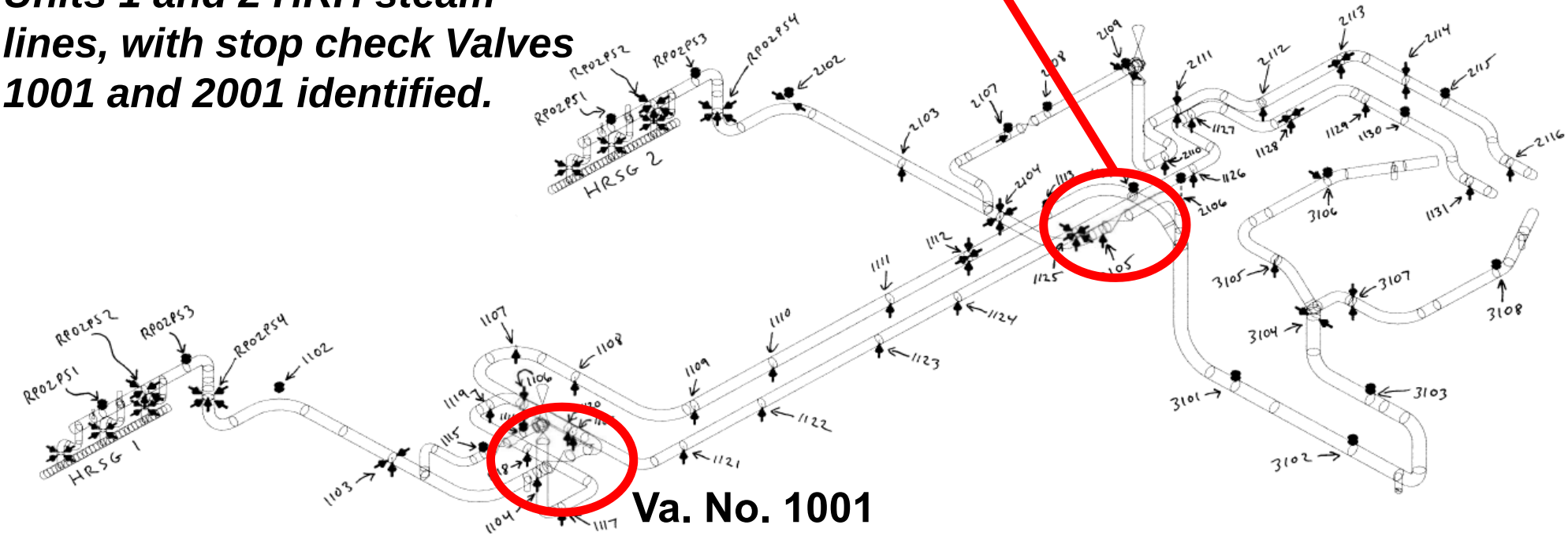
- In March 2016 and as a result of participation in EPRI research, Xcel Energy performed its first alternative weld repair in Grade 91 steel without PWHT.
  - Note: repair performed in non-boiler external piping (e.g. HRH system)
- Selected repair vendor was also engaged in the EPRI research, **providing a unique level of collaboration** between the organizations.
- **State jurisdiction was included** in the discussions of the repair options to:
  - Ensure a **seamless repair operation**.
  - **Increase confidence** in the selected alternative repair option.
  - Familiarization to **allow for future uses** of the methods in other components.
- Safety and integrity of any repair (PWHT or not) is the primary consideration.

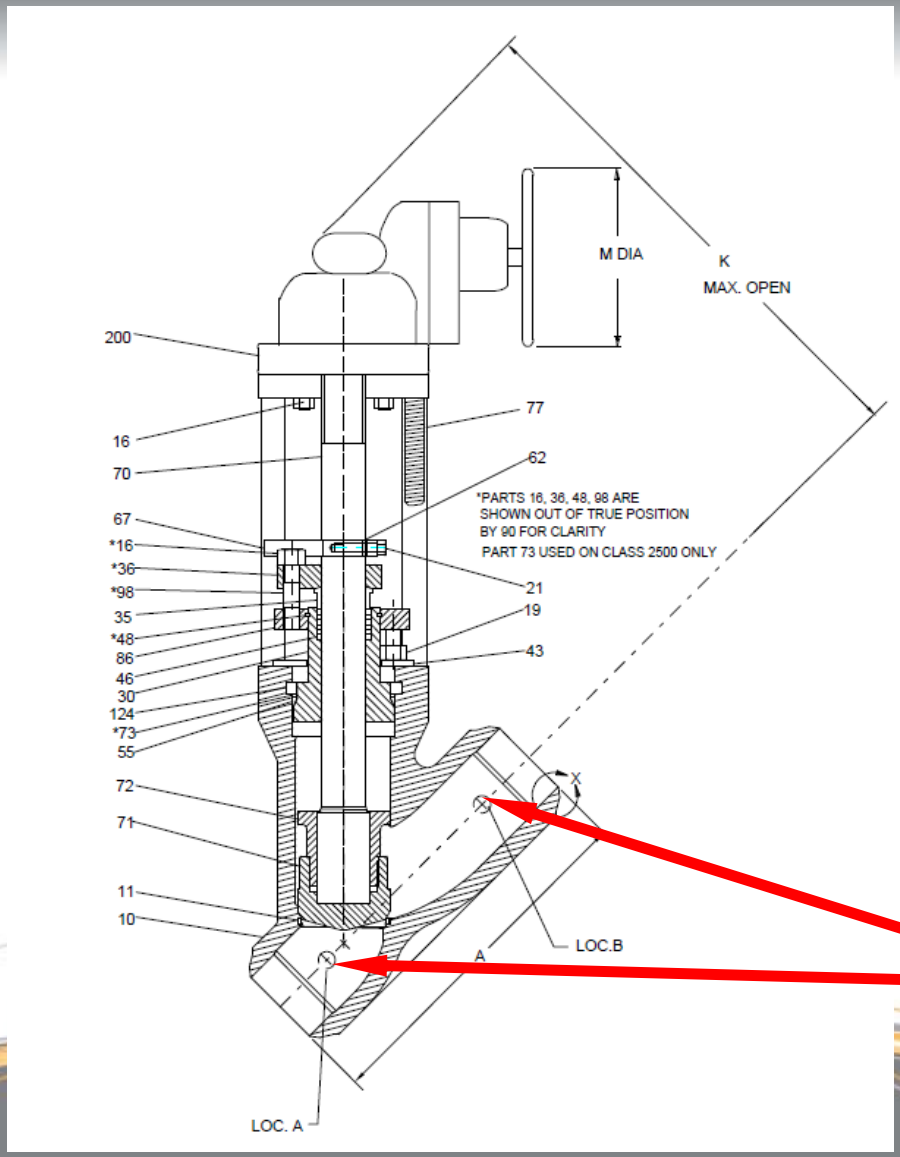
Supplemental Project "Application of Well Engineered Weld Repairs for CSEF Steels"

Rocky Mountain Energy Center (2 on 1 configuration)

- Operational 2004; Xcel purchased the plant in 2010
- Unit 1: Nooter Eriksen HRSG; SWH CT; 160 MW; 72,000 hrs; 1,075 starts.
- Unit 2: Nooter Eriksen HRSG; SWH CT; 160 MW; 71,000 hrs; 1,123 starts.
- Siemens Westinghouse (SWH) steam turbine; 320 MW
- Hot Reheat operating conditions: 1,035°F and 525 psig

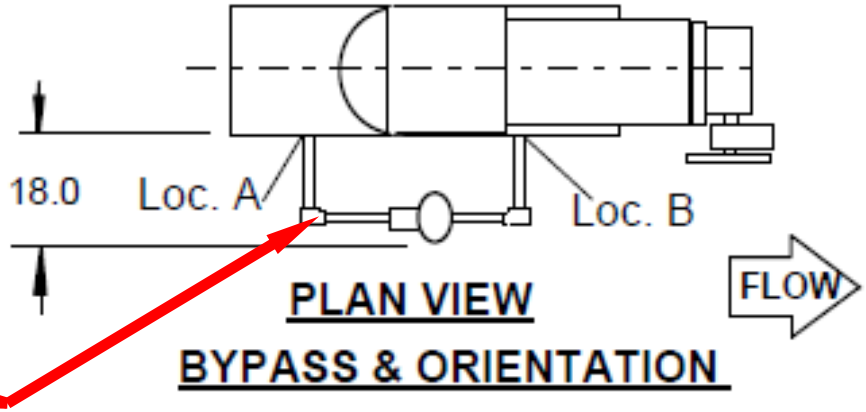
Drawings showing RMEC Units 1 and 2 HRH steam lines, with stop check Valves 1001 and 2001 identified.

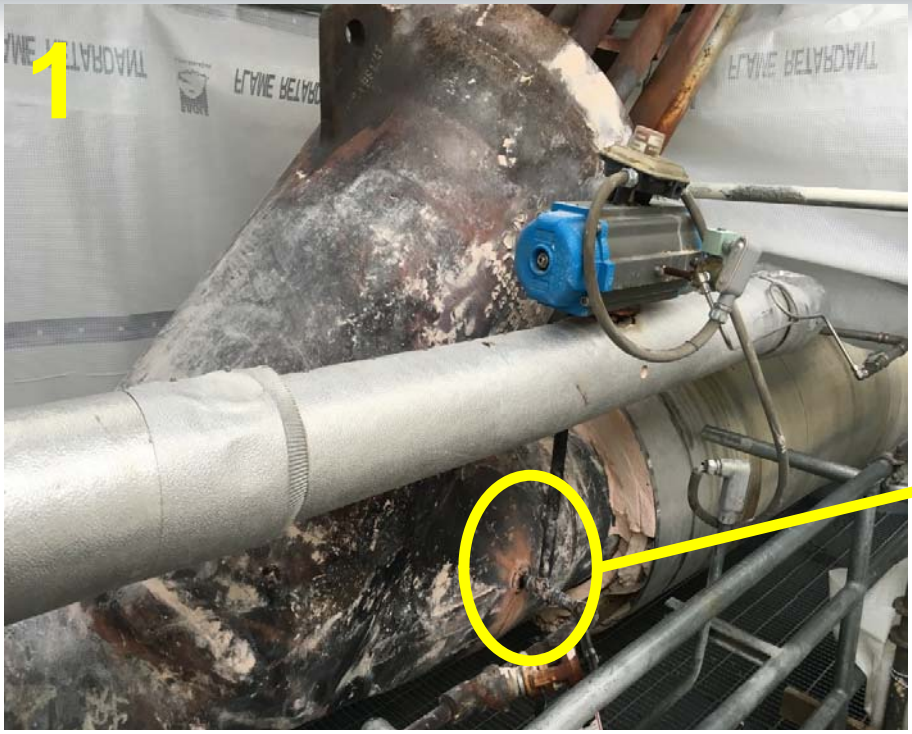




Valve cross section, with the bypass (warming) line locations A and B identified.

- ❑ 24” OD Sch 40 (0.688” WT) valve
  - ASTM A217 C12A
- ❑ 1” NPS Sch 80 (0.179” WT) warming line
  - ASTM A335 P91





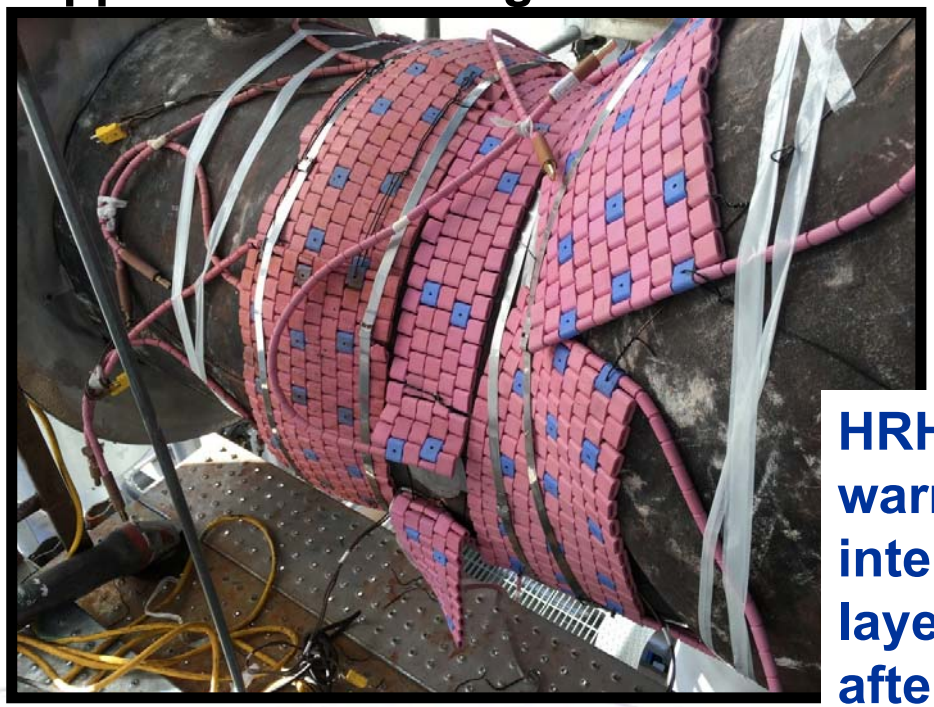
1/2. HRH valve No. 2001, with the leaking warming line identified within the circle.
3. Cracked warming line removed, then grinding of the socket face and MT of weld preparation were performed.

Damage mechanism identified as thermal fatigue

HRH Valve Repair Considerations

- The warming lines had been repaired 2X using PWHT
  - *Re-cracking occurred within ~3 years in each case*
- Concerns regarding subsequent softening of Grade 91 valve bodies after multiple PWHT cycles
  - *HRH 2001 valve body hardness field measured to be 190 HBW*
- No external loading with warming lines capped-prime candidate for non-PWHT repair.
  - Could re-install lines in the future if valve operability issues occur (note; although valve OEM consulted on this point, later clarification indicated this was not a preferred approach)
- Proposed Supplement 11 (later Supplement 8) utilized
  - *SMAW, E8015-B8-H4, 300 to 550°F, each layer dry MT'ed, bakeout, weld toes blend ground*
- Valve was not located in a high traffic area for personnel.
  - *Regardless, area was flagged and personnel notified to further reduce personnel exposure*

HRH valve 1001 being wrapped for preheat, and after initial weld layer applied for warming line No. 2.



HRH valve 1001 warming line 2 after intermediate weld layers applied and after final weld layer was applied, prior to blend grinding.

HRH Valve Repair Summary

- Re-inspection of HRH alternative weld repairs:
  - Dry MT at 7 months (3,700 hours and 50 starts); NRI
  - Wet MT at 12 months (6,000 hours and 75 starts); NRI
  - Re-inspection within 3 years.
- Alternative weld repairs now >20,000 hours of operation and >200 starts
- No reported valve operational issues to date.
- Following the HRH valve repairs, similar repair made to MS valve in March, 2017.

Case Study 2 – Repair of Main Steam Vent Valves

Preparation of Small Bore Vent Valves in the Shop Prior to Installation in the Field

- Small bore valve replacement not a straightforward exercise!
- Some valve internals are threaded into the body; others have seal welds
- Packing is typically OEM-limited to 1100 or 1200°F
  - *Removal of packing can damage threads or impossible for seal-weld design*
- Inlet/outlet lengths typically insufficient to meet the requirements of ASME B&PV Section I Mandatory Appendix C (and also B31.1)

Main Steam Vent Valve Repairs

- January 2018
- Comanche Unit 3 supercritical coal-fired unit (3,732 psig, 1055°F)
- Valves leaking after 61,000 hours of operation and 108 starts
  - Valve body: ASTM A-182 F91; 1 inch OD and 0.400 inch wall thickness
  - Line: A-335 P91; 1 inch OD and 0.400 inch wall thickness
- Weld repair: GTAW, ER80S-B8, no PWHT, procedure to Welding Supplement 8
  - Preheat/Interpass: 300 to 550°F; local preheat applied using a torch
  - Socket welds, controlled fill, stringers, ½ inch minimum fillet weld leg size.
  - Each weld layer was dry MT'ed
  - As-welded weld metal hardness ≤335 HBW
- Re-inspection in Fall 2020 using wet MT

Case Study 3 – Repairs Internal to Boiler Setting, but not to Welding Method 6

Weld Build-up on T91

- April 2018, Hayden Unit 1
- Application: radiant superheat (1,800 psig and 1,005°F)
  - SA-213 T91; 1.75 inch OD and 0.240 inch wall thickness
- Gouges in tube resulting from excessive grinding to remove tube shields
- Repair: GTAW, ER80S-B8, no PWHT
  - Utilized Welding Supplement 8
    - Preheat/Interpass: 300 to 550°F
    - Application of local preheat with torch
    - 2 layer overlay
    - PT after welding
- Re-inspection: MT and removal of 1 tube within 3 years
  - Tube to be provided to EPRI for post-mortem and/or condition assessment after removal

Thank you

Alternative Weld Repairs to the NBIC Part 3 Repairs and Alterations Welding Method 6

A Summary of Evergy Experience

Chris Ferguson, PE, MEM, CWI

Senior Engineer, Evergy

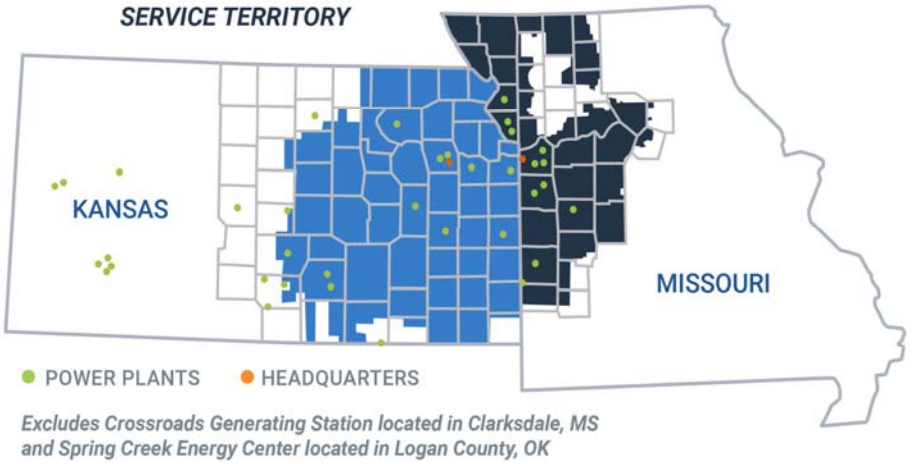
NBIC Main Committee Meeting

July 18, 2019

evergy

Introduction and Outline

- Evergy, Inc.
  - Created from KCP&L & Westar merger
  - Merger in June 2018
  - Serves ~1.6 million customers in Kansas and Missouri
- Outline of presentation
  - Historical EPRI & R-STAMP Participation
  - Installation of Grade 91 Steel in Every Facilities
  - Welding Method 6 Development and Implementation



Historical EPRI and R-Stamp Participation

- KCP&L has been an EPRI Member for many years including all seven years of my tenure with the company
- Westar was not a historical EPRI Member
- R-STAMP
  - KCP&L has held and maintained an R-STAMP since the 1980's
  - Westar did not maintain their own R-STAMP; use of alternative weld repair methods such as WM6 will be beneficial to both entities

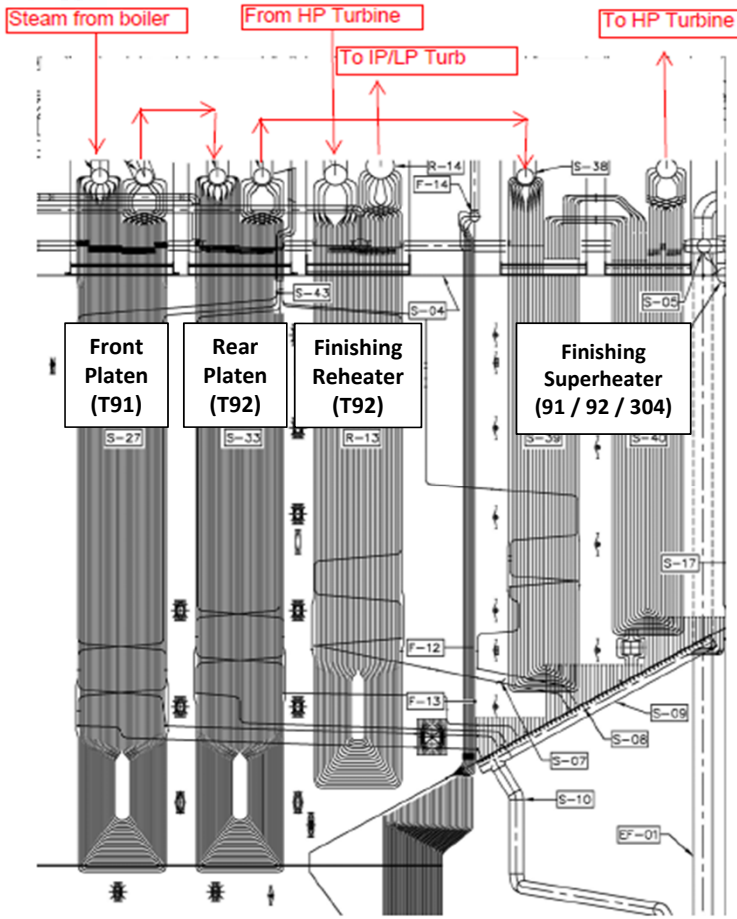
Installation of Grade 91 Steel in Evergy Facilities

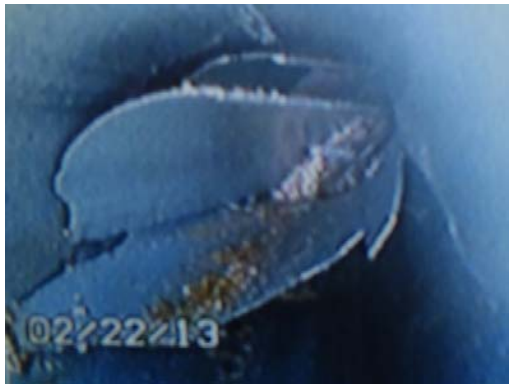
Station	Unit	Year	MW	Application	Extent (feet)	Welds (No.)
LaCygne	1	1973	812	SA-213 T91 Vertical Reheater	~29,000	~2,500
	2	1977	712	SA-213 T91 Reheater	~30,000	~2,200
Hawthorn	5	2000	570	SA-213 Vertical Reheater	~27,000	~2,500
				SA-213 T91 Secondary Superheater Outlet	~30,000	~1,500
				SA-335 P91 Main Steam and turbine piping		
Iatan	1	1979	740	SA-213 T91 Veritical Reheater	~45,000	~3,900
	2	2010	930	SA-213 T91 Platen superheater (front & rear)*	~400,000	~40,000
				SA-213 T91 Finishing superheater inlet*		
				SA-213 T91 Vertical reheater*		
				SA-335 P91 Hot reheat	~1,000	~100
				SA-335 P91 Main Steam	~1,000	~100

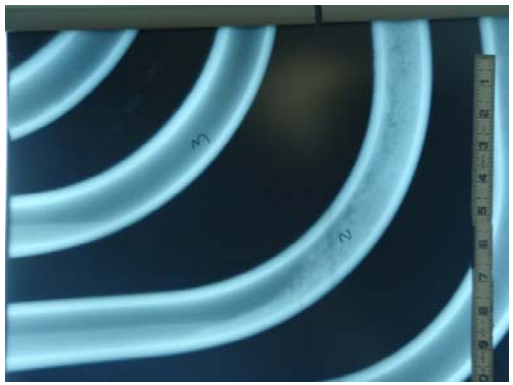
*Does not include headers/manifolds

evergy

Installation of Grade 91 Steel in Evergy Facilities

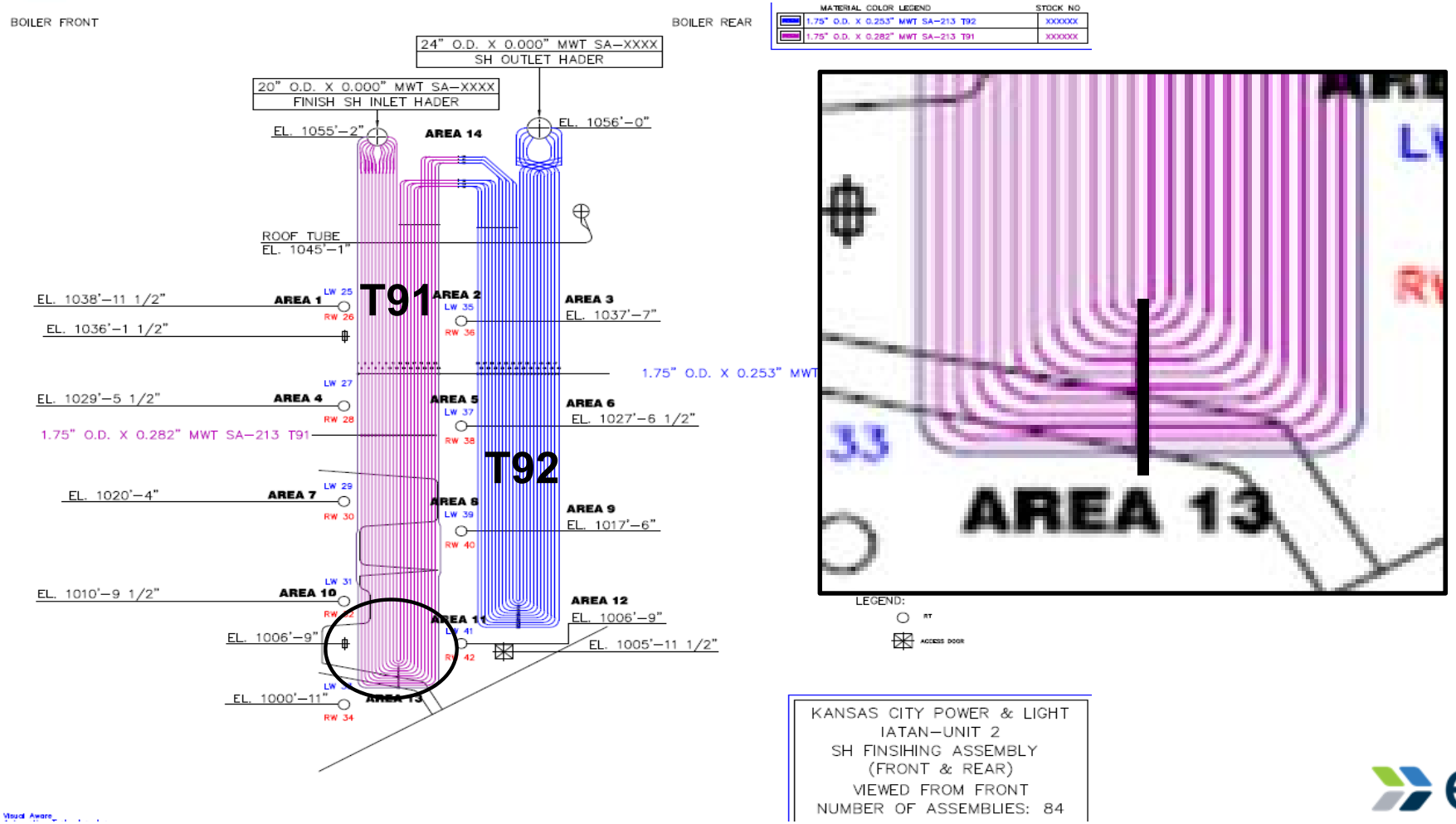






- **Finishing Superheater**
  - Issues begin in Aug. 2012
  - 6 Outages total (68 days)
  - 7 Primary Failures
  - 2750 X-Rays
  - 52 Cut and Cleans
  - Modifications in 2014
    - TC's (1008 circuits)
    - Bulb Design
- **Platen Superheater**
  - Issues begin in Nov. 2014
  - 5 Outages total (44 days)
  - 5 Primary Failures
  - 750 X-Rays
  - 25 Cut and Cleans
  - Modifications – none so far

Superheat Finishing Assembly



X-rays and Cut and Cleans

FSH Feb 2016 Findings

Pendant	Tb 1	Tb 2	Tb 3	Tb 4	Tb 5	Tb 6	Tb 7	Tb 8	Tb 9	Tb 10	Tb 11	Tb 12
5	0	0	10	0	0	0	0	0	0	80	0	0
6	0	0	5	0	5	0	0	0	0	0	0	0
7	0	0	0	0	0	0	2	0	0	5	0	0
8	0	5	0	0	0	2	2	98	0	0	0	0
9	2	5	2	0	0	0	0	2	2	0	0	0
10	0	0	5	2	0	0	0	0	0	70	0	0
11	0	0	0	0	0	0	0	0	0	0	0	2
12	0	0	0	0	0	5	0	0	2	0	0	0
13	0	0	0	0	0	2	0	0	0	0	0	0
14	0	0	0	0	5	5	0	0	5	0	0	0
15	0	0	5	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	70
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	2	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	10	0	0	2	0	0	0
22	0	0	5	5	0	0	0	0	0	0	0	0
23	0	0	0	0	0	2	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	5	0	5	0	2	0	0	0	0	0	0
26	0	0	0	0	0	2	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	100	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	5	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	25	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	10	0	10	0	0	0	0
35	0	0	0	0	0	2	5	5	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	2	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
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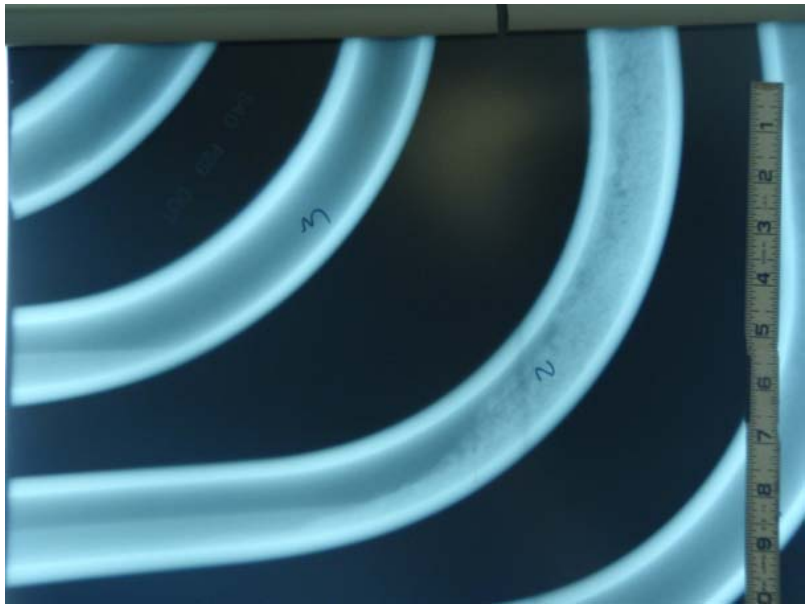
41	0	0	0	10	0	70	0	0	0	0	0	0



I2 2016.12.21 FO

I2 2016.12.10 FO

I2 2016.12.08 FO

I2 2016.11.26 FO

I2 2016.11.14 FO

X-rays and Cut and Cleans

Date	Round	T91	T92	304H	Super 304H	Total
Oct. 2016	1	11	125	18	1	155
Mid. Nov. 2016	2	25	65	16	30	136
Late Nov. 2016	3	11	56	15	34	116
Early Dec. 2016	4	2	5	5	0	12
Mid. Dec. 2016	5	1	7	4	23	35
Late Dec. 2016	6	1	0	1	0	2
Total		**51**				456

Welding Method 6 Development and Implementation

- Iatan 2 was experiencing extensive exfoliation issues
  - E.g. accumulation of internal scale in bends leading to pluggage
- Repairs consist of cutting the tubes, removing the blockage, and re-welding
- PWHT is typically >50% of the effort. Field PWHT creates a multitude of concerns:
  - Quality Control – what has been PWHT'ed and what has not?
  - Impact of Multiple PWHT – >25 outages over ~6 years including cut and clean in some circuits multiple times. This leads to follow-on concerns:
    - Is multiple PWHT cycles OK?
    - How wide of band to check?
    - Paperwork & tracking nightmare
  - Safety concerns, tripping hazards, hot surface hazards
  - Runaway PWHT (happened multiple times unfortunately)
- With the development of Welding Method 6, immediate implementation for all Grade 91 joints at Iatan 2
  - To date… 0 weld failures
  - To be fair, T91 material was upgrade in 2018 to reduce long-term issues with exfoliation

evergy

Thank you, any questions?

PROPOSED INTERPRETATION

Inquiry No.	**IN17-143**
Source	Allan Bornhorst, Geo-Tech Industries
Subject	R Certificate holder manufacturing parts and sub-assemblies **Background:** GEO-TECH INDUSTRIES INC is a "R" stamp holder (R-5577) and also a "U" stamp holder (27,481) which we have maintained for the past 20 years. We are looking to repair a 1920 Shay locomotive using the "R" stamp designation. The current boiler on the Shay locomotive is of riveted construction and we are wanting to perform the repair with welded construction. We have planned on reusing 2 pressure retaining backing plate in the boiler shell which supported the 1" pipe nipples that were threaded externally through the shell and backing plate plus riveted. Since originally these plate were riveted onto the interior of boiler shell, we would now attached the 2 backing plate parts as a welded connection. We were needing a code interpretation for the following.
Edition	2019
Question	**Question: According to NBIC Part 3-Section 3: 3.2.2 Replacement Parts** Can the "R" stamp repair shop performing the necessary repairs of a boiler use a sub assembly part, which is of the pressure boundary, that is welded in house; i.e. (shell of boiler)? **Background:** The question arises because I was informed by the Safety Authority that according to BPV Code Section 1, any welded part used for repair of a boiler shall be manufactured by a "S" stamp certified shop.
Reply	Yes
Committee's Question	May an "R" stamp Certificate Holder manufacture parts or sub-assemblies for their own use as part of the pressure boundary in their repair/alteration of a pressure retaining item?
Committee's Reply	Yes. Reference NBIC Part 3, 3.2.2
Rationale	The committee feels that providing any more information on your method of repair would be providing consulting services which is against NBIC committee protocol.
SC Vote	
NBIC Vote	
Negative Vote Comments	

PROPOSED INTERPRETATION

Inquiry No.	**18-34**				
Source	**James Barlow jbarlow@performancepulsation.com**				
Subject	Scope of Work				
Edition	2017				
Question	**Background** We received a vessel for repair of a cracked nozzle weld. The repair was performed per Part 3. During this work a discussion was started concerning the scope of responsibility for the "R" Certificate Holder. One side of the team said we should only be responsible for the requested repair. That our scope of work is defined by the owner/user and completion of the requested repair meets the requirements of NBIC Part 3. The other side, that I am on, feels we have a responsibility to inspect the vessel to ensure that what we are sending back into service is safe. As a licensed Engineer I am struggling with balancing wanting to ensure the vessel integrity is sound with the wants of a customer who may think that a repair means "the vessel" and not just what was in our scope of work. **Question:** When an "R" Certificate Holder performs a repair on a vessel, does the Certificate Holder assume responsibility for the integrity or condition of the rest of the vessel outside the scope of the repair?				
Reply	No				
Committee's Question	When an "R" Certificate Holder performs a repair to a pressure retaining item, does the Certificate Holder assume responsibility for the integrity or condition of the rest of the pressure retaining item outside the scope of the repair?				
Committee's Reply	No				
Rationale					
SC Vote		No. Affirmative	No. Negative	No. Abstain	No. Not Voting
NBIC Vote		No. Affirmative	No. Negative	No. Abstain	No. Not Voting
Negative Vote Comments					

NBIC Item 18-34
Gary Scribner to: Terrence Hellman 05/21/2019 08:58 AM
Cc: Jonathan Ellis, Luis Ponce

Gary Scribner NBIC Item 18-34

Terry,

Interrelation 18-34 As the question;

Does an R certificate holder assume responsibility for safety/integrity of a vessel outside the scope of repair?

The following answer was recommended by legal

Responsibility for safety/integrity of a vessel outside the scope of a repair is outside the scope of the NBIC and is to be considered a legal issue.

I would recommend referring the inquirer to the definition of a repair in the glossary.

Regards,

Gary L. Scribner
Assistant Executive Director, Technical

The National Board of Boiler & Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229
UNITED STATES
Office: 614.888.8320 / Fax: 614.985.4615
www.nationalboard.org

INTERPRETATION 95-17

Subject: R-404 Authorization of Organizations Making Repairs

1992 Edition with the 1994 Addendum

Question 1: Is it the intent of the NBIC to permit documented repairs (Form R-1) regardless of whether documented or undocumented repairs have been performed in the past?

Reply 1: Yes, provided the original construction was to the ASME Code.

Question 2: When an "R" Certificate Holder performs a repair on a vessel, does the Certificate Holder assume responsibility for the work performed by others on the vessel?

Reply 2: No.

INTERPRETATION 95-41

Subject: RC-1110 Nondestructive Examination
1995 Edition with the 1995 Addendum

Question 1: When performing in-service inspection, radiographic examination uncovers indications in welds made by the original manufacturer that are in excess of that allowed by the original code of construction. Is it a requirement that these welds be repaired?

Reply 1: The decision as to whether or not to perform a repair of deficiencies discovered during in-service inspection is outside the scope of the Code. See RB-3280.

Question 2: When nondestructive examination of a repair weld reveals indications in excess of that allowed by the original code of construction, must the indication be removed or reduced to an acceptable size?

Reply 2: Yes.

Action Item 18-53: Interpretation Request

Inquirer: Angel Rodriguez AGRodriguez@dow.com

Subject:
Definition of Alteration (NBIC Part 3, Section 9, 9.1)
Examples of Alteration (NBIC Part 3, 3.4.3)

Question:
Is changing the corrosion allowance noted on the original Manufacturer's Data Report considered an alteration per NBIC, when this task is performed solely for the purpose of establishing minimum required thicknesses on an internal Owner / User mechanical integrity database?

PROPOSED INTERPRETATION

Inquiry No. **19-4**	Part 3, Section 1, 1.2a Construction Standards for Pressure Retaining Items
Source	Inquirer: George Galanes NBIC Committee PM: Michael Quisenberry
Subject	Part 3, Section 1, 1.2a Construction Standards for Pressure Retaining Items
Edition	2017
Question	**Inquirer's Proposed Q and R** **Question 1:** May an earlier or later edition of the construction code be used for repair or alterations to a pressure retaining item? **Proposed Reply 1:** Yes
Reply	
Committee's Question	Q1; May an earlier edition of the construction code be used for repair or alteration of a pressure retaining item? Q2: May a later edition of the construction code be used for repair or alteration of a pressure retaining item?
Committee's Reply	R1: No. Earlier codes of construction may not be applicable to a pressure retaining item that had yet to be constructed. R2: Yes. Only if the later code of construction is **more** applicable that the original code of construction (See Part 3, 1.2(a) & (b).
Rationale	Earlier codes of construction may not represent the **most** applicable code of construction to the work at hand.
SC Vote	
NBIC Vote	
Negative Vote Comments	

BACKGROUND/INQUIRER'S REQUEST

Explanation of Need: Try to resolve if there should be a restriction to different editions of the code of construction.

Background Information: There are different Interpretations which have been issued on this topic.

NBIC EXCERPTS

1.2 CONSTRUCTION STANDARDS FOR PRESSURE-RETAINING ITEMS

a) When the standard governing the original construction is the ASME Code or ASME RTP-1, repairs and alterations to pressure-retaining items shall conform, insofar as possible, to the section and edition of the ASME Code most applicable to the work planned.

a) 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.

INTERPRETATION 95-19

Subject: RC-1000 General Requirements

1995 Edition

Question: When the NBIC references "the original code of construction," is it required to use the edition and addenda of that code as used for construction?

Reply: No. The term "original code of construction" refers to the document itself, not the edition/addenda of the document. Repairs and alterations may be performed to the edition/addenda used for the original construction or a later edition/addenda most applicable to the work.

INTERPRETATION 95-20

Subject: Foreword

1995 Edition

Question: May the requirements of an earlier Edition and Addenda of the NBIC be used when performing a repair or alteration?

Reply: Yes.

This is in reference to the NBIC not the Code of Construction. Some jurisdictions have not adopted the latest edition of the NBIC and require an earlier edition to be followed for Repairs and Alterations.

INTERPRETATION 04-18

Subject: Part RD-3010

2004 Edition with 2005 Addendum

Question: Using the rules of RD-3010, is rerating of a pressure-retaining item designed by a proof test method permitted using a later edition/addendum of the original Code of Construction?

Reply: Yes, except as may be limited by Code of Construction requirements for satisfactory assurance of accuracy in computing the maximum allowable working pressure. This would include, for example, that all pressure boundary parts be inspected to ensure that each part's current thickness is greater or equal to the minimum or nominal thicknesses as listed on the Manufacturer's Data Report.

Interpretation IN19-5

Proposed Interpretation

Inquiry:	IN19-5
Source:	
Subject:	NBIC Part 3 Section Part 3, 3.2.6
Edition:	2017
General Description:	
Question 1:	Can user's opinion, categorization and proposed Repair methods be considered under NBIC Part 3, 3.2.6?
Reply 1:	No
Committee's Question 1:	Can a bolt hole in a SA350-LF2 flange be repaired using SA-105 material that is welded using a Welding Procedure Specification (WPS) that was qualified without postweld heat treatment (PWHT) and without impact testing?
Committee's Reply 1:	~~No.~~This is consulting.
Question 2:	Does AI have final authority to take decision under Part 3, 3.2.6 when jurisdiction does not exist?
Reply 2:	Yes
Committee's Question 2:	Does the ~~Authorized~~ Inspector ~~(AI)~~ have final authority for review and acceptance of a ~~completed~~ repair by a repair organization that has an "R" Certificate of Authorization under Part 3, 3.2.6 when jurisdiction does not exist?
Committee's Reply 2:	Yes.
Rationale:	NBIC Part 3, Section 3.2.6
SC Vote	
NBIC Vote	

Rationale:

3.2.6 REFERENCE TO OTHER CODES AND STANDARDS

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

In the event of a conflict with the requirements of the NBIC, the requirements of the NBIC take precedence.

Some examples are as follows:
a) National Board *BULLETIN* - National Board Classic Articles Series;
b) ASME PCC-1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly;
c) ASME PCC-2, Repair of Pressure Equipment and Piping.

ASME Section IIA, SA-350/SA-350M, 2017 ED, SPECIFICATION FOR CARBON AND LOW-ALLOY STEEL FORGINGS, REQUIRING NOTCH TOUGHNESS TESTING FOR PIPING COMPONENTS

4. General Requirements

4.1 Product furnished to this specification shall conform to the requirements of Specification A 961, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A 961 constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 961, this specification shall prevail.

7.2 Impact Test:

7.2.1 Requirements — The material shall conform to the requirements for impact properties in Table 3 when tested at the applicable standard temperature in Table 4 within the limits of 7.2.4.2 and 7.2.4.3.

11. Rework and Retreatment

11.3.1 Repair by welding shall be made using welding procedures and welders qualified in accordance with ASME Section IX of the Code. The weld procedure qualification test shall also include impact tests of the weld metal and heat-affected zone. All impact test specimens shall have the longitudinal axis transverse to the weld and the base of the notch normal to the weld surface.

ASTM A 961: Standard Specification for Common Requirements for Steel Flanges, Forged Fittings, Valves, and Parts for Piping Applications

12. Impact Requirements

12.1 The part shall conform to the impact requirements prescribed in the product specification.

Background Information IN19-5 from the Inquirer:

Saudi Aramco Hawiyah Gas Plant (User) requested Repair to one of their Floating tube sheet Heat Exchanger (UHX-14.1(a)). The user requested repair organization to plug all bolt holes of floating tube sheet using Plug material SA-105 and close by welding. New holes were drilled at center of the ligament of previously drilled bolt holes as required by original drawing of the heat exchanger. No design has been performed and method classified as "Repair".

It is informed that the floating tube sheet has shrunk during service and due to which after dismantling it was difficult to reassemble the Floating tube sheet.

Tube Sheet Material is SA350 LF2 Class-1. WPS used to close holes is without PWHT and without impact.

National Board Inspector rejected the repair method with the following understanding:

1. Welding on SA-350 forging shall meet requirement for Repair of Base Material in accordance with SA 350 and Section 11.8.
2. Integrity of this Flange is compromised as it is Plugged with SA 105 Material and welded for 5 mm with Groove on both Side. This methodology of Repairing Base material is not approved as per Code

AIS Concurred and provided his Opinion to AI question as follows:

1. Welding on SA-350 forging shall meet requirement for Repair of Base Material in accordance with SA-350 and Section 11.8

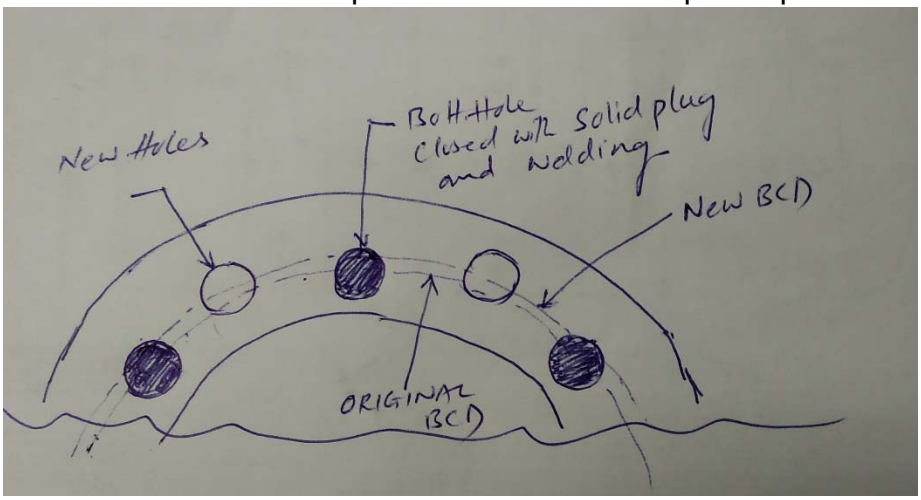
AIS Opinion: All types of repairs are not addressed in NBIC however para 3.2.6 shall be applicable and to be complied.

2. Integrity of this Flange is now compromised as it is Plugged with SA 105 Material and welded for 5 mm with Groove on both Side. This methodology of Repairing Base material is not approved as per Code

AIS Opinion: Refer my comments above, the user is cautioned in para 3.2.6 that the referenced codes, standards and practices may address methods categorized as repairs. These methods/Practices must be accepted by AI.

Questions:

1. Can user opinion, categorization and acceptance of Repair methods be considered under NBIC Para 3.2.6, Part 3?
2. Does NB consider this repair method as an acceptable practice?



PROPOSED INTERPRETATION

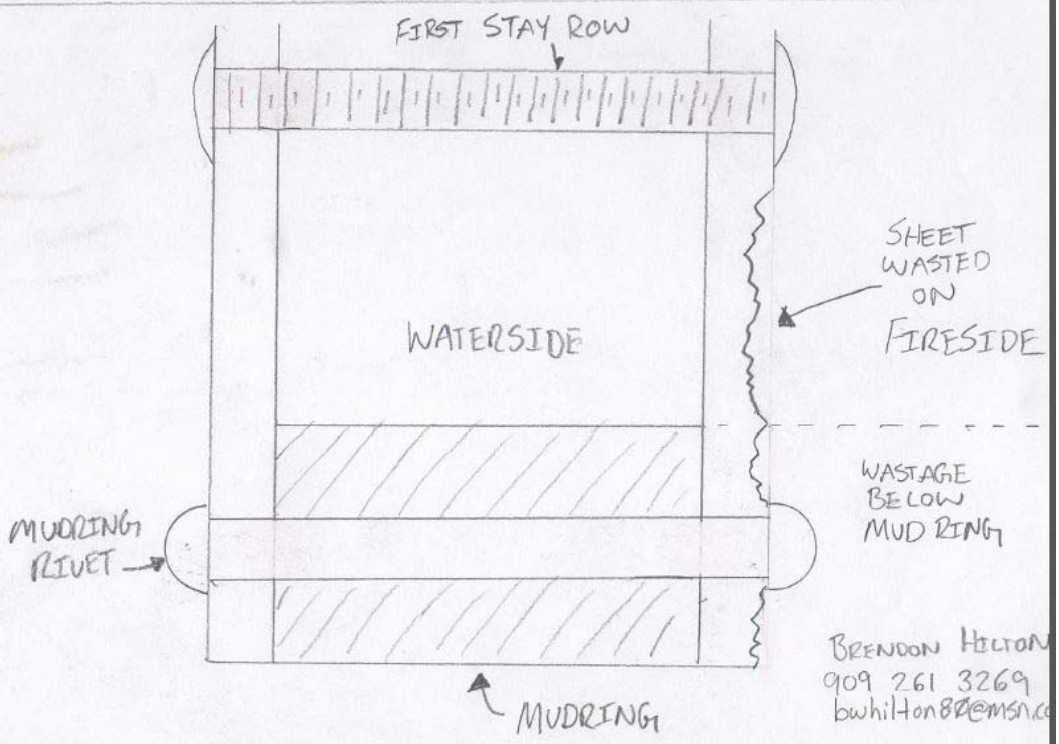
Inquiry No.	19-10
Source	Paul Shanks
Subject	Interpretations
Edition	2017
Question	May an interpretation issued to a past NBIC edition be used in any other NBIC edition when the words in the NBIC paragraph are the same? (See Part 3, Introduction, Interpretations for text reference)
Reply	Yes if the NBIC has not changed the requirements pertaining to the interpretation
Committee's Question	May an interpretation issued to ~~a~~an ~~past~~ earlier NBIC Edition be used for any other NBIC Edition when the requirements of the NBIC are the same?
Committee's Reply	Yes.
Rationale	NBIC currently limits each interpretation to the edition it was issued for. However, often time the words in question do not change from one edition to another. At present a new interpretation would be needed for each edition of the NBIC to address the same issues, this is a delay to field work and a drain on NBIC committee time. **Background Information:** Understandably each request for interpretation does not require a change to the words in the NBIC, but given the same NBIC words and consistent committee approach to resolving interpretations the same answer should be provided from one edition to the next. But this would cause a delay in working to a standard accepted practice and would consume time for the committee answering the same base question each year. Further the proposed approach is that which ASME currently employs and whilst NBIC and ASME are different they do operate within the same industrial sphere so the proposed interpretation is not unusual.
SC Vote	
NBIC Vote	

Negative Vote Comments	

PROPOSED INTERPRETATION

Inquiry No.	**IN 19-17**
Source	Brendon Hilton
Subject	Wastage **Background:** This question is in regards to a CFR 230, 1472 day boiler inspection on a 1927 built Baldwin 4-8-4 steam locomotive. The door sheet (aka back sheet) in the firebox has sustained wastage at the mudring on the fireside, caused by the proximity of the firebrick. In the figure S1.2.11.3, the drawing indicates a wastage on the waterside, yet the text of section S1.2.11.3 does not specify if it is referring to the waterside, the fireside, or both.
Edition	2019
Question	If the majority of wastage is on the fireside, does rule S.1.2.11.3 still govern?
Reply	No
Committee's Question	**If there are wasted areas on the fireside does NBIC Part 3, 3.3.4.3-a govern repairs?**
Committee's Reply	**Yes**
Rationale	**S1.2.11.3 specifically addresses wastage on the waterside of the shell at the mudring. Part 3, 3.3.4.3-a is the appropriate paragraph for this type of repair**
SC Vote	
NBIC Vote	
Negative Vote Comments	

QUESTION: IF THE MAJORITY OF WASTAGE IS ON THE FIRESIDE, DOES RULE 5.1.2.11.3 STILL GOVERN REPAIR?



BRENDON HILTON
909 261 3269
bwhilton82@msn.c

PROPOSED INTERPRETATION

Inquiry No.	**19-20** **NBIC Location: Part 3, 3.3.4.2 e)**
Source	Rob Troutt rob.troutt@tdlr.texas.gov Timothy McBee Timothy.McBee@tuvsud.com
Subject	Use of Heli-Coils for repairs and alterations of PRI's • When a bolt head is broken off, the normal way of correction is to drill out the bolt with a slightly larger size drill, thread the bigger diameter hole, install a Heli-Coil and replace the bolt. • Not only does this type of fix include adding material to the RPI, The hole diameter for the bolt is increased along with depending on the type of Heli-Coil used (may be non-threaded or threaded) pressure retention calculation should be provided for verification.
Edition	2017
Question	1. Is using a Heli-Coil considered a mechanical alteration? 2. If the answer to question 1 is no, then is it considered a mechanical repair?
Reply	1. Please see interpretation 04-19.
Committee's Question	
Committee's Reply	
Rationale	
SC Vote	
NBIC Vote	
Negative Vote Comments	

PROPOSED INTERPRETATION

Inquiry No.	Item 19-25
Source	M.A. Shah abmindustrialservices@gmail.com
Subject	This inquiry seeks an interpretation of NBIC Part 3, 4.4.2 c), which states the following: c) Nondestructive Examination NDE may be conducted when contamination of the pressure-retaining item by liquids is possible or when pressure testing is not practicable. Concurrence of the owner shall be obtained in addition to the Inspector, and where required, the Jurisdiction. Exclusive use of Visual Examination (VT) shall not be permitted. In all cases NDE methods or combination of methods used shall be suitable for providing meaningful results to verify the integrity of the alteration.
Edition	2017
Explanation of Need	For ASME BPV Section VIII Division 2 Vessel is under Alteration with Re-rate of lowering MAWP & increasing of Design Temperature & there is no physical alteration in the Vessel but only change is in the Alteration design report because of different design stress intensity value at higher design temperature.
Question	In lieu of a liquid pressure test, what kind of NDE methods or combination of methods used shall be suitable for providing meaningful results to verify the integrity of the alteration?
Reply	No further NDE shall be required as there is no Physical Alteration for the Vessel.
Committee's Question 1	An alteration to a Section VIII Div. 2 vessel is performed by lowering the MAWP and increasing the design temperature. No physical work was performed on the vessel. Calculations confirm that the hydrostatic test pressure for the new MAWP and design temperature would be higher than that of the original hydrostatic test pressure. Is a new hydrostatic test required after the alteration is completed?
Committee's Reply 1	Yes, except as provided in Part 3, 4.4.2.c.
Committee's Question 2	The NBIC Part 3, 4.4.2.c provides rules for performing NDE in lieu of a hydrostatic test of an alteration. Is it required that concurrence of the owner, the Inspector, and when required, the Jurisdiction be obtained regarding the NDE methods, or combination of methods, to be used to verify the integrity of the alteration?
Committee's Reply 2	Yes.
Rationale	NBIC Part 3, Section 3.3.4, Section 4.4.2. and Section 9.1
SC Vote	

NBIC Vote	
Negative Vote Comments	

Relevant Background

NBIC Section 3.4.4 clearly states that an example of an alteration is an increase in the design temperature for the pressure retaining item. Furthermore, the definitions section 9.1 states that nonphysical changes such as an increase in the design temperature shall be considered an alteration. Thus, in the background information provided by the requestor, it is clear that this scenario describes a vessel which has been altered.

Page 68, Section 3, Part 3

3.4.4 EXAMPLES OF ALTERATIONS (17)

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;

Page 237, Section 9, Part 3

Alteration — A change in the item described on the original Manufacturer's Data Report 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.

The 'explanation of need' now links to the relevant Section 4.4.2 which requires that one of the following shall be applied to an activity considered to be an alteration: liquid pressure test; pneumatic test; or nondestructive examination. The NBIC does not describe which NDE methods are acceptable, merely that: *concurrence of the owner and inspector and possibly the jurisdiction shall be obtained; that visual examination is not sufficient; and the selected method shall be suitable to provide meaningful results verifying the integrity of the vessel*.

Page 73, Section 4, Part 3

4.4.2 TEST OR EXAMINATION METHODS APPLICABLE TO ALTERATIONS

Based on the nature and scope of the alterations activity, one or a combination of the following examination and test methods shall be applied to alterations and replacement parts used in alterations.

a) Liquid Pressure Test

b) Pneumatic Test

c) Nondestructive Examination

Relevant Interpretations

INTERPRETATION 93-5

Subject: Chapter III, R-503(d)

1992 edition

Question: If a pressure test required for a re-rated vessel is less than or equal to the hydrostatic test performed during construction, is a new pressure test required after the re-rating is completed?

Reply: No, provided no physical work is performed.

INTERPRETATION 98-15

Subject: RC-3022 & RC-3030(h) Pressure Testing Requirements Related to Re-rating Activities

1995 Edition with the 1996 Addendum

Question 1: If calculations and current thickness measurements indicate that a pressure retaining item may be altered by re-rating only (no physical work being done), may the original pressure test as recorded on the Manufacturer's Data Report be used to satisfy RC-3022(d), if the pressure test is at least equal to the calculated test pressure required to verify the integrity of said alteration, subject to the approval of the Inspector and the requirements of the jurisdiction?

Reply 1: Yes.

Question 2: If the maximum allowable working pressure (MAWP) of a pressure-retaining item must be reduced, due to wall thinning below the minimum wall thickness required to contain the MAWP stated on the manufacturer's data report and on the ASME stamped nameplate, but the maximum allowable temperature is increased, is it the intent of the NBIC that this be considered a re-rate?

Reply 2: Yes. Any increase in pressure or temperature is considered a re-rate in accordance with RC-3022.

Question 3: If the maximum allowable working pressure (MAWP) of a pressure-retaining item must be reduced, due to wall thinning below the minimum wall thickness required to contain the MAWP stated on the manufacturer's data report and on the ASME stamped nameplate, but the maximum allowable temperature is increased, is it the intent of the NBIC that this is, in effect, a derate and outside the scope of the NBIC?

Reply 3: No. Any increase in pressure or temperature is considered a re-rate in accordance with RC-3022.

INTERPRETATION 98-34

Subject: RC-3030 Examination and Testing

1995 Edition with the 1996 Addendum

Question: When the design rated capacity of a boiler is increased without physical work such that the design pressure and temperature are unaffected, is it required to perform a pressure test in accordance with the NBIC?

Reply: No.

Interpretation IN19-26

Proposed Interpretation

Inquiry:	IN19-26
Source:	Doug Biggar
Subject:	NBIC Part 3 Section Part 3, 3.3.2
Edition:	[Current/all]
General Description:	Repair of none pressure boundary parts
Question 1:	If a welding repair is done to an appendage of a horizontal ASME LPG pressure vessel such as a faulty leg or the raised data plate holder, is this considered routine and are we exempt to have an inspector present to witness it and/or fill out a specialized form?
Reply 1:	No inspector needs to be present as the welding is not performed on any part of the pressure vessel directly related to its performance under pressure.
Question 2:	What is the minimum length of an appendage we can weld onto without being an ASME/NBIC certified welder (only a standard welding ticket)?
Reply 2:	1/4”
Committee’s Question 1:	Are refurbishment activities such as shot blasting, thread cleaning and painting considered within the scope of the NBIC?
Committee’s Reply 1:	No
Rationale 1:	These activities should not affect the pressure retaining integrity of the item, per the introduction to the NBIC that (maintenance) is the function of the NBIC. Reasonably these activities fall outside the scope of the NBIC
Committee’s Question 2:	When welding activities are conducted on materials which are not pressure retaining items of a Pressure Retaining Item and those welding activities do not affect the original design of the Pressure Retaining Item including applied loads, is said welding within the scope of the NBIC?
Committee’s Reply 2:	No, provided welding is not done directly on the pressure retaining item.
Rationale:2	Assumed intent-TBC by committee
Committee’s Question 3:	
Committee’s	

Reply 3:	
Rationale:3	Paragraph 5.11 requires that, subject to the approval of the Jurisdiction, an Inspector shall make witness to such activities.
Rationale:	NBIC Part 3, Introduction, Section 3.3.2 e), 3.3.3, 3.4.4 & 5.11
NBIC Vote	

Include in response letter: NA

Rationale:

Having emailed the enquirer to determine the scope of their typical operations it was clear that there was a general misunderstanding about the purpose of the NBIC, the proposed questions are overly specific and as sure fail to grasp the crux of the issue hence the question re-write. Q3 was added to ensure that no misunderstand occurs. With the exception of a very hardline reading on Section 3.3.2 a) the NBIC addresses in the main body and the introduction the pressure retaining capability of the item and not work conducted elsewhere.

Sections 3.3.2 e), 3.3.3 & 3.4.4 address working (welding / replacing) on components which have a pressure retaining function. Pipes, tubes, heads, shell, and tube sheet are mentioned, integral parts without pressure retaining function such as legs and davit arms are not addressed.

Section 3.3.3 a) can be read as "Weld repairs ~~or replacement of pressure parts or~~ of (sic) attachments that have failed in a weld or in the base material;"

Section 5.11 requires Inspector witnessing and Jurisdiction approval for nameplate removal/replacement.

PROPOSED INTERPRETATION

Inquiry No.	**19-34**
Source	GE Power
Subject	NBIC Part 3, paragraph 3.2.2 e), Pressure Testing of Replacement Parts
Edition	2017
Question	NBIC Part 3 paragraph 3.2.2 e) states that the replacement part shall receive a pressure test as required by the original code of construction. ASME has issued an interpretation (I-16-6) clarifying that Section I does not provide rules for hydrostatic testing of parts supplied for repair or alteration of existing boilers. Is it the intent of 3.2.2 e) that the reference to the original code of construction is for determining the hydrostatic test pressure?
Reply	Yes
Committee's Question	NBIC Part 3 paragraph 3.2.2 e) states that the replacement part shall receive a pressure test as required by the original code of construction. Is it the intent of 3.2.2 e) that the reference to the original code of construction is for determining the pressure used for the hydrostatic test?
Committee's Reply	Yes
Rationale	ASME has issued interpretation I-16-1 and revised PW-54 to clarify that Section I does not contain requirements for the hydrostatic testing of replacement parts. Based on this, the language in 3-3.2.2 e) *"… as required by the original code of construction"* could be interpreted to mean that pressure testing of parts is not required because Section I does not require testing of replacement parts. On review, this was not the Committee's intent when clause e) was added to 3.2.2. The proposed intent interpretation and a supporting text revision is provided to clarify this issue. By linking the words *"original code of construction"* to the test pressure, it eliminates the potential interpretation that testing is only required when the original code of construction specifically requires testing of replacement parts.
SC Vote	
NBIC Vote	
Negative Vote Comments	

Background Materials Submitted by the Inquirer

NBIC Part 3 Section 3 paragraph 3.2.2 e) (shown below) states that replacement parts shall receive a pressure test as required by the original code of construction. We are concerned that this clause is not being interpreted consistently by all users of the NBIC. The words in question are *"…as required by the original code of construction."* ASME issued interpretation I-16-1 (shown below) and revised PW-54 to clarify that Section I does not contain requirements for the hydrostatic testing of replacement parts provided for an existing unit. Based on this, the words *"… as required by the original code of construction."* could be interpreted to mean that pressure testing of the parts is not required because Section I does not require testing of replacement parts. We do not think that was the Committee's intent when clause e) was added to 3.2.2. We submit the proposed intent interpretation and proposed revision for the Committee's consideration to clarify this issue. By linking the words "original code of construction" to the test pressure, it eliminates the potential interpretation that testing is only required when the original code of construction specifically requires testing of replacement parts.

Proposed Intent Interpretation:
Question: NBIC Part 3 paragraph 3.2.2 e) states that the replacement part shall receive a pressure test as required by the original code of construction. ASME has issued an interpretation (I-16-6) clarifying that Section I does not provide rules for hydrostatic testing of parts supplied for repair or alteration of existing boilers. Is it the intent of 3.2.2 e) that the reference to the original code of construction is for determining the hydrostatic test pressure?
Reply: Yes.

Associated Revision:
e) Replacement parts addressed by 3.2.2 c) or d) above shall receive a pressure test ~~as required by~~ at the pressure determined for the completed pressure equipment (boiler, pressure vessel, etc.) in accordance with the original code of construction. If replacement parts have not been pressure tested to this pressure ~~as required by the original code of construction~~ prior to installation they may be installed without performing the ~~original code of construction~~ pressure test provided the owner, the Inspector and, when required, the Jurisdiction accept the use of one or a combination of the examination and test methods shown in Part 3, Section 4, paragraph 4.4.1 (for repairs) or 4.4.2 (for alterations). The R Certificate Holder responsible for completing the R Form shall note in the Remarks section of the R Form the examination(s) and test(s) performed, and the reason the replacement part was not tested at the pressure determined for the completed pressure equipment in accordance with the original code of construction.

Background Information:

NBIC Part 3 Section 3 paragraph 3.2.2 e)

e) Replacement parts addressed by 3.2.2 c) or d) above shall receive a pressure test as required by the original code of construction. If replacement parts have not been pressure tested as required by the original code of construction prior to installation they may be installed without performing the original code of construction pressure test provided the owner, the Inspector and, when required, the Jurisdiction accept the use of one or a combination of the examination and test methods shown in Part 3, Section 4, paragraph 4.4.1 (for repairs) or 4.4.2 (for alterations). The R Certificate Holder responsible for completing the R Form shall note in the Remarks section of the R Form the examination(s) and test(s) performed, and the reason the replacement part was not tested in accordance with the original code of construction.

ASME Interpretation I-16-6

Standard Designation:	BPV I
Edition/Addenda:	2015
Para./Fig./Table No:	PW-54
Subject Description:	Section I Intent Interpretation, PW-54 Hydrostatic Testing of Section I Parts
Date Issued:	08/16/2016
Record Number:	13-942
Interpretation Number :	BPV I-16-6
Question(s) and Reply(ies):	Question: Is it the intent of Section I that the rules of PW-54 regarding hydrostatic testing apply to parts supplied for repair or alteration of existing boilers? Reply: No. Section I does not provide rules for hydrostatic testing of parts supplied for repair or alteration of existing boilers. Please be guided by Appendix A-64, Repair to Existing Boilers.

PW-54.4 Refer to A-64 as guidance for welded pressure parts supplied to the user of an existing boiler as replacement or repair parts. (17)

A-64

A-64 REPAIRS TO EXISTING BOILERS

Where repairs are necessary that in any way affect the working pressure or safety of a boiler, a state inspector, municipal inspector, or an inspector employed regularly by an insurance company, which is authorized to do a boiler insurance business in the state in which the boiler is used, shall be called for consultation and advice as to the best method of making such repairs; after such repairs are made they shall be subject to the approval of a state inspector, municipal inspector, or an inspector regularly employed by an insurance company that is authorized to do a boiler insurance business in the state in which the boiler is used.

PROPOSED INTERPRETATION

Inquiry No. **19-35**	19-35 Part 3, 2.5.2 and 3.4 PWHT of PV
Source	Jagadheesan Vellingiri Muthukumaraswamy jaga4021@hotmail.com NBIC TPM: Jim Pillow jgpillow@comcast.net
Subject	Part 3, 2.5.2 and 3.4 PWHT of Section VIII PV
Edition	2017
Question	**Inquirer's question and reply.** **Question 1:** An R Certificate Holder is doing repair work on the shell side of heat exchanger, which was not Post Weld Heat Treated earlier. As per client request, repair welded joints are Post Weld Heat Treated and considered an alteration as per 3.4. For Welded Joints not repaired can Post Weld Heat Treatment be done and responsibility can be taken by R Certification and considered an alteration? **Proposed Reply 1:** No. **Question 2:** If R Stamp Holder holds WPS for the vessel with PWHT can that Post Weld Heat Treatment be carried out as per approved WPS in order to meet alteration requirement? **Proposed Reply 2:** Yes.
Reply	
Committee's Question	
Committee's Reply	Send the inquirer the following existing interpretation. **INTERPRETATION 13-06** **Subject:** Part 3, 2.5.2 **Edition:** 2013 **Question 1:** An R-Certificate holder decides to perform post weld heat treatment (PWHT) of a vessel at the request of a client, where no PWHT was performed in the original construction. Is the performance of PWHT of the vessel considered an alteration and subject to documentation using a Form R2?

	Reply: Yes. **Question 2:** For the vessel described above, must the weld procedures used for construction of the vessel be qualified with PWHT? **Reply:** Yes. **Question 3:** Must the PWHT described above be performed by the R-Certificate holder? **Reply:** No, the PWHT may be subcontracted; however the R certificate holder retains the responsibility for the performance of the PWHT.
Rationale	The inquirer is to be instructed to follow up with the NBIC Committee if the interpretation does not satisfy the inquiry.
SC Vote	
NBIC Vote	
Negative Vote Comments	

BACKGROUND

Original inquiry:

Explanation of Need: Welds not repaired by R Stamp Holder and already existing on equipment if Post Weld Heat Treated, is not under the responsibility of the R Stamp Holder.

Background Information: An R Certificate Holder is doing repair work on the shell side of heat exchanger, which was not PWHT earlier. As per client request, welded joints are Post Weld Heat Treated and considered an alteration; client wants shell side to undergo full Post Weld Heat Treatment including areas not repaired. NDE is being carried out for complete equipment and client wants PWHT for welds which are in services and without any repairs.

Question 1: An R Certificate Holder is doing repair work on the shell side of heat exchanger, which was not Post Weld Heat Treated earlier. As per client request, repair welded joints are Post Weld Heat Treated and considered an alteration as per 3.4. For Welded Joints not repaired can Post Weld Heat Treatment be done and responsibility can be taken by R Certification and considered an alteration?

Proposed Reply 1: No.

Question 2: If R Stamp Holder holds WPS for the vessel with PWHT can that Post Weld Heat Treatment be carried out as per approved WPS in order to meet alteration requirement?

Proposed Reply 2: Yes.

PROPOSED INTERPRETATION

Inquiry No. **19-36**	Part 3, Section 3, 3.3.2 and 3.3.5, Routine Repairs of Section VIII Div.2 and Div.3 Pressure Vessels
Source	Inquirer: Narayanan Murugappan NBIC Committee PM: Jim Pillow
Subject	Part 3, Section 3, 3.3.2 Routine Repairs and 3.3.5 Repair of Section VIII Div.2 and Div.3 Pressure Vessels
Edition	2017
Question	**Inquirer's Proposed Q and R** **Question 1:** Is Routine Repairs defined para 3.3.2 applicable to pressure vessels constructed to ASME Section VIII Division-2 and 3? **Proposed Reply 1:** Yes. **Question 2:** If the answer to the above question is Yes, are requirements specified in Para 3.3.5 to be followed for routine repairs to pressure vessels constructed to ASME Section VIII Division-2 and 3? **Proposed Reply 2:** Yes.
Reply	
Committee's Question	Q1; Is a repair plan required for all repairs of an ASME Section VIII Div. 2 or Div. 3 pressure vessel? Q2: May the repair plan for an ASME Section VIII Div.2 or Div.3 pressure vessel be accepted by the Inspector in lieu of the Authorized Inspection Agency or the Owner-User Inspection Organization? Q3: Must the Authorized Inspection Agency's or the Owner-User Inspection Organization's Inspector make an acceptance inspection of the repair of an ASME Section VIII Div.2 and Div.3 pressure vessels? Q4: Are routine repairs defined in Part 3, Section 3, 3.3.2, applicable to pressure vessels constructed to ASME Section VIII Div.2 or Div.3?

Committee's Reply	R1: Yes. See Part 3, 3.3.5.2. R2: No. See Part 3, 3.3.5.2(b). R3: Yes. See Part 3, 3.3.5.2(b). R4: No. Inspection of the repair by the Inspector is required.
Rationale	The rules for routine repairs do not require the Inspector to inspect and accept the repair. The rules described in Part 3, 3.3.5.2(b) are clear that the Inspector must make an acceptance inspection of the repair.
SC Vote	
NBIC Vote	
Negative Vote Comments	

BACKGROUND/INQUIRER'S REQUEST

Explanation of Need: Para 3.3.2 talks about requirements for and examples of routine repairs. It does not specify any restrictions on pressure retaining items construction Code. It states that Routine repairs are repairs for which the requirements for in-process involvement by the Inspector and stamping by the "R" Certificate Holder may be waived as determined appropriate by the Jurisdiction and the Inspector. It states that all other applicable requirements of this code (NBIC) shall be met. Para 3.3.5.1 of NBIC states that the following requirements shall apply for the repair of pressure vessels constructed to the requirements of Section VIII, Division 2 or 3, of the ASME Code. This calls for properly certified repair plan to be submitted to the Inspector who will make acceptance inspection and sign R-1 Form.

Background Information: The recent interpretations issued by NBIC are reproduced below.

INTERPRETATION 17-17

Subject: Repair and alteration of Section VIII Division 2 items

Edition: 2017

Question: Is it permissible to perform a repair or alteration on an ASME Section VIII, Division 2 pressure vessel in accordance with the NBIC when the original User's Design Specification (UDS) and/or the Manufacturer's Design Report (MDR) is not available?

Reply: No. The Repair/Alteration Plan is required to be compatible with the UDS and MDR per the NBIC Part 3, Sections 3.3.5 and 3.4.5.

INTERPRETATION 17-08

Subject: Repair/Alteration Plans for ASME VIII, Division 2, Class 1 Pressure Vessels

Edition: 2017

Question: Does the NBIC require a Repair/Alteration Plan for an ASME Section VIII, Division 2, Class 1 vessel to be certified by an engineer when a Manufacturer's Design Report was not required to be certified under the original code of construction?

Reply: No.

NBIC EXCERPTS

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

3.3.5.1 SCOPE

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

3.3.5.2 REPAIR PLAN

The user shall prepare, or cause to have prepared, a detailed plan covering the scope of the repair.

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

Note: The engineer qualification criteria of the Jurisdiction where the pressure vessel is installed should be verified before selecting the certifying engineer.

b) Authorized Inspection Agency Acceptance
Following review and certification, the repair plan shall be submitted for acceptance to the Authorized Inspection Agency/Owner-User Inspection Organization whose Inspector will make the acceptance inspection and sign the Form R-1.

Item 19-42 – Interpretation Request
Submitted by: Paul Shanks paul.shanks@onecis.com

NBIC Location: Part 3, 3.3.3 s) and 3.4.4 g)

Explanation of Need: The design requirement in 3.3.3 s) is not well defined and is allowing potentially unsafe material changes to be conducted as repairs without adequate assessment.

Background Information: Most pressure vessel parts are design in isolation from those around them or connected to them, heads and shell for example. There are however some components which take strength from or are subject to stresses imposed form adjacent components. For example, body flanges and bolting or tube sheets and the tubes. 3.3.3 s) allows materials of high strength than originally used to be implemented in a repair, under the condition that they "satisfy the material and design requirements of the original code" it is intuitively obvious what is meant by the material requirements but the design requirements are unclear and a great many people thing stronger is more better. But in the case of tubes in a fixed tube sheet heat exchanger or bolting on a custom body flange this is not necessarily the case, upgrading the bolts or tubes could introduce an unsafe overstressed condition in the adjacent materials unless calculations are conducted this will not be known. 3.4.4 g) could be used to indicate that the some material 'upgrades' need to be an alteration but as it refers back to 3.3.3 s) and the design requirement is not well defined it becomes hard to justify a material 'upgrade' as an alteration.

Question 1: 3.3.3 s) includes the following "provided the replacement material satisfies the material and design requirements of the original code of construction" it is clear that the material must be one permitted by the original code of construction but in referring to the "design requirements" is it the intent of the NBIC that when higher strength material are use the new material must not introduce an overstress situation?

Reply 1: Yes.

Question 2: If the above answer is no please remove 3.4.4 g) as it is superfluous or reword it to address changing to materials with lower allowable stresses specifically.

PROPOSED INTERPRETATION

Inquiry No.	**19-44**
Source	Laura Fuhrmann, Laura.Fuhrmann@FoxValleyMetrology.com
Subject	NBIC Part 3, 1.6.6.2.m ~~M-5-Am)~~, 1.6.7.2.m ~~M-1m), 1.6.7.2 M-4-A, 1.6.7.2 M-5-A~~, 1.6.8.2.m ~~M-1, 1.6.8.2 M-4-A, 1.6.8.2 M-5-Am)~~
Edition	2019
Question	The listed paragraphs show service to be provided in accordance with ISO/IEC 17025:2005. The 17025 standard has been revised to the 2017 version, and all labs accredited as such have a 3 year transition window.
Reply	A change similar to ASME Section III, which does not list a specific revision, instead, wording it as "most current".
Committee's Question	The listed paragraphs show service to be provided in accordance with ISO/IEC 17025:2005. The 17025 Standard has been revised to the 2017 version, and all labs accredited as such have a 3-year transition window. Is it permissible to use either the 2005 or the 2017 edition of ISO/IEC 17025?
Committee's Reply	Yes
Rationale	The NR program accepts the ILAC accreditation of calibration and testing laboratories in accordance with ISO/IEC 17025:2005. The ISO/IEC 17025 Standard has been revised to the 2017 version, and all labs accredited as such will have the 3-year renewal for accreditation in accordance with the 2017 version. The NR Task Group has compared the two versions and recommends acceptance of 2017 under the NR program. A separate action item is being process under 19-43 to incorporate reference to the 2017 version. Since publication would not occur until 2021, this interpretation is being processed to recognize use of the 2017 version for ILAC accreditation of the labs permitted for use by NR Certificate holders.
SC Vote	
NBIC Vote	
Negative Vote Comments	

Information as Submitted by Inquirer

Interpretation Request
Submitted by: Laura Fuhrmann Laura.Fuhrmann@FoxValleyMetrology.com

NBIC Location: Part 3, 1.6.6.2, 1.6.7.2, and 1.6.8.2

Explanation of Need: Many, if not all calibration labs are already accredited to ISO/IEC 17025:2017 and will be required to by 2020. No lab will bother accreditation to 2005 after that, so finding a calibration house will be difficult.

Background Information: 2019 NBIC Part 3, 1.6.6.2 M-5-Am), 1.6.7.2 M-1m), 1.6.7.2 M-4-A, 1.6.7.2 M-5-A, 1.6.8.2 M-1, 1.6.8.2 M-4-A, 1.6.8.2 M-5-Am)

Question 1: The listed paragraphs show service to be provided in accordance with ISO/IEC 17025:2005. The 17025 standard has been revised to the 2017 version, and all labs accredited as such have a 3 year transition window.

Reply 1: A change similar to ASME section III, which does not list a specific revision, instead, wording it as "most current".

1.6.6.2, 1.6.7.2, and 1.6.8.2 QUALITY PROGRAM ELEMENTS

m) Control of Measuring and Test Equipment
The “NR” Certificate Holder may utilize calibration and test activities performed by subcontractors when surveys and audits are performed. As an alternative to performing a survey and audit for procuring Laboratory Calibration and Test Services, the “NR” Certificate Holder as documented in their Quality Program may accept accreditation of an International Calibration and Test Laboratory Services by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) provided this alternative method is described in the “NR” Certificate Holder’s Quality Program and the following requirements are met:

1) The “NR” Certificate Holder shall review and document verification that the supplier of calibration or test services was accredited by an accredited body recognized by the ILAC MRA encompassing ISO/IEC-17025:20052017, “General Requirements for the Competence of Testing and Calibration Laboratories”;

2) For procurement of calibration services, the published scope of accreditation for the calibration lab-oratory covers the needed measurement parameters, ranges and uncertainties.

3) For procurement of testing services, the published scope of accreditation for the test laboratory covers the needed testing services including test methodology and tolerances/uncertainty.

4) The “NR” Certificate Holder’s purchase documents shall include:

a. Service provided shall be in accordance with their accredited ISO/IEC-17025:2005 2017 program and scope of accreditation;

b. As-found calibration data shall be reported in the certificate of calibration when items are found to be out-of-calibration;

c. Standards used to perform calibration shall be identified in the certificate of calibration;

d. Notification of any condition that adversely impacts the laboratories ability to maintain the scope of accreditation;

e. Any additional technical and/or quality requirements, as necessary, which may include tolerances, accuracies, ranges, and standards;

f. Service suppliers shall not subcontract services to any other supplier.

5) The “NR” Certificate Holder shall upon receipt inspection, validate that the laboratory documentation certifies that:

a. Services provided by the laboratory has been performed in accordance with their ISO/IEC-17025:2005 2017 program and performed within their scope; and

b. Purchase order requirements have been met.

n) Handling, Storage and Shipping

From 2019 ASME Section III, NCA:

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
11-1037	Revised Table NCA-3200-1, Document Distribution for Division 2 Construction.
11-2161	Added new definition "Certified Design Report Summary."
14-315	Revised Table NCA-7100-2 for TR-3 and TR-4 to the following: *(a)* TR-3 "2008 through 2017." *(b)* TR-4 "2008a through 2017."
15-2538	Revised editorially NCA-4134.17(d) to add lifetime record no. 20.
15-2539	Added reference to NC- and ND-6114.2(d) to NCA-8322.1(d).
16-363	Revised Table NCA-8100-1 to address appurtenances. Revised Form N-2 to address the certification of Nuclear parts and established a new Form N-2A for the certification of Nuclear appurtenances.
16-1827	Revised NCA-3820(c).
16-2116	Updated wording of NCA-3360(b) to show that the Certifying Engineer certifies the Construction Specification and Design Drawings on behalf of the Designer.
16-2145	Revised NCA-1274 to clarify that the inlet and outlet parts of rupture disk holders are to be considered as material, part, or appurtenance.
16-2204	Revised Table NCA-7100-2.
16-2964	Added the 2006 Edition of SNT-TC-1A as an acceptable Edition within Table NCA-7100-2, Table NCA-7100-3, and Table WA-7100-2.
17-650	Restructured and renumbered NCA-3551. Clarified that date of certification is the date(s) the Design Reports are certified with an alternative of the date the Summary is Certified.
17-1111	Revised NCA-3761(a).
17-2058	Revised Table NCA-7100-1 to update the referenced standards.
17-2149	Added reference to NCA-3127 in NCA-4134.7(g).
17-2210	Errata correction. See Summary of Changes for details.
17-2214	Errata correction. See Summary of Changes for details.
17-2295	Clarified the recent revision to the Forewords for Section III and Section XI to properly address all items that have nuclear rules addressing their structural integrity.
17-3081	Changed "Registered Professional Engineer" to "Certifying Engineer" in NCA-3784.2 and NCA-3784.5.
18-340	Revised Table NCA-7100-2 to reference NQA-1-2015. Revised NCA-4100 to clarify the use of NQA-1 Part II and the use of commercial grade dedication for software.
18-355	Added ISO/IEC 17025 reference editions 2005 and 2017 to Tables NCA-7100-2 and NCA-7100-3. Deleted 2005 reference edition from ISO/IEC 17025 in NCA-3126, NCA-3127, NCA-4354.3, NCA-4255.3(c), and NCA-4255.3(d).
18-402	Revised Table NCA-7100-3 to delete two references (PTI M50.1 and AASHTO LRFD Bridge Design Specifications) that are no longer needed based on changes approved in Record 17-718.
18-955	Errata correction. See Summary of Changes for details.
18-1446	Revised NCA-5125(i).
18-1669	Revised Table NCA-7100-3 to update the applicable reference editions.
18-2668	Revised Table NCA-7100-3.

Table NCA-7100-2
Standards and Specifications Referenced in Division 1

(19)

Standard ID	Published Title	Section III Referenced Edition
The American Society of Mechanical Engineers (ASME)		
ASME NQA-1	Quality Assurance Requirements for Nuclear Facility Applications	2015
ASME PTC 25	Pressure Relief Devices	2014
ASME QAI-1	Qualifications for Authorized Inspection	Latest
American Society for Nondestructive Testing (ASNT)		
SNT-TC-1A	Personnel Qualification and Certification in Nondestructive Testing	2006, 2011
American Society for Testing and Materials (ASTM)		
ASTM A275	Standard Test Method for Magnetic Particle Examination of Steel Forgings	2009a
ASTM A673	Standard Specification for Sampling Procedure for Impact Testing of Structural Steel	1977
ASTM E8	Standard Test Methods for Tension Testing of Metallic Materials	1969 through 2015
ASTM E23	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials	2002a
ASTM E94	Standard Guide for Radiographic Examination	1977
ASTM E142	Standard Method for Controlling Quality of Radiographic Testing (Discontinued 2000, Replaced by ASTM E94)	1977
ASTM E185	Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels	1982
ASTM E186	Standard Reference Radiographs for Heavy-Walled [2 in. to 4$^{1}/_{2}$ in. (51 mm to 114 mm)] Steel Castings	1967, 1973, 1975, 1979, 2010
ASTM E208	Standard Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels	1991
ASTM E213	Standards Practice for Ultrasonic Examination of Metal Pipe and Tubing	1979
ASTM E280	Standard Reference Radiographs for Heavy-Walled [4$^{1}/_{2}$ in. to 12 in. (114 mm to 305 mm)] Steel Castings	1968, 1972, 1975, 2010
ASTM E426	Standard Practice for Electromagnetic (Eddy-Current) Examination of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys	1988
ASTM E446	Standard Reference Radiographs for Steel Castings up to 2 in. (51 mm) in Thickness	1972, 1975, 1978, 2010
ASTM E571	Standard Practice for Electromagnetic (Eddy-Current) Examination of Nickel and Nickel Alloy Tubular Products	1982 (R1988)
ASTM E606	Standard Practice for Strain-Controlled Fatigue Testing	Latest
ASTM E883	Standard Guide for Reflected-Light Photomicrography	2002
ASTM E1921	Standard Test Method for the Determination of Reference Temperature, T_o, for Ferritic Steels in the Transition Range	2016
ASTM F788	Standard Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series	2013
ASTM F812	Standard Specification for Surface Discontinuities of Nuts, Inch and Metric Series	2012
American Welding Society (AWS)		
AWS A4.2	Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic and Duplex Ferritic-Austenitic Stainless Steel	1991
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	2005, 2017
Plastics Pipe Institute (PPI)		
PPI TR-3	Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe	2008 through 2017
PPI TR-4	PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe	2008a through 2017

Table NCA-7100-3
Standards and Specifications Referenced in Division 2 (Cont'd)

Standard ID	Published Title	Section III Referenced Edition
International Organization for Standardization		
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	2005, 2017
Post-Tensioning Institute (PTI)		
PTI M10.2	Specification for Unbonded Single Strand Tendons	2017
U.S. Army Corps of Engineers		
CRD-C 36	Method of Test for Thermal Diffusivity of Concrete	1973
CRD-C 39	Test Method for Coefficient of Linear Thermal Expansion of Concrete	1981
CRD-C 44	Method for Calculation of Thermal Conductivity of Concrete	1963

Item NB15-1405 (*formally IN14-0401*)

The following is a history of record number NB15-1405, formally inquiry record 14-0401, found in NBIC committee Minutes from inception in 2014.

January 2014 **(see attachment "A")**	**Main Committee Minutes:** **IN14-0401 - *Part 3, 1.2*** - Question 1: The NBIC Part 3 paragraph 1.2 states that a repair shall be carried out "insofar as possible to the section and edition of the ASME code most applicable to the work planned." If a vessel is constructed using SA-517-E (P-11B) material to ASME Section VIII Div. 1, where production and weld procedure impact tests were required during construction, would a repair to a crack in the shell require production and weld procedure impact testing under the NBIC? Proposed Reply 1: Yes. (No attachment) Question 2: If the answer to Question 1 is yes and there was no SA-517-E material from the original lot available, would the repair require the addition of new base material (e.g. a flush patch around the area of the crack) so that production impact tests could be performed with the original base metal to the new base metal? Proposed Reply 1: Yes. Question 3: If the vessel described in Question 1 was to be altered by adding an SA-675 (P-1) pump flange to the shell, would production and weld procedure impact tests be required using the same lot P-1 and P-11B base materials as used in the alteration? Proposed Reply 1: Yes. January 2014 A task group of Walt Sperko, Bob Wielgoszinski (PM), and George Galanes will work on this inquiry. **SC RA Minutes:** January 2014 Bob Wielgoszinski presented a document request for interpretation associated with welded repairs to UHT vessels. A task group of Walt Sperko, Bob Wielgoszinski (PM), and George Galanes will work on this inquiry. **SG RA Specific Minutes:** January 2014 Bob Wielgoszinski presented a document request for interpretation associated with welded repairs to UHT vessels. A task group of Walt Sperko, Bob Wielgoszinski (PM), and George Galanes will work on this inquiry.
January 2015 **(see attachment "B")**	**Main Committee Minutes** **Item Number: IN14-0401 NBIC Location: Part 3, 1.2 Attachment Pages 72-73** **General Description:** Interpretation questions regarding requirements for production impact tests after repair or alteration of a vessel **Subgroup:** Repairs and Altterations **Task Group:** Unknown **Meeting Action:** Mr. Galanes gave a report. The Subcommittee on Repairs and Alterations voted unanimously close this interpretation with no response. The Subcommittee on Repairs and Alterations opened a new action item NB15-1405 to

	address production impact tests. Mr. Wielgoszinski explained the subject of the interpretation and the new action item. The NBIC Committee voted unanimously to close this interpretation with no response. **SC RA Minutes:** January 2015 Mr. Wielgoszinski provided a report. After consideration, Mr. Wielgoszinski decided to withdraw the inquiry and requested a new item to address impact testing of P11B material. A motion was made to close this interpretation and open up an action Item. The new action item will be: **NB15-1405 Part 3-Impact testing of P-11B Material, SC R and A** (From IN14-0401) A task group was formed with Bob Wielgoszinski, as project manager and member Ben Schaefer, Walt Sperko, Monty Bost, and Dave Ford. (Attachment Pages 8-9)
July 2015	**No report. Not included on MC or RA agendas.**
January 2016	**No minutes available.**
July 2016	**No report. Not included on MC or RA agendas.**
January 2017	**No report. Not included on MC or RA agendas.**
July 2017	**No report. Not included on MC or RA agendas.**
January 2018	**No report. Not included on MC or RA agendas.**

Attachment "A"
This is the original request for interpretation in January 2014.

Request for Interpretation

Robert V. Wielgoszinski
Hartford Steam Boiler of CT

Item	IN 14-0401
Purpose	Code Interpretation & possible revision to present Code rules
Scope:	Repairs and alterations to vessels constructed of ferritic materials with tensile properties enhanced by heat treatment, i.e. Part UHT material.
Background	During the construction of liquid propane vessels it is typical to use SA-517 Gr. E (P-No. 11B) for use as heads and shells for propane transport tanks. The ASME Code requires the base materials, welding materials, and the WPS's to be qualified with impact tests. Also, the Code requires production impact testing to be performed. This is where the actual vessel material, actual filler materials, are welded with the actual WPS to be used in production, and the weld coupon is impact tested to meet the specified results of Section VIII. To do so, the Manufacturer of the vessel is sure to purchase enough extra base and filler material to perform these tests. When repairs / alterations are made to these vessels the NBIC requires the rules of the original construction Code to be followed. As such, any new material to be added to a vessel or any WPS's used or any filler metal used for the repair must then be impact tested and meet the results stated in Section VIII. Also, production impacts must therefore be made since this is a mandatory Section VIII requirement. This is usually accomplished by making a weld coupon out of existing material cut from the vessel and welding it to the new material to be added to the vessel, and then impact testing specimens from that coupon. But, not all repairs / alterations lend themselves the ability to take existing material from the vessel. If a small nozzle is added to the vessel, only a few inches of material is taken from the vessel. Or say a crack is to be weld repaired or there is weld metal build up to be made on some worn or wasted area. Then there is no extra material to be taken away from the vessel to run coupons for production impacts. Strict interpretation of the ASME Code would now require a piece of steel to be removed to run production impacts and then a flush patch installed over the area removed. Some individuals look at the words in NBIC, Part 3, Section 1, paragraph 1.2, where it says, "…the standard governing the original construction shall conform, insofar as possible…" gives one the leeway to not require production impacts because it's not possible. Others indicated that it is possible but not practical to cut perfectly good material out of a vessel when there is no need to. And others will say that the ASME clearly requires existing material to be removed to run impact tests. One thing is clear though, and that is there is lack of uniformity in applying these rules. So we are looking to the NBIC to provide some guidance in this matter. The Jurisdiction in this case is the US DOT, and 49CFR Chapter 1 § 180.413(a)(1) states that the NBIC is to be followed for repairs and modifications. DOT is also looking to the NBIC for clarification.

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

Attachment "B"
This is the attachment that was included in the NBIC Minutes from the January 2015 meeting. It is identical to the original inquiry except for the new item number assigned as a revision.

Action Item NB15-1405 from Request for Interpretation

Robert V. Wielgoszinski
Hartford Steam Boiler of CT

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

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

Supplement 14
Life Extension of High Pressure Fiber Reinforced Plastic Pressure Vessels

S14.1 Scope

This document may be used to evaluate whether the service life of high pressure fiber reinforced plastic pressure vessels (FRP) can be extended for an additional lifetime. High pressure means vessels with a working pressure from 3,000 psi (20 MPa) to 15,000 psi (103 MPa). For vessels intended for cyclic service, fatigue testing of new vessels is carried out by the vessel manufacturer to be certain that the vessel will not fail in service and such testing is typically required by regulatory authorities. Fatigue design and testing is the starting point for consideration of life extension.

S14.2 General

a) The procedure for in-service testing of high pressure composite pressure vessels, **Supplement 10** herein, is incorporated by reference into this procedure for life extension of high pressure composite pressure vessels. Supplement 10 is based on acoustic emission (AE) testing, specifically modal AE (MAE) testing. The MAE inspection procedure employs detection and analysis techniques similar to those found in seismology and SONAR. Much as with earthquakes, transient acoustical impulses arise in a composite material due to the motion of sources such as the rupture of fibers. These transients propagate as waves through the material and, if properly measured and analyzed by the methods in Supplement 10, the captured waves reveal, for example, how many fibers have ruptured. Similar information about other sources is also determinable, such as the presence and size of delaminations. Delaminations can play a significant role in vessel fatigue life, particularly delaminations near the transition regions and in the heads. The rupture behavior can be used to determine the integrity of the vessel. However, the development of criteria for life extension (LE) requires an understanding of the vessel design and fatigue life.

b) Fatigue testing of out of life vessels is a crucial part of the life extension process. It is used to validate the mechanical behavior of the vessels and to develop the numerical values for the allowables in the MAE pass/fail criteria for the particular design, material and construction.

S 14.3 Life Extension Procedure

a) New vessel fatigue life testing data shall be obtained from the Manufacturer's Design Report (MDR) and the number of cycles in a lifetime shall be determined from the MDR. The type of vessel under consideration for life extension shall have been shown through testing to be capable of sustaining at least three lifetimes of cycles to developed fill pressure followed by a subsequent burst test at a pressure greater than minimum design burst pressure.

b) An evaluation of the service the vessel has seen should take into account any operational conditions that may have differed from those used in the design testing and analysis. Such conditions include for example exposure to more severe weather than expected, more cycles

per year, constant high temperature and humidity, chemical attack or any other of a number of conditions under which operations take place that were not specifically included in testing at manufacture. Any such conditions shall be listed on the attached form. If no such conditions exist, it shall be so noted on the form. The test program delineated herein shall be revised to reflect the modified conditions as documented by the user and submitted for approval to the proper authorities.

c) Data and records for all vessels considered for life extension shall be kept and made readily available to inspectors or examination personnel. This includes an operating log, number of operating cycles since the previous examination, total number of operating cycles, examinations, examination techniques and results, maximum operating pressure and any unexpected pressures, temperatures, temperature cycles, damage events or other significant events that were outside the intended operating parameters or conditions.

d) A life extension test program shall be carried out for each type of vessel under consideration. Type of vessel means the particular manufacturer, materials (fiber and resin), water volume and design. If the type of vessel passes all requirements, then that type shall be eligible for life extension testing. If such a vessel passes the life extension MAE test its lifetime can be extended for one additional lifetime in five-year increments. In order to maintain life extension a vessel must be requalified every five years using the MAE test.

S14.4 Life Extension Test Program

a) The type of vessel under consideration for LE shall be noted. Manufacturer, place of manufacture and manufacturing date shall be recorded. The vessel dimensions shall be recorded. The specific fiber, matrix and winding pattern shall be recorded. If the fiber, matrix and winding pattern are not available from the manufacturer, then a vessel of the type under consideration shall be used to verify the winding pattern (hoop and helical angles and number of plies) through destructive testing.

b) Ten out-of-life vessels of the particular type shall be tested in the manner described herein. MAE techniques shall be applied to every vessel tested. Analysis of the MAE data is described herein. Two strain gages, one in the 0-degree and one in the 90-degree direction, shall be applied to every vessel pressure tested under this program. The purpose of strain gage data is to compute the 0 and 90 modulus values and to confirm that the modulus values of the material do not vary during the fatigue cycling required herein. Strain data shall be recorded and analyzed as described later on.

c) The LE test program proceeds by Steps. If the Step 1 is not successful, then there is no need to proceed to Step 2, and so forth.

S14.5 Life Extension Test Program Steps

S14.5.1 Step 1

Three vessels shall be selected from the ten and pressurized to burst. The vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs. MAE testing shall be done in conjunction with this testing as specified in Supplement 10, except for transducer spacing, pressurization plan and accept/reject criteria values. The values in Supplement 10 are for requalification testing. The transducer spacing shall be determined by the distance at which the 400 kHz component of a suitable pulser source is detectable along the axis of the vessel (essentially across the hoop fibers) and in the perpendicular direction (essentially parallel to the hoop fibers). Detectable means that the resulting signal component has an amplitude with at least a signal to noise ratio of 1.4. Transducer frequency response calibration and energy scale shall be carried out as specified in SUPPLEMENT 10. The pressurization plan shall follow that in ASME Section X Mandatory Appendix 8, i.e., there shall be two pressure cycles to test pressure with holds at test pressure as prescribed therein, however, the time interval between the two cycles may be reduced to one minute. For the purposes of life extension, the fiber fracture energy and BEO (background energy oscillation) values shall be as specified below.

a) No BEO greater than 2 times the quiescent energy (see Supplement 10) shall be observed up to test pressure or during pressure holds.

b) No fiber break event energy shall be greater than $24 \times 10^3 \times U_{FB}$ (see Supplement 10) during the second pressurization cycle.

c) No single event shall have an energy greater than $24 \times 10^5 \times U_{FB}$ during the second pressurization cycle.

Note: The numerical values specified in b) and c) can be adjusted through documented testing and stress analysis methods in order to account for the particular design, material and construction.

d) At least two sensors shall remain on each vessel all the way to burst in order to establish the BEO pressure for this type of vessel.

e) Plots of stress versus strain shall show linear behavior up to 90% of burst pressure.

f) The burst pressures of all three vessels shall be greater than the minimum design burst pressure.

g) If the burst pressure of any one of the three vessels is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension and there is no need to proceed with Step 2 below.

Note: It is possible that one or more of the vessels selected had damage not obvious to visual inspection. If during this burst testing phase the MAE test identifies a vessel as damaged, the substitution of three other randomly selected vessels is allowed.

S14.5.2 Step 2

If the vessels pass Step 1, fatigue testing shall be carried out on a minimum of three vessels of the same type being considered for life extension.

a) Prior to testing, the vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs.

b) Prior to fatigue testing, MAE testing as specified in Step 1 shall be done in conjunction with the fatigue testing, hereinafter called the MAE test or MAE testing, in order to determine the suitability of the vessels for fatigue testing, i.e., that they pass the MAE test.

c) Next, the vessels shall be subjected to fatigue cycles. Pressure shall be 100 psi +0, -50% to at least 1.05 x working pressure. Vessels shall survive one and one-half (1.5) additional lifetimes. If they survive then they shall be tested by an MAE test as was done prior to fatigue cycling.

d) Provided they pass the MAE test, they shall be burst tested. At least two sensors shall remain on each vessel all the way to burst in order to establish that the BEO (background energy oscillation) pressure for the fatigued vessels is consistent, i.e., is the same percentage of ultimate, with that of the vessels tested in Step 1.

e) Plots of stress versus strain shall show linear behavior up to 90% of burst pressure.

f) The burst pressures at the end of the fatigue testing shall be greater than or equal to the minimum design burst. If the burst pressure of any one of the three vessels is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension.

S14.5.3 Step 3

If the vessels pass Step 2, impact testing shall be carried out on a minimum of three vessels of the same type being considered for life extension.

a) Prior to testing, the vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs. Prior to impact testing, MAE testing shall be done in order to determine the suitability of the vessels for impact testing, i.e., that they pass the MAE test.

b) Two vessels shall be subjected to an ISO 11119.2 drop test and then subjected to the MAE test.

If they pass the MAE test, then one vessel shall be burst tested. At least two sensors shall remain on the vessel all the way to burst in order to establish that the BEO (background energy oscillation) pressure for the fatigued vessels is consistent, i.e., is the same percentage of ultimate, with that of the vessels tested in Step 1.

c) Plots of stress versus strain shall show linear behavior up to 90% of burst pressure.

d) If the burst pressure is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension.

e) If the first vessel passes the burst test, the other dropped vessel shall be fatigue cycled and subsequently subjected to the MAE test and, if it passes, shall be burst tested under the same conditions as before. If the vessel fails during fatigue cycling, i.e., bursts or leaks, then these vessels shall not be eligible for life extension.

f) If the modulus changes by more than 10%, then these vessels shall not be eligible for life extension. The strain gages should be mounted in a location that is away from the impact zone.

g) The burst pressure at the end of the fatigue testing of the dropped vessel shall be greater than or equal to the minimum design burst. The vessels shall have MAE testing applied during burst testing as before and the BEO shall be consistent with the previously established percent of burst ±10%.

S14.5.4 Step 4

If the vessels pass Step 3, cut testing shall be carried out on a minimum of two vessels of the same type being considered for life extension.

a) Prior to testing, the vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs. Prior to cut testing, MAE testing shall be done in order to determine the suitability of the vessels for cut testing, i.e., that they pass the MAE test.

b) Two vessels shall be subjected to an ISO 11119.2 cut test and then subjected to the MAE test. If they pass, then one shall be burst tested under all the conditions and procedures delineated in Step 2. If the burst pressure is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension.

c) If the cut vessel passes, then the other cut vessel shall be fatigue cycled as described in Step 2 and subsequently subjected to the MAE test and then burst tested with at least two MAE sensors remaining on and monitoring the vessel as before. If it does not survive fatigue cycling, then these vessels shall not be eligible for life extension.

d) The burst pressure at the end of the fatigue testing of the cut vessel shall be greater than or equal to the minimum burst pressure specified by ISO 11119.2.

If the vessel type passes Steps 1 to 4, then that type is eligible for life extension. An out of life vessel of the type subjected to the program above may have its life extended for one additional lifetime if it passes the MAE test. The vessel shall pass the MAE test at subsequent five-year intervals or at one-third of the lifetime, whichever is less, in order to continue in service. The vessel shall be labeled as having passed the NBIC life extension test.

PART 3
SUPPLEMENT 4
REPAIR AND ALTERATION OF FIBER-REINFORCED THERMOSETTING PLASTIC PRESSURE EQUIPMENT

S4.1 SCOPE
…
S4.2 INSPECTOR QUALIFICATIONS
…

S4.3 TOOLS
The following tools may be required by the Inspector:
a) adequate lighting including overall lighting and a portable lamp for close inspections;
b) handheld magnifying glass;
c) Barcol hardness tester;
d) small pick or pen knife;
e) small quantity of acetone and cotton swabs;
f) camera with flash capability; ~~and~~
g) liquid penetrant testing kit;
h) depth and length gages; and
i) metallic tap tester (e.g. quarter dollar).

S4.4 LIMITATIONS
…

S4.5 REPAIR LIMITATIONS FOR FILAMENT WOUND VESSELS
When the MAWP is greater than 200 psig (1.38 MPa), and less than 1500 psi (10.34 MPa) field repair of filament wound ASME Code Section X, Class I vessels shall be limited to corrosion barrier or liner repairs only, provided there is access to the vessel interior. ~~No s~~Structural repairs~~, re-rating, or alterations~~ are allowed for filament wound ASME Code Section X, Class 1 vessels that have an MAWP equal to or greater than ~~200 psig (1.38 MPa)~~ 1500 psi (10.34 MPa) and Class III vessels in accordance with the requirements of S4.19.

S4.6 VESSELS FABRICATED USING ELEVATED TEMPERATURE CURED RESIN SYSTEMS

…
…
…

S4.18 REPAIR AND ALTERATION METHODS
…

S4.19 REPAIR OF HIGH PRESSURE FILAMENT WOUND VESSELS

S4.19.1 Scope

Types of damage that are addressed in this section include abrasion, cuts and scratches, impact, chemical, fire and heat, and weathering.

S4.19.2 Level of damage

- Level 1 damage, up to 0.010 inch, is repairable any time
- Level 2 damage, defined by the manufacturer (or up to 0.050 if not defined), is repairable with the manufacturer's concurrence

- Level 3 damage, defined by the manufacturer (or 0.050 or greater if not defined), is not repairable

Softening of the resin due to chemical attack, or charring due to exposure to fire, ~~are considered to be~~shall be defined as Level 3 damage.

The manufacturer's guidance for assessing damage depth and levels shall be followed if it conflicts with general guidelines in this document.

Table S4.19.2-1 Damage Levels and Assessment

Type of damage	**Definition**				**Comment**
		Level 1 — accept	**Level 2**	**Level 3 — reject**	
Cuts/scratches	A sharp impression where material has been removed or redistributed	When depth is less than 0.010 in	Depth from 0.010 in to the limit defined by the manufacturer, or 0.050 if not defined.	Greater than the limit defined by the manufacturer, or greater than 0.050 if not defined	
Abrasion	An area that is scuffed or worn thinner by rubbing or scraping	When depth is less than 0.010 in	Depth from 0.010 in to the limit defined by the manufacturer, or 0.050 if not defined.	Greater than the limit defined by the manufacturer, or greater than 0.050 if not defined	
Charring/soot	Blackening or browning of an area, burning of an area	Soot only, which washes off	Minor discolouration; manufacturer's recommendation	Charring	
Chemical attack, including stress corrosion cracking	Vessel is subjected to a chemical that softens or dissolves the composite	Residue may be cleaned off, no evidence of softening or dissolving.	Permanent discoloration.	Softening or dissolving of the material, cracking of the composite due to stress and chemical exposure	
Impact	Composite material was struck or hit; the resin has a frosted or smashed appearance	Damaged area is less than 0.20 in^2 and no other damage is apparent	Damage is uncertain, requiring the manufacturer's advice	Permanent deformation of cylinder or liner, evidence of underlying delamination	
Weathering	Composite affected by UV exposure and general weather	Minor gloss loss or chalking, only non-structural materials affected.	Structural laminate affected to a level less than defined by the manufacturer, or 0.050 inch.	Structural laminate affected to a level greater than defined by the manufacturer, or 0.050 inch	

S4.19.3 Thickness considerations

Damage to a depth greater than 5% of the structural laminate thickness is not repairable, and the vessel shall be removed from service. Depth of damage does not include paint thickness, or material designated by the manufacturer as protective (non-structural) rather than structural.

S4.19.4 Impact damage considerations

Impact damage may result in rejection, without possibility of repair, regardless of the measurable depth due to risk of internal fracture or delamination. Impact damage may be characterized by noting permanent deformation, softness or deflection of the surface, or localized surface crazing.

S4.19.5 Assessment of damage depth

All loose fibers and affected resin ~~are to~~shall be removed. This includes material that is softened by actions of chemicals or heat. Confirmation that the material remaining is sound shall be determined by a tap test, Barcol hardness measurement, and/or visual inspection.

S4.19.6 Repair procedure

a) Non-structural material, including paint, shall be removed from any area involved in the repair.
b) Resin used in structural repairs shall be compatible with the resin used to fabricate the vessel.
c) Cloth patches made of glass or carbon fiber may be used in the repair and to cover the repaired area.
    1) Cloth patches shall extend at least 0.5 inches beyond the edge of the repair area, and subsequent layers ~~must~~shall extend at least 0.25 inch beyond the edge of the previous patch.
    2) Total patch thickness shall not be more than 5% of the structural thickness of the original laminate.
d) A layer of fiber wound continuously in the hoop direction may be applied over the repair.
e) Non-structural material may be applied to the repaired area for protection if originally used in the vessel design.
f) The repaired area may be covered with epoxy, polyurethane, or other compatible paint.
g) The repaired area shall be cured at a temperature that will not degrade the resin in the vessel. It may be cured prior to applying any non-structural material or paint.
h) The repair shall be confirmed by either:
    1) A tap test or Barcol hardness measurement conducted on the structural material after cure and prior to applying any non-structural material or paint, or
    2) A Modal Acoustic Emission test, in accordance with Part 2 S10.10, conducted after cure of the structural material
i) A hydrostatic proof test shall be conducted following confirmation of the repair.

S4.19.7 Acceptance of the vessel for return to service

The repair shall meet the repair confirmation requirement (i.e. confirmation of soundness using the tap test or Barcol hardness measurement, or confirmation using MAE). There shall be no delamination of the repaired area resulting from ~~thea~~ hydrostatic proof test in accordance with the Design Specification. A vessel that does not meet the requirements of the repair confirmation or hydrostatic proof test shall not be returned to service.

Item 17-137
Part 3, S4.18.2.1 2) d. 2. and 4.

1) …

2) Applying Test Patches to Verify Adequate Surface Preparation

a. Test patches should be applied to any substrate that will require a secondary bond to determine the integrity of the primer bond prior to the application of the laminate.

b. The subsequent steps shall be followed:

1. Apply the primer (0,003 -0.005 in. (0.08 to 0.13 mm)) to the prepared surface, and allow primer to cure.

2. Coat the primed surface with the same resin to be used in the laminate repair. Apply 4 in. (100 mm) x 14 in. (360 mm) piece of polyester, such as Mylar®, strip to one edge of primed area. Allow the polyester film to protrude from beneath the patch.

3. Apply two layers of 1-1/2 oz/sq. ft (0.46 kg/sq. m) chopped strand mat saturated with the same resin that will be used for the repair. Mat shall be 12 in. (305 mm) x 12 in. (305 mm) square.

4. Allow the mat layers to cure completely, this may be verified by checking the hardness of the laminate.

5. Pry patch from surface using a screwdriver, chisel, or pry bar.

6. A clean separation indicates a poor bond.

7. Torn patch laminate or pulled substrate indicates that the bond is acceptable.

c. If the bond is not adequate, go back to step a) and repeat the procedure.

Note: If the repair area is smaller than the test patch dimensions, decrease the test patch size accordingly.

d. As a last resort, if the previous procedure does not provide an adequate bond, the permeated laminate must be handled differently using the following procedure:

1. Hot water wash the equipment.

2. Abrasive blast ~~with #3 sand, or equal~~ to achieve a 0.003 to 0.005 in. (0.08 to 0.12 mm) anchor pattern, and allow to completely dry.

3. Prime with the recommended primer, an area 12 in. (305 mm) x 12 in. (305 mm) and apply a test patch.

4. Prime a second spot 12 in. (305 mm) x 12 in. (305 mm) and prime with a recommended ~~epoxy resin~~ alternate primer.

5. Allow this primer to cure.

Part 3, S4.18.2.2 2)

1) …

2) Note that any cracks, delaminations, or permeated surfaces must be removed. If the damage is deeper than the corrosion barrier and the material removed reaches the structural laminate, the vessel is not repairable. An adequate size abrasive or proper sanding disc must be used to obtain a ~~0.003 to 0.005~~ 0.002 to 0.003 in (0.05 to 0.08 mm) anchor pattern to the area that requires the repair.

3) Preparation of any surface requires that basic rules, common to all substrates, be followed. These rules are as outlined below:

    a. Surface must be free of contaminants;

    b. Surface must be structurally sound;

    c. Surface must have adequate anchor pattern;

    d. Surface must be dry;

    e. Surface must be primed with recommended primer.

    Note: After the surface has been properly prepared, it must be kept clean and dry until laminating can be started. Dust, moisture, or traces of oil that come in contact with the surface may act as a mold release or act to inhibit the cure and prevent a good secondary bond. Laminating should be done within two hours of the surface preparation.

Record 17-166

S3.3 REPAIRS OF A ROUTINE NATURE

a) The following repairs shall be considered routine, and shall comply with NBIC Part 3, 3.3.2.

1) Machining — routine repair shall not include the machining of pressure-retaining parts with the exception of minor machining for cleaning and joint preparation not to exceed 1/32 in. (0.8 mm) of material thickness.

2) Repair of Gasket Surfaces — re-machining of gasket surfaces, re-serrating, or flattening is permitted if the design thickness is maintained.

3) Replacing Individual Tubes — drilling out and replacing tubes with new tubes or repaired tubes. Only certified materials shall be used for this repair.

4) Nozzle Replacement — replacement of nozzles by removing the old nozzle and cementing a new nozzle in place. This is applicable for nozzles with inside diameters not exceeding ~~18 in. (460 mm).~~ **6 inches (152 mm)**.

5) Plugging Tubes – plugging individual tubes using accepted procedures.

6) Surface Repair — surface repair by installation of plugs or inlay material shall not exceed 1 $in.^3$ (16 cm^3) of total volume.

7) Replacement or Addition of Non-Load Bearing Attachments to Pressure-Retaining Item — For attachment of non-load bearing attachments to pressure-retaining items, the cementing procedure specification need only be qualified for the pressure part and cement to be used.

b) Complete records of these routine repairs shall be kept for review by the Inspector. The records shall include the number of tubes replaced or plugged and their location within the tube bundle.

NBIC Subcommittee R&A Action Block

Subject	Code Revision to Part 3, 2.5.3.6
File Number	NB18-12 **Prop. on Pg.** 2
Proposed Revision	1
Statement of Need	The revision is to Welding Method 6 to allow for weld build-up limited to 100 square inches on only Grade 91 tube OD surfaces for local erosion or mechanical damage.

Project Manager	John Siefert/G. Galanes

SubGroup Negatives	**SG Meeting Date**

Background;
Welding Method 6 was successfully introduced into the NBIC, part 3 to permit butt weld repair with no PWHT. This action permits weld build-up of the Grade 91 tubes within the boiler setting and same limitations to repair erosion or mechanical damage without the need for complete tube replacement. To ensure adequate controls, the size of the repair are using a weld overlay is limited to 100 square inches.

The size limitation for the weld build-up repair of 100 square inches is predicated on similar language which appears in Part 3 Supplements 2 and 4. For weld build-up repairs, section 2.5.3.6 c) 5) f) does not limit the F-No. 43 filler materials because the need for the weld build-up may be due to corrosion or erosion. In these examples, it may be necessary to use an optimized filler material which is otherwise prohibited in section 2.5.3.6 c) 5) d) for full thickness repairs.

The rev 4 version addressed a single comment received from the comment ballot ending in early March 2019. This comment is "*Subpara. a) needs clarification regarding "the attachment material may be dissimilar" comment, as WM-6 does not allow for welding of anything other than P-15E Grp. 1, Gr. 91 to itself (ref. a) 1)). Allowing for dissimilar material repairs at the integral attachment interface would require qualification of a new PQR and generation of a new WPS, which WM-6 does not provide for.*"

Item 18-12
2.5.3.6 WELDING METHOD 6

This welding method provides requirements for welding only Grade 91 tube material within the steam boiler setting. When using this welding method, the following applies:

a) This method is limited to butt welds, weld build-up repairs, or attachment weld to ~~in tubing~~ NPS 5 (DN 125) or less in diameter and ½ in. (13 mm) or less in wall thickness for which the applicable rules of the original code of construction did not require notch toughness testing;

b) Application shall be limited to only boiler tube repairs at a location internal to the boiler setting;

c) Upon the completion of weld repair, the repair area shall be kept above the dew point temperature so that condensation does not form on the repair surface before returned to service or a moisture-barrier coating shall be applied to the surface.

1) The material shall be limited to P-No 15E, Group 1, Grade 91, creep strength enhanced ferritic steel (CSEF).

2) The welding shall be limited to the SMAW and/or GTAW processes, manual or automatic, using suitably controlled maintenance procedures to avoid contamination by hydrogen producing sources. The surface of the metal shall be free of contaminants and kept dry.

3) The welding procedure qualification test coupon shall be P-No 15 E, Group 1, Grade 91.

4) Qualification thickness limits of base metal and weld deposit thickness shall be in accordance with ASME Section IX, QW-451.

5) The Welding Procedure Specification (WPS) shall be qualified in accordance with the requirements of ASME Section IX. No postweld heat treatment shall be applied to the test coupon. Additionally, the WPS shall include the following requirements:

a. The minimum preheat for the GTAW process shall be 200°F (100°C). The minimum preheat for the SMAW process shall be 300°F (150°C). The preheat temperature shall be checked to ensure the minimum preheat temperature is maintained during welding and until welding is completed. The maximum interpass temperature shall be 550°F (290°C).

b. When the SMAW process is specified for a fill pass layer, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm). When the GTAW-process is specified any limits in filler size is to be shown on the WPS.

c. Regardless of the welding process (SMAW and/or GTAW), only the use of stringer beads shall be permitted.

d. The filler metal shall be limited to an austenitic, nickel-base filler metal ~~having a designation F-No. 43~~ to those assigned to F-number 43 in Section IX, QW-432 and limited to the following consumables: ERNiCr-3, ENiCrFe-3,

ENiCrFe-2, ASME B&PV Code Cases 2733 and 2734 (e.g. EPRI P87); or
e. A martensitic, iron-base filler metal to those assigned to F-number 4 or F-number 6 in ASME Section IX, QW-432 ~~having a designation F-No. 4 or F-No. 6~~ and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.
f. For weld build-up repairs due to wastage, the filler metal shall be limited to those assigned to F-number 43 in ASME Section IX, QW-432.

NBIC Subcommittee R&A Action Block

Subject Code Revision to Part 3, 2.5.3.6

File Number NB18-13 **Prop. on Pg.** 2

Proposed Revision Statement of Need The revision is to add a new Welding Method 7 to allow for dissimilar metal welding of Grade 91 to austenitic steels and low alloy steels in a boiler setting and limited to butt welds, in accordance with approved welding method 6.

Project Manager John Siefert/G. Galanes

SubGroup Negatives **SG Meeting Date**

Background;
Welding Method 7 is being introduced to permit dissimilar metal weld repair with no PWHT between Grade 91 boiler tubes to austenitic steels and low alloy ferritic steels. This action permits DMW of Grade 91 tubes within the boiler setting following welding method 6 with no PWHT.

NB Item 18-13

2.5.3.7 WELDING METHOD 7

This repair method provides requirements for dissimilar metal welding (DMW) of Grade 91 tube material to either austenitic or low alloy ferritic steel tubing within the steam boiler setting. When using this welding method, the following applies:

a) This method is limited to butt welds in tubing NPS 5 (DN 125) or less in diameter and ½ in. (13 mm) or less in wall thickness for which the applicable rules of the original code of construction did not require notch toughness testing;

b) Application shall be limited to only boiler tube repairs at a location internal to the boiler setting;

c) Upon the completion of weld repair, the repair area shall be kept above the dew point temperature so that condensation does not form on the repair surface before returned to service or a moisture-barrier coating shall be applied to the surface.

For DMW of Grade 91 to austenitic steel steel tubing;

1) The materials shall be limited to P-No 15E, Group 1, Grade 91, creep strength enhanced ferritic steel (CSEF) joined to either P-No. 8, P-No. 42, P-No. 43, or P-No. 45, as permitted for welded construction by the applicable rules of the original code of construction.

2) The welding shall be limited to the SMAW and GTAW processes, manual or automatic, using suitably controlled maintenance procedures to avoid contamination by hydrogen producing sources. The surface of the metal shall be free of contaminants and kept dry.

3) The welding procedure qualification test coupon shall be P-No 15 E, Group 1, Grade 91 joined to either P-No. 8, P-No. 42, P-No. 43, or P-No. 45 and as required for the repair application.

4) Qualification thickness limits of base metal and weld deposit thickness shall be in accordance with ASME Section IX, QW-451.

5) The Welding Procedure Specification (WPS) shall be qualified in accordance with the requirements of ASME Section IX. No postweld heat treatment shall be applied to the test coupon. Additionally, the WPS shall include the following requirements:

a). The minimum preheat for the GTAW process shall be 200°F (100°C). The minimum preheat for the SMAW process shall be 300°F (150°C). The preheat temperature shall be checked to ensure the minimum preheat temperature is maintained during welding and until welding is completed.

The maximum interpass temperature shall be 550°F (290°C).

b). When the SMAW process is specified for a fill pass layer, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm). When the GTAW-process is specified any limits in filler size is to be shown on the WPS.

c). Regardless of the welding process (SMAW or GTAW), only the use of stringer beads shall be permitted.

d). The filler metal shall be limited to an austenitic, nickel-base filler metal to those assigned to F-number 43 in ASME Section IX, QW-432 and limited to the following consumables: ERNiCr-3 (e.g., Filler Metal 82), ENiCrFe-3 (e.g., INCONEL Welding Electrode 182), ENiCrFe-2 (e.g., INCO-WELD A), ASME B&PV Code Cases 2733 and 2734 (e.g. EPRI P87);
~~e. A martensitic, iron-base filler metal having a designation F-No. 4 or F-No. 6 and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.~~

For DMW of Grade 91 to low alloy (P-No 5A) steel tubing:

1) The materials shall be limited to P-No 15E, Group 1, Grade 91, creep strength enhanced ferritic steel (CSEF) joined to P-No. 5A steel.

2) The welding shall be limited to the SMAW and/or GTAW processes, manual or automatic, using suitably controlled maintenance procedures to avoid contamination by hydrogen producing sources. The surface of the metal shall be free of contaminants and kept dry.

3) The welding procedure qualification test coupon shall be P-No 15 E, Group 1, Grade 91 joined to P-No. 5A steels.

4) Qualification thickness limits of base metal and weld deposit thickness shall be in accordance with ASME Section IX, QW-451.

5) The Welding Procedure Specification (WPS) shall be qualified in accordance with the requirements of ASME Section IX. No postweld heat treatment shall be applied to the test coupon. Additionally, the WPS shall include the following requirements:

(a). The minimum preheat for the GTAW process shall be 200°F (100°C). The minimum preheat for the SMAW process shall be 300°F (150°C). The preheat

temperature shall be checked to ensure the minimum preheat temperature is maintained during welding and until welding is completed. The maximum interpass temperature shall be 550°F (290°C).

(b). When the SMAW process is specified for a fill pass layer, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm). When the GTAW-process is specified any limits in filler size is to be shown on the WPS.

(c). Regardless of the welding process (SMAW or GTAW), only the use of stringer beads shall be permitted.

(d). The filler metal shall be limited to a martensitic, iron-base filler metal to those assigned to F-number 4 or F-number 6 in ASME Section IX, QW-432 and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.

Item 18-75

3.3.4.6 PATCHES

a) Flush Patches

1) The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush where required by the applicable original code of construction. Examples of ~~flush welded~~ welded flush patches are shown in NBIC Part 3, Figure 3.3.4.6-a. ~~The welds shall be subjected to the nondestructive examination method used in the original code of construction or an alternative acceptable to the Inspector~~ and, ~~where required, the Jurisdiction~~. Nondestructive examination will be performed in accordance with the requirements from NBIC Part 3, Section 4.2.~~.~~

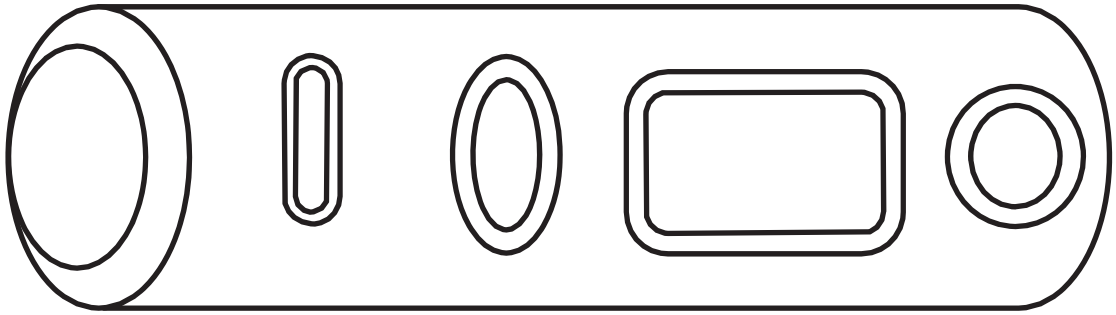
2) Before installing a flush patch, ~~the~~ ~~the~~ defective material ~~should~~ ~~should~~ shall be removed until sound material is reached. The patch ~~should~~ ~~should~~ ~~shall~~shall be ~~rolled~~ formed to the proper shape or curvature. The edges ~~should~~ ~~should~~ ~~shall~~shall align without 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 three 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.

b) Tube Patches

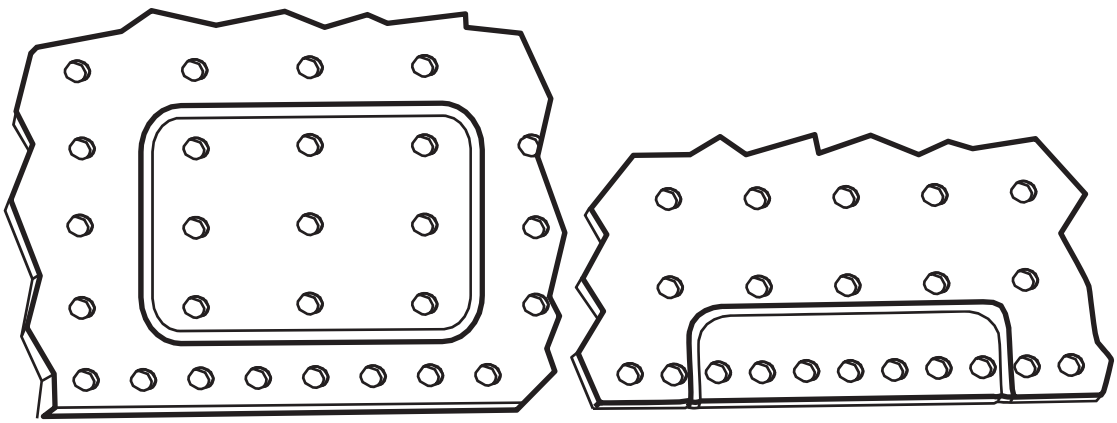
In some situations it is necessary to weld a flush patch on a tube, such as when replacing tube sections and accessibility around the complete circumference of the tube is restricted, or when it is necessary to repair a small bulge. This is referred to as a window patch. Suggested methods for window patches are shown in NBIC Part 3, Figure 3.3.4.6-b.

FIGURE 3.3.4.6-a

FLUSH PATCH CONFIGURATIONS IN UNSTAYED AREAS



FLUSH PATCHES IN STAYED AREAS



Item 18-84 9/19/2018

Patch Bolts

Proposed addition (*in italics*) to NBIC S1.2.8;

S1.2.8 Patch bolts

a) *ASME Section I, Part PL may be used for application of patch bolts.*

b) Patch bolts may be replaced in kind.

c) Seal welding of bolts is permitted.

d) Patch bolts shall either have 11 or 12 pitch thread pitch. Patch bolt threads shall be fit to support the structure to which the bolt is applied. Changing the patch bolt thread from 11 to 12, or the reverse, shall be considered a repair.

e) A patch bolt applied in place of a rivet shall be considered an alteration.

Item Number: 18-85

General Description: Correct the Title of SWPS AWS B2.1-1-233:2006 and AWS B2.1-1-235:2006 deleting "Flat Position Only" from the Title as it relates Part 3, Table 2.3

Sub Group: Repairs and Alterations

Task Group: Jim Sekely

Present Wording	**Proposed Wording**
B2,1-1-233: 2006 Standard Welding Procedure Specification for Argon Plus 25% Carbon Dioxide Shielded Gas Metal Arc Welding (Short Circuiting Transfer Mode) followed by Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, ~~Flat Position Only,~~ As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-233: 2006 Standard Welding Procedure Specification for Argon Plus 25% Carbon Dioxide Shielded Gas Metal Arc Welding (Short Circuiting Transfer Mode) followed by Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, As-Welded or PWHT Condition, Primarily Pipe Applications.
B2.1-1-235: 2006 Standard Welding Procedure Specification for Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, ~~Flat Position Only,~~ As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-235: 2006 Standard Welding Procedure Specification for Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, As-Welded or PWHT Condition, Primarily Pipe Applications.

Item 18-95

Existing wording:

a) Most steam locomotive boilers were manufactured in the first half of the 20th century or before. The calculations, formula, and shop practices used are now distant history and quite difficult to obtain. The rules for riveted construction were last published by ASME in Section I Code, 1971 Edition.

Proposed wording:

a) Most steam locomotive boilers were manufactured in the first half of the 20th century or before. The calculations, formula, and shop practices used are now distant history and quite difficult to obtain. The rules for riveted construction were last published by ASME in Section I Code, 1971 Edition. **Currently, ASME, Section I, Part PR and Part PL, now govern new riveted construction and steam locomotive boiler construction. These rules should be used for repairs and alterations when appropriate.**

Background for Interpretation 18-100

Task Group PM – David Martinez;

Task Group members: Marty Russel and Nathan Carter

Item Number: 18-100 NBIC Location: Part 3, 3.3.2 Attachment Page 44

General Description: Revision adding (plugging) heat exchanger tubes with an outside diameter of ¾" or smaller to NBIC Part 3.3.2 Routine Repairs

Subgroup: Repairs and Alterations

Task Group: David Martinez (PM)

January 2019 Meeting Action: Progress Report: Mr. Martinez reported on this item and presented interpretations (98-04 and 98-29) that may satisfy the revision request, however after a presentation from TEiC regarding the use of explosive welding of tubes to be considered as a routine repair, Mr. Martinez recommend this be considered progress report to continue working to address explosive welding as a Routine Repair.

3.3.2 ROUTINE REPAIRS

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

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

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

d) Alternative welding methods without postweld heat treatment as described in NBIC Part 3, 2.5.3 shall not be used for routine repairs.

(Example of proposed additional category to examples of Routine Repairs – paragraph e)

e) The following repairs may be considered as routine repairs and shall be limited to these categories:

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

NDE other than visual is required by the original code of construction. This includes their attachments such as clips, lugs, skirts, etc., but does not include nozzles to pressure-retaining items;

2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;

3) Weld buildup of wasted areas in heads, shells, flanges and fittings not exceeding an area of 100 in.2 (64,520 mm2) or a thickness of 25% of nominal wall thickness or 1/2 in. (13 mm), whichever is less;

4) Corrosion resistance weld overlay not exceeding 100 in.2 (64,520 mm2); ~~and~~

5) Seal welding a mechanical connection for leak tightness where by-design, the pressure retaining capability is not dependent on the weld for strength and requires no postweld heat treatment; and

6) Plugging of heat exchanger tubes ¾ in. outside diameter and smaller when explosive plugging is used as method of plugging tubes.

Background Interpretation

INTERPRETATION 15-04

Subject: Part 3, Section 3

Edition: 2015

Question: Is explosion welding of plugs into leaking heat exchanger tubes considered a repair per the NBIC Part 3?

Reply: Yes.

Support for Consideration of the Proposed Action

ASME Section IX – 2019 (Addresses Procedure and Performance Qualification for Explosion Welding heat exchanger tubes to tubesheets, but not the plug to the tube)

QW-193 TUBE-TO-TUBESHEET TESTS
When the applicable Code Section requires the use of this paragraph for tube-to-tubesheet demonstration mockup qualification, QW-193.1 through QW-193.1.3 shall apply.

QW-193.1 Procedure Qualification Specimens. Ten mockup welds are required for qualifying each tube-to tubesheet welding procedure. The mockup assembly shall essentially duplicate the tube-to-tubesheet weld joint design to be used in production, within the limits of the essential variables of QW-288. The mockup test assembly shall be prepared with the tubesheet element having a thickness not less than the lesser of the thickness of the production tubesheet or 2 in. (50 mm). For tube-to-tubesheet welds to clad tubesheets, the cladding or overlay may be represented by a base material with a chemical composition that is essentially equivalent to the cladding composition. All welds in the mockup assembly shall be subjected to the following tests and shall meet the applicable acceptance criteria.

QW-193.1.1 Visual Examination. The accessible surfaces of the welds shall be examined visually with no magnification required. The welds shall show complete fusion, be free from visual cracks or porosity indications,
and have no evidence of burning through the tube wall.

QW-193.1.2 Liquid Penetrant. The liquid penetrant examination shall meet the requirements of Section V, Article 6. The weld surfaces shall meet the requirements of QW-195.2.

QW-193.1.3 Macro-Examination. The mockup welds shall be sectioned through the center of the tube for macro-examination. The four exposed surfaces shall be smoothed and etched with a suitable etchant (see QW-470) to give a clear definition of the weld and heat-affected zone. Using a magnification of 10X to 20X, the exposed cross sections of the weld shall confirm
(a) minimum leak path dimension required by the design
(b) no cracking
(c) complete fusion of the weld deposit into the tubesheet and tube wall face

Table QW-288.2
Essential Variables for Procedure Qualification of Tube-to-Tubesheet Welding (Explosion Welding)

Paragraph		Brief of Variables
QW-403 Base Metals	.35	ϕ Tube thickness
QW-410 Technique	.82	ϕ Pressure application
	.83	ϕ Explosive
	.84	ϕ Distance charge to tubesheet
	.85	ϕ Specified clearance

Legend:
ϕ Change

QW-410.83 A change in the type of explosive or a change in the energy content greater than ±10%.

QW-410.84 A change in the distance between the explosive charge and the tubesheet face greater than ±10%.

QW-410.85 A change in the specified clearance between the tube and the tubesheet greater than ±10%.

QW-193.2 Performance Qualification Specimens.
A minimum of five mockup tube-to-tubesheet welds are required to qualify each welder or welding operator. The same rules as those applicable for procedure qualification (QW-193.1) shall be followed, with the following additional requirements and exceptions:
(a) The essential variables in QW-387 shall apply.
(b) Essential performance qualification variables applicable for each welding process listed in QW-350 or QW-360 shall also be observed in addition to the variables of Table QW-388.
(c) Postweld heat treatment may be omitted.

Only one mockup weld is required to renew a welder's or welding operator's qualification when that qualification has expired or has been revoked per the requirements of QW-322.1.

Logic to consider motion for approval:

- Explosion welding to plug leaking tubes is supported by qualified written welding procedures and welder qualification procedures compared to other mechanical tube-plugging methods that are performed with no NBIC guidance.
- Explosion welding does not rely on fusion to join the two materials. It is a pressure weld in which the explosive force joins the two materials. Unlike fusion welding that is allowed in other examples of Routine Repairs, there is no heat affected zone, and PWHT is not needed nor required.
- The majority, if not all explosion tube plugging is performed on tubes ¾" and smaller, and typically under emergency conditions. No Inspector involvement would be required if this specific category was added to the categories of Routine Repairs
- The explosion tube-plugging method for tubes ¾" and smaller would be more cost and schedule effective and is proven to be a reliable method for plugging leaking heat exchanger tubes for owners and users.

Note: The only realistic test upon completion of explosion tube-plugging is a pressure test.

Background for Interpretation 18-100

Task Group PM – David Martinez;

Task Group members: Marty Russel and Nathan Carter

Item Number: 18-100 NBIC Location: Part 3, 3.3.2 Attachment Page 44

General Description: Revision adding (plugging) heat exchanger tubes with an outside diameter of ¾" or smaller to NBIC Part 3.3.2 Routine Repairs

Subgroup: Repairs and Alterations

Task Group: David Martinez (PM)

January 2019 Meeting Action: Progress Report: Mr. Martinez reported on this item and presented interpretations (98-04 and 98-29) that may satisfy the revision request, however after a presentation from TEiC regarding the use of explosive welding of tubes to be considered as a routine repair, Mr. Martinez recommend this be considered progress report to continue working to address explosive welding as a Routine Repair.

3.3.2 ROUTINE REPAIRS

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

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

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

d) Alternative welding methods without postweld heat treatment as described in NBIC Part 3, 2.5.3 shall not be used for routine repairs.

(Example of proposed additional category to examples of Routine Repairs – paragraph e)

e) The following repairs may be considered as routine repairs and shall be limited to these categories:

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

NDE other than visual is required by the original code of construction. This includes their attachments such as clips, lugs, skirts, etc., but does not include nozzles to pressure-retaining items;

2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;

3) Weld buildup of wasted areas in heads, shells, flanges and fittings not exceeding an area of 100 in.2 (64,520 mm2) or a thickness of 25% of nominal wall thickness or 1/2 in. (13 mm), whichever is less;

4) Corrosion resistance weld overlay not exceeding 100 in.2 (64,520 mm2); ~~and~~

5) Seal welding a mechanical connection for leak tightness where by-design, the pressure retaining capability is not dependent on the weld for strength and requires no postweld heat treatment; and

6) Plugging of heat exchanger tubes ¾" and smaller when explosive plugging is used as method of plugging tubes.

Background Interpretation

INTERPRETATION 15-04

Subject: Part 3, Section 3

Edition: 2015

Question: Is explosion welding of plugs into leaking heat exchanger tubes considered a repair per the NBIC Part 3?

Reply: Yes.

Support for Consideration of the Proposed Action

ASME Section IX – 2019 (Addresses Procedure and Performance Qualification for Explosion Welding heat exchanger tubes to tubesheets, but not the plug to the tube)

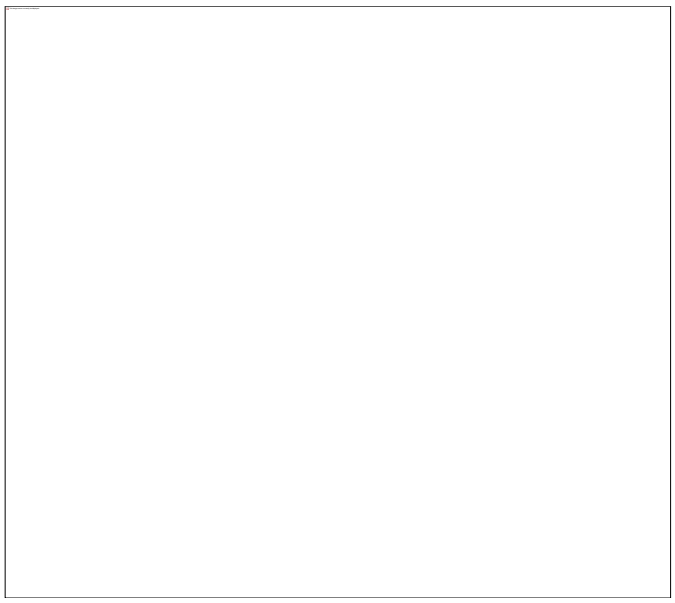
QW-193 TUBE-TO-TUBESHEET TESTS
When the applicable Code Section requires the use of this paragraph for tube-to-tubesheet demonstration mockup qualification, QW-193.1 through QW-193.1.3 shall apply.

QW-193.1 Procedure Qualification Specimens. Ten mockup welds are required for qualifying each tube-to tubesheet welding procedure. The mockup assembly shall essentially duplicate the tube-to-tubesheet weld joint design to be used in production, within the limits of the essential variables of QW-288. The mockup test assembly shall be prepared with the tubesheet element having a thickness not less than the lesser of the thickness of the production tubesheet or 2 in. (50 mm). For tube-to-tubesheet welds to clad tubesheets, the cladding or overlay may be represented by a base material with a chemical composition that is essentially equivalent to the cladding composition. All welds in the mockup assembly shall be subjected to the following tests and shall meet the applicable acceptance criteria.

QW-193.1.1 Visual Examination. The accessible surfaces of the welds shall be examined visually with no magnification required. The welds shall show complete fusion, be free from visual cracks or porosity indications,
and have no evidence of burning through the tube wall.

QW-193.1.2 Liquid Penetrant. The liquid penetrant examination shall meet the requirements of Section V, Article 6. The weld surfaces shall meet the requirements of QW-195.2.

QW-193.1.3 Macro-Examination. The mockup welds shall be sectioned through the center of the tube for macro-examination. The four exposed surfaces shall be smoothed and etched with a suitable etchant (see QW-470) to give a clear definition of the weld and heat-affected zone. Using a magnification of 10X to 20X, the exposed cross sections of the weld shall confirm
(a) minimum leak path dimension required by the design
(b) no cracking
(c) complete fusion of the weld deposit into the tubesheet and tube wall face



QW-410.83 A change in the type of explosive or a change in the energy content greater than ±10%.

QW-410.84 A change in the distance between the explosive charge and the tubesheet face greater than ±10%.

QW-410.85 A change in the specified clearance between the tube and the tubesheet greater than ±10%.

QW-193.2 Performance Qualification Specimens.
A minimum of five mockup tube-to-tubesheet welds are required to qualify each welder or welding operator. The same rules as those applicable for procedure qualification (QW-193.1) shall be followed, with the following additional requirements and exceptions:
(a) The essential variables in QW-387 shall apply.
(b) Essential performance qualification variables applicable for each welding process listed in QW-350 or QW-360 shall also be observed in addition to the variables of Table QW-388.
(c) Postweld heat treatment may be omitted.

Only one mockup weld is required to renew a welder's or welding operator's qualification when that qualification has expired or has been revoked per the requirements of QW-322.1.

Logic to consider motion for approval:

- Explosion welding to plug leaking tubes is supported by qualified written welding procedures and welder qualification procedures compared to other mechanical tube-plugging methods that are performed with no NBIC guidance.
- Explosion welding does not rely on fusion to join the two materials. It is a pressure weld in which the explosive force joins the two materials. Unlike fusion welding that is allowed in other examples of Routine Repairs, there is no heat affected zone, and PWHT is not needed nor required.
- The majority, if not all explosion tube plugging is performed on tubes ¾" and smaller, and typically under emergency conditions. No Inspector involvement would be required if this specific category was added to the categories of Routine Repairs
- The explosion tube-plugging method for tubes ¾" and smaller would be more cost and schedule effective and is proven to be a reliable method for plugging leaking heat exchanger tubes for owners and users.

Note: The only realistic test upon completion of explosion tube-plugging is a pressure test.

Note to Editor: Underlined text below is under consideration and is not intended to be underlined when published.
~~**Note to Staff Secretary: Circulate to Sections I, IV, VIII Div 1 & Div 2, and XII for adoption consideration.**~~

Code Case

Case XXXX

Use of Explosion Welding Process for Tube Plugging

Section IX, ***(*****Circulate to Sections I, IV, VIII Div 1 & Div 2, and XII for adoption consideration.)**

Inquiry: Under what conditions may the Explosion Welding process be used for Tube Plugging?

Reply: It is the opinion of the Committee that the Explosion Welding process may be used for Tube Plugging, when the following conditions are met.

1. General Requirements
   The requirements below shall only be used to qualify the welding procedure and operator performance qualification, using the explosion welding process for the plugging of tubes, when permitted by the referencing code, standard, or specification.

2. Welding Procedure Qualification

(a) The Welding Procedure Specification ~~to~~ shall be used for tube plugging with the explosion welding process as set forth in QW-200.

(b) Essential Variables

(1) a change in the P-Number classification ~~of~~ for any of the materials being joined. This includes the tube and plug materials. When the plug also joins to either the tubesheet or cladding, ~~they~~ these materials shall be included.
(2) a decrease in the nominal tube wall thickness of 10% or more (if the plug is welded to the tube).
(3) a decrease in the proximity of two plugs to be simultaneously joined by explosion welding.
(4) any increase in the number of plugs to be simultaneously joined by explosion welding.
(5) a change in the type of explosive to be used for welding.
(6) a change of 10% or more in the explosive charge mass to be used for welding.

(7) a decrease in the tubesheet ligament.
(8) the deletion of cleaning of the tube, plug, or hole contact surfaces, or a change in the cleanliness requirements (including surface oxide removal) for such surfaces prior to explosion welding.
(9) any change in the nominal plug geometry.
(10) a change of 10% or more in the clearance (stand-off) between the tube or hole and the plug in the bonding area.
(11) the addition or deletion of the use of adjacent hole packing material support bars used to prevent distortion during the welding process
(12) a change in the tubesheet cladding, when the explosive charge is installed within one tube diameter of the cladding metal
(13) for tube plugging, a change in the tube-to-tubesheet welding procedure when the explosive charge is installed within one tube diameter of the tube-to-tubesheet weld [see (e)(1)(-c)]

(c) Nonessential Variables

(1) a change in the P-Number of tubesheet material for tube plugging (when plug is not joined to tubesheet)

(d) Supplementary Essential Variables

(1) There are no Supplementary Essential Variables

(e) Procedure Qualification Specimens

(1) Test Assembly

(-a) The procedure qualification shall be made on a test assembly that replicates the conditions to be used in production with respect to position, tube hole pattern, and the essential variables listed in this Subparagraph.

(-b) The test assembly tubesheet thickness shall be as thick as the production tubesheet, except that it need not be more than 1 in. (25 mm) greater than the length of the explosion plug.

(-c) When the explosive charge is to be placed less than one tube diameter from cladding or a tube-to-tubesheet weld, the qualification test assembly shall include cladding or tube-to-tubesheet welds, as applicable.

(-d) The minimum of ten (10) explosion welds shall be required for procedure qualification.

(2) Examination of Test Assembly

(-a) When explosion welds between plugs and cladding or tube-to-tubesheet welds are required per (e)(1)(-c), such cladding and tube-to-tubesheet welds shall be examined by the liquid penetrant method and shall meet the requirements of Section V, Article 6 and shall apply the acceptance standards of QW-195.2.

(-b) Each plug weld and tube-to-tubesheet weld (when applicable) shall be sectioned longitudinally to reveal two cross-sectional faces, 180-deg apart. After polishing and etching the faces, each explosion weld joint area shall be metallographically examined at 10× or greater magnification for the length of the explosion bond. The bonding shall be considered acceptable if there is a minimum of five times the nominal tube wall thickness of continuous bond between the plug and tube or tubesheet on each cross-sectioned face. Each tube-to-tubesheet weld examination (if applicable) shall be considered acceptable if it is free from explosively produced cracks as determined visually using 10× magnification.

(-c) Ligament distortion caused by explosion welding is unacceptable when the resulting adjacent tube I.D. is less than the diameter of the tube plug.

(-d) The procedure shall be considered qualified when all ten (10) of the required explosion tube

plug welds are found to be acceptable.

3. Welding Operator Performance Qualification

Tube plugging by explosion welding shall be performed by welding operators who have been qualified following the required tests below:

(a) Required Tests. The welding operator shall prepare (if applicable), install, and weld a minimum of five plugs in conformance with an explosion plug Welding Procedure Specification. Acceptance of these plug welds qualifies the operator for welding with all other explosion plug welding procedures.

(b) Examination of Test Assembly. The five plugs shall be examined in accordance with the requirements of QW-193.2 and shall meet these acceptance standards.

(c) Renewal of Qualification. Renewal of qualification shall be performed in accordance with QW-193.2 and QW-322.

(4.) This Case number shall be recorded on the welding procedure specification, procedure qualification record, and welding operator performance qualificication.

~~(d) This Case number shall be shown on the Manufacturer's Data Report when used for new Construction applications.~~

NB Item # 18-102 **Update NBIC Part 3, Table 2.3 (01-16-2019)**

Revise Table 2.3 adding the listed SWPSs that were revised by the AWS B2 Committee in 2018.

PROPOSED REVISION

TABLE 2.3

Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.	**B2.1-1-016: 2018**
Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E6010, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.	**B2.1-1-017: 2018**
Standard Welding Procedure Specification (SWPS) for CO_2 Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E70T-1C and E71T-1C, in the As- Welded, Primarily Plate and Structural Applications.	**B2.1-1-019: 2018**
Standard Welding Procedure Specification (SWPS) for 75% Ar/25%CO_2 Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E70T-1M and E71T-1M, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.	**B2.1-1-020: 2018**
Standard Welding Procedure Specification (SWPS) for Gas Tungsten Followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, ER70S-2 and E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.	**B2.1-1-021: 2018**
Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E6010 (Vertical Uphill) Followed by E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.	**B2.1-1-022: 2018**
Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8, Group 1) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, in the As-Welded Condition, Primarily Plate and Structural Applications.	**B2.1-8-023: 2018**
Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E6010 (Vertical Downhill) Followed by E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.	**B2.1-2-026: 2018**
Standard Welding Procedure Specification (SWPS) for Self-Shielded Flux Cored Arc Welding of Carbon Steel (M-1 or P-1, Groups 1 and 2), 1/8 inch [3 mm] through 1/2 inch [13 mm] Thick, E71T-11, in the As-Welded Condition, Primarily Plate and Structural Applications	**B2.1-1-027:2018**

AWS 82.1-1-016:2018
An American National Standard

Approved by the
American National Standards Institute
April 10, 2018

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2nd Edition

Supersedes AWS B2.1-1-016-94R

Prepared by the
American Welding Society (AWS) 82 Committee on Procedure and Performance Qualification

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This standard contains the essential welding variables for carbon steel in the thickness range of 1/8 inch [3 mm] through 1-1/2 inch [38 mm], using manual shielded metal arc welding. It cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and the allowable joint designs for fillet and groove welds. This SWPS was developed primarily for plate and structural applications.

Foreword

This foreword is not part of this standard but is included for informational purposes only.

The American Welding Society and the Welding Research Council have joined in a cooperative effort to generate standard welding procedures for industry. The need for pretested welding procedures that are supported by adequate test data and that satisfy the technical requirements for the commonly used construction codes and specifications has been expressed by many individuals and organizations. The purpose of a welding procedure qualification is to provide test data for assessing the properties of a weld joint.

This Standard Welding Procedure Specification is an outgrowth of the coordinated work of the Welding Procedures Committee of the Welding Research Council and the AWS B2 Committee on Procedure and Performance Qualification. The Welding Procedures Committee has provided the data documented on the Summary of Procedure Qualification Records.

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Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, 82 Committee on Procedure and Performance Qualification, American Welding Society, 8669 NW 36 St. # 130, Miami, FL 33166.

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Standard Welding Procedure Specification (SWPS) for CO_2 Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2), 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E70T-1C and E71T-1C, in the As-Welded Condition, Primarily Plate and Structural Applications

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This SWPS is the first revision of AWS 82.1-1-019-94 that was amended to correct the permitted positions for E70T-1 electrode. Also, all references to ASME "S" material numbers have been deleted. The latest welding gas designators adopted by AWS A5.32M/A5.32 (ISO 14175 MOD) has been included. A Standard Units of Measure clause was added and the Safety clause was updated. Metric conversions were updated and Annex A on requesting an official interpretation on an AWS standard is included.

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\III

AWS 82.1-1-020:2018
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Standard Welding Procedure Specification (SWPS) for 75% Ar/25% CO_2 Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2), 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E70T-1M and E71T-1M, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications

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AWS 82.1-1-021:2018
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Standard Welding Procedure Specification (SWPS) for Gas Tungsten Arc Welding Followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, ER70S-2 and E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications

2nd Edition

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The welding terms used in this specification shall be interpreted in accordance with the definitions given in the latest edition of AWS A3 .0M/A3.0, *Standard Welding Terms and Definit ions Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying.* The AS.32 designation for weld ing gases shall be those shown in the latest edition of AWS A5.32M/AS.32 (ISO 14175 MOD), *Welding Consumables----{]ases and Gas Mixtures for Fusion Welding and Allied Processes.*

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Th is SWPS is th e first revision of AWS B2.1 -l -02 l -94. A ll references to ASME "S" material numbers have been deleted. The latest welding gas designators adopted by AWS A5.32M /AS.32 (ISO 14175 MOD) has been included. A Standard Units of Measure clause was added, and the Safety clause was updated. Metric conversions were updated and Annex A on requesting an official interpretation on an AWS standard is included.

A vertical line in the margin or underlined text in clauses, tables, or figures indicates an editorial or technical change from the previous edition.

Comments and suggestions for the improvem ent of th is standard are welcome . They should be sent to the Secretary, 82 Comm ittee on Procedure and Performance Qualification, American Welding Society, 8669 NW 36 St, # 130, Miam i, FL 33166.

American Welding Society®

AWS 82.1-1-022:2018
An American National Standard

Approved by the
American National Standards Institute
April 10, 2018

Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, E601O (Vertical Uphill) Followed by E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications

2nd Edition

Supersedes AWS B2.1-l-022-94R

Prepared by the
American Welding Society (AWS) B2 Committee on Procedure and Performance Qualification

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This standard contains the essential welding variables for carbon steel in the thickness range of 1/8 inch [3 mm] through 1-112 inch [38 mm], using manual shielded metal arc welding. lt cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and the allowable joint designs for fillet and groove welds. This SWPS was developed primarily for plate and structural applications.

Foreword

This foreword is not part of this standard but is included for informational purposes only.

The American Welding Society and the Welding Research Council have joined in a cooperative effort to generate standard welding procedures for industry. The need for pretested welding procedures that are supported by adequate test data and that satisfy the technical requirements for the commonly used construction codes and specifications has been expressed by many individuals and organizations. The purpose of a welding procedure qualification is to provide test data for assessing the properties of a weld joint.

This Standard Welding Procedure Specification is an outgrowth of the coordinated work of the Welding Procedures Committee of Welding Research Council and the AWS B2 Committee on Procedure and Perfonnance Qualification. The Welding Procedures Committee has provided the data documented on the Summary of Procedure Qualification Records.

The welding terms used in this specification shall be interpreted in accordance with the definitions given in the latest edition of AWS A3.0M/A3.0, *Standard Welding Terms and Definitions Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying.*

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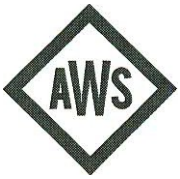

American Welding Society®

AWS 82.1-8-023:2018
An American National Standard

Approved by the
American National Standards Institute
April 10, 2018

Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8 Group 1) 1/8 inch [3 mm] through 1-1/2 inch [38 mm] Thick, in the As-Welded Condition, Primarily Plate and Structural Applications

2nd Edition

Supersedes AWS B2.1-8-023-94R

Prepared by the
American Welding Society (AWS) B2 Committee on Procedure and Performance Qualification

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This standard contains the essential welding variables for austenitic stainless steel in the thickness range of 1/8 inch [3 mm] through 1-1/2 inch [38 mm], using manual shielded metal arc welding. It cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and the allowable joint designs for fillet and groove welds. This SWPS was developed primarily for plate and structural applications.

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American Welding Society®

AWS 82.1-1-026:2018
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Approved by the
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April 10, 2018

Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch [38mm] Thick, E6010 (Vertical Downhill) Followed by E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications

2nd Edition

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Item 19-11 – Hellman – 7-15-2019

Location: Section 9 of Parts 1, 2, 3 and 4

Explanation of Need: Review the use of "Authorized Nuclear Inspection Agency" within the NBIC.

Background: An ANIA can not be an Inservice AIA since Endorsements for nuclear inspectors are issued only to new construction AIA's. The requirements for qualified Authorized Nuclear Inspectors/Supervisors are clearly specified in NB-263, RCI-1. Therefore revision to the Glossary definition is needed to clarify this requirement for the NR Accreditation Program.

Proposed Revision:

1.6.3 PREREQUISITES FOR ISSUING A NATIONAL BOARD "NR" CERTIFICATE OF

AUTHORIZATION

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

a) Have and maintain an inspection agreement with an Authorized Nuclear Inspection Agency accepted in accordance with NB-360, National Board Acceptance of Authorized Inspection Agencies (AIA) Accredited by the American Society of Mechanical Engineers (ASME) with authorization to perform repair and alteration acceptance inspections. ~~or accredited in accordance with NB-369, Accreditation of Authorized Inspection Agencies (AIA) Performing Inservice Inspection Activities and Qualification of Inspectors of Boilers and Pressure Vessels~~.
b) Have a written Quality Assurance Program that complies with the requirements of this section and address all controls for the intended category and scope of activities.
c) Have a current edition of the NBIC.

Item 19-12 – Withers – 01-22-2019

NBIC NR Revisions.

Paragraph 1.6.3 – revise text to clarify Quality Assurance Program requirements:

Existing Text;

b) Have a written Quality Assurance Program that complies with the requirements of this section and address all controls for the intended category and scope of activities.

Revised text;

b) Have a written Quality Assurance Program ~~that complies with the requirements of~~ which includes the quality assurance manual and any supporting procedures, instructions and specifications required to comply with ~~-~~this section. The Quality Assurance Program shall ~~and~~ address all controls for the intended category and scope of activities requested.

Item 19-13 – Hellman – 7-15-2019

NBIC NR Revisions.

Explanation of Need: Revise text to clarify responsibilities for performing audits between the Certificate Holder and the AIA.

Location: Paragraph's 1.6.6.2 s); 1.6.7.2 s); and 1.6.8.2 s) AUDITS

The provisions identified in ASME NQA-1, Part 1, and Requirement 18 shall apply and shall include the following:

A comprehensive system of planned and periodic audits of the NR Certificate Holder's Quality Assurance Program shall be performed. ~~Audits shall include internal audits by the Certificate Holder and audits by the Authorized Inspection Agency.~~ Audit frequency shall be specified in the organization's Quality Assurance Manual. Audits shall be conducted at least annually (within 12 months) for any ongoing code activity to verify compliance with the Quality Assurance Program requirements, performed criteria, and to determine the effectiveness of the Quality Assurance Program. When no code work has been performed, the required annual audit need only include those areas of responsibility required to be continually maintained such as training, audits, organizational structure, and Quality Assurance Program revisions. The Quality Assurance Manual shall as a minimum describe the following:

a. Audits shall be performed in accordance with written procedures or checklists by qualified audit personnel not having direct responsibility in areas being audited;
b. Audit personnel shall be qualified in accordance with the current requirements of ASME NQA-1;
c. Audit results shall be documented and reviewed by responsible management for adequacy and effectiveness of the quality assurance program;
d. Requirements for follow-up actions shall be specified for any deficiencies noted during the audit;
e. Audit records and applicable documentation shall be made available to the Authorized Nuclear Inspect~~or~~ion Agency for review;
f. Audit records shall include as a minimum;
    i. Written procedures
    ii. Checklists;
    iii. Reports;
    iv. Written replies; and
    v. Completion of corrective actions.

Performance of Authorized Inspection Agency audits required by ASME QAI-1 and NB-263, RCI-1 shall be addressed in the Quality Assurance Manual.

Proposed change to repair and alteration plan certificate with respect to ASME Section VIII DIv.2 class 1 vessels

3.3.5.2 REPAIR PLAN

The user shall prepare, or cause to have prepared, a detailed plan covering the scope of the repair.

a) Engineer Review and Certification

The repair plan shall be reviewed and certified by an engineer meeting the criteria of ASME Section VIII, Division 2 or 3, as applicable, for an engineer signing and certifying a Manufacturer's Design Report. The review and certification shall be such as to ensure the work involved in the repair is compatible with the User's Design Specification and the Manufacturer's Design Report. The certifying requirement may be waived for ASME Section VIII, Division 2, Class 1 vessels that did not require the Manufacturer's Design Report to be ~~signed~~ certified during initial construction.

Note: The engineer qualification criteria of the Jurisdiction where the pressure vessel is installed should be verified before selecting the certifying engineer.

3.4.5.1 ALTERATION PLAN

a) Engineer Review and Certification

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

Provided that the alteration does not introduce a condition that would require an engineer to sign the Manufacturer's Design Report for ASME Section VIII, Division 2, Class 1 vessels, the certifying requirement may be waived for vessels that did not require the ~~Manufacture's~~Manufacturer's Design Report to be ~~signed~~ certified during initial construction.

Note: The engineer qualification criteria of the jurisdiction where the pressure vessel is installed should be verified before selecting the certifying engineer.

Justification,

This change is in-line with interpretation 17-08 and is on the basis that some vessel during new construction do not the Manufacture design report to be certified by and Engineer and accordingly repair or alteration plans to the same equipment do not need this step.

I changed the wording of the enquirer as it appeared to waive engineering sign off for all Div.1 class 1 vessels whereas interpretation 17-08 was specifically limited to those which were not required to be signed.

Item 19-16: NBIC Part 3, 3.2.2 e)
Submitted by: Eben Creaser eben.creaser@gnb.ca

Explanation of Need: This wording of this clause is causing confusion. I have had multiple instances where owners have requested to purchase welded replacement parts directly and read this clause with the belief that they can purchase a replacement part for in some cases a welded pressure part for an ASME Section I boiler and safe money by having the fabricator not Hydro test as per Section I even when it was not impractical to have the testing performed.

Background Information: The second sentence of 3.2.2 seems to provide optional provisions that contradict the mandatory requirement stated in the first sentence that requires 3.2.2 c) or d) parts to be pressure tested by the original code of construction. If this is the intent of the committee then the clause should be reworded to add an "or" between the sentences. The wording could also be understood to mean that all parts addressed in 3.2.2 c) or d) have to be pressure tested. But then the second sentence alludes to an optional requirement, it's just not clear.

Proposed Text:
If the intent of this clause is to provide optional pressure test requirements for parts then;

e) Replacement parts addressed by 3.2.2 c) or d) above shall receive a pressure test as required by the original code of construction prior to installation, or, when accepted by the owner, the Inspector and, where required, the Jurisdiction, parts ~~. If replacement parts have not been pressure tested as required by the original code of construction prior to installation they~~ may be installed without performing the original code of construction pressure test provided the owner, the Inspector and, when required, the Jurisdiction accept the use of one or a combination of the examination and test methods shown in Part 3, Section 4, paragraph 4.4.1 (for repairs) or 4.4.2 (for alterations). The R Certificate Holder responsible for completing the R Form shall note in the Remarks section of the R Form the examination(s) and test(s) performed, and the reason the replacement part was not tested in accordance with the original code of construction.

SUPPLEMENT 4
REPAIR AND ALTERATION OF FIBER-REINFORCED THERMOSETTING PLASTIC PRESSURE EQUIPMENT

S4.1 SCOPE

a) This supplement provides requirements and guidelines that apply to repairs and alterations to fiber-reinforced pressure-retaining items.

b) The letters “RP” shall be included on the “R” *Certificate of Authorization* for those organizations authorized to perform repairs/alterations of fiber-reinforced plastic pressure equipment.

S4.2 ~~INSPECTOR~~ QUALIFICATIONS FOR “R” ~~STAMP~~CERTIFICATE HOLDER DESIGNEE

The “R” Stamp Holder~~’s inspector shall have~~ shall designate an employee who will have the responsibility of verifying the repair and/or alteration activity meets the requirements of the NBIC. The designee shall have the following qualifications:

a) No fewer than five years of current verifiable documented experience in an occupational function that has a direct relationship to Reinforced Thermoplastic (RTP) fabrication and inspection, following customer or national standards, and be directly involved in the following activities:

1) the development of plans, drawings, procedures, inspection requirements, acceptance criteria, and personnel qualification requirements;

2) fabrication, construction, and supervision of personnel in the production of assemblies or subassemblies;

3) detection and measurement of nonconformities by application of visual or other nondestructive evaluation processes to written procedures;

4) supervision of personnel engaged in material and component examination;

5) repairs of equipment or supervision of personnel performing repairs;

6) preparation of written procedures for assembly, acceptance, nondestructive evaluation, or destructive tests;

7) qualification of secondary bonders, laminators, and welders to applicable codes, standards, or specifications;

8) operation techniques or activities used to fulfill quality control requirements for RTP fabrication or assembly; and

9) train the occupational skills of fabrication or assembly of RTP equipment.

b) The ~~Inspector~~ designee shall meet the following visual and educational requirements:

1) be able to read a Jaeger Type No. 1 standard chart at a distance of not less than 12 in. (305 mm);

2) be capable of distinguishing and differentiating contrast between colors;

3) have visual acuity checked annually to assure natural or corrected near distance vision; and

4) be a high school graduate or hold a state or military approved high school equivalency diploma.

c) The ~~employer of the inspector~~"R" Certificate Holder shall certify that the ~~employee~~ designee complies with the above qualification requirements.

S4.3 TOOLS

The following tools may be required by the ~~Inspector~~"R" Certificate~~Stamp~~ Holder's designee.:

a) adequate lighting including overall lighting and a portable lamp for close inspections;
b) handheld magnifying glass;
c) Barcol hardness tester;
d) small pick or pen knife;
e) small quantity of acetone and cotton swabs;
f) camera with flash capability; and
g) liquid penetrant testing kit.

S4.4 LIMITATIONS

All field work shall be limited to secondary bonding.

Item 19-21: Part 3, S2.11 a)

S2.11 NONDESTRUCTIVE EXAMINATION AND TESTING

a) The Inspector may require nondestructive examination (RT, PT, MT, UT, and VT) as necessary to ensure satisfactory welded repairs and alterations have been accomplished. (See NBIC Part 3, 4.2)

b) 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.

c) 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.

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

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

f) The integrity of repairs and alterations shall be verified by examination or test. (See NBIC Part 3, 4.4)

REFERENCE: NBIC Part 3, 4.2

4.2 NONDESTRUCTIVE EXAMINATION

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

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

S6.16.4 REGISTRATION OF FORM R-1 AND FORM R-2

a) Organizations performing repairs, alterations, or modifications required by this supplement shall register such repairs, alterations, or modifications with the National Board.

b) The repair organization shall maintain a sequential Form “R” Log that shall identify the following:

1) Form number assigned ~~for Form R-1~~to the “R” Form;
2) Identify if the activity was a repair, alteration, or modification;
3) When the repair, alteration, or modification was completed, and
4) Date sent to the National Board.

Item Number: 19-27, SG Historical
Part 3, S2.13.14.3

S2.13.14.3 REPAIR OF FUSIBLE PLUG OPENING

a) Threaded holes with damaged threads may be repaired by re-tapping or weld buildup and rethreading the threads shall be removed prior to welding.

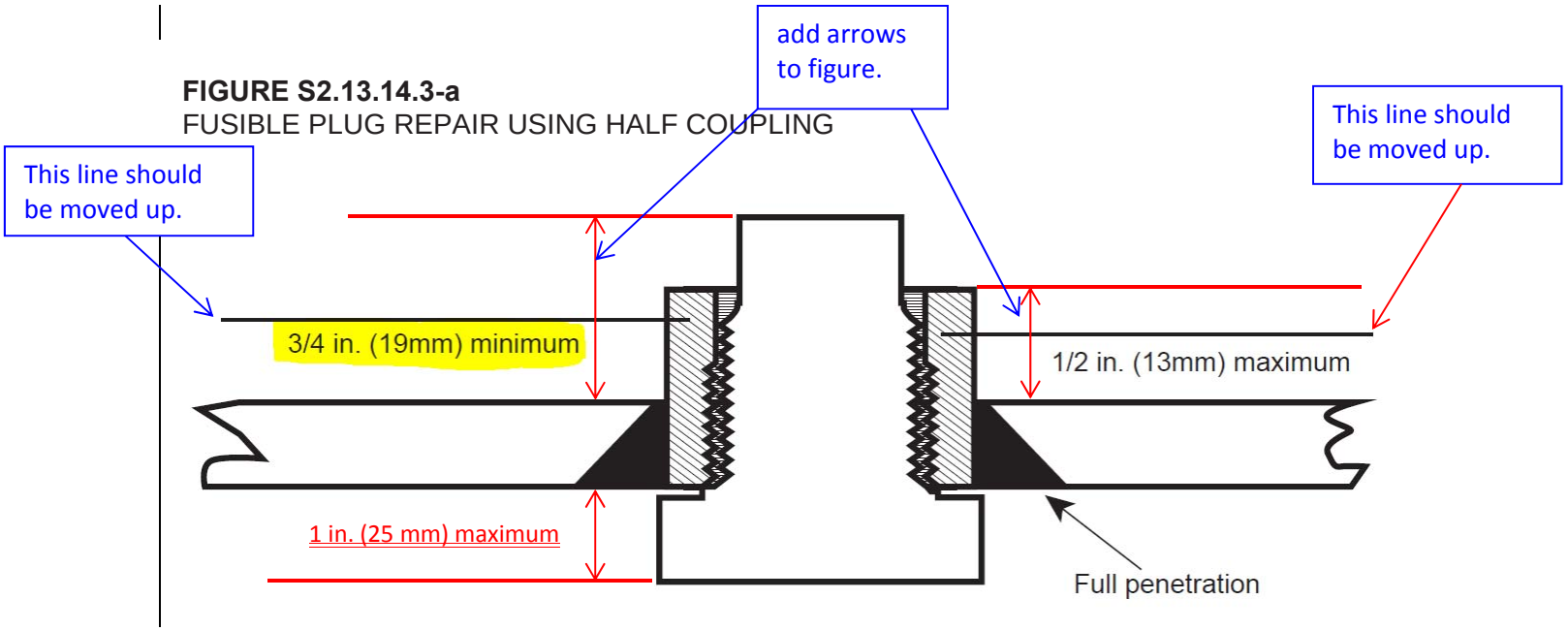
b) Threaded opening with damaged threads that ~~can not~~cannot be repaired by re-tapping or re-threading should be repaired by welding a flush patch or half coupling connection to the sheet.

c) The half coupling connection shall be such a size as to not interfere with proper operation of the fusible plug. The half coupling shall be welded flush to the fire side using a full penetration weld. The half coupling must not project higher than ½ inch (13 mm) from the water side (See Figure NBIC Part 3, S2.13.14.3-a).

d) Flush patch type repairs are to be installed in accordance with S2.13.9.3 and S2.13.10.3 (See Figure S2.13.14.3-b).

e) A fusible plug shall be of such length that when installed it shall project at least ¾ inch (19 mm) on the water side of the plate, tube, or flue. It shall extend through the plate, tube, or flue on the fire side as little as possible but not more than 1 inch (25 mm).

FIGURE S2.13.14.3-a
FUSIBLE PLUG REPAIR USING HALF COUPLING



2) Amended SWPSs: When an amendment occurs the suffix “AMD1” is added to the SWPS designation Amendments are issued when essential for the prompt correction of an error that could be misleading. Amendments are incorporated into the existing text of the SWPS, which is reprinted and clearly marked as incorporating an amendment(s), and which is identified in the revised Foreword of the amended SWPS.

3) Revised SWPSs: When a revision to a published SWPS occurs, the publication date is added to the SWPS designation. The date of the superseded SWPS is also noted on the cover page. Previous versions of the superseded SWPS may be used at the option of the R Certificate holder.

TABLE 2.3

(19)

CARBON STEEL — (M-1/P-1 MATERIALS)

SMAW — Shielded Metal Arc Welding	
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel, (M-1/P-1, Group 1 or 2), 3/16 in. ~~(5 mm)~~ through 3/4 in. ~~(19 mm)~~, in the As-Welded Condition, With Backing.	B2.1.001-90 and B2.1-1-001: 90(R2006)
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. (~~3.2 mm~~) through 1 ½ in. ~~(38 mm)~~ Thick, E7018, As-Welded or PWHT Condition.	B2.1-1-016-94 and B2.1-1-016-94R
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E6010, As-Welded or PWHT Condition.	B2.1-1-017-94 and B2.1-1-017-94R
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E6010 (Vertical Uphill) followed by E7018, As-Welded or PWHT Condition.	B2.1-1-022-94 and B2.1-1-022-94R
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E6010 (Vertical Downhill) followed by E7018, As-Welded or PWHT Condition.	B2.1-1-026-94 and B2.1-1-026-94R
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, E6010 (Vertical Uphill) followed by E7018, (Vertical Uphill) As-Welded Condition, Primarily Pipe Applications.	B2.1-1-201-96, and B2.1-1-201-96(R2007)
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ thick, E6010 (Vertical Downhill) followed by E7018 (Vertical Uphill), As-Welded Condition, Primarily Pipe Applications.	B2.1-1-202-96(R2007)
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, E6010 (Vertical Uphill), As-Welded Condition, Primarily Pipe Applications.	B2.1-1-203-96 and B2.1-1-203-96(R2007)
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, E6010 (Vertical downhill root with balance vertical uphill), As-Welded Condition, Primarily Pipe Applications.	B2.1-1-204-96 and B2.1-1-204-96(R2007)
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E6010 (Vertical Uphill) followed by E7018 (Vertical Uphill), As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-205-96 and B2.1-1-205-96(R2007)

Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ ~~3/4~~ in. ~~(19 mm)~~ Thick, E6010 (Vertical Downhill) followed by E7018 (Vertical Uphill), As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-206-96 and B2.1-1-206-96(R2007)
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ ~~3/4~~ in. ~~(19 mm)~~ Thick, E7018, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-208-96
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through1 ½ in. ~~(38 mm)~~ Thick, E7018, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-208-96(R2007)
GTAW — Gas Tungsten Arc Welding	
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Carbon Steel, (M-1/P-1, Group 1 or 2), 3/16 in. ~~(5 mm)~~ through 7/8 in. ~~(22 mm)~~ Thick, in the As-Welded Condition, With or Without Backing.	B2.1-002-90, B2.1-002-90(R2006) and B2.1-1-002-90R
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ ~~3/4~~ in. ~~(19 mm)~~ Thick, ER70S-2,	B2.1-1-207-96
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER70S-2, As-Welded or PWHT Condition, Primarily Pipe Application.	B2.1-1-207-96 (R2007)
Standard Welding Procedure Specification for Gas Tungsten Arc Welding (Consumable Insert) of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ ~~3/4~~ in. ~~(19 mm)~~ Thick, INMs1 and ER70S-2, As-Welded or PWHT Condition, Primarily Pipe Application.	B2.1-1-210-96
Standard Welding Procedure Specification for Gas Tungsten Arc Welding with Consumable Insert Root of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1-1/2 in. ~~(38 mm)~~ Thick, INMs-1, ER70S-2, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-210:2001 (R2012)
FCAW — Flux Core Arc Welding	
Standard Welding Procedure Specification for Self-Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E71T-8, As-Welded Condition.	B2.1-1-018-94 and B2.1-1.018-94R
Standard Welding Procedure Specification for CO2 Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E70T-1 and E71T-1, As-Welded Condition.	B2.1-1-019-94 and B2.1-1-019-94R and B2.1-1-94-AMD1
Standard Welding Procedure Specification for 75% Ar/25% CO2 Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ ~~1-1/2~~ in. ~~(38 mm)~~ Thick, E70T-1M and E71T-1M, As-Welded or PWHT Condition.	B2.1-1-020-94 and B2.1-1-020-94R and B2.1-1-020-94-AMD1
Standard Welding Procedure for Self-Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1/2 in. ~~(13 mm)~~ Thick, E71T-11, As-Welded Condition.	B2.1-1-027:~~1995~~ 1998 and B2.1-1-027-~~1998~~2011
Standard Welding Procedure Specification (SWPS) for Argon Plus 25% Carbon Dioxide Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E7XT-XM, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-234: 2006

GMAW – Gas Metal Arc Welding	
Standard Welding Procedure Specification for Argon Plus 25% Carbon Dioxide Shielded Gas Metal Arc Welding (Short Circuiting Transfer Mode) followed by Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER70S-3, Flat Position Only, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-233: 2006
Standard Welding Procedure Specification for Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER70S-3, Flat Position Only, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-235: 2006
GTAW/SMAW Combination of Welding Processes	
Standard Welding Procedure Specification for Gas Tungsten Arc Welding Followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-2 and E7018, As-Welded or PWHT Condition.	B2.1-1-021-94 and B2.1-1-021-94R
Standard Welding Procedure Specification for Gas Tungsten Arc Welding followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Groups 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ ~~3/4~~ in. ~~(19 mm)~~ Thick, ER70S-2 and E7018, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-209-96
Standard Welding Procedure Specification for Gas Tungsten Arc Welding followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Groups 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER70S-2 and E7018, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-209-96 (R2007)
Standard Welding Procedure Specification for Gas Tungsten Arc Welding (Consumable Insert) Followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½~~3/4~~ in. ~~(19 mm)~~ Thick, INMs1 and E7018, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-211-96
Standard Welding Procedure Specification for Gas Tungsten Arc Welding with Consumable Insert Root Followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, INMs-1, ER70S-2, and E7018 As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-211:2001 (R2012)
GMAW/FCAW – Combination of Welding Processes	
Standard Welding Procedure Specification for Argon Plus 25% Carbon Dioxide Shielded Gas Metal Arc Welding (Short Circuiting Transfer Mode) Followed by Argon Plus 25% Carbon Dioxide Shielded Flux Cored Arc Welding of Carbon Steel (m-1/P-1/S-1, Groups 1 and 2), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER70S-3 and EXT-X, As-Welded or PWHT Condition, Primarily Pipe Applications.	B2.1-1-232:2006

Austenitic Stainless Steel — (M-8/P-8/~~S8~~ Materials)

SMAW — Shielded Metal Arc Welding	
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, As-Welded Condition.	B2.1-8-023-94
Standard Welding Procedure Specification for Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, E3XX-XX, As-Welded Condition, Primarily Pipe Application.	B2.1-8-213-97 and B2.1-8-213-~~96~~97(R2007)

GTAW — Gas Tungsten Arc Welding	
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, As-Welded Condition.	B2.1-8-024-94
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/16 in. ~~(1.6 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER3XX, As-Welded Condition, Primarily Plate and Structural Applications.	B2.1-8-024:2001
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8~~1/16~~ in. ~~(1.6 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER3XX, As-Welded Condition, Primarily Pipe Applications.	B2.1-8-212-97
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/16 in. ~~(1.6 mm)~~ through 1 ½ in. ~~(38 mm)~~ thick, ER3XX, As-Welded Condition, Primarily Pipe Applications.	B2.1-8-212:2001 (R2012)
Standard Welding Procedure Specification for Gas Tungsten Arc Welding With Consumable Insert Root of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, IN3XX and ER3XX As-Welded Condition, Primarily Pipe Applications.	B2.1-8-215:1998 B2.1-8-215:2001 (R2012)
Combination Processes GTAW/SMAW	
Standard Welding Procedure Specification for Gas Tungsten Arc Welding followed by Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, As-Welded Condition.	B2.1-8-025-94
Standard Welding Procedure Specification for Gas Tungsten Arc Welding followed by Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER3XX and E3XX-XX, As-Welded Condition, Primarily Plate and Structural Applications.	B2.1-8-025:2001
Standard Welding Procedure Specification for Gas Tungsten Arc Welding Followed by Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER3XX and E3XX-XX, As-Welded Condition, Primarily Pipe Applications.	B2.1-8-214-97
Standard Welding Procedure Specification for Gas Tungsten Arc Welding Followed by Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER3XX and E3XX-XX, As-Welded Condition, Primarily Pipe Applications.	B2.1-8-214:2001 (R2012)
Standard Welding Procedure Specification for Gas Tungsten Arc Welding With Consumable Insert Followed by Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ thick, IN3XX, ER3XX, and E3XX-XX As-Welded Condition, Primarily Pipe Application.	B2.1-8-216-1998
Standard Welding Procedure Specification for Gas Tungsten Arc Welding with Consumable Insert Root followed by Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, IN3XX, ER3XX, and E3XX-XX As-Welded Condition, Primarily Pipe Applications.	B2.1-8-216:2001 (R2012)

Combination of Carbon Steel (M-1/P-1 Material) To Austenitic Stainless Steel (M-8/P-8 Material)

SMAW — Shielded Metal Arc Welding	
Standard Welding Procedure Specifications for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Groups 1 or 2) to Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, E309(L)-15, -16, or -17, As-Welded Condition, Primarily Pipe Applications.	B2.1-1/8-228:2002 (R2013)

GTAW — Gas Tungsten Arc Welding	
Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Carbon Steel (M-1/P-1/S-1, Groups 1 or 2) to Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/16 in. ~~(1.6 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, ER309(L), As-Welded Condition, Primarily Pipe Applications.	B2.1-1/8-227:2002, 2002 AMD1 and (R2013)
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding with Consumable Insert Root of Carbon Steel (M-1/P-1/S-1, Groups 1 or 2) to Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/16 in. ~~(1.6 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, IN309 and ER309(L), As-Welded Condition, Primarily Pipe Applications.	B2.1-1/8-230:2002, 2002 AMD1 and (R2013)
GTAW/SMAW Combination of Welding Processes	
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1,Groups 1 or 2) to Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, ER309(L) and E309(L)-15, -16, or -17, As-Welded Condition, Primarily Pipe Applications.	B2.1-1/8-229:2002, 2002 AMD1 and (R2013)
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding with Consumable Insert Root followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1/S-1, Groups 1 or 2) to Austenitic Stainless Steel (M-8/P-8/S-8, Group 1), 1/8 in. ~~(3.2 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, IN3009, ER309, and E309-15, -16, or -17 or IN309, ER309(L) and ER309(L)-15, -16, or -17, As-Welded Condition, Primarily Pipe Applications.	B2.1-1/8-231:2002 (R2015)

Chromium Molybdenum Steel (M-4/P-4 and M-~~5a~~5A/P-5A Materials)

SMAW — Shielded Metal Arc Welding	
Standard Welding Procedure Specifications for Shielded Metal Arc Welding of Chromium-Molybdenum Steel (M-4/P-4, Group 1 or 2), E8018-B2, 1/8 in. ~~(3.2 mm)~~ through ~~1 ½~~1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, PWHT Condition, Primarily Pipe Applications.	B2.1-4-218:1999 (R2009)
Standard Welding Procedure Specifications for Shielded Metal Arc Welding of Chromium-Molybdenum Steel (M-5A/P-5A), E9018-B3, 1/8 in. ~~(3.2 mm)~~ through ~~1 ½~~1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 1½ in. ~~(38 mm)~~ Thick, PWHT Condition, Primarily Pipe Applications.	B2.1-5A-223:1999 (R2009)
GTAW — Gas Tungsten Arc Welding	
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding of Chromium-Molybdenum Steel (M-4/P-4, Group 1 or 2), ER80S-B2, 1/8 in. ~~(3.2 mm)~~ through ~~1 ½~~1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, PWHT Condition, Primarily Pipe Applications.	B2.1-4-217:1999 (R2009)
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding (Consumable Insert Root) of Chromium-Molybdenum Steel (M-4/P-4, Group 1 or 2), E8018-B2, 1/8 in. ~~(3.2 mm)~~ through ~~1 ½~~1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, PWHT Condition, IN515 and ER80S-B2, Primarily Pipe Applications.	B2.1-4-220:1999 (R2009)
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding of Chromium-Molybdenum Steel (M-5A/P-5A), ER90S-B3, 1/8 in. ~~(3.2 mm)~~ through ~~1½~~1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, PWHT Condition, Primarily Pipe Applications.	B2.1-5A-222:1999 (R2009)

Standard Welding Procedure Specifications for Gas Tungsten Arc Welding (Consumable Insert Root) of Chromium-Molybdenum Steel (M-5A/P-5A), 1/8 in. ~~(3.2 mm)~~ through ~~1 1/2~~1 1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 3/4 in. ~~(19 mm)~~ Thick, PWHT Condition, IN521 and ER90S-B3, Primarily Pipe Applications.	B2.1-5A-225:1999 (R2009)
Chromium-Molybdenum Steel Processes GTAW/SMAW	
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding (Consumable Insert Root) followed by Shielded Metal Arc Welding of Chromium-Molybdenum Steel (M-4/P-4, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through ~~1 1/2~~1 1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, PWHT Condition, IN515, ER80S-B2, and E8018-B2, Primarily Pipe	B2.1-4-221:1999 (R2009)
Standard Welding Procedure Specifications for Gas Tungsten Arc Welded followed by Shielded Metal Arc Welding of Chromium-Molybdenum Steel (M-5A/P-5A), 1/8 in. ~~(3.2 mm)~~ through ~~1 ½~~1 1/2 in. ~~(38 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, PWHT Condition, ER90S-B3 and E9018-B3, Primarily Pipe Applications.	B2.1-5A-224:1999 (R2009)
Standard Welding Procedure Specifications for Gas Tungsten Arc Welding (Consumable Insert Root) followed by Shielded Metal Arc Welding of Chromium-Molybdenum Steel (M-5A/P-5A), 1/8 in. ~~(3.2 mm)~~ through ~~1 ½~~1 1/2 in. ~~(38 mm)~~ Thick, As- Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, PWHT Condition, IN521, ER90S-B3, and E9018-B3, Primarily Pipe Applications.	B2.1-5A-226:1999 (R2009)
Standard Welding Procedure Specifications (SWPS) for Gas Tungsten Arc Welded followed by Shielded Metal Arc Welding of Chromium-Molybdenum Steel (M-4A/P-4, Group 1 or 2), 1/8 in. ~~(3.2 mm)~~ through 1/2 in. ~~(13 mm)~~ Thick, As-Welded Condition, 1/8 in. ~~(3.2 mm)~~ through 1 ½ in. ~~(38 mm)~~ Thick, PWHT Condition, ER80S-B2 and E9018-B2, Primarily Pipe Applications.	B2.1-4-219:1999 (R2009)

2.4 AWS REFERENCE STANDARDS

The following AWS Standards have been adopted by the NBIC for use as referenced below:

a) AWS B2.1 - Specification for Welding Procedure and Performance Qualification

b) AWS B2.1 BMG - Base Metal Grouping for Welding Procedure and Performance Qualification

2.5 HEAT TREATMENT

(19) ### 2.5.1 PREHEATING

a) Preheating may be employed during use of a process to assist in completion of the joint. 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. The procedure specification for the material being joined shall specify the preheat temperature requirements.

b) See minimum temperatures for preheating given in NBIC Part 3, Table 2.5.1 as a general guide. It is cautioned that the preheating temperatures listed may not be the same as those of the original code of construction and do not necessarily ensure satisfactory completion of the joint. Requirements for individual materials within the P-Number listing may have preheating requirements more or less restrictive than this general guide. When reference is made in this section to materials by the ASME designation, P-Number and Group Number, the suggestions of this section apply to the applicable materials of the original code of construction, either ASME or other, which conform by chemical composition

Item 19-32: NBIC Part 3, 3.3.2 and 3.4.4
Submitted by: Paul Shanks paul.shanks@onecis.com

Explanation of Need: When heater treaters and some other similar equipment is constructed in accordance with section VIII div.1 an item called a fire tube is often removable (bolted) and should be part of the code boundary. In use these items are consumables and are replaced often with items not bearing the code markings or manufactured to code practices. This practice places the users and public in jeopardy and should be curtailed.

Background Information: ASME VIII Div.1 allows for the code boundary to terminate at a flange face only when connecting to external piping or other code items, if a code fire tube is replace with a none code item the ASME construction code has been violated and the potential for harm is increased. Please be aware that ASME has a task group focused on clarifying the requirements for fire tubes. https://www.glossary.oilfield.slb.com/en/Terms/h/heater_treater.aspx

Proposed Text Changes: see following pages

3.3.2 ROUTINE REPAIRS

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

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

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

d) Alternative welding methods without posteweld heat treatment as described in NBIC Part 3, 2.5.3 shall not be used for routine repairs.

e) The following repairs may be considered as routine repairs and shall be limited to these categories:

1) Welded repairs or replacements of valves, fittings, tubes, or pipes NPS 5 (DN 125) in diameter and smaller, or sections thereof, where neither postweld heat treatment nor NDE other than visual is required by the original code of construction. This includes their attachments such as clips, lugs, skirts, etc., but does not include nozzles to pressure-retaining items;

2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;

3) Weld buildup of wasted areas in heads, shells, flanges and fittings not exceeding an area of 100 in.2 (64,520 mm2) or a thickness of 25% of nominal wall thickness or 1/2 in. (13 mm), whichever is less;

4) Corrosion resistance weld overlay not exceeding 100 in.2 (64,520 mm2);

5) Seal welding a mechanical connection for leak tightness where by-design, the pressure retaining capability is not dependent on the weld for strength and requires no postweld heat treatment; and

6)The replacement (without welding) of a fire-tube with another physically identical item which bears the required code part stamp.

3.4.4 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 required relieving capacity (MRRC) required by the original code of construction as described on the original Manufacturer's Data Report.

j) For plate heat exchangers, in addition to the applicable examples of alterations above, the following changes from what is listed on the MDR or described on the Original Equipment Manufacturer's (OEM)-drawing:

1) For heat transfer plates:
    a. A change in material grade or nominal thickness;
    b. A reduction in number beyond any minimum, or when no minimum is specified;
    c. An increase in number beyond any maximum, or when no maximum is specified;
    d. A change in model type;
2) Any change in material whether described at 3.3.3 s) or as described at 3.4.4 g):
    a. A change in connection bolt or frame compression bolt diameter or material grade;

k) Performing postweld heat treatment where none was originally performed on the pressure retaining item;

l) The installation of a welded leak box; and

m)The replacement of a fire-tube with another which is either not identical or not supplied with code part stamping or requires welding activities.

Item 19-43

6/11/2019

Request for NBIC Part 3, Section 1.6 Revisions

Purpose	Update the edition of ISO/IEC-17025 to include 2017
Scope:	References to "ISO/IEC-17025:2005" need to be changed to include "ISO/IEC-17025:2017" to align with ASME Section III requirements in the following paragraphs: 1.6.6.2 m) 1), 1.6.6.2 m) 4) a), 1.6.6.2 m) 5) a), 1.6.7.2 m) 1), 1.6.7.2 m) 4) a), 1.6.7.2 m) 5) a), 1.6.8.2 m) 1), 1.6.8.2 m) 4) a), 1.6.8.2 m) 5) a)
Background	Based on Interp. 19-44: Many, if not all calibration labs are already accredited to ISO/IEC 17025:2017 and will be required to by 2020. No lab will bother accreditation to 2005 after that, so finding a calibration house will be difficult. Interpretation Item 19-44 intends to allow the 2017 edition of ISO/IEC-17025 to be used currently, however this Action Item (19-43 intends to correct the verbiage in the 2021 Edition of the NBIC.
Proposed Revision	See page 2 for proposed revisions. See pages 3-5 for 2019 ASME Sect III, NCA references.

1.6.6.2, 1.6.7.2, and 1.6.8.2 QUALITY PROGRAM ELEMENTS

m) Control of Measuring and Test Equipment

The "NR" Certificate Holder may utilize calibration and test activities performed by subcontractors when surveys and audits are performed. As an alternative to performing a survey and audit for procuring Laboratory Calibration and Test Services, the "NR" Certificate Holder as documented in their Quality Program may accept accreditation of an International Calibration and Test Laboratory Services by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) provided this alternative method is described in the "NR" Certificate Holder's Quality Program and the following requirements are met:

1) The "NR" Certificate Holder shall review and document verification that the supplier of calibration or test services was accredited by an accredited body recognized by the ILAC MRA encompassing ISO/IEC-17025:2005 or 2017, "General Requirements for the Competence of Testing and Calibration Laboratories".

2) For procurement of calibration services, the published scope of accreditation for the calibration laboratory covers the needed measurement parameters, ranges and uncertainties.

3) For procurement of testing services, the published scope of accreditation for the test laboratory covers the needed testing services including test methodology and tolerances/uncertainty.

4) The "NR" Certificate Holder's purchase documents shall include:

   a. Service provided shall be in accordance with their accredited ISO/IEC-17025:2005 or 2017 program and scope of accreditation;

   b. As-found calibration data shall be reported in the certificate of calibration when items are found to be out-of-calibration;

   c. Standards used to perform calibration shall be identified in the certificate of calibration;

   d. Notification of any condition that adversely impacts the laboratories ability to maintain the scope of accreditation;

   e. Any additional technical and/or quality requirements, as necessary, which may include tolerances, accuracies, ranges, and standards;

   f. Service suppliers shall not subcontract services to any other supplier.

5) The "NR" Certificate Holder shall upon receipt inspection, validate that the laboratory documentation certifies that:

   a. Services provided by the laboratory has been performed in accordance with their ISO/IEC-17025:2005 or 2017 program and performed within their scope; and

   b. Purchase order requirements have been met.

n) Handling, Storage and Shipping

From 2019 ASME Section 3, NCA:

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
11-1037	Revised Table NCA-3200-1, Document Distribution for Division 2 Construction.
11-2161	Added new definition "Certified Design Report Summary."
14-315	Revised Table NCA-7100-2 for TR-3 and TR-4 to the following: *(a)* TR-3 "2008 through 2017." *(b)* TR-4 "2008a through 2017."
15-2538	Revised editorially NCA-4134.17(d) to add lifetime record no. 20.
15-2539	Added reference to NC- and ND-6114.2(d) to NCA-8322.1(d).
16-363	Revised Table NCA-8100-1 to address appurtenances. Revised Form N-2 to address the certification of Nuclear parts and established a new Form N-2A for the certification of Nuclear appurtenances.
16-1827	Revised NCA-3820(c).
16-2116	Updated wording of NCA-3360(b) to show that the Certifying Engineer certifies the Construction Specification and Design Drawings on behalf of the Designer.
16-2145	Revised NCA-1274 to clarify that the inlet and outlet parts of rupture disk holders are to be considered as material, part, or appurtenance.
16-2204	Revised Table NCA-7100-2.
16-2964	Added the 2006 Edition of SNT-TC-1A as an acceptable Edition within Table NCA-7100-2, Table NCA-7100-3, and Table WA-7100-2.
17-650	Restructured and renumbered NCA-3551. Clarified that date of certification is the date(s) the Design Reports are certified with an alternative of the date the Summary is Certified.
17-1111	Revised NCA-3761(a).
17-2058	Revised Table NCA-7100-1 to update the referenced standards.
17-2149	Added reference to NCA-3127 in NCA-4134.7(g).
17-2210	Errata correction. See Summary of Changes for details.
17-2214	Errata correction. See Summary of Changes for details.
17-2295	Clarified the recent revision to the Forewords for Section III and Section XI to properly address all items that have nuclear rules addressing their structural integrity.
17-3081	Changed "Registered Professional Engineer" to "Certifying Engineer" in NCA-3784.2 and NCA-3784.5.
18-340	Revised Table NCA-7100-2 to reference NQA-1-2015. Revised NCA-4100 to clarify the use of NQA-1 Part II and the use of commercial grade dedication for software.
18-355	Added ISO/IEC 17025 reference editions 2005 and 2017 to Tables NCA-7100-2 and NCA-7100-3. Deleted 2005 reference edition from ISO/IEC 17025 in NCA-3126, NCA-3127, NCA-4354.3, NCA-4255.3(c), and NCA-4255.3(d).
18-402	Revised Table NCA-7100-3 to delete two references (PTI M50.1 and AASHTO LRFD Bridge Design Specifications) that are no longer needed based on changes approved in Record 17-718.
18-955	Errata correction. See Summary of Changes for details.
18-1446	Revised NCA-5125(i).
18-1669	Revised Table NCA-7100-3 to update the applicable reference editions.
18-2668	Revised Table NCA-7100-3.

Table NCA-7100-2
Standards and Specifications Referenced in Division 1

(19)

Standard ID	Published Title	Section III Referenced Edition
The American Society of Mechanical Engineers (ASME)		
ASME NQA-1	Quality Assurance Requirements for Nuclear Facility Applications	2015
ASME PTC 25	Pressure Relief Devices	2014
ASME QAI-1	Qualifications for Authorized Inspection	Latest
American Society for Nondestructive Testing (ASNT)		
SNT-TC-1A	Personnel Qualification and Certification in Nondestructive Testing	2006, 2011
American Society for Testing and Materials (ASTM)		
ASTM A275	Standard Test Method for Magnetic Particle Examination of Steel Forgings	2009a
ASTM A673	Standard Specification for Sampling Procedure for Impact Testing of Structural Steel	1977
ASTM E8	Standard Test Methods for Tension Testing of Metallic Materials	1969 through 2015
ASTM E23	Standard Test Methods for Notched Bar Impact Testing of Metallic Materials	2002a
ASTM E94	Standard Guide for Radiographic Examination	1977
ASTM E142	Standard Method for Controlling Quality of Radiographic Testing (Discontinued 2000, Replaced by ASTM E94)	1977
ASTM E185	Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels	1982
ASTM E186	Standard Reference Radiographs for Heavy-Walled [2 in. to 4½ in. (51 mm to 114 mm)] Steel Castings	1967, 1973, 1975, 1979, 2010
ASTM E208	Standard Test Method for Conducting Drop-Weight Test to Determine Nil-Ductility Transition Temperature of Ferritic Steels	1991
ASTM E213	Standards Practice for Ultrasonic Examination of Metal Pipe and Tubing	1979
ASTM E280	Standard Reference Radiographs for Heavy-Walled [4½ in. to 12 in. (114 mm to 305 mm)] Steel Castings	1968, 1972, 1975, 2010
ASTM E426	Standard Practice for Electromagnetic (Eddy-Current) Examination of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys	1988
ASTM E446	Standard Reference Radiographs for Steel Castings up to 2 in. (51 mm) in Thickness	1972, 1975, 1978, 2010
ASTM E571	Standard Practice for Electromagnetic (Eddy-Current) Examination of Nickel and Nickel Alloy Tubular Products	1982 (R1988)
ASTM E606	Standard Practice for Strain-Controlled Fatigue Testing	Latest
ASTM E883	Standard Guide for Reflected-Light Photomicrography	2002
ASTM E1921	Standard Test Method for the Determination of Reference Temperature, T_o, for Ferritic Steels in the Transition Range	2016
ASTM F788	Standard Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series	2013
ASTM F812	Standard Specification for Surface Discontinuities of Nuts, Inch and Metric Series	2012
American Welding Society (AWS)		
AWS A4.2	Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic and Duplex Ferritic-Austenitic Stainless Steel	1991
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	2005, 2017
Plastics Pipe Institute (PPI)		
PPI TR-3	Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe	2008 through 2017
PPI TR-4	PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe	2008a through 2017

Table NCA-7100-3
Standards and Specifications Referenced in Division 2 (Cont'd)

Standard ID	Published Title	Section III Referenced Edition
International Organization for Standardization		
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories	2005, 2017
Post-Tensioning Institute (PTI)		
PTI M10.2	Specification for Unbonded Single Strand Tendons	2017
U.S. Army Corps of Engineers		
CRD-C 36	Method of Test for Thermal Diffusivity of Concrete	1973
CRD-C 39	Test Method for Coefficient of Linear Thermal Expansion of Concrete	1981
CRD-C 44	Method for Calculation of Thermal Conductivity of Concrete	1963

Item Number: 19-47
NBIC Location: Part 3, 1.5.1 k)
No Attachment
General Description: Specify Welding, NDE and Heat Treatment requirements in 1.5.1 of Part 3
Subgroup: Repairs and Alterations
PM: Ray Miletti
Explanation of Need: The Quality Control Elements of "welding, NDE, and Heat Treatment" need to have clear controls. Currently the paragraph really only references welding. NDE and Heat Treatment are only referenced by the last sentence in the paragraph, "Similar responsibility for nondestructive examination and heat treatment shall be described in the manual." Minimum controls or requirements for NDE or Heat Treatment need to be expressed in order for these elements to be auditable.

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

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.~~ The manual shall describe the approval and implementation of nondestructive examination (NDE) procedures as required by the NBIC. NDE personnel shall be qualified and certified as required by the NBIC. All NDE equipment that requires calibration shall have written records documenting calibration. NDE results shall be documented in a form suitable for the type of examination.
The manual shall describe the preparation, approval and execution of preheat and PWHT procedures. The manual shall describe the responsibility for the procedures, monitoring the process, approving and maintaining heat treatment records.

Item Number: 19-50	NBIC Location: Part 3, 3.3.4.3 e) 3) l)	Attachment Page 89
General Description: Revising Part 3, 3.3.4.3 e) 3) l) to match rules of ASME PCC-2 **Subgroup:** Repairs and Alterations **Task Group:** None assigned **Explanation of Need:** There are a couple of typos in the paragraph as it does not match up with the rules of ASME PCC-2 for External Weld Metal Buildup.		

David Martinez (PM)

NBIC Part 3

3.3.4.3 WASTED AREAS

e) External Weld Metal Buildup

3) External weld buildup shall be applied in accordance with the following requirements:

l. For each repair, the maximum dimension (L, length along axis) compensated by a circular or oval weld buildup shall not exceed the lesser of 1/4 the nominal outside diameter ~~or~~ of the component ~~of~~ or 8 in. (200 mm). The length of a rectangular patch is not limited;

ASME PCC-2–2018

Article 202 External Weld Buildup to Repair Internal Thinning

202-3.1.3.1 Prequalified Design. Application of weld buildups on straight piping sections and associated welds to correct limited degradation may be considered a *prequalified design* and shall be exempt from an engineered design qualification or a proof test qualification if all of the following conditions are met:

(f) For each repair, the maximum dimension (*L*, length along axis) compensated by a circular, oval, or rectangular buildup does not exceed the lesser of one-half the nominal outside diameter of the pressure component or 200 mm (8 in.).

Issue: Is the maximum dimension (*L,* length along axis) not to exceed the lessor of ¼ or ½ the nomimal outside diameter of the pressure component, or 8”?

NBIC Part 3

L = length of area to be repaired along the axis of the component

C = length of area to be repaired along outside circumference of the component

W = the completed thickness of the overlay

ą = the angle between the component and the overlay (maximum 45°)

B = 3/4 $(Rt)^{0.5}$ minimum

R = nominal outside radius of the component

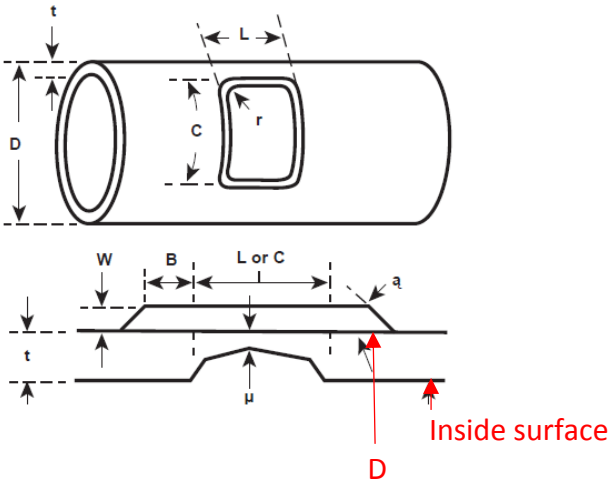
D = the nominal outside diameter of the component

t = nominal wall thickness of the component

μ = remaining wall thickness of the component shall be 1/16 in. (1.6 mm) or greater

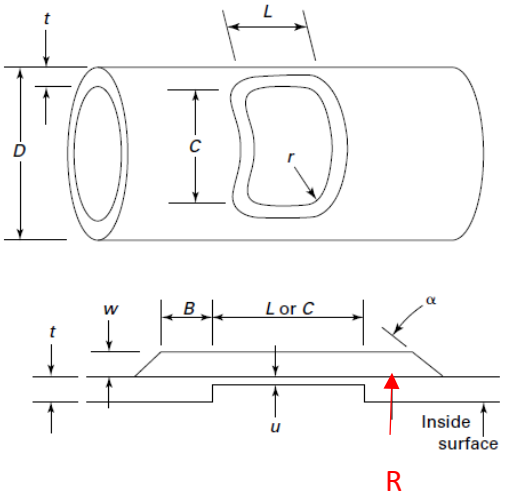
r = minimum radius, not less than the overlay thickness

FIGURE 3.3.4.3-c
EXTERNAL OVERLAY TERMS AND DEFINITIONS



ASME PCC-2

Figure 202-3-1 Weld Buildup Profile



202-3.1.2.2 Extension Beyond Base Metal. The weld shall extend, at full thickness, a minimum distance, B, in each direction beyond the affected base metal (unless otherwise justified by a fitness for service assessment).

$$B = {}^{3}\!/_{4}\sqrt{Rt_{nom}}$$

where

R = outer radius of the component, or $\frac{1}{2}D$

t_{nom} = nominal wall thickness of the component

Item 19-52 - Hellman – 6/25/19

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

4.1 SCOPE

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

4.2 NONDESTRUCTIVE EXAMINATION

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

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

NB19-53
6/25/19
Request for NBIC Part 3, Supplement 2 Revision

Robert V. Underwood
The Hartford Steam Boiler Inspection & Insurance Company

Purpose	To address record retention requirements in Supplement 2.
Scope:	Revise S2.12 to refer to Part 3, 1.5.1(t) record retention requirements.
Background	S2.12 only states that job records "should" be retained by the owner. Paragraph 1.5.1(t) and Table 1.5.1 requires that all job records that substantiates the description of work on the applicable "R" Form be retained for five years. This revision will clarify record retention requirements in Supplement 2 and bring them to compliance with Part 3, Section 1.

PROPOSED REVISION TO SUPPLEMENT 2, S2.12

S2.12 DOCUMENTATION

Organizations performing repairs to historic boilers shall document the repair or alteration on Form R-1 or R-2, as applicable. Job records shall be retained in accordance with NBIC Part 3, 1.5.1 t). Additionally, ~~Permanent~~ documentation detailing repairs or alterations ~~should~~ shall be retained by the owner in permanent boiler records such as an operator log book.

REFERENCE: Part 3, 1.5.1 t)

t) Records Retention

The quality manual shall describe a system for filing, maintaining, and easily retrieving records supporting 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 1.5.1.

Item 19-55

7/9/2019

Request for NBIC Part 3, Section 4 Revision

Purpose	To change the maximum test pressure requirement when performing liquid pressure tests of repair and alteration activities. This proposal was initially part of item NB16-2603, which proposed changes to 4.4.1 a) 1) and 4.4.2 a) 1). However, only the changes to 4.4.1 a) 1) made it into the 2019 NBIC.
Scope:	To revise paragraph 4.4.2 a) 1) of the NBIC Part 3 to require maximum liquid test pressure be in accordance with the original construction Code.
Background	For liquid pressure testing of repairs and alterations, paragraph 4.4.2(a)(1) of the NBIC Part 3 require a maximum test pressure of 150% of the maximum allowable working pressure (MAWP) stamped on the pressure retaining item, as adjusted for temperature. However, repairs and alterations of DOT vessels are required to be tested at a minimum of 150% of design pressure which makes it virtually impossible to comply with the NBIC maximum requirement. Further, repairs and alterations to DOT ammonia transport vessels made from UHT materials require a test pressure of 200% of design pressure (49CFR 180.413(b)(6) and 177.337-16). Obviously, this is in violation of the NBIC Part 3. Paragraph UG-99 of ASME Section VIII, Div. 1 does not not specify a maximum test pressure for hydrostatic tests. Therefore, it is p[proposed that paragraph 4.4.2(a)(1) be revised to remove the maximum test pressure of 150% of MAWP. The paragraph will have new wording (similar to existing paragraph 4.4.1(b) for pneumatic testing) which states test pressure shall not to exceed the maximum test pressure of the original code of construction.
Proposed Revision	See page 2 for proposed revisions.

EXISTING PARAGRAPH 4.4.2(a)(1) of NBIC Part 3

4.4.2 TEST OR EXAMINATION METHODS APPLICABLE TO ALTERATIONS

Based on the nature and scope of the alterations activity, one or a combination of the following examination and test methods shall be applied to alterations and replacement parts used in alterations.

a) Liquid Pressure Test

Pressure testing of alterations shall meet the following requirements:

1) A pressure test as required by the original code of construction shall be conducted. ~~The test pressure shall not exceed 150% of the maximum allowable working pressure (MAWP) stamped on the pressure retaining item, as adjusted for temperature.~~ When the original test pressure included consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance. The pressure test for replacement parts may be performed at the point of manufacture or point of installation;

PROPOSAL OF REVISION TO 4.4.2(a)(1)

1) A pressure test as required by the original code of construction shall be conducted. The test pressure shall not exceed the maximum liquid test pressure of the original code of construction. When the original test ~~t~~pressure included consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance. The pressure test for replacement parts may be performed at the point of manufacture or point of installation.

NB15-0321
AMR suggested edits
7-16-19

Response to D DeMichael Comments:

3.2.4.5 b) I believe for some devices the pin is contained in an enclosure. Thus the enclosure must be opened to compare the pin markings with nameplate markings. These enclosures contain linkages that move during the activation of the pin device. I'm not familiar with the specific details of the design but do we want to provide inspection guidance for the pin that may expose an individual to a physical hazard while the enclosure cover is removed? Note that Section 3 title states "In-service Inspection" so I would think the inspection guidance would be for when the device is exposed to pressure. The manufacturer's instructions should cover how to inspect without hurting yourself.

3.2.5.2 d) The pin device is not being destructively tested. It's either the pin that is being destructively tested or the device's set pressure is verified using a pressure test. You are destructively testing the pin and testing that the valve components still work properly after being in service. I will delete the word "destructively."

3.2.5.2 e) The activation of the pin device is based on the pressure applied to the piston versus the buckling strength of the pin. Exposure of the piston to 100 psi of water provides the same force as a 100 psi of air so why the media requirement? Will be deleted

3.2.5.3 c) As written the activation test can only be done with the device installed in the service piping and then it will be difficult to perform the leak test since you probably don't have access to the back side of the disk. If you remove a disk device with a non-pretorqued holder from the service piping the leak test and activation test will no longer be accurate. Only a "should"

Having reviewed all of former Part 2, Section 2.5.7, the mandatory parts of the optional in-service test should remain mandatory. The mandates are related to safety and to not altering the relief device set pressure.

Per the expanded scope of this project, edits to Part 4 are suggested that separate out general guidance that applies to the testing of any device, and provide specific guidance (in separate subsections) for testing of relief valves, non-reclosing PRDs with pins or bars, and rupture disks.

3.2.4.4 ~~RUPTURE DISKS~~NON-RECLOSING PRESSURE RELIEF DEVICES

g) 11) For non-reclosing PRDs that use pins or bars, those components should be checked for bends/deflection, cracks, or corrosion. Pin deflection may be the results of pin fasteners being overtightened.

g) 12) For non-reclosing PRDs that use pins or bars, the markings on those components should be checked against information on the device nameplate to ensure that they are installed on the correct device. If markings are illegible or missing, the device should be taken out of service and the pin or bar should be replaced with a component specified by the manufacturer. Replacement shall not be performed while the device is pressurized.

g) 13) For non-reclosing PRDs that use pins or bars, check that there is no foreign object present that could interfere with the bar or pin, prevent proper operation of the device, hold the device shut.

g)14) It is recommended that pins or bars be replaced periodically to prevent unintended failure while in service due to deterioration of the load-bearing component.

3.2.5 GENERAL CONSIDERATIONS FOR TESTING AND OPERATIONAL INSPECTION OF PRESSURE RELIEF DEVICES

a) Pressure relief ~~valves shall be tested periodically to ensure that they are free to operate and will operate~~devices shall be subject to periodic inspection and/or testing based upon the type of device. ~~in accordance with the requirements of the original code of construction. Testing should include device~~

~~set or opening pressure, reclosing pressure, where applicable, and seat leakage evaluation. Tolerances specified for these operating requirements in the original code of construction shall be used to determine the acceptability of test results.~~

b) Testing may be accomplished by the owner on the unit where the valve is installed or at a qualified test facility. In many cases, testing on the unit may be impractical, especially if the service fluid is hazardous or toxic. Testing on the unit may involve the bypassing of operating controls and should only be performed
by qualified individuals under carefully controlled conditions. It is recommended that a written procedure be available to conduct this testing.

1) The Inspector should ensure that calibrated equipment has been used to perform this test and the results should be documented by the owner.

2) If the testing ~~was~~ is performed at a test facility, the record of this test should be reviewed to ensure the ~~valve~~ device meets the requirements of the original code of construction. ~~Valves~~ Devices which have been in toxic,
flammable, or other hazardous services shall be carefully decontaminated before being tested. In particular, the closed bonnet of valves in these services may contain fluids that are not easily removed or neutralized. If a test cannot be safely performed, the ~~valve~~ device shall be disassembled, cleaned, ~~and~~ decontaminated, repaired, and reset.

3) If a ~~valve~~ device has been removed for testing, the inlet and outlet connections should be checked for blockage by product buildup or corrosion.

3.2.5.1 TESTING AND OPERATIONAL INSPECTION OF PRESSURE RELIEF VALVES

In addition to 3.2.5, the following apply to testing and operational inspection of pressure relief valves.

a) Pressure relief valves shall be tested periodically to ensure that they are free to operate and will operate
in accordance with the requirements of the original code of construction. Testing should include device set or opening pressure, reclosing pressure, where applicable, and seat leakage evaluation. Tolerances specified for these operating requirements in the original code of construction shall be used to determine the acceptability of test results.

b) Valves may be tested using lift assist devices when testing at full pressure may cause damage to the valve being tested, or it is impractical to test at full pressure due to system design considerations. Lift assist devices apply an auxiliary load to the valve spindle or stem, and using the measured inlet pressure, applied load and other valve data allow the set pressure to be calculated. If a lift assist device is used to determine valve set pressure, the conditions of 4.6.3 shall be met. It should be noted that false set pressure readings may be obtained for valves which are leaking excessively or otherwise damaged.

~~c~~c) If valves are not tested on the system using the system fluid, the following test mediums shall be used:

1) High pressure boiler pressure relief valves, high temperature hot-water boiler pressure relief valves, low pressure steam heating boilers: steam;

2) Hot-water heating boiler pressure relief valves: steam, air, or water;

3) Hot water heater temperature and pressure relief valves: air or water;

4) Air and gas service process pressure relief valves: air, nitrogen, or other suitable gas;

5) Liquid service process pressure relief valves: water or other suitable fluid;

6) Process steam service pressure relief valves: steam or air with manufacturer's steam to air correction factor.

Note: Valves being tested after a repair must be tested on steam except as permitted by 4.6.2.

~~e~~d) As an alternative to a pressure test, the valve may be checked by the owner for freedom of operation by activating the test or "try" lever (manual check). For high pressure boiler and process valves, this test should be performed only at a pressure greater than 75% of the stamped set pressure of the valve or the lifting device may be damaged. This test will only indicate that the valve is free to operate and does not provide any information on the actual set pressure. All manual checks should be performed with some pressure under the valve in order to flush out debris from the seat that could cause leakage.

Note: The manual check at 75% or higher is based on lift lever design requirements for ASME Section I and VIII valves. Code design requirements for lifting levers for Section IV valves require that the valve be

capable of being lifted without pressure.
~~f~~e) Systems with multiple valves will require the lower set valves to be held closed to permit the higher set valves to be tested. A test clamp or “gag” should be used for this purpose. The spring compression screw shall not be tightened. It is recommended that the test clamps be applied in accordance with the valve manufacturer’s instructions when the valve is at or near the test temperature, and be applied hand tight only to avoid damage to the valve stem or spindle.
~~g~~f) Upon completion of set pressure testing, all pressure relief valve gags shall be removed. Any stop valves used to isolate lower set pressure relief devices shall be reopened (and locked, if applicable).

3.2.5.2 TESTING AND OPERATIONAL INSPECTION OF NON-RECLOSING PRESSURE RELIEF DEVICES WITH PINS OR BARS

In addition to 3.2.5, the following apply to testing and operational inspection of non-reclosing PRDs with pins or bars.
a) Periodic set point testing is not required since pins or bars are single use.
b) Periodic inspection shall be per 3.2.4.4.
c) Non-reclosing PRDs shall be periodically inspected by the owner for freedom of motion. Freedom of motion inspection frequency shall be per 3.2.6.
1) Remove pressure from the PRD, or remove the PRD from service, prior to performing this check.
2) Remove the pin or bar.
3) Manually exercise the sealing mechanism to ensure it is capable of its full range of motion.
4) Reinstall the pin or bar or replace with new. Replacement pin or bar shall be per manufacturer recommendation.
5) Restore pressure to the PRD.
6) The PRD should be checked for seat leakage following restoration of pressure.
d) The owner may elect to have a non-reclosing PRD tested periodically in order to determine service life of the device. Such tests should ensure that the PRD is free to operate and will operate in accordance with the requirements of the original code of construction. Testing should include device set or opening pressure and seat leakage evaluation. Tolerances specified for these operating requirements in the original code of construction should be used to determine the acceptability of test results.

3.2.5.3 TESTING AND OPERATIONAL INSPECTION OF RUPTURE DISKS

In addition to 3.2.5, the following apply to testing and operational inspection of rupture disks.

a) Periodic testing of rupture disks is not required
b) Rupture disks shall be subject to periodic inspection per 3.2.4.4.
c) The owner may elect to have a rupture disks tested periodically in order to determine service life. Such tests should ensure that the disk is free to operate inside its holder and will operate in accordance with the requirements of the original code of construction. Testing should include an evaluation of leakage through the disk (e.g. due to cracks or porosity), followed by device opening or burst pressure at rated temperature. Tolerances specified for these operating requirements in the original code of construction should be used to determine the acceptability of test results.
d) If PRDs are not tested on the system using the system fluid, the following test mediums shall be used:
1) Air and gas service PRDs: air, nitrogen, or other suitable gas;
2) Liquid service PRDs: water or other suitable fluid.

3.2.5.~~1~~ 4 CORRECTIVE ACTION

a) If a ~~valve~~ pressure relief valve or a non-reclosing PRD that is actuated by a pin or bar is found to be stuck closed, the system should immediately be taken out of service until the condition

can be corrected, unless special provisions have been made to operate on a temporary basis (such as additional relief capacity provided by another valve.) The owner shall be notified and corrective action such
as repairing or replacing the inoperable ~~valve~~ device shall be taken.
b) If a pressure relief device leaks, the owner shall be notified and decide what corrective action (if any) will be taken.

NB15-0324 Testing, storage, and shelf life guidelines
7-16-19

Updated to respond to comments from failed ballot

BEGIN PROPOSED CHANGE
New glossary entry

Pressure Relief Valve Shelf Life – For a pressure relief valve or pilot valve, the length of time for which the device can be stored, after it has been set and tested or repaired, prior to installation, without requiring a retest or reduced service interval.

New supplement

SUPPLEMENT S8
PRESSURE RELIEF AND PILOT VALVE STORAGE & SHELF LIFE

S8.1 SCOPE

This supplement provides guidance for proper conditions and duration of pressure relief valve storage. This guidance applies to pressure relief valves, temperature & pressure relief valves, and pilot operated pressure relief valves (including the main body valve and the pilot valve).

~~4.2.2.1~~S8.2 PRESSURE RELIEF VALVE STORAGE ~~& SHELF LIFE~~

Pressure relief valve set pressure and/or seat tightness can deviate during storage. The manufacturer's recommendations ~~shall~~ should be followed regarding shelf life. In some cases, it may be necessary to retest the relief valve prior to installation or reduce maintenance interval if the relief valve was in storage for an extended period. When storing relief valves, a first in / first out policy should be followed.

~~4.2.2.1.1~~S8.3 PRESSURE RELIEF VALVE STORAGE CONDITIONS
Relief valves ~~shall~~ should be stored per manufacturer recommendations. Where the manufacturer has no recommendations, the following guidelines should be followed.

a) Storage temperature should be between 40 and 72 °F, where practical. Minimum storage temperature should not be below the minimum operating temperature. Maximum storage temperature should not exceed the lesser of the maximum operating temperature or 125 °F.
b) Ideal relative humidity in the storage area should be 70 percent or less. For relief valves with soft seats, relative humidity should be kept between 30 and 70 percent. Some soft materials require a minimum humidity level to prevent material degradation.
c) Storage area should have a non-corrosive atmosphere. Otherwise, stored relief valves should be protected from the atmosphere.
d) Relief valves that utilize spindles or weights should be stored in a vertical position.
e) Temperature and pressure relief valves should have their probes supported to prevent bending or detachment.
f) All ports should be plugged, blanked, or capped.
g) Relief valves that have been cleaned for oxidizing gas or other specialty service should be sealed in a plastic bag. Plastic wrapping may be acceptable for larger relief valves.

h) Storage should be off the ground (e.g. on a shelf or pallet).
i) Storage area should limit exposure to direct sunlight
j) Relief valves constructed of materials subject to corrosion (such as carbon steel) should be painted or otherwise protected against the environment prior to storage.

~~4.2.2.1.2~~S8.4 PRESSURE RELIEF VALVE SHELF LIFE

Pressure Relief valve shelf life shall be determined based upon manufacturer's recommendations and performance history. Shelf life may increase or decrease based upon storage conditions and performance history. ~~If shelf life is exceeded, the valve shall either be tested prior to installation or tested using its lift lever (if applicable) following installation. Storage for a length of time less than the shelf life of the pressure relief valve does not reduce the time before the first regularly scheduled retest. Where the manufacturer has no~~In the absence of manufacturer or service provider recommendations, and performance history, the shelf life recommendations ~~in~~ per table ~~4.2.2.1.2~~S8.4 should be used when stored in accordance with S8.3. Shelf life may be increased or decreased, from the recommended values, ~~based upon~~once performance history is established. ~~and/or warranty periods offered by the manufacturer or service provider.~~

TABLE S8.4 RECOMMENDED RELIEF VALVE SHELF LIFE (IF NOT PROVIDED BY MANUFACTURER)

Pressure Relief Valve Description	Recommended Shelf Life (years)
Pressure relief valve with metal-to-metal seat	5
Pressure relief valve with nonmetal seat	~~5~~2
Temperature and pressure (T&P) relief valve	2

S8.4.1 EXCEEDING SHELF LIFE

If shelf life is exceeded, the valve shall either be tested prior to installation or tested using its lift lever (if applicable) following installation. Storage for a length of time less than the shelf life of the pressure relief valve does not reduce the time before the first regularly scheduled retest. If performance history shows that time in storage less than shelf life causes the device to function outside of acceptable tolerance, then the shelf life shall be reduced.

END OF PROPOSED CHANGE

Research/Technical Justifications for
NB15-0324 - Create Guidelines for Inspection and Testing Frequencies with respect to shelf life and storage of pressure relief valves.

Note: PRVs with metal-to-metal seats with or without o-ring body seals typically have longer shelf life. Much of the deviation in set point that occurs over time in a PRV is due to compression and creep in the soft seat. This means having o-ring body seals won't impact the shelf life of your metal-seated valve. This note does not apply to valves with o-ring seats. The guidance for soft seats would also apply to o-ring seats.

RegO: Per phone conversation with Fay, shelf life is 10 years without set pressure deviating from tolerance. There is no effect on service life or maintenance schedule if installed before expiration of shelf life. Time after shelf life would be included in maintenance schedule. This means, if you have a 5

year test frequency for your relief valve, and it sits on the shelf for 11 years, your first retest would take place 5 +(11-10) = 4 years after installation, instead of 5 years.

Generant: Per phone conversation with Dino V. D'Onofrio, shelf life is 5 years without set pressure deviating from tolerance. There is no effect on service life or maintenance schedule if installed before expiration of shelf life. Time after shelf life would be included in maintenance schedule. Generant will try to perform some sanity check tests on old inventory ~~before the January meeting. (Waiting for response)~~See results below.

GENERANT Valves & Bi-Lok Fittings

Evaluation Testing Form

	Part Number
Valve 1	CRVP3-250B-K-600
Valve 2	CRVP3-500B-K-232
Valve 3	CRV-500B-K-375

Notes:

Valve 1: K11 = November 2011
Valve 2: K12 = November 2012
Valve 3: A14 = January 2014

Evaluation Date:	1/8/2016
Quantity:	3
Testing Media:	Nitrogen
Tested by:	Tim Knapp
Transducer #:	TR-09

Relief Valves			Test 1 (Initial Crack)			Test 2 (After Initial Crack)			
Valve #	DATE CODE	Nom.	First Bubble	Full Flow	Reseat	First Bubble	Full Flow	Reseat	Testing Notes
1	K11	600	603	607	566	604	607	580	4 years, 2 months
2	K12	232	233	237	212	239	239	227	3 years, 2 months
3	A14	375	389	389	352	384	384	358	2 years

Mueller: Hot water tank relief valves have 2 year shelf life

What is the shelf life of a Mueller Relief Valve?

2 years.

My relief valve discharged "popped" and the setting of the valve seems to be lower!

All Relief Valves must be replaced after they pop. When a Relief Valve pops, debris can get trapped in the seal and the spring can either rotate or take what is called a "set" which can potentially relax the spring and lower the set pressure. Because of this, relief valves must be replaced in order to function properly.

FlowSafe: Per phone conversation and follow-up email from Cindi Zaragoza, shelf life is 1 year without set pressure deviating from tolerance. After that, they recommend lifting the relief valve prior to installing it.

Herose: per email valves have 10 year shelf life without set pressure change.

Anderson Greenwood: (waiting for response)

Watts: Per phone conversation, hot water tank relief valves have indefinite shelf life, but must be tested annually after installation. Hot water tank relief valves are tested immediately after initial start-up of the heater. Thus, time spent on shelf would not impact test frequency anyways. Warranty expires 1 year from date of purchase. So it would be wise not to store relief valve for more than 1 year. **Table above has a 2 year reccomendation?**

ANNUAL OPERATION OF T&P RELIEF VALVES:

WARNING: Following installation, the valve lever MUST be operated AT LEAST ONCE A YEAR by the water heater owner to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, blocking waterways, rendering it inoperative. When the lever is operated, hot water will discharge if the waterways are clear. PRECAUTIONS MUST BE TAKEN TO AVOID PERSONAL INJURY FROM CONTACT WITH HOT WATER AND TO AVOID PROPERTY DAMAGE. Before operating lever, check to see that a discharge line is connected to this valve, directing the flow of hot water from the valve to a proper place of disposal. If no water flows when the lever is operated, replacement of the valve is required. TURN THE WATER HEATER "OFF" (see your water heater instruction manual) AND CALL A PLUMBER IMMEDIATELY.

REINSPECTION OF T&P RELIEF VALVES:

WARNING: Temperature and Pressure Relief Valves should be inspected AT LEAST ONCE EVERY THREE YEARS, and replaced, if necessary, by a licensed plumbing contractor or qualified service technician, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions can only be detected if the valve and its components are physically removed and inspected. Do not attempt to conduct an inspection on your own. Contact your plumbing contractor for a reinspection to assure continuing safety. FAILURE TO REINSPECT THIS VALVE AS DIRECTED COULD RESULT IN UNSAFE TEMPERATURE OR PRESSURE BUILD-UP WHICH CAN RESULT IN SERIOUS INJURY OR DEATH AND/OR SEVERE PROPERTY DAMAGE.

2.3 STORAGE AND HANDLING

A. STORAGE

Prior to installation, Flow Safe pressure relief valve assemblies and parts should be stored in a clean, dry environment if possible. Inlet and outlet connections should remain covered until the item is ready for installation.

For outside storage, protection from the elements is recommended particularly if plugs and flange covers are not weather-tight. Exposed carbon steel surfaces should remain coated with a suitable rust inhibitor until the assembly is ready for installation.

Even though elastomers and lubricants in the relief valve typically have a long shelf life and can be used in environments down to -40 °F/°C, operability of the main piston should be checked before placing the valve in service after extended storage. See Section 2.4.

2.4 INSTALLATION

Prior to installation, check that the set pressure on the nameplate is as required, and meets the system requirements. Lifting and handling should follow the instructions in Section 2.3.

If the valve has been in storage for a significant length of time, verify that the main piston can still freely move by pushing on it manually through the valve inlet. If it does not return to the closed position, it may be necessary to seat the piston using a pressure source connected to the field test, pilot, or main valve cap.

Herose's statement of shelf life:

- Storage temperature between +5°C (278°K) and +20°C (293°K)
- relative humidity should be bellow 70%
- not expose to direct sunlight

Ideally the safety valves remains in their original HEROSE packaging.
The max. period of storage is dependend from the used sealing material (see table).

Soft seal	Shelf life
PTFE (Teflon)	10 years
PTFE /25% Kohle	10 years
PCTFE	10 years
NBR	5 years
FPM (Viton)	10 years
EPDM	5 years
Vullkolan	4 years

From: "Little, Junior R" <jlittle@eastman.com>
To: "Adam_Renaldo@praxair.com" <Adam_Renaldo@praxair.com>
Date: 12/19/2017 01:03 PM
Subject: RE: [I] NB-15-0324 0 PRV shelf life

Adam here is some information for shelf life from Leser. I think I have sent this to you but wanted to make sure.

Regarding shelf life of the valves, depending on the valve seat and size, and also as to how they store them?

O-ring valves, if stored properly and not in a bad environment they should be good for 4 plus years as well metal seats depending on the humidity. We would recommend verification of set before installation

Responses to Survey sent out by Alton Cox

PRV Shelf Life and Pre-Test Prior to Installation Requirements Survey 2018

Background:

This Question was sent to me by an Owner/User VR Holder. I forwarded it to 27 Owner/Users with whom I have an established relationship. 10 Sent Responses. Below are the Responses.

Questioner's Comment:

NBIC for Section VIII PRVs (UV) and ASME OM code (IST applications) pre-testing Pressure Relief Valves is acceptable, but no timeframe is provided between the date of the test and date of installation.

Question 1: ***If you receive a PRV with documented test results from the Vendor (Manufacturer, Assembler or VR Shop), do typically install the PRV directly in the system and use the Vendor Test Documentation as confirmation of PRV Set pressure and Seat Tightness?***

Responder #1: We do; users are allowed to install out of the box provided the PRV is tagged with the installed date within reason of when purchased.

Responder #2: No, we have always tested new PRV's, regardless of vendor test results.

Responder #3: We test all valves for set point and seat leakage prior to install. The exception to this is very large valves that are removed, shipped to vendor for refurb and testing then shipped back and installed. If we had the ability we would test those too.

Responder #4: Yes we do. We usually install RV in a couple days of it being returned to us from a VR SHOP

Responder #5: Depends on how long it sits in our storeroom or shop prior to installation. While we have no specific timing, if we don't install for a month or more after receipt, we'll do a pre-test. We got burned on a new PRV that had a very long, vertical tail pipe. The PRV leaked until material (hot oil) filled the tail pipe and over flowed.

Responder #6: Yes.

Responder #7: Yes.

Responder #8: Since we are an on-site Owner/User VR shop, we test every valve coming
directly from vendors and our storeroom to confirm set pressure, seat tightness and functionality, before it is installed. We send valves that we do not have the capabilities of testing to an outside VR shop for testing, and review their repair records for code conformity, and rely on their assessment of set pressure, seat tightness and functionality. That being said, in performing these “PRE-TESTS”, we have found valves with set pressure, seat tightness or functionality nonconformity issues, which required working with Manufacturers, Vendors and VR
Repair Shops to address and resolve the non-conformities.
PRV Shelf Life and Pre-Test Prior to Installation Requirements Survey 2018
Responder #9: We look at the valve to see if there has been any shipping damage to the valve
and container. If all looks good, AND there is a test certificate with the valve, then we do install into the system without testing. Depending on the type of valve, if there is no test certificate, then we test. (small pull ring type do not usually get tested prior to installation.)
Responder # 10: You have to watch this one because the Section I (V) PSVs because of the
time line of testing , shelf and re-install could be about 14 months. Per Our Corporate standard
==========
Question 2: ***If so, how long is the Shelf Life of the PRV?***
Responder #1: 3 years is allowed.
Responder #2: Up to ~3 months, but we do not have a documented in-house requirement for
shelf life. We always retest the valve before putting it in service, but if it has been less than a few months since WE (in-house) tested the valve, we may put it in service without retesting.
Responder #3: We find a high percentage of valves fail set point and/or leakage even when set
and certified from the manufacture or an independent company.
Responder #4: Now we enter a different game. Valves ordered by ENG. for a project etc. can
have some shelf life. My personal opinion – 6 mo. or less install , 6 mo. or more perform Test Only and RESET the Start Date. (for our PM’s) Primarily basing this off our 3 year interval.
Responder #5: The shelf life is not the big concern to me as long the opening are covered and it
is stored properly. My issue is with the improper storing and handling (banging, bumping, jostling etc.
Responder #6: Variable – we don’t formally track or record the received-on date prior to valve
installation.
Responder #7: Varies…typically ranges from 12 to 36 months.

Responder #8: Since we confirm set pressure and seat tightness on all PRV's before they are
installed, we do not consider this a concern.
Responder #9: Most soft goods have a shelf life of at least 10 years (o-rings, gaskets, diaphragms, soft seats). Our maximum maintenance cycle is 4 years, so the valve could be on the shelf for 4 years, then installed for 4 years, leaving 2 years 'safety factor'. The soft items will be inspected to determine if they can last another maintenance cycle, and if in doubt are changed out.
PRV Shelf Life and Pre-Test Prior to Installation Requirements Survey 2018
Responder #10: I'm glad you are bringing this up because my failure rate of 'NEW" next day
out of the box across the industry is about 95%. If I was using the vendor's test documentation all the time I wouldn't even know there was an issue. The shelf life time line doesn't change anything because they fail out the box the next day and/or new sitting on the shelf for a year. I've been raising the same issue to our lead PRD person because they don't realize how bad it is and they're trusting the vendor doc as being accurate. When I test valves after they come from another VR shop, next day and/or that's been sitting on a shelf for any length of time the failure rate is about 10%.
==========
Question 3: ***Does the "Shelf Life" Time Frame have any technical merit?***
Responder #1: Users are moving slowly to have ready to install spares.
Responder #2: We take the testing/inspection due date to be from the time it was last tested/inspected, not the installation date. We replace our ammonia valves every five years, and only perform a visual inspection of the valve installed in the field during that time; for these valves, we order NEW valves within a couple of months of when they're due to be replaced, and presumably these valves that we receive have been on the shelf for less than 6 months, but we don't have a documented requirement for shelf life.
Responder #3: Based on this we do not track shelf life unless there is an elastomer in the
component.
Responder #4: Now we enter another game. With our new RBI* program, cough cough. Intervals going to 10 years – big whoop if it sat for 3 years – have 7 years left before due. This hasn't been practiced though (yet) – RBI Program is in its infancy at this time.
***NOTE:** Risk-based inspection. Risk Based Inspection (**RBI**) is an Optimal **maintenance** business process used to examine equipment such as pressure vessels, heat exchangers and piping in industrial plants.
Responder #5: Again, depends on storage set up. I think if properly stored, shelf life is not issue.
I would be interested in hearing some of the other responses though. We have several PRV's that may sit on the shelf up to 5 years.
Responder #6: I can see the merit in tracking the shelf life and re-testing valves after a period of
time. For properly stored valves, I would expect the "period of time" would be

on the order of 5 to 7 years.
Responder #7: No - Spare valves stay on the shelf until the scheduled inspection date for the inservice
valve.
PRV Shelf Life and Pre-Test Prior to Installation Requirements Survey 2018
Responder #8: Since we are an Owner/User VR shop, Our Storerooms are controlled, and we
“Pre-Test” all PRV’s before installation, we do not feel that shelf life has any technical merit.
Responder # 9: Yes, it should be considered, especially for o-rings, diaphragms, and soft seats
that are stored as spare parts.
Responder #10: NO RESPONSE GIVEN

NB-1c-0805 ~~AMR~~ AMR edits ~~7 2~~11-22-1~~8 16~~

Update language about pipe material able to handle temperature requirements, in line with IMC.

~~Note that this is already covered in 5.2. So we will be somewhat beating a dead horse~~

~~5.2 GENERAL REQUIREMENTS~~

~~For piping, the basic considerations are: the design temperature, the pressure retained by the pipe, the fluid~~
~~in the pipe, the load resulting from the thermal expansion or contraction, and impact or shock loads imparted~~
~~(such as water hammer, external loads, wind loads and vibration from equipment).~~

Proposed Edits (Note that we intentionally are not adding this to power boilers. Power boilers are getting their own supplement that will include PRV piping requirements specific to power boilers):

Part 1, 3.9.1.5 PRESSURE RELIEF VALVE DISCHARGE PIPING

~~i~~c) ~~The design~~ Discharge piping shall be rated for the discharge fluid conditions of pressure and temperature including a minimum and maximum design temperature. Material selection for the discharge piping shall consider the reduction in material toughness at the low end of design temperature and the reduction in material strength at the high end of design temperature[DDB1][RA2]. Rigid pipe or tubing ~~shall~~should be used for discharge lines that carry hot water or steam.

~~k)~~
~~lreduction in mechanical strength (e.g.threads/flanges/components), bonding strength of joints, exposure to discharge media,~~d) Plastic discharge pipe and fittings are permitted (when compatible with the process fluid, system design temperatures, and other ambient conditions such as light and humidity) and shall conform to NSF/ANSI 14 Plastics Piping System Components and Related Materials.[DDB3][RA4]
~~m~~
e~~n~~) Discharge piping shall be rated for any static pressure present and the back pressure that may develop when the pressure relief device is at full capacity[DDB5][RA6]. Where multiple pressure relief devices or vents discharge into common piping, the back pressure that could develop due to simultaneous flow from all sources shall be considered.

Repeat the same addition to the following paragraphs (note that the letters change)

Part 1, 3.9.4.7 TEMPERATURE AND PRESSURE RELIEF VALVE DISCHARGE PIPING

~~i The design~~ ~~Material selection for the~~

~~k) lreduction in mechanical strength (e.g.threads/flanges/components), bonding strength of joints, exposure to discharge media,mn designcapacitycommond)~~
e)
f)

Part 4, 2.4.1.5 PRESSURE RELIEF VALVE DISCHARGE PIPING

c)
d)

e)

Part 4, 2.4.4.7 TEMPERATURE AND PRESSURE RELIEF VALVE DISCHARGE PIPING

c)
d)
e)

~~i) The design~~ ~~Material selection for the~~

~~k) lreduction in mechanical strength (e.g.threads/flanges/components), bonding strength of joints, exposure to discharge media,mn designcapacitycommon~~ j)
k)
l)

7/16/2019 – Main Committee ballot comments on last page

Item Numbers: 17-131 (Pressure Relief) and 17-159 (Installation) NBIC Location: Part 4, 2.5.7 a) and Part 1, 4.7.3 a)

17-131 General Description: Review overpressure protection requirements for hot water storage tanks that exceed 160 psi.

17-159: General Description: Result of 17-147; review Part 1, 4.7 for references to hot water storage tanks. With the definition of Potable Hot Water Storage Tank items referencing this in Part 1, Section 4.7 need to be updated, modified and or revised.

The following proposal combines the proposals from 17-131 and 17-159.

"Hot water storage tank" is deleted from 4.7.3 a) because is covered in c), and the temperature could exceed 210 deg. F. for those vessels. The item from installation was not changed otherwise. The Part 4, par. 2.5.7 is new but is just Part 1, par. 4.7 slightly rewritten.

Proposal:

NBIC Location: Part 1, 4.7

4.7 REQUIREMENTS FOR HOT WATER STORAGE TANKS/POTABLE HOT WATER STORAGE TANK
4.7.1 SUPPORTS
Each hot water storage tank shall be supported in accordance with NBIC Part 1, 1.6.1.
4.7.2 CLEARANCE AND ACCEPTABILITY
a) The required nameplate (marking or stamping) should be exposed and accessible.
b) The openings when required should be accessible to allow for entry for inspection and maintenance.
c) Each hot water storage tank shall meet the requirements of NBIC Part 1, 4.3.2.
4.7.3 TEMPERATURE AND PRESSURE RELIEF DEVICES
a) Each potable hot water storage tank~~/ hot water storage tank~~ shall be equipped with an ASME/NB certified temperature and pressure relief ~~device~~ valve set at a pressure not to exceed the maximum allowable working pressure and 210°F (99°C).
b) Potable hot water storage tanks exceeding the pressure limit of ASME Code Section IV shall meet the original code of construction and shall be protected by a pressure relief ~~device~~ valve set not to exceed the vessel's maximum allowable working pressure. A temperature limiting device shall be installed so that the water inside the storage tank does not exceed 210°F (99°C).
c) Each hot water storage tank shall be equipped with an ASME/NB certified pressure relief valve set at a pressure not to exceed the maximum allowable working pressure.
d) The temperature and pressure relief ~~device~~ valve shall meet the requirements of NBIC Part 1, 4.5.

4.7.4 THERMOMETERS

a) Each hot water storage/potable hot water storage tank shall be equipped with a thermometer.
b) Each hot water storage/potable hot water storage tank shall have a thermometer so located that it shall be easily readable at or near the outlet. The thermometer shall be so located that it shall at all times indicate the temperature of the water in the storage tank.

4.7.5 SHUT OFF VALVES
a) Each hot water storage/potable hot water storage tank shall be equipped with stop valves in the water inlet piping and the outlet piping in order for the hot water storage tank to be removed from service without having to drain the complete system.
b) Each hot water storage/potable hot water storage tank shall be equipped with a bottom drain valve to provide for flushing and draining of the vessel.

NBIC Location: Part 4, 2.5.7

2.5.7 TEMPERATURE AND PRESSURE RELIEF DEVICES FOR HOT WATER STORAGE TANKS/POTABLE HOT WATER STORAGE TANK

a) Each potable hot water storage tank shall be equipped with an ASME/NB certified temperature and pressure relief ~~device~~ valve set at a pressure not to exceed the maximum allowable working pressure and 210°F. (99°C).
b) Potable hot water storage tanks exceeding the pressure limit of ASME Code Section IV shall meet the original code of construction and shall be protected by a pressure relief ~~device~~ valve set not to exceed the vessel's maximum allowable working pressure. A temperature limiting device shall be installed so that the water inside the storage tank does not exceed 210°F (99°C).
c) Each hot water storage tank shall be equipped with an ASME/NB certified pressure relief valve set at a pressure not to exceed the maximum allowable working pressure.

~~b~~d) The temperature and pressure relief ~~device~~ valves shall meet the requirements of 2.5.1 through 2.5.6 above.

Archived Comments for Ballot: 17-131159-MC	
Amato,Joel 3/5/2019 10:55:03 AM	Do we define "hot water storage tank" and "potable hot water storage tank"? Is there a difference? I think we also need to remain consistent with the terms device and valve.
Ball,Joseph 3/4/2019 8:53:59 AM *Reply To: Newton,Venus*	When a Section VIII vessel is used the new paragraph b) has two separate requirements in two separate sentences. The first is for a pressure relief device for overpressure protection (a separate comment on valve vs. device will be supplied). The second sentence requires a "temperature limiting device" that give the same temperature protection as a T&P valve. This would usually be a control valve of some type. This addresses the problem that T&P valves are not available under Section VIII, and at pressures higher than 160 psig.
Newton,Venus 3/4/2019 6:57:24 AM	The wording is confusing to me. It looks like you not only need a pressure relief device, but that a temperature and pressure relief valve is also always required, even on the Section VIII storage tanks.
Wadkinson,Melissa 2/27/2019 10:10:16 AM	Regarding the use of device vs valve, if the tank exceeds the pressure limitations of Section IV it will be built to Section VIII and over pressure protection does not necessarily have to be a valve.
Richards,Michael 2/25/2019 2:54:00 PM	Concur with Mr. Galanes observation.
Galanes PE,George 1/30/2019 10:58:52 AM	GWG comment; I have no objection to the proposed revisions. I am abstaining because I do see the words valve and device are used interchangeably. We should stick with device rather than valve to be consistent.

Item #NB 18-73 Rev 7/22/19

Proposal:

PART 4

2.3 OVER PRESSURE PROTECTION FOR THERMAL FLUID HEATERS

2.3.1 GENERAL
Thermal fluid heaters shall be provided with overpressure protection in accordance with the code of construction.

2.3.2 PRESSURE RELIEF ~~DEVICES~~ VALVES
Thermal fluid heaters shall be equipped with one or more pressure relief ~~devices~~ valves unless the option for overpressure protection by system design is utilized (when permitted by the original code of construction).

When pressure relief ~~devices~~ valves are used, the following shall apply:
a) Pressure relief valve(s) shall be of a totally enclosed type. ~~A body drain is not required~~

~~b) Rupture disks may be installed upstream or downstream of the pressure relief valve(s) in accordance with the original code of construction.~~

b) A lifting lever shall not be used in Pressure relief valve(s). A body drain is not required.

c) Pressure relief valves ~~and rupture disks~~ shall be in accordance with the code of construction and designed for liquid, vapor, or combination service as required for the specific installation, service fluids, and overpressure conditions.

d) Cast iron fittings shall not be used.

e) Copper and copper alloys shall not be used.

f) The inlet connection to the valve shall be not less than NPS ½ (DN 15).

2.3.3 LOCATION
a) Pressure relief ~~devices~~ valves shall be connected to the heater in accordance with the original code of construction.

2.3.4 CAPACITY
a) The pressure relief ~~device(s)~~ valves shall have sufficient capacity to prevent the pressure vessel from exceeding the maximum pressure specified in the vessel code of construction.

2.3.5 SET PRESSURE
a) When a single relief ~~device~~ valve is used, the set pressure marked on the ~~device~~ valve shall not exceed the maximum allowable working pressure.

b) When more than one pressure relief ~~device~~ valve is provided to obtain the required capacity, only one pressure relief ~~device~~ valve set pressure needs to be set at or below the maximum allowable working pressure. The set pressure of the additional relief ~~devices~~ valves shall be such that the pressure cannot exceed the maximum pressure permitted by the code of construction.

2.3.6 INSTALLATION

Pressure relief valves and the associated discharge piping shall be installed in accordance with the heater Manufacturer's recommendations. The installation of the pressure relief valves required for Thermal Fluid Heaters shall include but not be limited to following requirements.

a) The pressure relief valve shall be provided with discharge piping. ~~When a discharge pipe is used,~~ The cross-sectional area of discharge piping shall not be less than the full area of the valve outlet. The size of the discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity or adversely affect the operation of the attached pressure vessel relief ~~devices~~ valves. Discharge piping shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief

~~device~~ valve.

b) The pressure relief valve or valves shall be connected to the pressure vessel independent of any other connection, and shall be attached as close as possible without any unnecessary intervening pipe or fitting.

c) The cross sectional area of the piping between the heater and the relief ~~device~~ valve shall be sized either to avoid restricting the flow to the pressure relief ~~devices~~ valves or made at least equal to the inlet area of the pressure relief ~~devices~~ valves connected to it.

d) When two or more required pressure relief ~~devices~~ valves are placed on one connection, the inlet cross-sectional area of this connection shall be sized either to avoid restricting the flow to the pressure relief ~~devices~~ valves or made at least equal to the combined inlet areas of the pressure relief ~~devices~~ valves connected to it.

e) Unless permitted by the code of construction, there shall be no intervening stop valve between the vessel and its pressure relief ~~device(s)~~ valves, or between the pressure relief ~~device~~ valve and the point of discharge.

f) Pressure relief ~~device~~ valve discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location, such as a catchment tank, for the disposal of fluids being relieved.

g) The pressure relief discharge ~~should~~ shall be connected to a closed, vented storage tank or blowdown tank with solid piping (no drip pan elbow~~,~~ or other air gap).

When outdoor discharge is used, the following ~~should~~ shall be considered for discharge piping hazards.

At the point of discharge:

1) Both thermal and chemical reactions (personnel hazard)

2) Combustible materials (fire hazard)

3) Surface drains (pollution and fire hazard)

4) ~~Loop seal or~~ Rain cap on the discharge ~~(keep both air and water out of the system)~~, if installed the opening cross sectional area shall be equal to or greater than the discharge piping.

Along the discharge piping:

5) Drip leg near device and anywhere ~~into~~ ~~loop~~ along the discharge line ~~point~~ (prevent liquid collection)

6) Heat tracing for systems using high freeze point fluids (prevent blockage)

h) Discharge lines from pressure relief ~~devices~~ valves shall be designed to facilitate drainage or be fitted with low point or valve body drains to prevent liquid from collecting in the discharge side of a pressure relief ~~device~~ valve. Drain piping shall discharge to a safe location for the disposal of the fluids being relieved. The possibility of solidification of fluid leakage into the discharge piping system shall be considered.

~~h) A suitable condenser that will condense all the vapors discharged from the pressure relief valve may be used in lieu of piping the vapors to the atmosphere.~~

~~i) In order to minimize the loss by leakage of material through the pressure relief valve, a rupture disk may be installed between the pressure relief valve and the vaporizer, provided the following requirements are met:~~

~~1). The cross-sectional area of the connection to a vaporizer shall be not less than the required relief area of the rupture disk.~~

~~2) The maximum pressure of the range for which the disk is designed to rupture shall not exceed the opening pressure for which the pressure relief valve is set or the maximum allowable working pressure of the vessel.~~

~~3) The opening provided through the rupture disk, after breakage, shall be sufficient to permit a flow equal to the capacity of the attached valve, and there is no chance of interference with the proper functioning of the valve, but in no case shall this area be less than the inlet area of the valve.~~

~~4) The space between a rupture disk and the valve shall be provided with a pressure gage, try cock, free vent, or a suitable telltale indicator. This arrangement permits the detection of disk rupture or leakage.~~

i) Pressure relief valve discharge capacity for liquid service shall be determined from the following equation:

For Liquid
U.S. Customary Units
$W = 2{,}407KA\sqrt{(P - Pd)w}$

SI Units
$W = ~~5092~~ 5.092\ KA\sqrt{(P - Pd)w}$

Where.
W = Liquid Capacity in lb/hr (kg/hr).
A = Discharge Area of Pressure relief Valve, in² (mm²)
K = coefficient of discharge for valve design
P = (Set pressure + OP + Atmosphere pressure, psia (Mpa)
OP = Overpressure required for Pressure Relief
Valve to reach capacity specified in
code of construction
Pd = Pressure at discharge of valve, psia (Mpa)
w = Specific ~~liquid~~ weight of liquid at inlet condition
lb/ft³ (kg/m³)

To convert lb/hr of water to gal/min, multiply the capacity in lb/hr by 1/500.

!!!!!!! (SEE PART 1 PROPOSAL ON NEXT PAGE) !!!!!!!

PROPOSAL:

Part 1 SUPPLEMENT 5

S5.7.6 INSTALLATION

Pressure relief valves and the associated discharge piping shall be installed in accordance with the heater Manufacturer's recommendations. The installation of the pressure relief valves required for Thermal Fluid Heaters shall include but not be limited to following requirements.

a) The pressure relief valve shall be provided with discharge piping. ~~When a discharge pipe is used,~~ The cross-sectional area of discharge piping shall not be less than the full area of the valve outlet. The size of the discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity or adversely affect the operation of the attached pressure vessel relief ~~devices~~ valves. Discharge piping shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief ~~device~~ valve.

b) The pressure relief valve or valves shall be connected to the pressure vessel independent of any other connection, and shall be attached as close as possible without any unnecessary intervening pipe or fitting.

c) The cross sectional area of the piping between the heater and the relief ~~device~~ valve shall be sized either to avoid restricting the flow to the pressure relief ~~devices~~ valves or made at least equal to the inlet area of the pressure relief ~~devices~~ valves connected to it.

d) When two or more required pressure relief ~~devices~~ valves are placed on one connection, the inlet cross-sectional area of this connection shall be sized either to avoid restricting the flow to the pressure relief ~~devices~~ valves or made at least equal to the combined inlet areas of the pressure relief ~~devices~~ valves connected to it.

e) Unless permitted by the code of construction, there shall be no intervening stop valve between the vessel and its pressure relief ~~device(s)~~ valves, or between the pressure relief ~~device~~ valve and the point of discharge.

f) Pressure relief ~~device~~ valve discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location, such as a catchment tank, for the disposal of fluids being relieved.

g) The pressure relief valve discharge shall be connected to a closed, vented storage tank or blowdown tank with solid piping (no drip pan elbow or other air gap).

When outdoor discharge is used, the following shall be considered for discharge piping hazards.

At the point of discharge:

1) Both thermal and chemical reactions (personnel hazard).

2) Combustible materials (fire hazard)

3) Surface drains (pollution and fire hazard)

4) Rain cap on the discharge, if installed the opening cross sectional area shall be equal to or greater than the discharge piping.

Along discharge piping:

5) Drip leg near device and anywhere along the discharge line (prevent liquid collection)

6) Heat tracing for systems using high freeze point fluids (prevent blockage)

h) Discharge lines from pressure relief valves shall be designed to facilitate drainage or be fitted with low point or valve body drains to prevent liquid from collecting in the discharge side of a pressure relief valve. Drain piping shall discharge to a safe location for the disposal of the fluids being relieved. The possibility of solidification of fluid leakage into the discharge piping system shall be considered.

18-87, Edwards, 01-15-19

Reference: Part 4, Supplement 6, S6.4.b.2

Discussion: Part 4, S6.4.b.2 was revised under 16-0603 and approved for publication in the 2019 Edition. Inserting the word *"Nuclear"* in reference to an Authorized Inspection Agency was subsequently approved in response to PR18-0403, however on further review this action is incorrect. The ASME QAI-1 Standard does not include *"Nuclear"* in reference to accredited AIAs (only in reference to Supervisors and Inspectors). In addition, the ASME QAI-1 Standard does not address *"inspection of repaired nuclear pressure relief valves"* by AIAs.

Proposal: Action is proposed to revise Part 4, S6.4.b.2 in accordance with the following:

~~Have a contract or agreement with an Authorized Nuclear Inspection Agency that is qualified in accordance with the requirements of ASME QAI-1, Qualifications for Authorized Inspection to provide inspection of repaired pressure relief devices;~~ Have a contract or agreement with an Authorized Inspection Agency that is accredited in accordance with the requirements of ASME QAI-1, "Qualifications for Authorized Inspection" to provide nuclear inspection services;

NBIC Part 4

SUPPLEMENT 3

GUIDE TO JURISDICTIONS FOR AUTHORIZATION OF OWNERS OR USERS TO MAKE ADJUSTMENTS TO PRESSURE RELIEF VALVES

S3.1 GENERAL

The Jurisdiction may authorize properly trained and qualified employees of boiler and pressure vessel owners or users or their designees to confirm or restore set pressure shown on the unmodified original nameplate or stamping, or repair nameplate and/or performance of pressure relief valves. All external adjustments shall be resealed with a seal identifying the responsible organization and a metal tag that identifies the organization and the date the adjustment shall be installed.

S3.2 TRAINING

a) The user shall establish a documented in house training program. This program shall establish training objectives and provide a method of evaluating the training effectiveness. As a minimum, training objectives for knowledge level shall include:

1) Applicable ASME Code and NBIC requirements;

2) Responsibilities within the organization's quality system;

3) Knowledge of the technical aspects and mechanical skills for making set pressure and/or blowdown adjustments to pressure relief valves; and

4) Knowledge of the technical aspects and mechanical skills for marking of pressure relief valve adjustments.

b) If the user established a designee, the designee shall establish a training program and make their documentation available to the user and the Jurisdictional authority.

S3.3 DOCUMENTATION

Each user shall document the evaluation and acceptance of an employee's or designee's qualifications.

S3.4 QUALITY SYSTEM

a) A written quality system shall be established by either the user or the designee with a written description available to the Jurisdictional authority.

b) The written description shall include at a minimum:

1) Calibration of Test Equipment: This shall describe a system for the calibration of measuring and test equipment. Documentation of these calibrations shall include the standard used and the results. Calibration standards shall be calibrated against the equipment having valid relationships to nationally recognized standards.

2) Valve Testing, Setting, and Sealing: This system shall include provisions that each valve shall be tested, set, and all external adjustments sealed according to the requirements of the applicable ASME Code section and S3.1.

3) Valve Marking: An effective marking system shall be established to ensure proper marking of the metal tag required by S3.1. The written quality system shall include a description or drawing of the metal tag.

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~~S3.5 EXTERNAL ADJUSTMENTS~~

~~Only external adjustments to restore the set pressure shown on the unmodified original nameplate or stamping, or repair nameplate and/or performance of a pressure relief valve shall be made under the provisions of 2.2.5 and S3.1.~~

~~S3.6 REPAIRS~~

~~If disassembly, change of set pressure, or additional repairs are necessary, the valve shall be repaired by an organization that meets the requirements of the NBIC.~~

NB11-1901

SUPPLEMENT X
INSTALLATION OF HIGH PRESSURE COMPOSITE PRESSURE VESSELS

SX.1 SCOPE

This supplement provides requirements for the installation of high-pressure composite pressure vessels. This supplement is applicable to pressure vessels with an MAWP not exceeding 15,000 psi, and is applicable to the following classes of vessels:

a) Metallic vessel with a Fiber Reinforced Plastic FRP) hoop wrap over the shell part of the vessel both load sharing)

b) Metallic vessel with a full FRP wrap (both load sharing)

c) FRP vessel with a non-load sharing metallic liner

d) FRP vessel with a non-load sharing non-metallic liner

SX.2 SUPPORTS

Design of supports, foundations, and settings shall consider the dead loads, live loads, wind, and seismic loads. Vibration and thermal expansion shall also be considered. The design of supports, foundations, and settings shall be in accordance with ASCE/SEI 7, *Minimum Design Loads for Buildings and Other Structures*. The importance factors used in calculating the seismic and wind loads shall be the highest value specified for any category in ASCE/SEI 7.

SX.3 CLEARANCES

The pressure vessel installation shall allow sufficient clearance for normal operation, maintenance, and inspection. Stacking of pressure vessels is permitted. The minimum clear

space between pressure vessels shall be 1 ft. vertical and 2 ft. horizontal. Vessel nameplates shall be visible after installation for inspection. The location of vessels containing flammable fluids shall comply with NFPA 2. The vessel owner shall document the vessel pressure and pipe diameters used as a basis for compliance with NFPA 2 location requirements.

SX.4 PIPING LOADS

Piping loads on vessel nozzles shall be determined by a formal flexibility analysis per ASME B31.12: paragraph IP-6.1.5(b). The piping loads shall not exceed the maximum nozzle loads defined by the vessel manufacturer.

SX.5 MECHANICAL CONNECTIONS

Mechanical connections shall comply with pressure vessel manufacturer's instructions, and with requirements of the Jurisdiction. Connections to threaded nozzles shall have primary and secondary seals. The seal design shall include a method for detecting a leak in the primary seal. Seal functionality shall be demonstrated at the initial pressurization of the vessel.

SX.6 PRESSURE INDICATING DEVICES

Each pressure vessel shall be equipped with a pressure gage mounted on the vessel. The dial range shall be from 0 psi to not less than 1.25 times the vessel MAWP. The pressure gage shall have an opening not to exceed 0.0550in (1.4mm) (No. 54 drill size) at the inlet connection. In addition, vessel pressure shall be monitored by a suitable remote pressure indicating device with alarm having an indicating range of 0 psi to not less than 1.25 times the vessel MAWP.

SX.7 PRESSURE RELIEF DEVICES

Each pressure vessel shall be protected by pressure relief devices per the following requirements:

a) Pressure relief devices shall be suitable for the intended service.

b) Pressure relief devices shall be manufactured in accordance with a national or international standard and certified for capacity (or resistance to flow for rupture disk devices) by the National Board.

c) Dead weight or weighted lever pressure relief valves are prohibited.

d) Pressure relief valves shall not be fitted with lifting devices.

e) The pressure relief device shall be installed directly on the pressure vessel with no isolation valves between the vessel and the pressure relief device except:

1) When these isolation valves are so constructed or positively controlled below the minimum required capacity, that closing the maximum number of valves at one time will not reduce the pressure relieving capacity, or

2) Upon specific acceptance of the Jurisdiction, an isolation valve between vessel and its pressure relief device may be provided for vessel inspection and repair only. The isolation valve shall be arranged so it can be locked or sealed open.

f) The discharge from pressure relief device(s) shall be directed upward to prevent any impingement of escaping fluid upon the vessel, adjacent vessels, adjacent structures, or personnel. The discharge must be to outdoors, not under any structure or roof that might permit formation of a “cloud”. The pressure relief device(s) discharge piping shall be designed so that it cannot become plugged by

animals, insects, rainwater, or other materials.

g) The pressure relief device(s) shall be set at a pressure not exceeding the MAWP of the vessel.

h) The pressure relief device(s) shall have sufficient capacity to ensure the pressure vessel does not exceed the MAWP of that specified in the original code of construction.

i) The owner shall document the basis for selection of the pressure relief device(s) used, including capacity.

j) The owner shall have such analysis available for review by the Jurisdiction.

k) Pressure relief devices and discharge piping shall be supported so that reaction forces are not transmitted to the vessel.

l) Heat detection system: a heat activated system shall be provided so that vessel contents will be vented per f) (above), if any part of the vessel is exposed to a temperature greater than 220ºF.

m) Positive methods shall be incorporated to prevent overfilling of the vessel.

SX.8 ASSESSMENT OF INSTALLATION

a) Isolation valve(s) shall be installed directly on each vessel, but not between the vessel and the pressure relief device except as noted in 3.7, e), above.

b) Vessels shall not be buried.

c) Vessels may be installed in a vault subject to a hazard analysis, verified by the manufacturer, owner, user, qualified engineer, or the Jurisdiction, to include as a minimum the following:

1) Ventilation

2) Inlet and outlet openings

3) Access to vessels

4) Clearances

5) Intrusion of ground water

6) Designed for cover loads

7) Explosion control

8) Ignition sources

9) Noncombustible construction

10) Remote monitoring for leaks, smoke, and fire

11) Remote controlled isolation valves

d) Fire and heat detection/suppression provisions shall comply with the requirements of the Jurisdiction and, as a minimum, include relief scenarios in the event of a fire or impending overpressure from heat sources.

e) Installation locations shall provide the following:

1) Guard posts shall be provided to protect the vessels from vehicular damage per NFPA 2.

Protection from wind, seismic events shall be provided.

2) Supports and barriers shall be constructed of non-combustible materials.

3) Vessels shall be protected from degradation due to direct sunlight.

4) Access to vessels shall be limited to authorized personnel.

5) Any fence surrounding the vessels shall be provided with a minimum of two gates. The gates shall open outward, and shall be capable of being opened from the inside without a key.

6) Access for initial and periodic visual inspection and NDE of vessels, supports, piping, pressure gages or devices, relief devices and related piping, and other associated equipment.

7) Completed installations shall be validated as required by the Jurisdiction as addressing all of the above, and any requirements of the Jurisdiction, prior to first use. This verification shall be posted in a conspicuous location near the vessel and, when required, on file with the Jurisdiction. Certificates shall be updated as required by mandated subsequent inspections.

8) Piping installation shall comply with ASME B31.12 or NFPA 2.

9) The vessels shall be electrically bonded and grounded per NFPA 55.

SX.9 LADDERS AND RUNWAYS

See NBIC Part 1, Section 1.6.4 *Ladders and Runways*

NB16-0102

Action Item Request Form

8.2 CODE REVISIONS OR ADDITIONS

Request for Code revisions or additions shall provide the following:

Existing Text:

2.10.2 PRESSURE TEST

Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in accordance with the original code of construction. Any pressure piping and fittings such as water columns, blowoff valves, feedwater regulators, superheaters, economizers, stop valves, etc., which are shipped connected to the boiler as a unit, shall be hydrostatically tested with the boiler and witnessed by an Inspector.

2.10.4 SYSTEM TESTING

Prior to final acceptance, an operational test shall be performed on the complete installation. The test data shall be recorded and the data made available to the jurisdictional authorities as evidence that the installation complies with the provisions of the governing code(s) of construction. This operational test may be used as the final acceptance of the unit.

3.10.1 PRESSURE TEST

Prior to initial operation, the completed boiler, individual module, or assembled module, shall be subjected to a pressure test in accordance with the requirements of the original code of construction.

4.6 TESTING AND ACCEPTANCE

a) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. The installer shall inspect the interior of the vessel and its appurtenances where possible prior to making the final closures for the presence of foreign debris.

b) The completed pressure vessel shall be pressure tested in the shop or in the field in accordance with the original code of construction. When required by the Jurisdiction, owner or user, the Inspector shall witness the pressure test of the completed installation, including piping to the pressure gage, pressure relief device, and, if present, level control devices.

4.7.6 TESTING AND ACCEPTANCE

Testing and acceptance shall be in accordance with NBIC Part 1, 4.6

b) Statement of Need

NB10-1201 Covered reformatting multiple items. Pressure Testing was inconsistent between the three sections and really needs to be addressed

c) Background Information

Consolidation of Testing and Final Acceptance to Section 1 General.

Proposed Wording:

1.6.10 TESTING AND FINAL ACCEPTANCE

~~Boilers, heaters, or pressure vessels may not be placed into service until its installation has been inspected and accepted by the appropriate jurisdictional authorities.~~

a) The completed boiler/ pressure vessel shall be pressure tested in the shop and/or in the field in accordance with the original code of construction and documented on the appropriate Manufacturer's Data Report.

b) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. Prior to making the final closure the installer shall inspect the interior of the vessel and its appurtenances for the presence of foreign debris.

c) Subject to the jurisdictional requirements, a leak test may be performed on any components whose pressure test is not documented under the items' Manufacturer's Data Report. This leak test should not exceed 90% of the lowest pressure relief device setpoint. The test data shall be recorded, and the data made available as required.

d) Prior to final acceptance, an operational test shall be performed on the completed installation. The test shall include operating controls, limit controls and safety devices. The test data shall be recorded, and the data made available to the Jurisdictional Authorities as evidence that the installation complies with provisions of the governing code(s) of construction.

2.10.2 PRESSURE TEST

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in accordance with the original code of construction. Any pressure piping and fittings such as water columns, blowoff valves, feedwater regulators, superheaters, economizers, stop valves, etc., which are shipped connected to the boiler as a unit, shall be hydrostatically tested with the boiler and witnessed by an Inspector.~~

2.10.4 SYSTEM TESTING

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Prior to final acceptance, an operational test shall be performed on the complete installation. The test data shall be recorded and the data made available to the jurisdictional authorities as evidence that the~~

~~installation complies with the provisions of the governing code(s) of construction. This operational test may be used as the final acceptance of the unit.~~

3.10.1 PRESSURE TEST

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Prior to initial operation, the completed boiler, individual module, or assembled module, shall be subjected to a pressure test in accordance with the requirements of the original code of construction.~~

4.6 TESTING AND ACCEPTANCE

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~a) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. The installer shall inspect the interior of the vessel and its appurtenances where possible prior to making the final closures for the presence of foreign debris.~~

~~b) The completed pressure vessel shall be pressure tested in the shop or in the field in accordance with the original code of construction. When required by the Jurisdiction, owner or user, the Inspector shall witness the pressure test of the completed installation, including piping to the pressure gage, pressure relief device, and, if present, level control devices.~~

4.7.6 TESTING AND ACCEPTANCE

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Testing and acceptance shall be in accordance with NBIC Part 1, 4.6~~

NB16-0102

Old wording that has been submitted as a letter ballot to the MC:

a) The completed boiler/ pressure vessel shall be pressure tested in the shop and/or in the field in accordance with the original code of construction.

b) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. Prior to making the final closure. The installer shall inspect the interior of the vessel and its appurtenances where possible prior to making the final closures for the presence of foreign debris.

c) Subject to the jurisdictional requirements, Prior to final acceptance, an operational pressure test, with the approval of the jurisdiction if required, shall may be performed on any components whose pressure test is not documented under the items' Manufacturer's Data Report. This pressure test should not exceed 90% of the lowest pressure relief device setpoint. The test data shall be recorded and the data made available as required. This operational test may be used as the final acceptance of the unit.

Comments for Ballot: NB16-01-02	
Welch,Paul voted: Approve 10/19/2016 1:50:39 PM	I recommend approval with a minor change to the proposed wording in para b. second sentence to read: Prior to final acceptance, an operational test, with the approval of the Jurisdiction, shall be performed...
Pillow,James voted: Approve 10/6/2016 8:00:39 AM	I approve the proposal, but suggest a minor editorial change in last sentence of first paragraph as follows. Prior to making the final closures, the installer shall inspect the interior of the vessel and its appurtenances where possible for the presence of foreign debris.
Webb,Michael voted: Disapprove 10/5/2016 3:01:27 PM	At this time, I will vote to "disapprove" this item. My understanding of this action item was to; generally consolidate the pressure testing requirements of the various Part 1, Sections into a more general practice to be described in Part 1, Section 1-General Guidelines. In my read whether intended or my misunderstanding, the product of the SC-Installation effort may have offered the ASME code-required pressure testing to be circumvented as presented in the SC-proposed paragraph "b)". To add, I would propose for consideration the item as presented in the attachment or otherwise presented be inserted as: Part 1, Section 1, 1.4.1 b) with the current 1.4.1 b) re-introduced to become 1.4.1 c). As a note to the attachment: the text in red represents the text implying the operational test may satisfy final acceptance of the unit.–M. Webb, 10-5-16 Reference Document: NB16-0102-letter ballot Part 1 Section 1 G. Guidelines proposed 1.4.1. b. 10-5-16.pdf
Troutt,Robby voted: Disapprove 10/5/2016 8:09:44 AM	My disapproval is based on the lack of reference to a jurisdictional inspection prior to the operational test in paragraph (b). Some jurisdictions do not allow an operational test prior to the initial inspection.
Sekely,Jim voted: Approve 10/3/2016 1:07:21 PM	1.?? b): Change who's to whose

7/16/2019 – Main Committee ballot comments on last page

Item Numbers: 17-131 (Pressure Relief) and 17-159 (Installation) NBIC Location: Part 4, 2.5.7 a) and Part 1, 4.7.3 a)

17-131 General Description: Review overpressure protection requirements for hot water storage tanks that exceed 160 psi.

17-159: General Description: Result of 17-147; review Part 1, 4.7 for references to hot water storage tanks. With the definition of Potable Hot Water Storage Tank items referencing this in Part 1, Section 4.7 need to be updated, modified and or revised.

The following proposal combines the proposals from 17-131 and 17-159.

"Hot water storage tank" is deleted from 4.7.3 a) because is covered in c), and the temperature could exceed 210 deg. F. for those vessels. The item from installation was not changed otherwise. The Part 4, par. 2.5.7 is new but is just Part 1, par. 4.7 slightly rewritten.

Proposal:

NBIC Location: Part 1, 4.7

4.7 REQUIREMENTS FOR HOT WATER STORAGE TANKS/POTABLE HOT WATER STORAGE TANK
4.7.1 SUPPORTS
Each hot water storage tank shall be supported in accordance with NBIC Part 1, 1.6.1.
4.7.2 CLEARANCE AND ACCEPTABILITY
a) The required nameplate (marking or stamping) should be exposed and accessible.
b) The openings when required should be accessible to allow for entry for inspection and maintenance.
c) Each hot water storage tank shall meet the requirements of NBIC Part 1, 4.3.2.
4.7.3 TEMPERATURE AND PRESSURE RELIEF DEVICES
a) Each potable hot water storage tank~~/ hot water storage tank~~ shall be equipped with an ASME/NB certified temperature and pressure relief ~~device~~ valve set at a pressure not to exceed the maximum allowable working pressure and 210°F (99°C).
b) Potable hot water storage tanks exceeding the pressure limit of ASME Code Section IV shall meet the original code of construction and shall be protected by a pressure relief ~~device~~ valve set not to exceed the vessel's maximum allowable working pressure. A temperature limiting device shall be installed so that the water inside the storage tank does not exceed 210°F (99°C).
c) Each hot water storage tank shall be equipped with an ASME/NB certified pressure relief valve set at a pressure not to exceed the maximum allowable working pressure.
d) The temperature and pressure relief ~~device~~ valve shall meet the requirements of NBIC Part 1, 4.5.

4.7.4 THERMOMETERS

a) Each hot water storage/potable hot water storage tank shall be equipped with a thermometer.
b) Each hot water storage/potable hot water storage tank shall have a thermometer so located that it shall be easily readable at or near the outlet. The thermometer shall be so located that it shall at all times indicate the temperature of the water in the storage tank.

4.7.5 SHUT OFF VALVES
a) Each hot water storage/potable hot water storage tank shall be equipped with stop valves in the water inlet piping and the outlet piping in order for the hot water storage tank to be removed from service without having to drain the complete system.
b) Each hot water storage/potable hot water storage tank shall be equipped with a bottom drain valve to provide for flushing and draining of the vessel.

NBIC Location: Part 4, 2.5.7

2.5.7 TEMPERATURE AND PRESSURE RELIEF DEVICES FOR HOT WATER STORAGE TANKS/POTABLE HOT WATER STORAGE TANK

a) Each potable hot water storage tank shall be equipped with an ASME/NB certified temperature and pressure relief ~~device~~ valve set at a pressure not to exceed the maximum allowable working pressure and 210°F. (99°C).
b) Potable hot water storage tanks exceeding the pressure limit of ASME Code Section IV shall meet the original code of construction and shall be protected by a pressure relief ~~device~~ valve set not to exceed the vessel's maximum allowable working pressure. A temperature limiting device shall be installed so that the water inside the storage tank does not exceed 210°F (99°C).
c) Each hot water storage tank shall be equipped with an ASME/NB certified pressure relief valve set at a pressure not to exceed the maximum allowable working pressure.

~~b~~d) The temperature and pressure relief ~~device~~ valves shall meet the requirements of 2.5.1 through 2.5.6 above.

Archived Comments for Ballot: 17-131159-MC	
Amato,Joel 3/5/2019 10:55:03 AM	Do we define "hot water storage tank" and "potable hot water storage tank"? Is there a difference? I think we also need to remain consistent with the terms device and valve.
Ball,Joseph 3/4/2019 8:53:59 AM *Reply To: Newton,Venus*	When a Section VIII vessel is used the new paragraph b) has two separate requirements in two separate sentences. The first is for a pressure relief device for overpressure protection (a separate comment on valve vs. device will be supplied). The second sentence requires a "temperature limiting device" that give the same temperature protection as a T&P valve. This would usually be a control valve of some type. This addresses the problem that T&P valves are not available under Section VIII, and at pressures higher than 160 psig.
Newton,Venus 3/4/2019 6:57:24 AM	The wording is confusing to me. It looks like you not only need a pressure relief device, but that a temperature and pressure relief valve is also always required, even on the Section VIII storage tanks.
Wadkinson,Melissa 2/27/2019 10:10:16 AM	Regarding the use of device vs valve, if the tank exceeds the pressure limitations of Section IV it will be built to Section VIII and over pressure protection does not necessarily have to be a valve.
Richards,Michael 2/25/2019 2:54:00 PM	Concur with Mr. Galanes observation.
Galanes PE,George 1/30/2019 10:58:52 AM	GWG comment; I have no objection to the proposed revisions. I am abstaining because I do see the words valve and device are used interchangeably. We should stick with device rather than valve to be consistent.

Explanation: Duplicate wording in 2.8.1 and 2.8.5.

Summary of changes:

Add "Column" to the title in 2.8.1. Delete 2.8.1 (a) and (c) as they are covered under 2.8.5 (a) and 2.8.5 (d).

Relocate 2.8.1 (b) to 2.8.5 (e).

2.8.1 WATER COLUMN

~~a) Each automatically fired steam boiler shall be equipped with at least two low-water fuel cutoffs. The water inlet shall not feed water into the boiler through a float chamber.~~

~~b) Each electric steam boiler of the resistance element type shall be equipped with an automatic low-water cutoff so located as to automatically cut off the power supply to the heating elements before the surface of the water falls below the visible part of the glass. No low-water cutoff is required for electrode-type boilers.~~

~~c) Designs embodying a float and float bowl shall have a vertical straightaway drainpipe at the lowest point in the water equalizing pipe connections, by which the bowl and the equalizing pipe can be flushed and the device tested~~.

a) The water column shall be directly connected to the boiler. Outlet connections (except for damper regulator, feedwater regulator, low-water fuel cutoff, drains, steam gages, or such apparatus that does not permit the escape of an appreciable amount of steam or water) should not be placed on the piping that connects the water column to the boiler.

b) Straight-run globe valves of the ordinary type shall not be used on piping that connects the water column to the boiler. Where water columns are 7 ft. (2.1 m) or more above the floor level, adequate means for operating gage cocks or blowing out the water glass shall be provided.

c) When automatic shutoff valves are used on piping that connects the water column to the boiler, they shall conform to the requirements of the code of construction for the boiler.

d) When shutoff valves are used on the connections to a water column, they shall be either outside-screw-and-yoke or lever-lifting-type gate valves or stop cocks with levers permanently fastened thereto and marked in line with their passage, or of such other through-flow constructions to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open.

e) Each steam boiler having a fixed waterline shall have at least one water-gage glass except that boilers operated at pressures over 400 psig (2.8 MPa) shall be provided with two water-gage glasses that may be connected to a single water column or connected directly to the drum. The gage glass connections and pipe connection shall be not less than NPS 1/2 (DN 15). Each water-gage glass shall be equipped with a valved drain.

f) Electric steam boilers shall have at least one water-gage glass. On electrode-type electric boilers, the gage glass shall be located as to indicate the water levels both at startup and maximum steam load conditions, as established by the boiler manufacturer. On resistance element type electric steam boilers, the lowest visible part of the gage glass shall be located at least 1 in. (25 mm) above the lowest permissible water level established by the boiler manufacturer.

g) The lowest visible part of the water-gage glass shall be at least 2 in. (50 mm) above the lowest permissible water level established by the boiler manufacturer.

h) For all installations where the water-gage glass or glasses are not easily viewed by the operator, consideration should be given to install a method of remote transmission of the water level to the operating floor.

i) Boilers of the horizontal firetube type shall be so set that when the water is at the lowest reading in the water-gage glass, it shall be 3 in. (75 mm) above the lowest permissible water level as determined by the manufacturer. Horizontal firetube boilers that do not exceed 16 in. (400 mm) in inside diameter shall have the lowest visible level in the gage glass at least 1 in. (25 mm) above the lowest permissible level as determined by the manufacturer.

j) Each water-gage glass shall be equipped with a top and a bottom shutoff valve of such through-flow construction as to prevent blockage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in the open or closed position. The pressure-temperature rating shall be at least equal to that of the lowest set pressure of any safety valve on the boiler drum and the corresponding saturated steam temperature.

2.8.5 AUTOMATIC LOW-WATER FUEL CUTOFF AND/OR WATER FEEDING DEVICE FOR STEAM OR VAPOR SYSTEM BOILERS

a) Each automatically fired steam-or vapor-system boiler shall have an automatic low-water fuel cutoff so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest visible part of the water-gage glass. If a water feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feedwater.

b) Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed in the tapped openings available for attaching a water glass directly to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than NPS 1/2 (DN 15) between the boiler and water glass so that the water glass is attached directly and as close as possible to the boiler; the run of the tee or Y shall take the water glass fittings, and the side outlet or branch of the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full-size diameter.

c) In addition to the requirements in a) and b) above, a secondary low-water fuel cutoff with manual reset shall be provided on each automatically fired steam or vapor system boiler.

d) Fuel cutoffs and water feeding devices embodying a separate chamber shall have a vertical drain pipe, extended to a safe point of discharge, and a blowoff valve not less than NPS 3/4 (DN 20), located at the lowest point in the water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

e) Each electric steam boiler of the resistance element type shall be equipped with an automatic low-water cutoff so located as to automatically cut off the power supply to the heating elements before the surface of the water falls below the visible part of the glass. No low-water cutoff is required for electrode-type boilers.

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
Submission of Public Review Comment
2019 Draft Edition

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Comments Must be Received No Later Than: October 15, 2018

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

Date: Sep. 10, 2018

Commenter Name: Alex Garbolevsky

Commenter Address: Hartford Steam Boiler
One State St., 8th Flr., Hartford, CT 06102-5024

Commenter Phone: (860) 722-5098

Commenter Fax: none

Commenter Email: alex_garbolevsky@hsb.com

Section/Subsection Referenced: NBIC Part 1, 1.6.3 (NB16-0905)

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

Comment: Not all pressure vessels are fired or electrically heated. Would it be more appropriate to use "fired or electrically heated pressure vessels" rather than "pressure vessels" in this text?

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

Submit Form To: Jonathan Ellis, NBIC Secretary, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, email: jellis@nationalboard.org

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Commenter No. Issued: _____ Project Committee Referred To:

Comment No. Issued: _____ _____

1.5 CHANGE OF SERVICE

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

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

(19) 1.6 GENERAL REQUIREMENTS

The following are general requirements for the boilers, potable water heaters, thermal fluid heaters and pressure vessels covered in NBIC Part 1, Section 2, NBIC Part 1 Section 3, NBIC Part 1 Section 4, and NBIC Part 1 Supplement 5. Refer to each referenced section for additional requirements specific to the type of equipment covered by each section.

(19) 1.6.1 SUPPORTS, FOUNDATIONS, AND SETTINGS

Each boiler, potable water heater, thermal fluid heater and pressure vessel and the associated piping must be safely supported. Design of supports, foundations, and settings shall consider vibration (including seismic where necessary), movement (including thermal expansion and contraction), and loadings (including the weight of the fluid in the system during a pressure test) in accordance with jurisdictional requirement, manufactures recommendations, and/or other industry standards, as applicable.

1.6.2 STRUCTURAL STEEL

a) If the boiler, heater, or vessel is supported by structural steel work, the steel supporting members shall be so located or insulated that the heat from the furnace will not affect their strength.

b) Structural steel shall be installed in accordance with jurisdictional requirements, manufacturer's recommendations, and/or other industry standards, as applicable.

(19) 1.6.3 EXIT

Two means of exit shall be provided for equipment rooms exceeding 500 ft.^{2} (46.5 m^2) of floor area and containing one or more boilers, potable water heaters, thermal fluid heaters or pressure vessels having a combined fuel capacity of 1,000,000 Btu/hr (293 kW) or more (or equivalent electrical heat input). Each elevation shall be provided with at least two means of exit, each to be remotely located from each other. A platform at the top of a single boiler, potable water heater, thermal fluid heater or pressure vessel is not considered an elevation.

1.6.4 LADDERS AND RUNWAYS

a) All walkways, runways, and platforms shall be:

1) of metal construction or equivalent material;

2) provided between or over the top of boilers, heaters, or vessels that are more than 8 ft. (2.4 m) above the operating floor to afford accessibility for normal operation, maintenance, and inspection;

3) constructed of safety treads, standard grating, or similar material and have a minimum width of 30 in. (760 mm);

4) of bolted, welded, or riveted construction; and

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One State St., 8th Flr., Hartford, CT 06102-5024

Commenter Phone: (860) 722-5098

Commenter Fax: none

Commenter Email: alex_garbolevsky@hsb.com

Section/Subsection Referenced: NBIC Part 1, 1.6.9 (NB16-0101)

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

Comment: Does this also apply to "potable water heaters" and "thermal fluid heaters" which are not specifically mentioned?

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

Submit Form To: Jonathan Ellis, NBIC Secretary, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, email: jellis@nationalboard.org

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f) The size of openings specified in c) above may be reduced when special engineered air supply systems approved by the Jurisdiction are used.

g) Care should be taken to ensure that steam, water and fluid lines are not routed across combustion air openings, where freezing may occur.

1.6.7 LIGHTING

The equipment room should be well lighted and it should have an emergency light source for use in case of power failure.

(19) 1.6.8 CHIMNEY OR STACK

Chimneys or stacks shall be installed in accordance with jurisdictional requirements, manufacturer's recommendations, and/or industry standards, as applicable.

(19) 1.6.9 CARBON MONOXIDE (CO) DETECTOR/ALARM

The owner or user shall install a carbon monoxide (CO) detector/alarm in equipment rooms where fuel fired boilers and/or fuel fired pressure vessels are located in accordance with the authority having Jurisdiction.

(19) 1.6.10 FINAL ACCEPTANCE

Boilers, heaters, or pressure vessels may not be placed into service until its installation has been inspected and accepted by the appropriate jurisdictional authorities.

NBIC Part 1 Item 19-49

2.9.1 VALVE REQUIREMENTS – GENERAL (19)

a) Only direct spring loaded, pilot operated, or power actuated pressure relief valves designed to relieve steam shall be used for steam service.

b) Pressure relief valves shall be manufactured in accordance with a national or international standard.

c) Deadweight or weighted-lever pressure relief valves shall not be used.

d) For high-temperature water boilers, safety relief valves shall have a closed bonnet, and valve bodies shall not be constructed of cast iron.

e) Pressure relief valves with an inlet connection greater than NPS 3 (DN 80) used for pressure greater than 15 psig (103 kPa), shall have a flange or a welded inlet connection. The dimensions of flanges subjected to boiler pressure shall conform to the applicable standards.

f) When a pressure relief valve is exposed to outdoor elements that may affect operation of the valve, the valve may be shielded with a cover. The cover shall be vented and arranged to permit servicing and normal operation of the valve.

g) Shipping caps or plugs shall be removed prior to installation.

3.9.1 PRESSURE RELIEF VALVE REQUIREMENTS – GENERAL

The following general requirements pertain to installing, mounting, and connecting pressure relief valves on heating boilers.

a) Shipping caps or plugs shall be removed prior to installation.

2.9.1.1 NUMBER

At least one National Board capacity certified pressure relief valve shall be installed on the boiler. If the boiler has more than 500 ft2. (46.5 m2) of heating surface, or if an electric boiler has a power input of more than 3.76 million Btu/hr (1,100 kW), two or more National Board capacity certified pressure relief valves shall be installed**. For a boiler with combined bare tube and extended water-heating surface exceeding 500 ft2 (47 m2), two or more pressure relief valves are required only if the maximum designed steaming capacity of the boiler exceeds 4,000 lb/hr (1 800 kg/h).**

ASME BPV Liaison Report

NBIC Standards Committee
July 18, 2019

ASME BPV Liaison Report

- CA-1 Conformity Assessment Requirements
  - *Ongoing work to incorporate CAP-22 Policy on multiple AIAs, alternate methods of applying the ASME Mark, identification of Certificate numbers on Data Plates, transition of AIA accreditation requirements from QAI-1, and Nuclear CA requirements*
  - *2019 Edition planned; approved revision items include CAP-21 criteria for reapplication of the ASME Mark, clarification of permitted activities prior to issue of a Certificate of Authorization, and update of PRD and PRT program references*
- Parts Fabrication Certificate
  - *Program continues to gain participation; 55 certificates issued*
  - *Planned transition for Scope Statements to include multiple Code Sections*
  - *Proposal for PRT Designator to reference the Code Section of the part*

ASME BPV Liaison Report

- QAI-1 Qualifications for Authorized Inspection
  - *Work continues on a major reorganization of the QAI-1 Standard*
  - *Book Section actions to reference QAI-1 for types of AIAs*
  - *Proposal to establish eye examination requirements for Inspectors*
  - *Proposal to establish a QAI-1 AIA Review Committee, with representation from each accredited AIA*
  - *Proposal for AIA notification to ASME of unresolved Code or Program nonconformances*
- Field Site Task Group
  - *Field Site definition developed; planned incorporation in CA-1*
  - *Intermediate locations to be recognized via Temporary Location authorization letter; all code activities permitted except stamping and data reports*
  - *Follow-up actions planned with BPV Book Sections*

ASME BPV Liaison Report

- Additional Developments
  - *Ongoing resolution of comments on Section XIII; publication planned coincident with construction code changes*
  - *Work continues in resolution of revised scope for ASME VIII-1*
  - *TOMC Task Group developing uniform AI/ANI inspection requirements, for incorporation in BPV Book Sections*
  - *Resource Development Group being established for CA*
  - *Rollout of redesigned ASME website and replacement of CA Connect*
  - *Next ASME BPV Code meetings August 5-9, in Minneapolis, MN*
- Questions / Discussion

The following listed actions are currently in process within the American Welding Society.

- The B2 committee has agreed to systematically update all published SWPS's to bring them in line with the advancements realized by the Welding Community over the last 20 years or so. This effort is to include:
  - Deletion of the reference to "S" numbers recently deleted by ASME
  - Deleting the Metric Conversion Table opting to reference the actual metric equivalent adjacent to the listed Imperial value.
  - Adding a paragraph or so to address "Repairs".
  - Offering additional Tungsten Classifications (as applicable).
  - Updating and or deleting the Welding Symbols from Figure 1
  - Additional items as determined by the SWPS Sub Committee (correct typos, inadvertent omissions etc.)
  - Although minor word engineering may come into play, no change in philosophy or application will be permitted
- The NBIC needs to understand that these changes will not affect previous versions of the same SWPS. Those version are still very valid and readily useable and unless you have a specific need to replace them; I would not.
- The AWS B2 committee is in process of developing a compliment of Aluminum SWPS using both the GTAW and GMAW processes for the common grades of Aluminum.
- The B2 committee is also developing the plan to begin development of additional SWPS's for Carbon, Stainless and Low Alloy Steels using the GMAW, FCAW and SAW processes.
- At some point in the distant future, additional SWPS's will be developed addressing Notch Toughness applications (incorporating both traditional and Wave Form variables) for the common Carbon and Low Alloy Steels.

The following SWPS's have been adopted by the B2 committee and were balloted to this committee at this meeting under Item # 18-102.

B2.1-1-016: 2018	B2.1-1-019: 2018	B2.1-1-021: 2018	B2.1-1-023: 2018	B2.1-1-027:2018
B2.1-1-017: 2018	B2.1-1-020: 2018	B2.1-1-022: 2018	B2.1-1-026: 2018	

The long-range plan for the updated SWPSs is to group them into an ANSI approved "Stabilized Maintenance Program" exempting them from the traditional ANSI 5/10-year re-affirmation balloting requirement.

As in the past, as newly developed SWPS's are approved by the various committees, they will be offered to the NBIC for adoption.

Regards,

Jim Sekely