Date Distributed:

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE COMMITTEE

MAIN SESSION AGENDA

Meeting of July 10, 2025
Cincinnati, OH

The National Board of Boiler & Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, Ohio 43229-1183
Phone: (614)888-8320
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1. **Call to Order**
   The Chair will call the meeting to order at 9:00 a.m. Eastern Time. The meeting will be held in Madisonville A/B on the fourth floor of the hotel.

2. **Introduction of Members and Visitors**

3. **Check for a Quorum**

4. **Awards/Special Recognition**
   Craig Hopkins – 30 years on Main Committee

5. **Announcements**
   - This meeting marks the end of Cycle B for the 2027 NBIC edition.
   - As a reminder, anyone who would like to become a member of a group or committee:
     - Should attend at least two meetings prior to being put on the agenda for membership consideration. The nominee will be on the agenda for voting during their third meeting.
     - The nominee must submit the formal request along with their resume to the NBIC Secretary **PRIOR TO** the meeting. *nbicsecretary@nbbi.org*
     - If needed, we can also create a ballot for voting on a new member between meetings.
   - Thank you to everyone who registered online for this meeting. Online registration is very helpful for planning our reception, meals, room setup, etc. It is also a good way to make sure we have the most up-to-date contact information. Please continue to use the online registration for each meeting.

6. **Adoption of the Agenda**

7. **Approval of the Minutes of the January 2025 Meeting**
   The minutes are available for review online at https://www.nationalboard.org/Index.aspx?pageID=13&ID=18.

8. **Items Approved for the 2027 NBIC**
   A list of items approved for the 2027 edition of the NBIC can be found on Attachment Page 1

9. **Subcommittee Reports**

   a. **Subcommittee Installation**

      i. **Interpretations**

Item Number: 25-11	**NBIC Location: Part 1, 3.8.2.4**	**Attachment page 2**
General Description: External Low-Water Fuel Cutoff for Hot Water Heating Boilers **Subgroup:** SG Installation **Task Group:** None assigned. **Explanation of Need:** The valves proposed are a means to avoid draining the hot water boiler of its water just to test the low water fuel cutoff, we want to verify that they satisfy the requirements of the code.		
July 2025 Meeting Action:		

ii. Action Items – Old Business

Item Number: 22-28	NBIC Location: Part 1	Attachment Page 3
General Description: Pool Heater definition and requirements **Subgroup:** SG Installation **Task Group:** J. Kleiss (PM), R. Spiker, T. Creacy, and M. Byrum **Explanation of Need:** The NBIC Installation and Inspection Codes do not have a definition for pool heaters. There is potential for confusion regarding which NBIC requirements, if any, should apply to pool heaters.		
July 2025 Meeting Action: Mr. Patten provided a progress report for this item.		

Item Number: 23-52	NBIC Location: Part 1, 2.5.3.2 and 3.5.3	Attachment Page 6
General Description: Harmonize electrical requirements for all types of boilers/water heaters **Subgroup:** SG Installation **Task Group:** T. Clark (PM), S. Konopacki, J. Kleiss, R. Spiker, and John Choitz **Explanation of Need:** Electrical requirements for power boilers, heating boilers, and water heaters are inconsistent, particularly regarding remote emergency shutdown switches. In some cases the requirements are the same, but worded or ordered differently. In order to promote better understanding of code requirements and consistency in their application, I propose making sections 2.5.3 and 3.5.5 as uniform as possible.		
January 2025 Meeting Action: Mr. Patten announced that the proposal for this item is ready to be balloted to Main Committee. **NOTE:** This item is currently being balloted to the Main Committee, with a close date of July 9, 2025.		

Item Number: 24-05	NBIC Location: Part 1, New Supplement	Attachment Page 9
General Description: Add heat pump water heater & heat pump hydronic heater requirements **Subgroup:** SG Installation **Task Group:** J. Kleiss (PM), B. Ahee **Explanation of Need:** Heat pump water heating and hydronic heating are growing in prevalence. Guidance for installation and inspection of these products is needed.		
July 2025 Meeting Action: Mr. Patten provided a progress report for this item.		

Item Number: 24-26	NBIC Location: Part 1, 3.7.8	No Attachment

General Description: NBIC Requirements for ASME Modular Water Heaters

Subgroup: SG Installation

Task Group: R. Spiker (PM), M. Byrum, J. Kleiss

Explanation of Need: ASME Section IV added requirements in the 2023 Edition for modular water heaters. The NBIC currently includes requirements for modular steam heating and hot-water heating boilers, but not for modular water heaters.

July 2025 Meeting Action: Mr. Patten provided a progress report for this item.

Item Number: 24-56	NBIC Location: Part 1, S3.6.1	No Attachment

General Description: LCDSV Systems: Add Table and Figure

Subgroup: SG Installation

Task Group: M. Byrum (PM), R. Black

Explanation of Need: In accordance with the NBIC Policy For Metrication, metric units need to be shown alongside US customary units. Table S3.6.1 and Figure S3.6.1-b both show only US customary units. I recommend adding Table S3.6.1M and Figure S3.6.1-bM to show metric units. I've also included some additional editorial recommendations.

July 2025 Meeting Action: Mr. Patten provided a progress report for this item, stating that it is on hold until a Part 2 item is opened to address similar language.

Item Number: 24-89	NBIC Location: Part 1, S3.6 d)	No Attachment

General Description: Require means to prevent safety valve discharge piping blockage for LCDSV (Part 1)

Subgroup: SG Installation

Task Group: None assigned.

Explanation of Need: Adding verbiage to the NBIC Part 1, Part 2 and Part 4 to require a means to prevent foreign material introduction to the safety valve discharge pipe.

January 2025 Meeting Action: Mr. Patten stated that Subgroup and Subcommittee Installation both voted to close this item because it is covered by a Part 4 item, Item 24-91. No further discussion was held. A motion was made, seconded, and unanimously approved to close this item with no further action.

Item Number: 24-97	NBIC Location: Part 1, 2.7.5	No Attachment

General Description: Anchoring of Threaded Blowdown Piping

Subgroup: SG Installation

Task Group: None assigned.

Explanation of Need: An operator opened a blowdown valve located between a 90-degree elbow and the floor drain. The pressure released caused the piping to rotate at the elbow striking the operator and pressing him to the ground which resulted in his death. This could have been avoided if the piping was anchored at a point between the elbow and the discharge.

July 2025 Meeting Action: Mr. Patten provided a progress report for this item.

Item Number: 24-102	NBIC Location: Part 1, 1.6.9	No Attachment

General Description: Strengthen requirements for Carbon monoxide monitoring

Subgroup: SG Installation

Task Group: None assigned.

Explanation of Need: Approximately 50 to 75 percent of the Chief Boiler Inspectors have requested some version of the proposed text above to be included in the NBIC Part 1. Since this has not happened, in many jurisdictions the Chief Inspector has had to include requirements for interlocking Carbon Monoxide detectors with boilers to secure the burners when the detector senses CO. The NBIC is a Health and Safety Code and therefore should provide requirements that prevent the many injuries and deaths the Chief Boiler Inspectors across the U.S. have had to investigate.

July 2025 Meeting Action: Mr. Patten provided a progress report for this item.

Item Number: 25-03	NBIC Location: Part 1, 1.6.1 & 3.7.7.1	No Attachment

General Description: Create uniformity between sections on requirements for drains and blowoff pipes

Subgroup: SG Installation

Task Group: T. Clark (PM), J. Choitz, R. Spiker, R. Adams

Explanation of Need: Create uniformity between sections on requirements for drains and blowoff pipes

July 2025 Meeting Action:

iii. Action Items – New Business

Item Number: 25-07	NBIC Location: Part 1, S5.7.6 h)	Attachment Page 13
General Description: Organic fluid relief valves are installed with discharge to 55-gallon drum **Subgroup:** SG Installation **Task Group:** None assigned. **Submitted by:** V. Scarcella **Explanation of Need:** A 55-gallon drum is not designed for the temperatures or pressures of a relief valve discharge		
July 2025 Meeting Action:		

Item Number: 25-12	NBIC Location: Part 1, 2.7.5 and 3.7.7.1	No Attachment
General Description: Requirements for drain and blowoff lines **Subgroup:** SG Installation **Task Group:** None assigned. **Submitted by:** J. Choitz **Explanation of Need:** Create uniformity between sections on requirements for drains and blowoff pipes.		
July 2025 Meeting Action:		

Item Number: 25-15	NBIC Location: Part 1, S3.6.1	No Attachment
General Description: LCDSV Systems: Add Table and Figure **Subgroup:** SG Installation **Task Group:** None assigned. **Submitted by:** M. Byrum **Explanation of Need:** In accordance with the NBIC Policy For Metrication, metric units need to be shown alongside US customary units. Table S3.6.1 and Figure S3.6.1-b both show only US customary units. I recommend adding a Table S3.6.1M and Figure S3.6.1-bM to show metric units.		
July 2025 Meeting Action:		

Item Number: 25-24	NBIC Location: Part 1, 3.8.1.5 and 3.8.2.4	Attachment Page 14

General Description: Clearly state no time delay on the flow switches on a loss of flow.

Subgroup: SG Installation

Task Group: None assigned.

Submitted by: T. Bolden

Explanation of Need: One of the primary causes of boiler failure is a low water condition. Time delays in testing these safety controls can complicate their assessment and will not mitigate the failure rates associated with low water conditions. Note this also needs to apply to flow switches on forced flow units.

July 2025 Meeting Action:

Item Number: 25-33	NBIC Location: Glossary	No Attachment

General Description: Revise definition "Field" in the Glossary of Terms

Subgroup: SG Installation

Task Group: None assigned.

Submitted by: J, Kleiss

Explanation of Need: ASME CA-1 Conformity Assessment Requirements is replacing the use of "Temporary Location" with "Secondary Location". The proposed revision is intended to maintain agreement in terminology between NBIC and ASME.

July 2025 Meeting Action:

b. Subcommittee Inspection

i. Interpretations

Item Number: 25-02 **NBIC Location:** 2023 NBIC, Part 2, 4.4.7.3 and 4.5.3 b) **Attachment Page 15**

General Description: Overriding Part 2 Inspection Requirements with RBI Program

Subgroup: Inspection
Task Group: D. Graf (PM), J. Beauregard, J. Sowinski, J. Mangas, L. Burton, B. Ray
Submitted by: Riley Collins

Explanation of Need: There needs to be some clarity on whether an RBI program has the ability to override some of the inspection requirements listed in Part 2 as long as all jurisdictional requirements are met.

July 2025 Meeting Action:

Item Number: 25-34	NBIC Location: 2023 NBIC, Part 2, 2.3.6.2 b) 2) a. 3.	Attachment Page 16
General Description: Interpretation request into the NBBI for the NB-23 2023 paragraph 2.3.6.2 **Subgroup:** Inspection **Task Group:** None assigned. **Submitted by:** Ari Ben Swartz **Explanation of Need:** Numerous air receivers are found to be less than the required wall thickness.		
July 2025 Meeting Action:		

ii. Action Items – Old Business

TG FRP Items:

Item Number: NB16-1402	NBIC Location: Part 2, New Supplement	Attachment Page 17
General Description: Life extension for high pressure FRP vessels above 20 years **Subgroup:** FRP **Task Group:** M. Gorman (PM) **Background:** In 2016, when this item was first opened, it was assigned as an item for Part 3. Recent discussions with SC R&A and the FRP Task Group have revealed that this item is better suited for Part 2. This item has been approved by the FRP Task Group. **Scope:** The goal of this proposal is to provide a method to evaluate whether the service life of high-pressure fiber reinforced plastic pressure vessels can be extended for an additional lifetime. **July 2025 Meeting Action:** Mr. Horbaczewski provided a progress report for this item.		

TG Historical Items:

Item Number: 23-85	**NBIC Location: Part 2, S2.14.7**	**No Attachment**
General Description: Review paragraphs to replace with proper verbiage **Subgroup:** SG Historical **Task Group:** M. Wahl (PM), K. Anderson **Explanation of Need:** There is some slang and second person (POV) verbiage throughout these paragraphs. Recommend rewording with proper terminology (such that it could be understood internationally) and changing point of view (e.g., changing "you're pulling water" to "water is being pulled"). Since I don't have the technical knowledge to know what is slang and what isn't, what I have proposed will still need to be reworded.		
July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.		

Item Number: 25-14	**NBIC Location: Part 2, S2.10.**	**No Attachment**
General Description: UT Inspection of Boilers with Jackets **Subgroup:** SG Historical **Task Group:** M. Wahl (PM) **Explanation of Need:** Currently this information is not in the same location as the other UT requirements and needs to be updated for proper terminology.		
July 2025 Meeting Action:		

TG Locomotive Items:

Item Number: 24-78	**NBIC Location: Part 2, S1.2.4.22**	**No Attachment**
General Description: Minimum Washout Plug Thread Engagement **Subgroup:** Locomotive **Task Group:** B. Zeigler (PM), E. Armpriester, D. Domitrovich **Explanation of Need:** Text should be changed to clarify how minimum thread engagement is quantified.		
July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.		

Item Number: 25-05	NBIC Location: Part 2, S1.2.4.22	No Attachment
General Description: Washout plug engagement limits for locomotive boilers. **Subgroup:** Locomotive **Task Group:** L. Moedinger (PM) **Explanation of Need:** There is no current wording for washout plug engagement.		
July 2025 Meeting Action:		

Item Number: 25-16	NBIC Location: Part 2, S1.2.4.22	No Attachment
General Description: Washout plug obstructions **Subgroup:** Locomotive **Task Group:** T. Sposato (PM) **Explanation of Need:** Analyze possible issues.		
July 2025 Meeting Action:		

SG Inspection Items:

Item Number: 23-81	NBIC Location: Part 2, 4.4.3 b)	No Attachment
General Description: Evaluate Inspector responsibilities relating to 4.4.3 FFS **Subgroup:** Inspection **Task Group:** M. Horbaczewski (PM), J. Clark, & B. Ray **Submitted by:** R. Underwood **Explanation of Need:** Currently, 4.4.3-b states the Inspector shall review the condition assessment methodology and ensure the inspection data and documentation are in accordance with Section 4. This proposal would redefine the role and responsibility of the Inspector.		
July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.		

Item Number: 24-03	NBIC Location: Part 2, S6	No Attachment
General Description: Wording Updates for Clarity **Subgroup:** Inspection **Task Group:** B. Wilson (PM), R. Kennedy, and J. Smith **Submitted by:** L. Ponce **Explanation of Need:** Part 2 Supplement 6 should be revised to align with Part 3, Suppl 6 and the DOT. A few references are S6.4.2 a), S6.4.2 c), S6.4.4, S6.4.5, S6.4.6, and S6.4.6.1. However, this may not be an all-inclusive list.		
July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.		

Item Number: 24-37	NBIC Location: Part 2, 2.2.10	No Attachment

General Description: Add language in the event boiler can't be secured at the time of inspection

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: In some circumstances boilers cannot be shut down and a dead man switch is not allowed.

July 2025 Meeting Action: Mr. Horbaczewski stated that the proposal for this item will be sent to the Subgroup for Review & Comment.

Item Number: 24-42	NBIC Location: Part 2, 2.4.1 and 2.4.4	No Attachment

General Description: Add language to NBIC Part 2 in regards to piping inspections

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: Two fatal incidents resultant from radiator failure prompted an ask for these changes.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-62	NBIC Location: Part 2, Section 2	No Attachment

General Description: Temporary Boiler Inspection

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: No guidance for inspectors for temporary boiler inspections.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-75	NBIC Location: Part 2, Table 2.5.8	No Attachment

General Description: NBIC Part II Review table 2.5.8, suggest changes to align with NBIC Part 4

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: Tim Baker and Tim Bolden raised needed changes to NBIC Part II in table 2.5.8, the table needs review and alignment with the table in Part 4 3.2.6

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-76	NBIC Location: Part 2, S7.9	No Attachment

General Description: Revision to Part 2, S7.9

Subgroup: Inspection
Task Group: None assigned.
Submitted by: James Roberts

Explanation of Need: Currently commercially refurbishers can inspect pressure vessels per NBIC S7.8.1 through S7.8.5 and place back into service without any statement this inspection was completed and by who.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-84	NBIC Location: Part 2, 2.3.6.10 and 2.3.6.11	No Attachment

General Description: Vessels above 10,000 psi reevaluation of remaining life

Subgroup: Inspection
Task Group: None assigned.
Submitted by: Craig Bierl

Explanation of Need: Inspectors need to be able to have a paper trail of the code integrity of these vessels. Changing the original data (in this case, designed cycle life) should ONLY be completed with the involvement of an authorized inspector and MUST be documented on a National Board form in order to be audited by the inservice inspector.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-90	NBIC Location: Part 2, S12.7 d)	No Attachment

General Description: Require means to prevent safety valve discharge piping blockage for LCDSV (Part 2)

Subgroup: Inspection
Task Group: None assigned.
Submitted by: Mark Edwards

Explanation of Need: Adding verbiage to the NBIC Part 1, Part 2 and Part 4 to require a means to prevent foreign material introduction to the safety valve discharge pipe.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-100	NBIC Location: Part 2, Section 5	Attachment

General Description: Add field to NB 6 & NB 7 from JRS Team

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: Repeatedly came up in investigations and in discussions that after reviewing an inspection form the reader has no idea if the object was operating.

July 2025 Meeting Action: Mr. Horbaczewski and Mr. Scarcella presented the proposal for this item. A motion was made and seconded to approve the proposal as presented. Discussion was held regarding the new disclaimer statement being added to the forms. Several Committee members and National Board staff members requested that this proposal be put on hold to further review the language. The motion was rescinded, and further work will be done on this item.

Item Number: 24-104	NBIC Location: Part 2, 2.1	No Attachment

General Description: Add language clarifying the limitation of inspections presented by design.

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: Currently an inspector could be held responsible for conditions they could not reasonably access.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item.

Item Number: 24-105	NBIC Location: Part 2, 1.5.1	Attachment Page 33

General Description: Need to restrict signatures to inspections for which the inspector was present

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: It has become practice in one jurisdiction for inspectors to sign inspection reports for apprentices.

July 2025 Meeting Action: Mr. Horbaczewski provided a progress report for this item, stating that the proposal will be sent to Subcommittee Inspection for Review & Comment.

iii. New Items:

Item Number: 24-28	NBIC Location: Part 2, S9.9 b) 4)	No Attachment

General Description: Applying PWHT to previously "as welded" item

Subgroup: Inspection
Task Group: Brent Ray, Paul Davis, Phil Gilston
Submitted by: J. Swezy

Explanation of Need: The NBIC clearly lists the application of PWHT to a PRI that was not previously PWHT by the original Manufacturer as an example of an alteration. I agree with that statement and believe it is appropriate to consider this to be an alteration. I do not under why the NBIC considers this as an acceptable alteration but does not provide its users with any guidance as to how they should address its implementation. It seems very clear to me that applying PWHT to such welds is rarely detrimental when properly applied and should not reduce their strength or toughness. If anything, it should prove helpful rather than harmful under properly considered application. Good engineering practice mandates that a carbon steel vessel undergoing a change to wet H2S service should receive PWHT to provide an improved resistance to hydrogen cracking corrosion. Failing to do so would be irresponsible. The NBIC rules for a change of service even mention this as a factor to consider in Part 2, Table S-9.4.

January 2025 Meeting Action:
A task group was formed to work on this item.
Note: on 1.14.25 at SG RA, George Galanes has pulled this item out of STG PT 2 / PT 3. George will interface with Part 2 once the wording has been finalized. This item to be removed prior to next meeting.

Item Number: 25-23	NBIC Location: Part 2, 3.4.8	Attachment Page 34

General Description: Add guidance for tube sag allowance

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: Inspectors were asking for clarification and better guidance. Item needs a working group to consider language.

July 2025 Meeting Action:

Item Number: 25-27	NBIC Location: Part 2, 2.3.6.2, 2.3.6.4, 4.4, S7.8	Attachment Page 35

General Description: Fitness-for-service coordination with API 579-1/ASME FFS-1

Subgroup: Inspection
Task Group: None assigned.
Submitted by: J. Hadley

Explanation of Need: Alert users about situations where acceptance criteria in Part 2 may be less strict than API 579-1/ASME FFS-1.

July 2025 Meeting Action:

Item Number: 25-31	NBIC Location: Part 2, New Supplement	Attachment Page 8

General Description: Add a supplement that lists the standard boiler and pressure vessel types

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: This would get states using the standard across the country both from a violation and object type.

July 2025 Meeting Action:

Item Number: 25-32	NBIC Location: Part 2, New Supplement	Attachment Page 8

General Description: Referenced standards added supplement to NBIC Part II

Subgroup: Inspection
Task Group: None assigned.
Submitted by: V. Scarcella

Explanation of Need: Need working group to review and propose appropriate action.

July 2025 Meeting Action:

Item Number: 25-36	NBIC Location: Part 2, S8.2	Attachment Page 46

General Description: Relief valve differential percentage conflict.

Subgroup: Inspection
Task Group: None assigned.
Submitted by: I. McGregor

Explanation of Need: Clarification is needed to ensure a correct assessment of the recommended differential pressure percentage between the operating pressure and lifting pressure of the pressure relief valve. When making formal recommendations for corrective action due to high operating pressure differentials observed during inspections, the correct recommended value is needed to guide the adjustments necessary.

July 2025 Meeting Action:

Item Number: 25-37	NBIC Location: Part 2, Forms	Attachment Page 47
General Description: Minor changes to NBIC Part 2 forms **Subgroup:** Inspection **Task Group:** None assigned. **Submitted by:** V. Scarcella **Explanation of Need:** Minor changes to NBIC Part 2 forms		
July 2025 Meeting Action:		

c. Subcommittee Repairs & Alterations

i. Old Interpretation Requests:

Item Number: I24-36	NBIC Location: Part 3, 3.4	No Attachment
General Description: Alteration of Plate Heat Exchanger **Subgroup:** Repairs and Alterations **Task Group:** T. Seime (PM) **Explanation of Need:** This question is asked frequently by Repair firms that want to increase the number of heat transfer plates. **January 2025 Meeting Action:** Mr. Seime announced that the task group is still working on this item.		

Item Number: I24-44	NBIC Location: Part 3, 2.5.3	No Attachment
General Description: Alternative weld methods and special services **Subgroup:** Repairs and Alterations **Task Group:** R. Derby (PM), P. Gilston **Explanation of Need:** In section VIII Div.1 construction some special service conditions as described in UW-2 make mandatory PWHT when it is not otherwise required for the actual thickness of material and P-number. This subtlety leads some to believe that the use of the Alternative weld methods is either not allowed or that they can only be conducted as an alteration. **January 2025 Meeting Action:** Mr. Seime announced that a proposal for this item will be balloted to Task Group Interpretations.		

ii. New Interpretation Requests:

Item Number: I25-09	NBIC Location: Part 3, 4.4.1 e) and 4.4.2 c)	Attachment Page 54

General Description: NDE in lieu of hydrotest

Subgroup: Repairs and Alterations

Task Group: B. Hrubala (PM)

Explanation of Need: Performing a hydrotest of these "Parts" presents a contamination risk as mentioned in Part 3, paragraph 4.4.2.c. During the installation phase, the authorized inspection agency (AIA) performing the installation inspection determined that the Part was required to have been hydrotested. Despite the clear allowance of NDE per Part 3, paragraphs 4.4.1.e and 4.4.2.c, the AIA stated that the only means to allow NDE is if hydrotest is not practicable. The installation AIA refused to allow the equipment to be installed without a hydrotest prior to installation so the fabricator incurred significant costs performing a hydrotest to meet the demands by the installation AIA. This is a typical repair scenario and clarity as to the requirements is necessary to avoid future instances of this issue.

July 2025 Meeting Action:

Item Number: I25-35	NBIC Location: Part 3, 3.3.4.3 e) 3) m.	Attachment Page 56

General Description: External Weld Metal Buildup - Proximity to Major Structural Discontinuities

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: NBIC Part 3 Section 3.3.4.3 e) 3) m provides clarity on the spacing between adjacent buildups but does not provide clarity on the required spacing between a buildup and other major structural discontinuities which could also interact with the stress concentration created by the buildup.

July 2025 Meeting Action:

Item Number: I25-40	NBIC Location: Part 3, 2.5.3.2	Attachment Page 57

General Description: Fillet welds using alternative welding method #2

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Welding on non-pressure parts (P11B Pads) to the outside of a VIII Div 1 P11B Pressure Vessel. Welding method #4 speaks specifically about fillet welds, when welding method #2 does not specifically reference fillet welds. Is this a potential oversight and it can be done, or is it written this way to exclude fillet welds using welding method #2?

July 2025 Meeting Action:

Item Number: I25-41	NBIC Location: Part 3, 3.4.1	Attachment Page 58

General Description: Pressure testing for re-rating: waiving requirements

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Composing an Alteration Plan for future service work. Owner/user would like to increase a drying cylinder MAWP from 150 psi steam pressure to 160 psi.

July 2025 Meeting Action:

iii. Action Items

TG Graphite Items:

Item Number: A24-67	NBIC Location: Part 3, S3.3	No Attachment

General Description: Requirement for G-mark when replacing parts

Subgroup: Graphite

Task Group: A Viet, J. Wince, S. Mehrez

Explanation of Need: Clarifying requirements for use of graphite pressure vessel replacement parts for repairs or alterations.

January 2025 Meeting Action: Mr. Viet provided a progress report for the item.

TG FRP Items:
There are currently no FRP items open for Part 3.

TG Historical Items:

Item Number: 20-25	**NBIC Location: Part 3, S2.13**	**No Attachment**
General Description: Repair Procedure for Fire Boxes **Subgroup:** SG Historical **Task Group:** M. Wahl (PM), R. Forbes, T. Dillon, L. Moedinger, C. Jowett, F. Johnson **Explanation of Need:** In NBIC Part 3, S2.13.10.3, S2.13.11 do not define what to do at a riveted joint. On the tubesheet, or firedoor sheet, where it is flanged to rivet to the firebox, the repairs are silent on what to do at the riveted joint. **January 2025 Meeting Action:** Mr. Seime stated that work is still being done on this item.		

Item Number: 25-13	**NBIC Location: Part 3, S2.7.1**	**No Attachment**
General Description: Update list to add acceptable materials for rivets and bronze castings and **Subgroup:** SG Historical **Task Group:** M. Wahl (PM) **Explanation of Need:** Update list to add acceptable materials for rivets and bronze castings and clarify the difference between flange bolts and boiler casting bolts.		
July 2025 Meeting Action:		

TG Locomotive Items:

Item Number: 24-77	**NBIC Location: Part 3, S1.2.3k)**	**Attachment Page 59**
General Description: Clarify Alteration for transition from rigid to flexible bolts. **Subgroup:** TG Locomotive **Task Group:** M. Ray (PM), W. Fengler, T. Botti, J. Churchill **Explanation of Need:** This is omission from the code.		
February 2025 TG Locomotive Meeting Action: Mr. Ray discussed this item and stated he had not made a lot of progress with the proposal. The group reviewed section S1.2.3 of Part 3. Mr. Ray then presented a proposal he created to the TG. The TG made changes to the proposal, and a motion was made to accept the revised proposal. The motion was seconded and **unanimously approved**. **July 2025 Meeting Action:**		

Item Number: 24-79	NBIC Location: Part 3, S1.1.1 b)	Attachment Page 60

General Description: Value of Default Tensile Strength

Subgroup: TG Locomotive
Task Group: M. Ray (PM)

Explanation of Need: FRA mandates default of 50,000 psi but boilers built after 1921 have better than 55,000 psi steel.

February 2025 TG Locomotive Meeting Action:
Mr. Ray presented a proposal to the TG. After a short discussion, a motion was made to accept the proposal as presented. The motion was seconded, and then the TG had further discussion on whether the language in the proposal was contradictory to the language in Title 49, Part 230. After further discussion the proposal was revised. The motion and second was revised to accept the revised proposal. The chair called for the vote, and the revised proposal was unanimously approved.

July 2025 Meeting Action:

Item Number: 24-80	NBIC Location: Part 3, S1.2.2	No Attachment

General Description: adding a paragraph l) to Part 3, S1.2.2

Subgroup: TG Locomotive
Task Group: S. Butler (PM), Dervin Lambert

Explanation of Need: It is a past practice used in locomotive boiler repair for stay bolts that could not be accessed from both sides.

February 2025 TG Locomotive Meeting Action:
The TG stated there has not been a lot of movement on this item. After discussion, and review of Part 3, S1.2.2, Mr. Butler will get a proposal together and the TG will come back to this item later in the meeting. The TG came back to this item and Mr. Bulter presented a proposal. The TG had a lot of discussion on the wording and weather or not the wording would be passed through Part 3 Repairs and Alterations since this goes against almost everything Part 3 says about staybolts. A motion was made to **close this item with no action**. The motion was seconded and unanimously approved.

July 2025 Meeting Action:

Item Number: 24-81	NBIC Location: Part 3, Table S1.1.3.1	Attachment Page 61

General Description: Revise Table S1.1.3.1, Part 3, Section 6

Subgroup: TG Locomotive
Task Group: R. Franzen (PM), T. Botti

Explanation of Need:
Need alternate material for Hollow Cylindrical Pressure Retaining Parts. Propose SA-106-B which is hollow seamless pipe to be used for super heater ball end parts. The new line-item title in the table would be "SH Unit Ball Ends", material options would be SA-106-B, SA-675, SA-696.
Change first line item from Boiler Tubes & Flues, Arch Tubes, Superheater Units, change to Boiler Tubes & Flues, Arch Tubes, Superheater Units & Tubing.
See other changes in table in RED.

February 2025 TG Locomotive Meeting Action:
Ms. Metzmaier reported that this item was omitted from the SC R& A January 2025 agenda. The proposal will be sent to letter ballot to the SC R&A for vote. No action was taken by the TG.

July 2025 Meeting Action:

Item Number: 24-106	NBIC Location: Part 3, S1.2.2	Attachment Page 62

General Description: S1.2.2 Threaded Staybolts, change wording concerning reduced body staybolts

Subgroup: TG Locomotive

Task Group: None Assigned
Submitted by: R. Franzen

Explanation of Need: Clarification on staybolts over 8" long is needed whether they need telltale holes or not in rigid, flexible, radial and crown bolts.

February 2025 TG Locomotive Meeting Action:
Mr. Franzen stated he has not created a proposal for this item. The TG had a lot of discussion over Part 3, S1.2.2. The TG is considering changing the layout of Part 3, S1.2.2 b) so it is more easily understood and easier to follow. Mr. Botti will work on the layout of this section with his restructure of telltale holes & flexible staybolts. The TG put together a proposal for changes to this section. A motion was made to accept the proposal as presented. The motion was seconded and unanimously approved.

July 2025 Meeting Action:

Item Number: 25-05	NBIC Location: Part 3,	Attachment Page 8

General Description: Washout plug engagement limits for locomotive boilers.

Subgroup: TG Locomotive
Task Group: None Assigned
Submitted by: Linn Moedinger

Explanation of Need: There is no current wording for washout plug engagement.

February 2025 TG Locomotive Meeting Action:
Mr. Moedinger presented a proposal for new wording. A motion was made to accept the proposal as presented. The motion was seconded. During discussion, the TG made a few changes to the proposal. The motion was revised to accept the revised proposal. The Chair called for the vote, and the proposal was **unanimously approved**.

July 2025 Meeting Action:

NR Task Group Items:

Item Number: A23-60	NBIC Location: Part 3, 1.6	No Attachment

General Description: Endorsements required for Nuclear Inspectors based on Category of work

Subgroup: NR TG

Task Group: C. Dinic (PM)

Explanation of Need: Endorsements required for Nuclear Inspectors based on Category of work (1, 2, or 3)

January 2025 Meeting Action: Mr. Spuhl stated that the proposal is still in development for this item.

Item Number: A24-09	NBIC Location: Part 3, 1.6.1 – 1.6.5	No Attachment

General Description: Update and revise NR Scope in 1.6.1 - 1.6.5

Subgroup: NR TG

Task Group: R. Spuhl (PM)

Explanation of Need: Scope and update and revision to 1.6.1 - 1.6.5.

January 2025 Meeting Action: Mr. Spuhl reported that work is still being done on this item.

SG Repairs & Alterations Items:

Item Number: 21-45	NBIC Location: Part 3, Supplements	No Attachment

General Description: Add a supplement for engineered repairs and alterations

Subgroup: Repairs and Alterations

Task Group: M. Schaser (PM), B. Boseo, B. Ray, D. Marek, R. Underwood, J. Siefert, P. Becker

Explanation of Need: There has been interest from companies operating with the Oil, Gas and Chemical industries to address certain types of repairs that may exist in ASME PCC-2 or API. NBIC does not have many of these repair methods within the book.

January 2025 Meeting Action: Ms. Moore gave a progress report for this item.

Item Number: 21-53	NBIC Location: Part 3, S8.5 a)	No Attachment

General Description: Post Repair Inspection of weld repairs to CSEF steels

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM), E. Cutlip, A. Triplett

Explanation of Need: The requirement for Inspector involvement in post-repair inspections to CSEF weld repairs is to ensure future safe operation of the boiler. This is a function of the inservice Authorized Inspection Agency, not the Repair Inspector, whose duties end with completion of repair documentation.

January 2025 Meeting Action: Ms. Moore stated that work is still being done on this item.

Item Number: 23-09	NBIC Location: Part 3, New Supplement	Attachment Page 63

General Description: Scope and Rules for use of Additive Manufacturing Pressure Parts

Subgroup: Repairs and Alterations

Task Group: T. Melfi (PM), J. Siefert, B. Schaefer, W. Sperko, J. Ferreira, J. Getter, T. Seime, M. Wadkinson

Explanation of Need: Developing rules for the use of additive manufacturing pressure parts in alterations.

January 2025 Meeting Action: Ms. Moore announced that a proposal will be letter balloted to Subcommittee R&A prior to the next meeting.

NOTE: This item was approved by SC letter ballot on April 19, 2025. It is ready to be presented to the Main Committee.

Item Number: A23-21	NBIC Location: Part 3, 3.3.4.9	No Attachment

General Description: Boiler tube plug guidelines and inclusion or watertube boilers

Subgroup: Repairs and Alterations

Task Group: E. Cutlip (PM), P. Gilston, K. Moore, A. Triplett, J. Ferreira

Explanation of Need: Currently both firetube and watertube boilers require a boiler tube be plugged when replacement of a tube is not practicable at the time the defective tube is detected.

January 2025 Meeting Action: Ms. Moore stated that the task group is still working on a proposal for this item.

Item Number: A23-24	NBIC Location: Part 3	Attachment Page 70

General Description: Repairs to quick actuating closures

Subgroup: Repairs and Alterations

Task Group: T. McBee (PM), C. Becker, M. Schaser, A. Khssassi, R. Smith

Explanation of Need: Put safe guidelines for repairs to quick actuating closures.

January 2025 Meeting Action: Ms. Moore stated that the proposal for this item will be balloted to Subcommittee R&A.

Item Number: A23-35	NBIC Location: All Parts, 9.1	No Attachment

General Description: Definition of "non-load bearing attachment" (All Parts)

Subgroup: Repairs and Alterations

Task Group: T. White (PM), A. Khssassi, J. Walker, P. Lentzer

Explanation of Need: The term "nonload bearing attachment" is used as a basis for determining a routine repair but is not defined in the NBIC.

January 2025 Meeting Action: Ms. Moore stated that the task group is still working on a proposal for this item.

Item Number: A23-61 NBIC Location: Part 3, S9.3 No Attachment

General Description: Revise NBIC R-2 Report and guide

Subgroup: Repairs and Alterations

Task Group: B. Schaefer (PM), T. LeBeau

Explanation of Need: Updates to the R-2 Report and the guide for completing R Report.

January 2025 Meeting Action: Ms. Moore stated that the task group is still working on this item.

Item Number: A23-68 NBIC Location: Part 3, 3.4.4 c) and d) No Attachment

General Description: Changes to Examples of Alterations

Subgroup: Repairs and Alterations

Task Group: M. Schaser (PM), T. McBee, P. Becker, L. Baker

Explanation of Need: The current wording of 3.4.4.d (2023) is open ended and may result in allowing significant design changes to a pressure vessel under the guise of a repair when an alteration is a more appropriate classification. Rewording is required to limit the scope of potential design changes.

January 2025 Meeting Action: Ms. Moore informed the Committee that the task group is still working on this item.

Item Number: A23-77 NBIC Location: Part 3, 4.2 a) No Attachment

General Description: Performance of Original NDE During Repairs and Alterations

Subgroup: Repairs and Alterations

Task Group: A. Triplett (PM), S. Frazier, J. Walker, R. Collins, P. Becker

Explanation of Need: The existing language in Part 3, Section 4, Paragraph 4.2.a does not provide enough guidance or flexibility for Repair Organizations and owners to prescribe appropriate NDE for repairs/alterations to existing welds. Based on the limited, often non-specific documentation typically available to these entities during NBIC repairs and alterations, additional allowances and direction should be provided.

January 2025 Meeting Action: Ms. Moore informed the Committee that the task group is still working on this item.

Item Number: A24-11	NBIC Location: Part 3, S9	No Attachment

General Description: Addition of a section on the R-1 Form for "Unresolved Issues"

Subgroup: Repairs and Alterations

Task Group: M. Quisenberry (PM), T. Seime, T. McBee

Explanation of Need: There have been multiple instances discussed during NBIC meetings of Certificate Holders having to leave known defects unrepaired because of the owner/user not wanting to make the repair. This field would allow AIA and Jurisdictional Authorities to be made aware of known and identified issues with a pressure retaining item that were not corrected. Additionally, this provides cover for the Certificate Holder that they identified the defect, brought it to everyone's attention, and the owner/user decided to leave it.

January 2025 Meeting Action: Ms. Moore stated that work is still being done on this item.

Item Number: A24-17	NBIC Location: Part 3, 5.7.5 b)	No Attachment

General Description: Specific Requirements For Stamping And Nameplates

Subgroup: Repairs and Alterations

Task Group: E. Cutlip (PM), B. Schaefer, A. Khssassi

Explanation of Need: 2023 ASME Section VIII-Div 1 UG-119(c)(5) has been revised to allow for the use of mechanical etching or laser annealing on nameplates.

January 2025 Meeting Action: Ms. Moore stated that work is still being done on this item.

Item Number: A24-18	NBIC Location: Part 3, 9.1	No Attachment

General Description: Definition of Controlled Fill

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM), A. Triplett, R. Collins, F. Johnson

Explanation of Need: Interpretation item I 23-79 addresses the use of the term 'controlled fill' in relation to welding method 6. The term is used in 2.5.3 d in relation to welding method 6 and more specifically in Supplement 8. Supplement 8 gives a lot of detail in schematics about a controlled fill in terms of weld bead placement, its use in controlling heat input etc., but in Welding Method 6 the term is not specifically used, but direction for welding is given, typically preheats are specified, electrode size for SMAW, and the use of stringer beads only.

January 2025 Meeting Action: Mr. Gilston presented a proposal for this item. A motion was made and seconded to approve the proposal as presented. Discussion was held on the wording of the definition for "Controlled Fill". After discussion a vote was taken on the motion. The motion failed because many committee members felt that the definition presented in the proposal should match definitions used elsewhere instead of coming up with a new definition. This item will be sent back to Subcommittee R&A for further work.

Item Number: A24-20	NBIC Location: Part 3, 9.1	No Attachment

General Description: Define "Engineered Repairs" and "Engineered Alterations"

Subgroup: Repairs and Alterations

Task Group: M. Schaser (PM), B. Ray, R. Underwood, B. Boseo, D. Marek, J. Siefert, P. Becker

Explanation of Need: The new supplement dealing with "Engineered Repairs and Alterations" (A21-45) will impact Part 3 Section 1, the NB-415, QRRs, the application process for Certificate Holders, and other documents to be determined. Defining "Engineered Repairs" and "Engineered Alterations" clarify the intent for these new scopes.

January 2025 Meeting Action: Ms. Moore gave a progress report for this item.

Item Number: A24-21	NBIC Location: Part 3, 9.1	No Attachment

General Description: Engineered Repairs and Alterations - Section 1 Scope and Manual reqs

Subgroup: Repairs and Alterations

Task Group: M. Schaser (PM), B. Ray, R. Underwood, B. Boseo, D. Marek, J. Siefert, P. Becker

Explanation of Need: The scope of "Engineered Repairs and Alterations" (A21-45)needs to be clarified in 1.4.1 d) and reflected in the scope statement requirements for manuals in 1.5.1 a).

January 2025 Meeting Action: Ms. Moore stated that the task group is still working on a proposal for this item.

Item Number: A24-96 **NBIC Location: Part 3, 5.5 a)** **Attachment Page 74**

General Description: Add examples of repairs and alterations specific to Electrochemical Stacks

Subgroup: Repairs and Alterations

Task Group: A. Triplett (PM)

Explanation of Need: With inclusion and initial deployments of electrochemical stacks as U Stamped pressure vessels under ASME BPVC Section VIII Division 1 and Code Case 3078, these stacks are starting to be shipped and registered with the National Board. Some basic examples of allowed repairs are needed to help guide an understanding of limitations for electrochemical stacks.

January 2025 Meeting Action: Ms. Moore stated that work is still being done on this item.

Item Number: A24-98 **NBIC Location: Part 3, 2.5.2** **No Attachment**

General Description: Review and revise the PWHT Requirements in 2.5.2

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM)

Explanation of Need: Simplify PWHT requirements in 2.5.2.

January 2025 Meeting Action: Ms. Moore informed the committee that the task group is still working on this item.

iv. New Items:

Item Number: A25-04 **NBIC Location: Part 3, 2.5.3** **Attachment**

General Description: Part 3, 2.5.3 Special Service Equipment

Subgroup: Repairs and Alterations

Task Group: R. Derby (PM), P. Gilston

Explanation of Need: An interpretation request was received regarding the use of alternate welding methods for pressure equipment identified as Special Service. Comments received in the initial R&C indicated that the current words did not support the proposed Q&A. The proposal had been presented as an intent interpretation, and the comment was made if this was the desire, then to have a separate action item.

July 2025 Meeting Action:

Item Number: A25-18	NBIC Location: Part 3, 5.7.5	Attachment Page 78

General Description: Requirements for Stamping and Nameplates

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: which contains critical identification information. However, HRSG boilers differ in that they have multiple master nameplates for different sections (e.g., HP, LP, economizer), all located on the outer casing of the boiler. Currently, NBIC repair nameplates do not provide a way to indicate which specific section was repaired. This limitation creates confusion for future inspections and maintenance, as there is no clear indication of which section underwent repairs. Adding a requirement for repair nameplates to include the specific HRSG boiler section being repaired will enhance clarity and traceability.

July 2025 Meeting Action:

Item Number: A25-20	NBIC Location: Part 3, 3.3.4.6	Attachment Page 80

General Description: Adoption of reinforcement/fillet welded patches from PCC-2

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Oil refineries are scant on shutdown opportunities and vital to the fuel needs of the community. At times inspection departments will detect corrosion on an in-service piece of equipment and be unable to clean it up for internal entry without a planned outage. Fillet welded patches are a safer alternative to external weld metal build up, or fitness for service.

July 2025 Meeting Action:

Item Number: A25-21	NBIC Location: Part 3, S11.2.3 and S11.3.2	Attachment Page 81

General Description: Synchronize/Revise Repairs & Alterations of VIII-2, VIII-3 PRIs

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Mr. Tim Gardner, NBBI Senior Staff Engineer/Training Instructor, plans to create an online course for repairs of ASME Sect VIII-2 and VIII-3 PRIs but the current requirements in S11.2.3 and S11.3.2 (formerly 3.3.5 and 3.4.5) do not seem to be in agreement.

July 2025 Meeting Action:

Item Number: A25-22	NBIC Location: Part 3, Table 2.5.1	Attachment Page 82

General Description: Revise Part 3, Table 2.5.1

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: There have been changes to materials in the ASME Code that have made a review/revision of Table 2.5.1 necessary. If anything, the obsolete group numbers should be deleted. It will be up to the committee to decide whether to add the missing P/group numbers and the associated temperatures.

July 2025 Meeting Action:

Item Number: A25-25	NBIC Location: Part 3, S11.2.2	Attachment Page 85

General Description: Repair of PRIs Without Complete Removal of Defect

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: To clarify this repair activity can be used for welded or non-welded repairs. This proposal will remove reference to welded repairs in S11.2.2 and only refer to "repair."

July 2025 Meeting Action:

Item Number: A25-26	NBIC Location: Part 3, 3.2.2 and 5.7.4	Attachment Page 86

General Description: Stamping of non-ASME Parts and Distribution of Form R-3

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Part 3 does not address the distribution of the R-3 and provides no specific details on how to stamp non-ASME parts fabricated by the R Certificate Holder.

July 2025 Meeting Action:

Item Number: A25-28	NBIC Location: Part 3, 1.3 b) and 9.1	Attachment Page 88

General Description: Remove references to FIA's throughout - This is now a scope under OUIO

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: FIA's are to be a scope under OUIO. Definitions have been removed from RCI-1. This will remove references in the: Introduction; 1.3 b); and in the definition of an Inservice AIA.

July 2025 Meeting Action:

Item Number: A25-29	NBIC Location: Part 3, 2.5.3 and 3.3	Attachment Page 90

General Description: Referencing for Weld Metal, Filler Metal etc.

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM)

Explanation of Need: Within Part 3, welding consumables are referred to in several different ways e.g., filler metal, weld metal etc. This item is to review these references and identify if a single reference description is beneficial for users of the Code.

July 2025 Meeting Action:

d. Subcommittee Pressure Relief Devices

i. Interpretations

Item Number: 24-38	NBIC Location: Part 4, 2.5.4.2 & Part 1, 3.9.1.6 c)	Attachment Page 98

General Description: T&P relief device installation on modular HWH supply header

Task Group: None assigned.

Explanation of Need: The NBIC does not address the installation or location of a common T&P valve for modular HWH's. Clarification is needed on whether the common supply header can be considered part of the HWH, and whether T&P valves can be installed in the horizontal position with the outlet pointed down, if installed directly to the header with no more than 4 in. maximum interconnecting piping.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 24-46	NBIC Location: Part 4, 4.3.1 a)	Attachment Page 99

General Description: Replacement of Bodies and Transfer of Nameplates During Repair

Task Group: None assigned.

Explanation of Need: Clarity on what defines "the valve". Is "the valve" the nameplate solely or the nameplate and serialized base; and subsequent ability to divorce the nameplate and base during repair when the base requires replacement.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 24-87	NBIC Location: Part 4, 4.7.3 a) and b)	Attachment Page 100

General Description: Changes to the original pressure relief device nameplate.

Task Group: None assigned.

Explanation of Need: Clarification is needed on the correct way to communicate changes to a relief device through nameplate stamping.

January 2025 Meeting Action: Mr. Renaldo informed the Committee that this is an intent interpretation item, and that an accompanying action item (25-01) has been opened to revise relevant code language. These items will be presented together once a proposal for 25-01 has been finalized.

New Interpretation Requests:

Item Number: 25-10	NBIC Location: Part 4, 2.6	Attachment Page 101

General Description: Is a Pressure Relief Device the only Relief Method for Pressure Vessels?

Task Group: None assigned.

Explanation of Need: The jurisdiction is claiming the NBIC implies that a pressure relief device is the only acceptable relief method for a pressure vessel since Part 4 Section 2.6 only addresses pressure relief devices.

July 2025 Meeting Action:

ii. Action Items – Old Business

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

General Description: Create Guidelines to address Overpressure Protection by System Design.

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

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item. A proposal will be balloted to Subgroups Installation, Inspection, and PRD.

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

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 19-83	NBIC Location: Part 4, 4.7.5	No Attachment

General Description: Address Alternate Pressure Relief Valve Mounting Permitted by ASME CC2887-1

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

Explanation of Need: ASME Code Case 2887-1 permits the installation of pressure relief valves below a low mass water tube boiler or water heater under certain conditions. This set of conditions and alternate location should be addressed in the NBIC as the use of low mass water tube boilers and water heaters becomes more widespread.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item. The item was also assigned a new project manager.

Item Number: 21-08	NBIC Location: Part 4, S4.4	No Attachment

General Description: Additional guidance for tank vent repairs

Subgroup: PRD

Task Group: B. Nutter (PM), B. Donalson, B. Nutter, K. Beise, J. Grace

Explanation of Need: The recently approved S4.4, "Weight Loaded Vents," provided new guidance for tank vent repairs. Several additional topics need to be addressed to enhance the guidance. These topics include: 1) Suggested test equipment and configuration for the prescribed tank vent testing. 2) Minimum requirements for replacement parts, 3) Guidance for painting tank vent components.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 22-09	NBIC Location: Part 4, 4.6.1	No Attachment

General Description: Add language to NBIC Part for valves manufactured to Code Case 2787

Subgroup: PRD

Task Group: A. Donaldson (PM), H. Cornett, B. Nutter, T. Tarbay, J. Simms

Explanation of Need: There are no requirements to address valve repairs that were manufactured or assembled to Code Case 2787 (use of more than one certified capacity on the pressure relief valve or the nameplate).

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 22-20	NBIC Location: Part 4, 4.7.4	No Attachment

General Description: Inspection and testing of PRV's located above isolation valves.

Subgroup: PRD

Task Group: D. Marek (PM), K. Beise, J. Ball, E. Creaser, H. Cornett, A. Renaldo

Explanation of Need: Add requirement to make sure the internals of a PRV inlet and outlet are inspected when it is tested, and require tests to be done with a pressure vessel with volume.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 23-32	NBIC Location: Part 4, 3.3 and Supp. 6	No Attachment

General Description: Rules for T/O activities related to Nuclear Class Valves

Subgroup: PRD

Task Group: E. Creaser (PM), P. Dhobi, D. McHugh, J. Simms

Explanation of Need: Nuclear facilities that perform repair and T/O activities would by allowing them to use T/O for nuclear class valves that were serviced but not in need of repair but need to be set and sealed again.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 24-35	NBIC Location: Part 4, 4.6.2	No Attachment

General Description: Update Testing of UV-Designated Steam valves on Air to match ASME XIII

Subgroup: PRD

Task Group: T. Beirne (PM)

Explanation of Need: ASME Section XIII Table 3.6.3.1-1 Note 3 permits UV-designated steam valves to be tested using air when the valve is beyond the testing capabilities due to set pressure or capacity. The NBIC only permits steam valves to be tested on air by the owner/user. This should be permitted by any VR shop that has steam test equipment since it is permitted under the rules for new construction.

January 2025 Meeting Action: Mr. Renaldo gave a progress report for this item.

Item Number: 24-72	NBIC Location: Part 4, 4.3.1	No Attachment

General Description: Add Language to Address Replacement of Valve Bodies and Bases

Subgroup: PRD

Task Group: A. Donaldson (PM), G. Salwan, E. Creaser, H. Cornett, B. Nutter, P. Dhobi, T. Tarbay, T. Patel

Explanation of Need: Under the current text of 4.3.1 there are no guidelines for the replacement of valve components to which the original nameplate is attached.

January 2025 Meeting Action: Mr. Renaldo announced that a task group was assigned to begin work on this item.

Item Number: 24-91	NBIC Location: Part 4, 3.2.3	No Attachment

General Description: Require means to prevent safety valve discharge piping blockage for LCDSV (Part 4)

Subgroup: PRD

Task Group: A. Renaldo (PM), J. Simms, D. Schirmer, D. Sullivan, R. Ceccarelli

Explanation of Need: Adding verbiage to the NBIC Part 1, Part 2 and Part 4 to require a means to prevent foreign material introduction to the safety valve discharge pipe.

January 2025 Meeting Action: Mr. Renaldo announced that a task group was assigned to begin work on this item.

Item Number: 24-101	NBIC Location: Part 4, Sections 3 and 4	No Attachment

General Description: Revise NBIC to expand VR and T/O programs beyond ASME Certified Valves

Subgroup: PRD

Task Group: E. Creaser (PM), D. Marek, T. Beirne, H. Cornett, K. Beise, R. Viers, N. Bailey, A. Donaldson

Explanation of Need: The National Board upper management and Board of Trustees have decided to expand the VR and T/O programs to valves that are constructed to standards other than ASME. The proposal file contains changes that would accomplish this goal. Changes to NB-514 and NB-528 will follow.

January 2025 Meeting Action: Mr. Renaldo announced that a task group was assigned to begin work on this item.

iii. New Items:

Item Number: 25-08	NBIC Location: Part 4, 4.6.1	Attachment Page 102

General Description: Add Requirements for Qualification of Mobile Test Equipment

Subgroup: PRD

Task Group: None assigned.

Explanation of Need: The current working in 4.6.1 only addresses performance test equipment. We do not address mobile test equipment. I believe we need to add a new paragraph 4.6.1 c) that addresses test equipment other than just the performance test equipment.

Background Information: Per T. Tarbay:
The reason I think we need to address test equipment is I am finding shops that are using low volume tests stands for field testing (i.e. nitrogen bottle with an air hose). As you know, using these low volume stands, you cannot "pop" a valve.

July 2025 Meeting Action:

Item Number: 25-19	NBIC Location: Part 4, Supplement 4	No Attachment

General Description: Spring slackness with time in the HP steam for more than 5 years

Subgroup: PRD

Task Group: None assigned.

Explanation of Need: The current NBIC guidelines do not explicitly address the time-dependent degradation of safety valve springs in high-temperature steam services. We have observed premature opening of safety valves in our HP steam headers, which has been attributed to spring relaxation over time. Without specific guidance on inspection frequency and replacement intervals, there is a risk of undetected spring degradation leading to operational disruptions, potential overpressure events, and increased maintenance costs. This amendment will provide clear and practical recommendations to mitigate these risks.

Background Information: To ensure the continued reliability and integrity of high-pressure steam safety valves, it is proposed that the NBIC guidelines be amended to include:
1- Mandatory spring inspection during each scheduled safety valve inspection. This inspection should include, but not be limited to, assessing spring relaxation, free height, and visual inspection for signs of fatigue or damage.
2- A recommended spring replacement interval of five years for safety valves operating in high-temperature steam services. This interval is based on observed spring relaxation and the potential for thermal/mechanical fatigue over time.

This amendment aims to proactively address the issue of premature safety valve operation and potential spring failures, enhancing safety and operational reliability.

July 2025 Meeting Action:

Item Number: 25-30	NBIC Location: Part 4, 4.7.2 b) 3)	Attachment Page 103

General Description: Association of Repair for Pilots and Main Valves

Subgroup: PRD

Task Group: None assigned.

Explanation of Need: There is currently not language tying the pilot and main valve of a pilot-operated pressure relief valve to one another following repair.

Background Information: ASME Section XIII 3.9 (f) (1) mandates that the pilot and main valve of a pilot-operated pressure relief valve each be marked with the same unique identifier to establish association of both components. This would create a similar requirement in NBIC to establish association of the pilot and main valve of pilot-operated pressure relief valves as being part of a single VR repair.

July 2025 Meeting Action:

Item Number: 25-38	NBIC Location: Part 4, 3.2.5.1 and 4.6.1	Attachment Page 104

General Description: Address Testing of Pilot Valves as Complete Assembly

Subgroup: PRD

Task Group: None assigned.

Explanation of Need: ASME CC 3057 requires that pilot operated valves be tested at least once as a complete assembly to verify all components are properly connected, leak tight, and that the pilot actuates the main valve. This also verifies freedom of operation of the main valve.

Background Information: Pilot operated valves in service have been field tested by checking pilot set point without verification that the main valve will open.

July 2025 Meeting Action:

10. Liaison Activities

i. **American Society of Mechanical Engineers BPV Code (ASME BPV)**
   - **a.** Mr. Gary Scribner will provide updates on ASME activities.
   - **b.** Mr. Brent Ray will provide updates on PCC activities.

ii. **American Welding Society (AWS)**
   - **a.** Mr. Jim Sekely will provide an update on AWS activities.

iii. **American Petroleum Institute (API)**
   - **a.** Mr. Brent Ray to provide an update on recent API activities.

11. Future Meetings

i. January 12-15, 2026 – New Orleans, LA

12. Adjournment

Respectfully submitted,

Jonathan Ellis

Jonathan Ellis
NBIC Secretary

NATIONAL BOARD INSPECTION CODE COMMITTEE

ATTACHMENTS

Items Approved for the 2027 NBIC (as of July 2025)

Title	Item Number	Cycle	Assigned Committee
Create Guidelines for Repair of Pin Devices	NB15-0307	A	Subcommittee Pressure Relief Devices
Registration of NR Forms within 30 Days	24-95	A	Subcommittee Repairs/Alterations
Part 2, 2.3.6.8 ASME PVHO Forms call out the 2016 Edition.	24-94	A	Subcommittee Inspection
Changing Part 3 supplement 8's title for clarity	24-93	A	Subcommittee Repairs/Alterations
NR Inspector and Agency Qualification Reqs in 1.3 - TIED TO A23-60	24-92	A	Subcommittee Repairs/Alterations
Increase nozzle routine repair limit for graphite nozzles	24-86	A	Subcommittee Repairs/Alterations
Change Part 3, 1.6.4 d) (or elsewhere) to require audits to be performed by Supervisor	24-83	A	Subcommittee Repairs/Alterations
Rewrite Part 3, S1.1.4	24-82	A	Subcommittee Repairs/Alterations
Revise the repair and alteration Sect VIII Div 2 and 3 paragraphs	24-60	A	Subcommittee Repairs/Alterations
Strengthening Prevention of Defect Recurrence	23-39	A	Subcommittee Repairs/Alterations
Addition of requirement for Inspector to be present for inspections.	23-27	A	Subcommittee Inspection
High pressure limit control requirements for fired jacketed steam kettles	22-32	A	Subcommittee Installation
To provide better guidance as it relates to carbon monoxide	21-47	B	Subcommittee Inspection
Testing and Acceptance: Boiling-out Procedure	20-86	B	Subcommittee Installation

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	External Low-Water Fuel Cutoff for Hot Water Heating Boilers
NBIC Location:	2023 NBIC, Part 1, 3.8.2.4 d)
Statement of Need:	The valves proposed are a means to avoid draining the hot water boiler of its water just to test the low water fuel cutoff, we want to verify that they satisfy the requirements of the code.
Background Information:	A client has proposed using these "Test-N-Check" valves that are intended to be installed at the cross in the external piping above and below the low water cutoff device. We are concerned about the longevity and verification of the spring-loaded action to return the valves to normal position after testing the device and are curious if these valves satisfy the automatic return requirement. I will provide an info sheet of the valves in question.
Proposed Question:	Would a spring-loaded flapper "check" valve be considered as a temporary means to isolate the device that will automatically return to its normal position?
Proposed Reply:	Yes - a spring-loaded flap would be considered automatic No - a different method of returning to normal position is considered automatic
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

Item 22-28

SUPPLEMENT XX

POOL HEATERS

SXX.1 SCOPE

NBIC Part 1, Supplement XX provides requirements for various aspects of the installation of Pool Heaters which are unique from other products covered by this section.

Pool Heaters are appliances designed for heating non-potable water stored at atmospheric pressure, such as water in swimming pools, spas, hot tubs, or similar applications. The installation requirements are different for:

a) Direct-type Pool Heaters, in which the heat is exchanged directly from the combustion products to the pool water. Direct-type Pool Heaters may be non-Code if they cannot be isolated from the pool, spa or tub that is open to atmosphere. ASME marked direct-type Pool Heaters may bear either the H or HLW designator.

b) Indirect-type Pool Heaters, in which the heat is exchanged directly from the combustion products to a heat transfer medium and a secondary heat exchanger transfers heat from the heat transfer medium to the pool water. The primary heat source for an indirect-type pool Heater is connected to a small closed loop system and as such is a water boiler and should meet all the requirements for water boiler installations.

SXX.2 WATER

a) Water fill connections shall be installed. A means shall be provided at or near the direct-type pool heater to prevent backfeeding. Such means shall be rated for the direct-type pool heater design pressure and temperature.

b) Provision should also be made in every equipment room for a convenient water supply that can be used to flush out the direct-type pool heater and to clean the equipment room floor.

Since direct-type pool heaters are connected to a body of water that is exposed to atmosphere, expansion tanks and pressure reducing valves are not required. See Figure SXX.2 Pool Heaters in Battery — Acceptable Piping Installation.

SXX.3 DRAIN VALVES

a) Each direct-type pool heater shall have a bottom drain pipe connection fitted with a valve or cock connected with the lowest water space practicable. The minimum size bottom valve shall be NPS 3/4 (DN 20).

b) Any discharge piping connected to the bottom drain connection shall be full size to the point of discharge.

SXX.4 TEMPERATURE CONTROLS AND THERMOMETERS

Pool Heaters shall not allow water supplied directly to the pool above 140°F (60°C).

SXX.5 PRESSURE RELIEF VALVES

For Direct-type pool heaters:

a) Pressure relief valves shall be manufactured in accordance with a national or international standard and be certified for capacity by the National Board.

Commented [TGC1]: Should there be a hyphen between direct and type, e.g. “Direct-type Pool Heater”? If so, the same would be true for “Indirect-type”.

Commented [JK2R1]: While there is some inconsistency within Part 1, the predominant style is as you suggest. I have made the recommended revisions throughout the document.

Commented [TGC3]: Should there be a hyphen between direct and type, e.g. “Direct-type Pool Heater”? If so, the same would be true for “Indirect-type”.

Commented [JK4R3]: While there is some inconsistency within Part 1, the predominant style is as you suggest. I have made the recommended revisions throughout the document.

Commented [TGC5]: I would recommend striking this text. We don’t comment on labeling, listing, or stamping for other types of equipment. Those would be jurisdictional requirements.

Commented [JK6R5]: This section contains some of the information that I most wanted to communicate to boiler inspectors. I have attempted removing the reference to CSA/ANSI.

Commented [JK7]: First ballot: Marvin Byrum advised that, “non-code vessels should not be mentioned in this code supplement. They are not allowed.” I responded, “I would be happy to discuss this with you further.
Non-ASME code pool heaters do exist. The CSA/ANSI safety certification standard for pool heaters does not require ASME construction as it does for pool heaters and water heaters.
Pool heaters are different from boilers and water heaters. They have lower operating temperature limits and may be connected to open vessels with no means of isolation from those vessels.”

Commented [JK8]: First ballot: H. Michael Richards recommended removing (b), “this is a 'housekeeping item and not in the scope of the document.” My reply to the comment, “Similar requirements to S12.2 b) currently exist in clauses 2.4.4 and 3.5.1 c). Please reply if you still feel this clause should be removed.” No further communication.

Commented [JK9]: First ballot: Rodger Adams comments interpreted as recommendation to replace references to sections in Part 1 with exceptions with straight forward instruction regarding what is allowed. Revisions made accordingly.

Commented [JK10]: First ballot: Rodger Adams comments interpreted as recommendation to replace references to sections in Part 1 with exceptions with straight forward instruction regarding what is allowed. Revisions made accordingly.

Commented [JK11]: First ballot: Rodger Adams comments interpreted as recommendation to replace references to sections in Part 1 with exceptions with straight forward instruction regarding what is allowed. Revisions made accordingly.

b) Each direct-type pool heater shall have at least one National Board capacity certified pressure relief valve, of the automatic reseating type set to relieve at or below the maximum allowable working pressure of the boiler.

c) Direct-type pool heaters may have, in lieu of the valve(s) specified in b) above, one or more National Board capacity certified temperature and pressure relief valves of the automatic reseating type set to relieve at or below the maximum allowable working pressure of the boiler.

d) When more than one pressure relief valve is used on a direct-type pool heater, the additional valves shall be National Board capacity certified and may have a set pressure within a range not to exceed 6 psig (40 kPa) above the maximum allowable working pressure of the boiler up to and including 60 psig (414 kPa), and 5% for those having a maximum allowable working pressure exceeding 60 psig (414 kPa).

e) No pressure relief valve shall be smaller than NPS 3/4 (DN 20) nor larger than NPS 4 (DN 100), except that boilers having a heat input not greater than 15,000 Btu/hr (4.4 kW) should be equipped with a rated pressure relief valve of NPS 1/2 (DN 15).

f) The required relieving capacity, in lbs/hr (kg/hr), of the pressure relief device or devices on a Direct-type pool heater shall be the greater of that determined by dividing the maximum output in Btu/hr (Watts) at the boiler nozzle obtained by the firing of any fuel for which the unit is installed by 1,000 Btu/lb (645 W-hr/kg).

g) When operating conditions are changed, or additional heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and shall be in accordance with NBIC Part 1, SXX.5 h). The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.

h) Pressure relief valve capacity for each direct-type pool heater with a single pressure relief valve shall be such that, with the fuel burning equipment installed and operated at maximum capacity, the pressure cannot rise more than 10% above the maximum allowable working pressure. When more than one pressure relief valve is used, the over pressure shall be limited to 10% above the set pressure of the highest set valve allowed by NBIC Part 1, SXX.5 d).

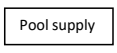
SXX.6 CONDENSING POOL HEATERS

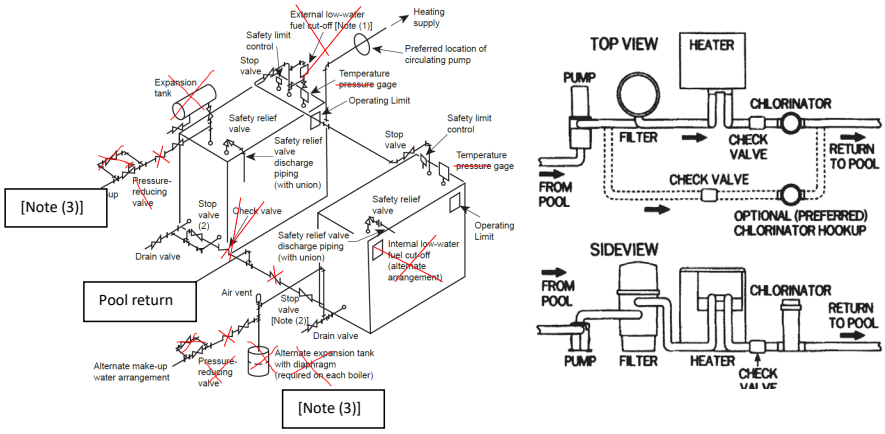
All condensing pool heaters shall comply with the requirements in Supplement 6 for Condensing Boilers. Since pool heaters are often installed near chemicals used for pool maintenance, special care is needed to ensure that intake air for the pool heaters is not contaminated with chlorine or other fumes that will increase the acidity of condensate and result in harm to the pool heater or venting.

SXX.7 CHIMNEY OR STACK

See NBIC Part 1, Section 1.6.8, *Chimney or Stack*.

FIGURE SXX.1
[Notes for NBIC editor/graphics: This image is taken from the water boiler piping diagram. Remove low-water cutoffs. Remove expansion tank and associated piping. Remove check valves. Replace "temperature pressure gauge" with "temperature gauge".]
POOL HEATERS IN BATTERY − ACCEPTABLE PIPING INSTALLATION





General Notes:

(1) Recommended control. Acceptable shutoff valve or cocks in the connecting piping may be installed for convenience or control testing and/or service.

(2) The common return header stop valves may be located on either side of the check valves.

(3) Make-up water may alternatively be added to the pool rather than at the return.

2.5.3 ELECTRICAL

A disconnecting means capable of being locked in the open position shall be installed at an accessible location at the boiler so that the boiler can be disconnected from all sources of potential energy. This disconnecting means shall be an integral part of the boiler or adjacent to it.

2.5.3.1 WIRING

All wiring for controls, heat generating apparatus, and other appurtenances necessary for the operation of the boiler or boilers should be installed in accordance with the provisions of national or international standards and comply with the applicable local electrical codes.

2.5.3.2 REMOTE EMERGENCY SHUTDOWN SWITCHES

~~a)~~ A manually operated remote emergency shutdown switch~~(es)~~ or circuit breaker shall be ~~located just outside the equipment room door~~ provided and marked for easy identification. ~~Consideration should also be given to the type and location of the switch(es) in order to safeguard against tampering. Where approved by the Jurisdiction, alternate locations of remote emergency switch(es) may be provided.~~

a) The default location for the switch or circuit breaker shall be just outside the boiler room door, though the following factors must be considered when determining the appropriate location and number of switches to be installed:

1) If the equipment room door is on the building exterior, the switch should be located just inside the door.

2) ~~b)~~ For equipment rooms exceeding 500 ft.$_2$ (46 m$_2$) floor area or containing one or more boilers having a combined fuel capacity of 1,000,000 Btu/hr. (293 kW) or more, additional manually operated remote emergency shutdown switches shall be located at suitably identified points of egress acceptable to the Jurisdiction.

3) ~~c)~~ Where a boiler is located indoors in a facility and not in an equipment room, a remote emergency shutdown switch shall be located within 50 ft. (15 m) of the boiler along the primary egress route from the boiler area.

4) Additional consideration should be given to the type and location of the switch(es) in order to facilitate proper operation and safeguard against tampering. Where approved by the Jurisdiction, alternate locations of remote emergency shutdown switch(es) may be provided.

5) For utility boilers or other large scale units operated from a control room, the switch should be installed in a location immediately accessible to the operator.

~~d)~~ b)For atmospheric-gas burners and for oil burners where a fan is on the common shaft with the oil pump, the ~~emergency~~ remote emergency shutdown switch~~(es)~~ or circuit breaker~~(s)~~ must disconnect all power to the burner controls.

~~e)~~ c)For power burners with detached auxiliaries, the ~~emergency~~ remote emergency shutdown switch~~(es)~~ or circuit breaker~~(s)~~ need only shut off the fuel input to the burner.

~~f) When existing boiler installations do not include remote emergency shutdown switches, it is not required that these switches be retroactively installed unless required by the Jurisdiction.~~

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3.5.3 ELECTRICAL

A disconnecting means capable of being locked in the open position shall be installed at an accessible location at the boiler or water heater so that the boiler or water heater can be disconnected from all sources of potential energy. This disconnecting means shall be an integral part of the boiler or water heater or adjacent to it.

3.5.3.1 WIRING

All wiring for controls, heat generating apparatus, and other appurtenances necessary for the operation of the boiler(s) or water heater(s) should be installed in accordance with the provisions of national or international standards and comply with the applicable local electrical codes.

3.5.3.2 REMOTE EMERGENCY SHUTDOWN SWITCHES~~3.5.3.1 STEAM HEATING, HOT WATER HEATING, AND HOT WATER SUPPLY BOILERS~~

~~a) All wiring for controls, heat generating apparatus, and other appurtenances necessary for the operation of the boiler or boilers shall be installed in accordance with the provisions of national or international standards and comply with the applicable local electrical codes.~~

~~b) A disconnecting means capable of being locked in the open position shall be installed at an accessible location at the boiler so that the boiler can be disconnected from all sources of potential. This disconnecting means shall be an integral part of the boiler or adjacent to it.~~

~~c)~~ A manually operated remote emergency shutdown switch or circuit breaker shall be ~~located just outside the equipment room door~~ provided and marked for easy identification. ~~Consideration should also be given to the type and location of the switch to safeguard against tampering.~~

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a) The default location for the switch or circuit breaker shall be just outside the boiler room door, though the following factors must be considered when determining the appropriate location and number of switches to be installed:

1) ~~d)~~ If the equipment room door is on the building exterior, the switch should be located just inside the door. ~~If there is more than one door to the equipment room, there should be a switch located at each door of egress.~~

2) For equipment rooms exceeding 500 ft.^{2} (46 m^2) floor area or containing one or more boilers and/or water heaters having a combined fuel capacity greater than or equal to 1,000,000 Btu/hr. (293 kW), additional manually operated remote emergency shutdown switches shall be located at suitably identified points of egress acceptable to the Jurisdiction.

3) Where a boiler or water heater is located indoors in a facility and not in an equipment room, a remote emergency shutdown switch shall be located within 50 ft. (15 m) of the boiler along the primary egress route from the equipment area.

4) Additional consideration should be given to the type and location of the switch(es) in order to facilitate proper operation and safeguard against tampering. Where

approved by the Jurisdiction, alternate locations of remote emergency shutdown switch(es) may be provided.

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~~1)~~ b)For atmospheric-gas burners, and oil burners where a fan is on a common shaft with the oil pump, ~~the complete burner and controls should be shut off~~ the remote emergency shutdown switch or circuit breaker must disconnect all power to the burner controls.

~~2)~~ c)For power burners with detached auxiliaries, ~~only the fuel input supply to the firebox need to be shut off~~ the remote emergency shutdown switch or circuit breaker need only shut off the fuel input to the burner.

~~**3.5.3.2 POTABLE WATER HEATERS**~~

~~a) All wiring for controls, heat generating apparatus, and other appurtenances necessary for the operation of the potable water heaters shall be installed in accordance with the provisions of national or international standards and comply with the applicable local electrical codes.~~

~~b) A manually operated remote shutdown switch or circuit breaker shall be located just outside the equipment room door and marked for easy identification. Consideration should also be given to the type and location of the switch to safeguard against tampering.~~
~~c) A disconnecting means capable of being locked in the open position shall be installed at an accessible location at the heater so that the heater can be disconnected from all sources of potential. This disconnecting means shall be an integral part of the heater or adjacent to it.~~

~~d) If the equipment room door is on the building exterior, the switch should be located just inside the door. If there is more than one door to the equipment room, there should be a switch located at each door of egress.~~

~~1) For atmospheric-gas burners, and oil burners where a fan is on a common shaft with the oil pump, the complete burner and controls should be shut off.~~

~~2) For power burners with detached auxiliaries, only the fuel input supply needs be shut off.~~

Item 24-05

Proposed NBIC Part 1 Changes

HEAT PUMP WATER HEATERS & HEAT PUMP HYDRONIC HEATERS

For information only, Proposal summary:

Heat pump water heating and heat pump hydronic heating are growing in frequency, heating capacity and capability. The proposal is a step toward incorporation of heat pump technology in the NBIC code.

When the code makes no distinction between units based on the heat source (such as in clause 3.5.3.3) the proposal is to remove the specific heat sources from the text.

When electrical power input is relevant to the code, remove “combustion” and replace “fuel source” with “energy source”.

Finally, the terms in the Glossary for “Potable Water Heaters” currently includes some combinations of design characteristics that are better expressed separately as each feature may influence applicable requirements.

	Storage-type	Circulating or instantaneous
Fired (gas or oil)		
Electric Resistance		
Heat pump		

Note: The proposal suggests that heat pump water heaters with backup resistance heating elements be treated as electric resistance water heaters because the maximum temperature output from a resistance heating element is much higher than a heat pump; therefore, the requirements should be based on the greatest source of risk.

Proposed NBIC Part 1 Changes

HEAT PUMP WATER HEATERS & HEAT PUMP HYDRONIC HEATERS

PART 1, SECTION 3

INSTALLATION — STEAM HEATING BOILERS, HOT-WATER HEATING BOILERS, HOT-WATER SUPPLY BOILERS, AND POTABLE WATER HEATERS

3.5 SOURCE REQUIREMENTS

3.5.3 ELECTRICAL

3.5.3.3 CONTROLS AND HEAT GENERATING APPARATUS

a) ~~Oil- and gas-fired and electrically heated boilers~~Boilers and water heaters shall be equipped with suitable primary (flame safeguard) safety controls, safety limit controls, and burners or electric elements as required by a nationally or internationally recognized standard.

b) The symbol of the certifying organization that has investigated such equipment as having complied with a nationally recognized standard shall be affixed to the equipment and shall be considered as evidence that the unit was manufactured in accordance with that standard.

c) These devices shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards, as applicable.

3.8 INSTRUMENTS, FITTINGS, AND CONTROLS

3.8.3 POTABLE WATER HEATERS

3.8.3.1 TEMPERATURE CONTROLS

Each individual ~~automatically fired~~ water heater, in addition to the operating control used for normal water heater operation, shall have a separate high limit temperature actuated ~~combustion~~ control that will automatically cut off the ~~fuel supply~~energy source. The temperature range of the high limit temperature actuated control shall not allow a setting over 210°F (99°C).

a) On gas-fired water heaters, the high limit temperature control, when actuated, shall shut off the fuel supply with a shutoff means other than the operating control valve. Separate valves may have a common body.

b) On electrically heated water heaters, the high limit temperature control when actuated shall cut off all power to the electric resistance elements, heat pump compressor or both~~operating controls~~.

c) On oil-fired water heaters, the high limit temperature control when actuated shall cut off all current flow to the burner mechanism.

d) On indirect water heating systems, the high limit temperature control when activated shall cut off the source of heat.

PART 1, SECTION 9
INSTALLATION — GLOSSARY OF TERMS

9.1 DEFINITIONS

For the purpose of applying the rules of the NBIC, the following terms and definitions shall be used herein as applicable to each part:

Additional terms and definitions specific to DOT Transport Tanks are defined in NBIC Part 2, Supplement 6.

Potable Water Heaters — A corrosion resistant appliance that includes the controls and safety devices to supply potable hot water at pressure not exceeding 160 psig (1,100 kPa) and temperature not in excess of 210°F (99°C).

Fired ~~Storage~~ Water Heater — A potable water heater in which water is heated by electric~~ity~~ resistance heating elements, the combustion of solid, liquid, or gaseous fuels ~~and stores water within the same appliance~~.

Heat Pump Water Heater – A potable water heater in which water is heated only by a heat pump.

Heat Pump Water Heater with Electric Resistance Heating Elements – See Fired Water Heater.

Indirect Fired Water Heater — A potable water heater in which water is heated by an internal coil or heat exchanger that receives its heat from an external source. Indirect fired water heaters provide water directly to the system or store water within the same appliance.

Circulating Water Heater — A potable water heater which furnishes water directly to the system or to a separate storage tank. Circulating water heaters may be either natural or forced flow.

Storage Water Heater — A potable water heater in which water is heated and stored water within the same appliance.

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Subject:	Organic fluid relief valves are installed with discharge to 55 gallon drum
NBIC Location:	2023, Part 1, S5.7.6 h)
Statement of Need:	A 55-gallon drum is not designed for the temperatures or pressures of a relief valve discharge.
Background Information:	We are finding installations with relief valves discharging to 55 Gallon drums.

Proposed Text:

S5.7.6 INSTALLATION

h) The pressure relief valve discharge shall be connected to a closed, vented storage tank with solid piping (no drip pan elbow or other air gap). The storage tank should be located as close to the system as possible, but away from flammable surfaces. Overflow or high level protection should be considered. The capacity of the storage tank should consider the volume of fluid which may be relieved or sized in accordance with the heater manufacturer's recommendation. Storage tanks located outdoors shall be located such that water cannot collect in the vessel. The vented storage tank shall be designed and installed to endure the pressures and temperatures that occur if all relief valves activate. The following shall be considered for discharge piping hazards:

1) Both thermal and chemical reactions (personnel hazard);
2) Combustible materials (fire hazard);
3) Surface drains (pollution and fire hazard); and
4) Heat tracing for systems using high freeze point fluids (prevent blockage).

Subject:	Clearly state no time delay on the flow switches on a loss of flow.
NBIC Location:	2025 Part 1, 3.8.1.5 and 3.8.2.4
Statement of Need:	One of the primary causes of boiler failure is a low-water condition. Time delays in testing these safety controls can complicate their assessment and will not mitigate the failure rates associated with low water conditions. Note this also needs to apply to flow switches on forced flow units.
Background Information:	I have been informed some Manufacturers may be moving in the direction to add time delays to these safety features prior to having them cut off the burner.

Proposed Text:

3.8.1.5 AUTOMATIC LOW-WATER FUEL CUTOFF AND WATER FEEDING DEVICE

a) Each automatically fired steam boiler shall have an automatic low-water fuel cutoff. The low-water fuel cutoffs must be located to automatically cut off the fuel supply ~~when the surface of~~as soon as the water falls to a level not lower than 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.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Overriding Part 2 Inspection Requirements with RBI Program
NBIC Location:	2023 NBIC, Part 2, 4.4.7.3 and 4.5.3 b)
Statement of Need:	There needs to be some clarity on whether an RBI program has the ability to override some of the inspection requirements listed in Part 2 as long as all jurisdictional requirements are met.
Background Information:	NBIC Part 2, Section 4, Para. 4.5.3 specifically states that one of the benefits of having an RBI program is to identify items that do not require inspection or mitigation. However, NBIC Part 2, Section 4, Para. 4.4.7.3 states that PRIs in non-corrosive service are required to have thickness measurements taken.
Proposed Question:	If a company has an established RBI program and has deemed a PRI to be in non-corrosive service through an RBI assessment, can the company choose to omit the thickness measurements called out in Part 2, Section 4, Para. 4.4.7.3 as long as all jurisdictional requirements are met?
Proposed Reply:	Yes.
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Interpretation request into the NBBI for the NB-23 2023 paragraph 2.3.6.2
NBIC Location:	2025 NBIC Part 2, 2.3.6.2 b) 2) a. 3.
Statement of Need:	Numerous air receivers are found to be less than the required wall thickness.
Background Information:	https://www.dir.ca.gov/dosh/pressure.html CAL-OSHA Circular Letter PV-2017-1 It is permissible to take a 10% reduction of the nameplate or data report thick § 462. Field Inspections and Reports. (a) (1) Thickness determinations indicating significant reduction in the material thickness over a general area (National Board Inspection Code Par. U-107 may be used as a guide) shall be shown on the inspection report as well as the calculations for the reduction in the allowable working pressure.
Proposed Question:	If there is general uniform wall thinning where the thinnest point is not less than 75% of the required wall thickness, is the required average wall thickness required to be at least the minimum required wall thickness?
Proposed Reply:	No.
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

NBIC Life Extension/Continuation Testing of ASME High Pressure Carbon Fiber Reinforced Plastic (CFRP) Section X Class III Pressure Vessels

General

An ASME CFRP vessel without inflicted damage from external forces is quite a robust structure with a very long fatigue life. Until recently, ASME Section X Class III CFRP pressure vessels had a 20-year service life limit. That limitation has been removed. However, this vessel class has been in use for less than 20 years and it is important to assess and verify the safety of these vessels considering the gases could be at 15,000 psi or over 1,000 bar. The procedure herein describes how to do modal acoustic emission (MAE) testing of ASME Section X Class III CFRP vessels in order to determine if the service life can be safely extended or continued beyond 20 years for up to an additional twenty (20) years beyond the date of manufacture listed on the vessel's label. Life extension could be called life continuation for the newer vessels that have no specified life, however, life extension is the term used herein for both. Each extended life vessel is subject to requalification testing by MAE testing every five years in order to continue in service for up to 20 years.

Scope

This document applies to ASME Section X Class III CFRP pressure vessels. The vessels can be either fully overwrapped with a load-bearing liner (commonly called Type 3 vessels) or fully overwrapped with a non load-bearing (e.g., plastic) liner (commonly called Type 4 vessels).

References

ASNT-SNT-TC-1A (Recommended Practice Outlines for Qualification of Non-destructive Testing Personnel) or equivalent (e.g., ISO 9712) – Qualifications and certification of NDT personnel.

CGA C.6.2 (STANDARD FOR VISUAL INSPECTION AND REQUALIFICATION OF FIBER REINFORCED HIGH PRESSURE CYLINDERS) or ISO 11623, Gas Cylinders – Composite cylinders and tubes – Periodic inspection and testing.

ISO 19016 Gas cylinders — Cylinders and tubes of composite construction — Modal acoustic emission (MAE) testing for periodic inspection and testing.

ASME Section X Class III High Pressure CFRP Pressure Vessels Background

Many pressure vessels are fabricated by filament winding with carbon fiber reinforcement in an epoxy matrix. ASME vessels are fabricated under Section X, Mandatory Appendix 8. The materials, construction and testing procedures laid out in Appendix 8 must be followed carefully and thoroughly documented.

Once stressed, all composite materials will have internal characteristic damage states consistent with all the many studies found in the open literature on the subject. There will be both matrix damage and fiber damage caused by voids and other defects. Such characteristic damage does not compromise the use or safety of the vessels. Further, there are defects inherent in the fibers and it is well-known that these defects cause fibers (filaments) to fail (rupture) at different loads and times. Again, this is normal and expected behavior. What is not expected is the rupture of a

large number of fibers (on the order of a tow or greater) simultaneously at the same position in a vessel. This requires a significant stress concentration of the kind caused by damage that has been inflicted on the vessel by external forces. If a significant stress concentration exists, it is possible for that stress concentration to reduce burst pressure to a value below that required by the safety factor.

Defects in carbon fibers are randomly distributed along the fibers and that carbon fiber strengths follow a Weibull probability distribution. Weaker fibers in a vessel will fail during proof testing after which very few fibers fail at operating pressure under normal service conditions. Stress concentrations that develop in service can cause fibers to fail during subsequent requalification testing. These are usually few in number and serve to relieve stress concentrations. They do not lessen the integrity of the vessel. Fibers normally begin to fail in large numbers once the pressure in the vessel exceeds around 90% of ultimate.

Well-manufactured CFRP pressure vessels are very robust because of the way a fiber break redistributes loads to neighboring fibers and even to the same fiber itself at a distance from a break called the ineffective fiber length. A broken fiber is unloaded only at the ruptured ends. Beyond the ineffective length the fiber is fully loaded again. This is the key reason that these vessels are so rugged and safe.

There are many possibilities for harming a pressure vessel, for example, fire damage. Other types of damage are cuts and impact. Experience, as well as many research studies, has shown that CFRP materials are essentially notch insensitive. For example, in an ISO notch test for Type 3 vessels an axial cut is made halfway through the depth of the cylindrical wall of the vessel with a length in the axial direction of five times the wall thickness. Extensive testing has shown that the effect of such a notch in a typical CNG tank is a burst pressure reduction of typically less than 20%. A CNG tank with an operating pressure of 3,600 psi and a safety factor of 2.25, must burst at 8100 psi or above. A typical design yields a burst pressure of around 10,000 psi, and, in such a case, a 20% reduction in burst pressure reduces the safety factor to just under the 2.25 requirement. The test described herein focuses on ensuring that vessels containing a stress concentration of 1.2 or more are removed from service.

Background for MAE

Note: ISO/TS 19016 contains much additional information on MAE testing, including definitions of terms, and is highly recommended.

Modal acoustic emission (MAE) testing is a type of acoustic emission test (AT) that attempts to make a direct connection between elastodynamic theory predictions of the waveform type, energy and frequency content expected from various damage mechanisms in materials. For this reason the stress waves are measured with absolutely calibrated broadband transducers. The waveforms are digitally captured and stored. Each waveform is analyzed to determine the type of damage event that produced it. For example, a fiber break stress wave can be distinguished from stress waves of other damage mechanisms found in CFRP composite materials. The ability to do this has been reduced to a set of rules in the case of CFRP pressure vessel testing and programmed in software to automatically identify sources and numbers, much as in other fields of acoustics such as SONAR. Research on the effects of various damage mechanisms has taken MAE testing even

further. MAE testing is currently used for in-service requalification testing of high pressure CFRP pressure vessels used in transportation under USDOT and Transport Canada rules and regulations. It is also approved for life extension testing of self-contained breathing apparatus pressure vessels under USDOT rules and regulations. The accept/reject criteria use four MAE allowance factors F1, F2, M1 and M2, which are defined and described below.

MAE Allowance Factors and Accept/Reject Criteria

F1 the fiber rupture energy allowed during testing in any single MAE event. The single fiber break energy is calculated by the formula given in this document and divided into the MAE event energy. The number obtained is the number of fibers that ruptured in near proximity to one another simultaneously. The values of F1 for different vessel circumferences and test pressures are given in Table 1.

F2 is the largest single event energy. Delamination and frictional emission wave energies can be much greater than fiber break wave energies. F2 shall be set at 100 x F1.

M1 is the allowed energy rise in the background energy (BE). The background energy is the minimum energy in a windowed portion of the waveform.

M2 is the allowed peak to peak excursion between neighboring maxima and minima of an N point moving average calculated from all BE values.

It is well-known that production vessels have a range of burst pressures. This is driven by statistical variations in the materials and fabrication variables. In these vessels, the random distribution of defects in the materials leads to a statistical failure process.

The hoop fibers control the burst pressure. For example, an axially cut ISO notch cuts across tens or even hundreds of thousands of hoop fibers. A heavily notched vessel always fails at the notch if it is undamaged elsewhere. MAE testing detects fiber ruptures and counts the number of fiber breaks represented by the energy in each fiber break event during a pressure test.

In addition to direct detection of fiber breaks, the MAE test also determines if there is a rise and oscillation of the background energy (BE) level. Energy oscillations are caused when fibers under load rupture, release energy in the form of stress waves (acoustic emission) and their load is transferred through shear in the matrix to neighboring fibers. The rising pressure in a test provides the energy input for the oscillation process as the overloaded fibers fail and transfer their load. All pressure vessels exhibit continuing BEO at some point during pressurization to burst. There is a statistical nature to this process due to the randomness of defects. BEO is never expected at operating pressure or test pressure in a good vessel.

Another way MAE testing detects damage is through frictional emission. Frictional emission is caused by the rubbing of fracture surfaces against each other as the vessel is pressurized and depressurized. Frictional events can be very energetic, far surpassing the energies in fiber breaks. It is mostly detected at lower pressure upon pressurization and depressurization, particularly depressurization when the fracture surfaces are closing upon one another. Frictional emission is usually present and persistent in CFRP vessels even when there is no new damage. It is especially evident after impact damage has caused significant delamination in the vessel.

Personnel Qualifications

The person doing the type testing shall be a senior technical person (SRT – Senior Review Technologist) who holds a degree in mechanical engineering, physics or closely related engineering science discipline and who has extensive experience with MAE testing, plate wave theory, composite materials, laminated plate theory, composite failure models, damage types and their effects, as well as CFRP pressure vessel manufacturing, pressure testing and burst testing, or a Level III technician certified by ISO 9762 or equivalent (e.g., ASNT TC-1A) with equivalent knowledge and experience.

Requalification testing shall be conducted by a Level I or Level II or a person who holds a bachelor's degree in mechanical engineering or physics, and who is trained and under the direct supervision of the SRT or Level III.

General Test Procedure

MAE 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 MAE events.

Equipment

a) Testing System - A testing system shall consist of: 1) sensors; 2) preamplifiers; 3) high pass and low pass filters; 4) amplifiers; 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 0.05 V/ nm.

c) Scaling Fiber Break Energy

The wave energy shall be computed by the formula:

$$U = \frac{1}{Z}\int V^2 \ dt$$

which is the formula for computing energy in the MAE signal, where V is the voltage in volts (V) and Z is the input impedance in ohms (Ω). A rolling ball impact setup 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.

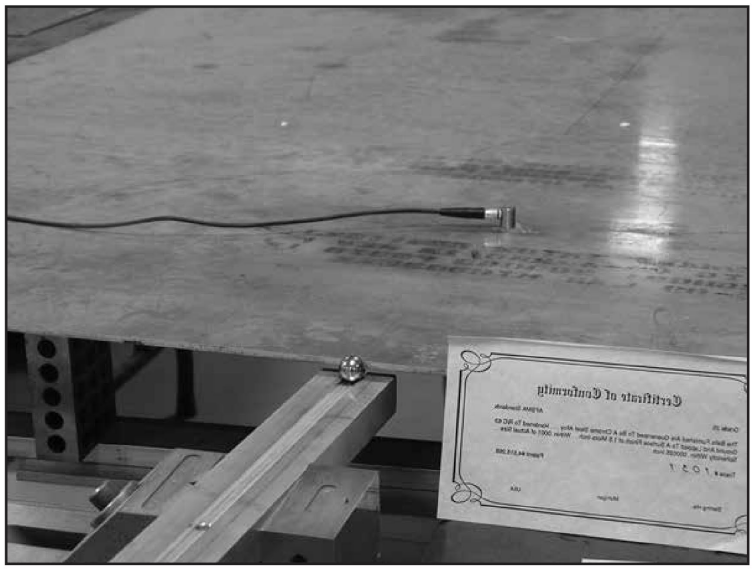

FIGURE 1. ROLLING BALL IMPACT CALIBRATION SETUP

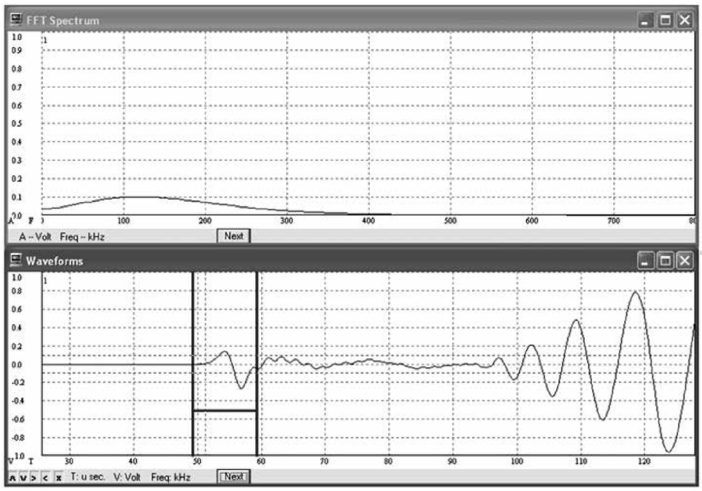

FIGURE 2. FRONT END WAVEFORM - The front end of waveform created by rolling ball impact calibration setup is shown in Figure 2. A Fast Fourier transform (FFT) shows that the center frequency of the first cycle is approximately 125kHz.

The impact setup, an example of which is shown in Figure 1, 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 2. The energy value in joules of the first half cycle of the E wave shall be used to scale the fiber break energy, as illustrated there. This shall be an “end to end” calibration meaning that the energy shall be measured using the complete MAE instrumentation (sensor, cables, preamplifiers, amplifiers, filters and digitizer) that are to be used in the actual testing situation.

The energy linearity of the complete MAE 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 R2 > 0.9 shall be obtained.

d) Preamplifiers and Amplifiers – low noise and high fidelity are important to achieve the required sensitivity.

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 the front end of the E wave arrives. This is called a “clean front end”. The sampling rate, or sampling speed, shall be such that aliasing does not occur. A minimum of 2 MHz is recommended.

The recording system (consisting of all preamplifiers, 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

$$U = V^2\ NT/2Z\ \ (J)$$

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).

SENSOR PLACEMENT

At least two sensors shall be used in any MAE 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 24 in. (610 mm). 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 24 in. (610 mm) along the axis of the vessel, until the other end of the vessel is reached. See Figure 3. 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) as measured along the cylinder axis. The diagonal distance created by offsetting every other row will be greater than 24 inches. This spacing allows for capturing the higher frequency components of the acoustic emission impulses and high channel count wave recording systems are readily available. If it is demonstrated that the essential data can still be obtained using a greater distance, and the authority having jurisdiction concurs, the spacing may be adjusted accordingly.

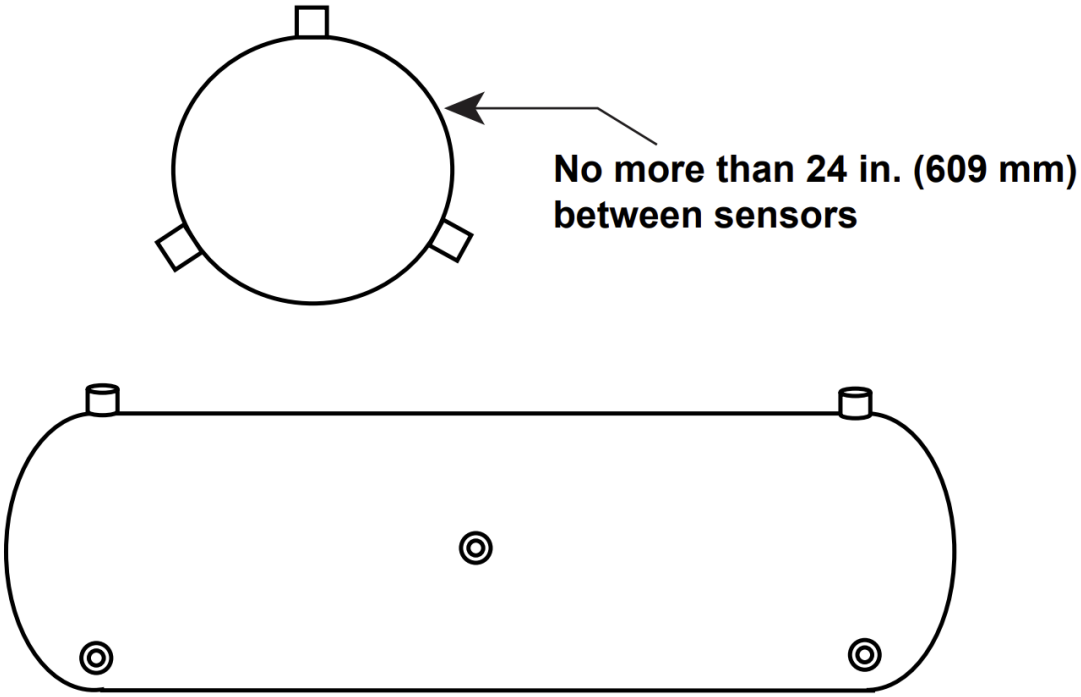

FIGURE 3. SENSOR SPACING AND PATTERN. No more than 24 in. (609 mm) between sensors as measured along the cylinder axis. The diagonal distance to neighboring sensors created by offsetting every other row will be greater than 24 inches.

Analysis Procedure and Accept/Reject Criteria

Before applying the evaluation procedure below all noise must be eliminated from the data set. Noise comes in many forms with characteristic features. See ISO 19016 for detailed information about the different types of noise waveforms. Only events with clean front ends shall be used for accept/reject evaluation.

a) 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: U0

100 – 200 kHz: U1

250 – 400 kHz: U2

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

$U0 \geq (U_{FBB})$

$U2 / (U1 + U2) \geq 15\%$

$U2 / U0 \geq 10\%$

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

$$U_{FB} = \frac{1}{2}(E * A * \delta * \varepsilon^2)$$

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 (m2), and δ is the ineffective fiber length in meters (m) for the fiber and matrix combination. If the ineffective length is not readily available, ten (10) times the fiber diameter shall be used.

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 = πd2 /4 and δ = 10d,

$$U_{FB} = \frac{1}{2}(E * A * \delta * \varepsilon^2)$$

$$U_{FB} = 13.4 * 10^{-9}\ (J)$$

d) Example of Scaling Calculation

Suppose that the rolling ball impact (RBI) acoustical energy measured by a particular high fidelity MAE transducer is U^{AE}_{RBI} = 5 x 10-10 J and the impact energy U_{RBI} = 1.9 x 10-3 J (due to gravity). A carbon fiber with a break energy of U_{FB} = 13.4 $x10^{-9}$ J would correspond to a wave energy of

$U^{AE}_{FB} = U_{FB} \times U^{AE}_{RBI} / U_{RBI}$

U^{AE}_{FB} = 13.4 $x10^{-9}$ J x 5 x 10^{-10} J / 1.9 x 10^{-3} J

U^{AE}_{FB} = 3.5 x 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.

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.)

f) Accept/Reject Criteria

Criterion 1: $U_{FBB} \leq F1 \times U_{FB}$, where U_{FB} has been calculated and scaled by the rolling ball impact energy as in the examples below. If this criterion is not met, significant fiber bundle break damage has occurred during the test and the vessel shall be removed from service.

Criterion 2. For a vessel to be acceptable no AE event shall have an energy greater than (F2) x U_{FB} at anytime during the test.

Criterion 3. Background energy of any channel shall not exceed 10 times the quiescent background energy of that channel.

Criterion 4. Any oscillation in background energy with a factor of two excursion 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.

Table 1: MAE allowance factors for vessels with a 2.25 safety factor and 3,600 psi working pressure. Common vessel diameters (or circumferences) are given. Weibull parameters for the probability calculation were shape = 5 and scale = 508 ksi. Common winding pattern of OXOXO, where O=hoop and X=helical.

Fiber T700			
Working Pressure	3600 psi		
Test Pressure	5400 psi	4500 psi	
Circumference (in.)	F1	F1	
25.13	2500	1000	
50.26	10000	4200	
100.52	42000	17000	
157	104000	41000	

The allowance factors in Table 1 assume T700 carbon fiber in an epoxy matrix. Values for other carbon fibers can be calculated from material properties found in the open literature. The shape parameter is a measure of dispersion. The greater the dispersion in fiber strength, the more fibers that fail at lower pressures including test pressures. The scale parameter is a 30% knockdown of the published 5000 MPa (725 ksi) fiber strength.

NBIC Vessel Life Extension Information Form

This needs to be filled out only once and attached to the test form below for each vessel of the same type undergoing requalification for an additional five years beyond 20 years from the manufacturing date stated on the vessel's original label.

Fiber Manufacturer's data: Fiber strength, X _____ (Pa or psi)

Fiber Young's Modulus, E _____ (Pa or psi)

Fiber Diameter, d _____ (micron or in.)

Vessel overall length _____ (cm or in.)

Vessel cylindrical section length _____ (cm or in.)

Vessel circumference _____ (cm or in.)

Fiber Break Energy Calculation

The formula for fiber break energy shall be used

$U_f = (½ X^2/E)(pi\ d^2/4)\delta$,

where E is fiber Young's modulus (Pa), X is fiber strength (Pa) , d is fiber diameter (m), pi is 3.14 and δ is the ineffective fiber length. If the ineffective length is unknown, a value of 10 shall be used.

Calculated value of fiber break energy U_f _____ (Joule)

This value shall be input into the software for evaluating energies in waveforms of detected fiber breaks.

MAE Recording Equipment Data

Equipment Manufacturer_____

Model Name/Number_____

Number of recording channels used _____

Digitization Rate_____ (must be equal or greater than 2 MHz)

Number of bits for A/D converter _____

Number of points per waveform _____

Number of pretrigger points per waveform_____

Note: The equivalent to discreet waveform data capture shall be produced by software if streaming capture is used. Must be capable of determining first arrival channel for every MAE event.

Has the equipment been calibrated? Date of Calibration_____

Calibration method? (Toneburst frequency = 100 kHz, number of cycles = 20 and voltage amplitude = 0.1 V) _____

Toneburst generator Model _____ Calibration date _____

Calculated energy of calibration toneburst _____ (Joule)

Measured energy of calibration toneburst _____ (Joule)

Amplifier gain in addition to preamplifier gain to be used during testing _____ (dB)

Transducer Data

Transducer Manufacturer and Model Number _____

Published bandwidth _____

Integral preamplifier? Y/N If yes, the gain is _____ (dB).

Transducers must be calibrated using the Rolling Ball Impact (RBI). They must also be absolutely calibrated using a Michelson Interferometer or other methods equivalent to ASTM E1106-12. Sensor sensitivity shall be at least 0.05 V/nm at the preamplifier input. MAE sensors shall have a diameter no greater than 0.5 inch for the active part of the face and the aperture effect shall be considered for MAE testing.

Calibration Date _____

Is absolute calibration curve attached to this form? If not, testing shall not be performed.

Has transducer energy RBI conversion factor been measured? If not, testing shall not be performed.

Transducer energy conversion factor determined from RBI _____

Transducer Spacing and Pattern

Standard pattern is no more than 24 inch intervals between sensors around the circumference and between rows of sensors on an axial line from one end of the cylindrical portion of the vessel to the other as specified earlier. Alternatively, attenuation measurements can made that allow a greater distance to be used between transducers in either the axial or circumferential directions provided that the frequencies necessary to determine fiber break events are detectable. This means the amplitude of the 400 kHz component of a 0.3mm 2H Pentel pencil lead break on the surface at one transducer is at least a factor of 1.4 above the noise level when measured at the nearest distant axial and circumferential transducers. The amplitude of the 400 kHz frequency component of the detected waveform shall be noted.

400 kHz amplitude at axial transducer spacing _____ (Volt)

400 kHz amplitude at circumferential transducer spacing _____(Volt)

Total number of transducers used in test _____

Describe and provide a rough sketch below of the alternative spacing pattern to be used based on attenuation measurements.

Pressurization

Pressure shall be applied hydrostatically by a computer-controlled system. Proper precautions should be observed for test personnel safety.

A pressure output voltage shall be supplied to the MAE instrumentation according to the voltage level requirement of the MAE recording system.

Pressure gage type and model _____

MAE transducers shall be attached and checked for proper functioning either by recording pencil lead breaks or auto-sensor test results. The quiescent background energy shall be recorded automatically for every channel just before pressurization begins.

ASME Section X Class III Pressure Vessel Requalification/Life Extension Test Report Form

MAE Test Technician

Technician Name _____

Certification Agency and Certification Number _____

Or

Certifying Authority, Certification Level, and Certification Date

_____

Vessel Data

Vessel Manufacturer _____

Date Manufactured _____

Operating Pressure _____

Service (e.g., CNG, hydrogen) _____

Vessel Serial Number _____

Date of last requalification test _____

Visual Examination

Note: The VE must be performed prior to running an MAE test.

The VE procedure and accept/reject criteria can be found in Section X Mandatory Appendix 8.

VE performed by _____

Date _____

Result (Pass or Fail. Note reason for failure.) _____

Test Procedure

The test shall be conducted with modern MAE equipment. Modern means that the equipment is automated to the point that the test technician is a running a software program that can compute and display live during the test any violation of the accept/reject criteria. The test technician shall verify that the values (numbers) of the criteria have been input into the software. The MAE instrumentation, including the MAE transducers, shall be fully calibrated as described earlier in this document. The MAE instrumentation shall be fully capable of all displays, waveform acquisition and storage as previously described.

The technician shall verify amplifier gain settings, waveform digitizer settings, have been properly input. The pressure gage input shall be verified as working properly. All required data capture and evaluation plots shall be displayed on the computer screen.

1. Verify each transducer has a current calibration document.

2. Record serial number (S/N) and calibration date for each transducer used in the test.

3. Verify all transducers are well-coupled mechanically and acoustically to the vessel.

4. An auto-sensor test shall be performed, and the acoustical response of each transducer shall be recorded by the computerized equipment. In case a transducer response is 6 dB below the average response level, the technician can recouple it and retest the response. If it is still not acceptable, it shall be replaced with a similar transducer and the new transducer's S/N and calibration date noted.

5. Connect pressure gage to MAE equipment and verify signal.

6. A leak check shall be performed at 10% of test pressure. Pressure shall be increased at a rate of not less than 10 psi/sec but not greater than 100 psi/sec. Pressurization rate shall not permit flow noise. Pressure shall be held at 125% of operating pressure for five minutes before proceeding to test pressure. Test pressure shall be held for fifteen minutes. Pressure shall be reduced to zero psi. After pressure is reduced to zero, a transducer coupling check should be performed (auto-sensor test) and documented.

Note: The vessel under test may still be in service. The test may be conducted by pressurizing pneumatically, in which case the MAE test pressure will be lower than the normal hydrostatic test pressure of 3/2 or 5/3 of working pressure. If the MAE test pressure is lower than that used in the type testing (for example, if fill pressure or developed pressure is used) the appropriate accept/reject criteria shall be provided by the SRT in writing and noted here.

The MAE computer shall display waveforms for each channel, events and pressure versus time, and background energy versus time. If an accept/reject violation occurs, the pressure shall be reduced, and the vessel rejected for life extension/continuation.

The following numbers shall be noted immediately following the MAE test:

The pressure at which the BE energy first rises by more than 2 times the quiescent background energy shall be noted. BE initial rise pressure _____ (psi) and energy level _____ (Joule). (If no rise, so state.) There shall be no rise in BE greater than 10 x the quiescent energy.

The pressure at which a fall and subsequent rise of the BE (called background energy oscillation or BEO) with a peak-to-peak energy greater than a factor of two (2) shall be noted. BEO Pressure _____ (psi) (If no oscillation, so state.) There shall be no oscillations with a peak-to-peak energy greater than 2.

Highest event energy _____ (Joule) Shall be less than F2 x Uf.

Highest fiber break event energy _____ (Joule) Shall be less than F1 x Uf.

Do all the numbers meet the MAE A/R criteria? Yes/No (Circle one.)

7. All the waveforms for a vessel that fails shall be saved and provided to the SRT. The waveforms for a vessel that passes can be discarded, but the test displays at the final pressure showing that the accept criteria have been met shall be attached to this form, a copy of which shall be retained with the vessel records by the owner of the vessel. A copy shall be retained by the entity performing the test for a period of six (6) years.

8. A vessel that has passed shall have a label attached stating approval for continued service for five years.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Need to restrict signatures to inspections for which the inspector was present
NBIC Location:	Part 2, 1.5.1
Statement of Need:	It has become practice in one jurisdiction for inspectors to sign inspection reports for apprentices.
Background Information:	

Proposed Text:

The inspector is required to be present during the inspection and should only sign documents pertaining to inspections at which they were in attendance.

PART 2, SECTION 1
INSPECTION — GENERAL REQUIREMENTS FOR INSERVICE INSPECTION OF PRESSURE-RETAINING ITEMS

1.5.1 INSERVICE INSPECTION ACTIVITIES

Any defect or deficiency in the condition, operating, and maintenance practices of a boiler, pressure vessel, piping system, and pressure relief devices noted by the Inspector shall be discussed with the owner or user at the time of inspection and recommendations made for the correction of such defect or deficiency shall be documented. Use of a checklist to perform inservice inspections is recommended. The inspector shall be present during the inspection and shall only sign documents pertaining to inspections which they performed.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Add guidance for tube sag allowance
NBIC Location:	Part 2, 3.4.8a)
Statement of Need:	Inspectors were asking for clarification and better guidance. Item needs a working group to consider language.
Background Information:	This item was summitted on behalf of Patrick McGiveron, an inspector working for Chief Clark.

Proposed Text:

3.4.8 OVERHEATING

a) Overheating is one of the most serious causes of deterioration. Deformation and possible rupture of pressure parts may result.

b) Attention should be given to surfaces that have either been exposed to fire or to operating temperatures that exceed their design limit. It should be observed whether any part has become deformed due to bulging or blistering. If a bulge or blister reduces the integrity of the component or when evidence of leakage is noted coming from those defects, proper repairs must be made.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Fitness-for-service coordination with API 579-1/ASME FFS-1
NBIC Location:	Part 2, Sections: 2.3.6.2 Compressed Air, 2.3.6.4 Liquid Ammonia, 4.4.7.2 Method for Estimating Inspection Intervals, 4.4.8 Evaluating Inspection Intervals, S7.8 Acceptance Criteria [for LPG]
Statement of Need:	Alert users about situations where acceptance criteria in Part 2 may be less strict than API 579-1/ASME FFS-1.
Background Information:	Portions of closed Item 23-17 didn't make it into the 2025 edition and also don't seem to have been folded into a broader effort on fitness for service, as of the January 2025 meeting.

Proposed Text:

2.3.6.2 COMPRESSED AIR VESSELS

a) Compressed air vessels include receivers, separators, filters, and coolers. Considerations of concern include temperature variances, pressure limitations, vibration, and condensation. Drain connections should be verified to be free of any foreign material that may cause plugging.

b) Inspection shall consist of the following:

1) Welds — Inspect all welds for cracking or gouging, corrosion, and erosion. Particular attention should be given to the welds that attach brackets supporting the compressor. These welds may fail due to vibration;

2) Shells/Heads — Externally, inspect the base material for environmental deterioration and impacts from objects. Hot spots and bulges are signs of overheating and should be noted and evaluated for acceptability. Particular attention should be paid to the lower half of the vessel for corrosion and leakage. For vessels with manways or inspection openings, an internal inspection should be performed for corrosion, erosion, pitting, excessive deposit buildup, and leakage around inspection openings. UT thickness testing may be used where internal inspection access is limited or to determine actual thickness when corrosion is suspected;

a. UT Acceptance Criteria. These may not meet API 579-1/ASME FFS-1, including near welds, supports, structural discontinuities, for less than 0.1-inch vessel-wall remaining, if brittle fracture is a concern, or possibly other circumstances.

1. For line or crevice corrosion, the depth of the corrosion shall not exceed 25% of the required wall thickness.

2. Isolated pits may be disregarded provided that their depth is not more than 50% of the required thickness of the pressure vessel wall (exclusive of any corrosion allowance), provided the total area of the pits does not exceed 7 sq. in. (4,500 sq. mm) within any 8 in. (200 mm) diameter circle, and provided the sum of their dimensions along any straight line within that circle does not exceed 2 in. (50 mm).

3. For a corroded area of considerable size, the thickness along the most critical plane of such area may be averaged over a length not exceeding 10 in. (250 mm). The thickness at the thinnest point shall not be less than 75% of the required wall thickness, and the average thickness shall meet API 579-1/ASME FFS-1.

b. If the corrosion exceeds any of the above criteria, the following options are available to the owner/user.

1. The owner/user may conduct a complete UT survey of the vessel to verify remaining vessel wall thickness.

2. The vessel shall be removed from service until the vessel is repaired by an "R" ~~stamp holder~~ Certificate Holder.

3. The vessel shall be removed from service until it can be de-rated to a lower MAWP subject to review and approval by the Jurisdiction.

4. A fitness-for service analysis is performed by a qualified organization.

5. The vessel is permanently removed from service.

3) Fittings and Attachments — Inspect all fittings and attachments for alignment, support, deterioration, damage, and leakage around threaded joints. Any internal attachments such as supports, brackets, or rings shall be visually examined for wear, corrosion, erosion, and cracks;

4) Operation — Check the vessel nameplate to determine the maximum allowed working pressure and temperature of the vessel. Ensure the set pressure of the safety valve does not exceed that allowed on the vessel nameplate and determine that the capacity of the safety valve is greater than the capacity of the compressor. Ensure there is a functioning manual or automatic condensate drain; and

5) Quick-Closure Attachments — Filter-type vessels usually have one quick-type closure head for making filter changes, see NBIC Part 2, 2.3.6.5.

2.3.6.4 LIQUID AMMONIA VESSELS

Vessels in liquid ammonia service are susceptible to stress corrosion cracking (SCC) [~~(~~see NBIC Part 2, 3.3.2 b)~~)~~] in areas of high stress. High-strength and coarse-grained materials seem to be more at risk of SCC than are fine-grained or more moderate strength materials, although no commonly used steels appear to be immune to the problem. Postweld heat treatment of new or weld-repaired vessels or cold formed heads is beneficial in reducing the incidence of SCC. The presence of 0.2% minimum water in the liquid ammonia also inhibits SCC. Any leak should be thoroughly investigated and the necessary corrective action initiated.

a) Internal inspection

1) Where existing openings permit, perform a visual internal inspection of the vessel. Look for any obvious cracks (very advanced SCC) and note areas that are subject to high stress such as welds, welded repairs, head-to-shell transitions, sharp interior corners, and interior surfaces opposite external attachments or supports.

2) Fittings, such as liquid level gage floats and excess flow valves, should be removed or otherwise protected from power buffing or light sandblasting when preparing the interior surface of the vessels for inspection.

3) Vessels in services where liquid ammonia is used as a reactant or is being preheated/vaporized should be inspected for localized corrosion in the reaction or vaporizing zones.

b) Examination and detection of SCC

1) All interior welds and highly stressed areas should be examined by the Wet Fluorescent Magnetic Particle Testing method (WFMT) using an A/C yoke for magnetization. Note that weld cracks are often transverse in orientation. It is extremely important to ensure that the NDE method used will disclose cracks in any orientation.

2) If cracks are discovered, a calculation shall be made to determine what depth of grinding may be carried out for crack removal (without encroaching on the minimum thickness required by the original code of construction).

3) Where possible, crack removal by grinding is the preferred method of repair. Since the stresses at the crack tips are quite high, even very fine cracking shall be eliminated.

4) Where crack depth is such that removal requires welded repair, a weld procedure shall be employed that will minimize HAZ hardening and residual stresses. Welded repairs, regardless of the depth of the repair, shall be postweld heat treated. The use of alternative welding methods in lieu of PWHT is permitted. Any repairs required and associated postweld heat treatment shall be completed in accordance with NBIC Part 3.

5) Re-inspection by WFMT after welded repair shall be done to ensure complete crack removal.

6) It is not intended to inhibit or limit the use of other NDE evaluation methods. It is recognized that acoustic emission and fracture mechanics are acceptable techniques for assessing structural integrity of vessels. Analysis by fracture mechanics may be used to assess the structural integrity of vessels when complete removal of all ammonia stress cracks is not practical. If alternative methods are used, the above recommendation that all cracks be removed, even fine cracks, may not apply. In addition to NDE and repair of liquid ammonia vessels that are susceptible to SCC, it is acceptable to use fitness for service evaluation methods to determine acceptability of a pressure-retaining item to perform its intended function. These methods shall be consistent with NBIC Part 2, 4.4, *Methods To Assess Damage Mechanisms And Inspection Frequency For Pressure-Retaining Items*.

c) Inspection of parts and appurtenances

1) If valves or fittings are in place, check to ensure that these are complete and functional. Parts made of copper, zinc, silver, or alloys of these metals are unsuitable for ammonia service and shall be replaced with parts fabricated of steel or other suitable materials.

2) Check that globe valves are installed with the direction of flow away from the vessel.

3) Observe that excess flow valves are properly installed and in good repair.

4) Check that hydrostatic relief valves are installed in the system piping where required.

5) Piping shall be observed to be a minimum of Schedule 80 if threaded and Schedule 40 if welded. Seamless or ERW piping is acceptable. Type F piping shall not be used for ammonia service.

6) Fittings shall be forged or Class 300 malleable iron. Seal welding is permitted only with forged fittings.

7) The Inspector shall note the pressure indicated by the gage and compare it with other gages on the same system. If the pressure gage is not mounted on the vessel itself, it should be ascertained that the gage is installed on the system in such a manner that it correctly indicates actual pressure in the vessel.

8) The Inspector shall note the liquid level in the vessel by observing the liquid level gage or other liquid level indicating device.

d) Inspection of pressure relief devices

1) See NBIC Part 2, 2.5 for the inspection of pressure relief devices used to prevent the overpressure of liquid ammonia vessels. Pressure relief devices in ammonia service shall not be tested in place using system pressure. Bench testing or replacement is required, depending on the type of pressure relief device used.

2) The Inspector shall note the replacement date marked on vessel safety valves and piping system hydrostatic relief valves requiring replacement every five years.

e) External inspection of insulated vessels

1) Insulated pressure vessels can suffer from aggressive external corrosion that is often found beneath moist insulation. The Inspector should closely examine the external insulation scaling surfaces for cold spots, bulges, rust stains, or any unusual conditions in previous repair areas. Bulging or distorted insulation on refrigerated vessels may indicate the formation of ice patches between the vessel shell and insulation due to trapped moisture. Careful observation is also required where the temperatures of insulated vessels cycle continually through the freezing temperature range.

2) The lower half and the bottom portions of insulated vessels should receive special focus, as condensation or moisture may gravitate down the vessel shell and soak into the insulation, keeping it moist for long periods of time. Penetration locations in the insulation or fireproofing, such as saddle supports, sphere support legs, nozzles, or fittings should be examined closely for potential moisture ingress paths. When moisture penetrates the insulation, the insulation may actually work in reverse, holding moisture in the insulation and/or near the vessel shell.

3) Insulated vessels that are run on an intermittent basis or that have been out of service require close scrutiny. In general, a visual inspection of the vessel's insulated surfaces should be conducted once per year.

4) The most common and superior method to inspect for suspected corrosion under insulation (CUI) damage is to completely or partially remove the insulation for visual inspection. The method most commonly utilized to inspect for CUI without insulation removal is by x-ray and isotope radiography (film or digital) or by real-time radiography, utilizing imaging scopes and surface profilers. The real time imaging tools will work well if the vessel geometry and insulation thickness allows. Other less common methods to detect CUI include specialized electromagnetic methods (pulsed eddy current and electromagnetic waves) and long range ultrasonic techniques (guided waves).

5) There are also several methods to detect moisture soaked insulation, which is often the beginning for potential CUI damage. Moisture probe detectors, neutron backscatter, and thermography are tools that can be used for CUI moisture screening.

6) Proper surface treatment (coating) of the vessel external shell and maintaining weather-tight external insulation are the keys to prevention of CUI damage.

f) Acceptance criteria. These may not meet API 579-1/ASME FFS-1, including near welds, supports, structural discontinuities, for less than 0.1-inch vessel-wall remaining, if brittle fracture is a concern, or possibly other circumstances.

The following are the acceptance criteria for liquid ammonia vessels. Vessels showing indications or imperfections exceeding the conditions noted below are considered unacceptable.

1) Cracks

Cracks in the pressure vessel boundary (e.g., heads, shells, welds) are unacceptable. When a crack is identified, the vessel shall be removed from service until the crack is repaired by an "R" ~~Stamp holder~~ Certificate Holder or the vessel permanently removed from service. (See NBIC Part 3, *Repairs and Alterations*.)

2) Dents

When dents are identified that exceed the limits set forth below, the vessel shall be removed from service until the dents are repaired by an "R" ~~Stamp holder~~ Certificate Holder, a fitness for service analysis is performed, or the vessel permanently retired from service.

a. Dents in Shells

The maximum mean dent diameter in shells shall not exceed 10% of the shell diameter, and the maximum depth of the dent shall not exceed 10% of the mean dent diameter. The mean dent diameter is defined as the average of the maximum dent diameter and the minimum dent diameter. If any portion of the dent is closer to a weld than 5% of the shell diameter, the dent shall be treated as a dent in a weld area, as shown in b. below.

b. Dents in Welds

The maximum mean dent diameter on welds (i.e., part of the deformation includes a weld) shall not exceed 10% of the shell diameter. The maximum depth shall not exceed 5% of the mean dent diameter.

c. Dents in Heads

The maximum mean dent diameter on heads shall not exceed 10% of the shell diameter. The maximum depth shall not exceed 5% of the mean dent diameter. The use of a template may be required to measure dents on heads.

3) Bulges

When bulges are identified that exceed the limits set forth below, the vessel shall be removed from service until the bulges are repaired by an "R" ~~Stamp holder~~ Certificate Holder or a fitness for service analysis is performed, the vessel may also be permanently retired from service.

a. Bulges in Shells

If a bulge is suspected, the circumference shall be measured at the suspect location and at several places remote from the suspect location. The variation between measurements shall not exceed 1%.

b. ~~Dents~~Bulges in Heads [Already approved for 2025 edition.]

If a bulge is suspected, the radius of the curvature shall be measured by the use of templates. At any point the radius of curvature shall not exceed 1.25% of the diameter for the specified shape of the head.

4) Cuts or Gouges

When a cut or gouge exceeds 25% of the original wall thickness of the vessel, the vessel shall be removed from service until it is repaired by an "R" ~~Stamp Holder~~ Certificate Holder or a fitness-for-service analysis is performed. The vessel may also be permanently retired from service.

5) Corrosion

a. For line or crevice corrosion, the depth of the corrosion shall not exceed 25% of the original wall thickness.

b. Isolated pits may be disregarded provided that their depth is not more than 50% of the required thickness of the pressure vessel wall (exclusive of any corrosion allowance), provided the total area of the pits does not exceed 7 sq. in. (4,500 sq. mm) within any 8 in. (200 mm) diameter circle, and provided the sum of their dimensions along any straight line within that circle does not exceed 2 in. (50 mm).

c. For a corroded area of considerable size, the thickness along the most critical plane of such area may be averaged over a length not exceeding 10 in. (250 mm). The thickness at the thinnest point shall not be less than 75% of the required wall thickness, and the average thickness shall meet API 579-1/ASME FFS-1. When general corrosion is identified that

exceeds the limits set forth in this paragraph, the pressure vessel shall be removed from service until it is repaired by an "R" ~~Stamp holder~~ Certificate Holder or a fitness-for-service analysis is performed, or the vessel may be permanently retired from service.

4.4.7.2 METHOD FOR ESTIMATING INSPECTION INTERVALS FOR EXPOSURE TO CORROSION

a) When the pressure-retaining item is exposed to service temperatures below the creep range, and the corrosion rate controls the remaining wall thickness of the pressure-retaining item, the inspection interval shall be calculated by the formula below or by other industry methods as accepted by the Jurisdiction.

$$\text{remaining life (years)} = (t_{(actual)} - t_{(required)}) / \text{corrosion rate}$$

$t_{(actual)}$ = thickness in inches (mm) measured at the time of inspection for the limiting section used in the determination of $t_{(required)}$.

$t_{(required)}$ = minimum allowable thickness in inches (mm) for the limiting section of the pressure-retaining item or zone. It shall be the greater of the following:

1) The calculated thickness, exclusive of the corrosion allowance, required for the pressure relieving device set pressure, static head, or other loading and design temperature; or

2) The minimum thickness permitted by the provision of the applicable section of the original code of construction.

Corrosion Rate = inches (mm) per year of metal removal as a result of corrosion.

b) Any suitable nondestructive examination method may be used to obtain thickness measurements, provided the instruments employed are calibrated in accordance with the manufacturer's specification or an acceptable national standard.

1) If suitably located existing openings are available, measurements may be taken through the openings.

2) When it is impossible to determine thickness by nondestructive means, a hole may be drilled through the metal wall and thickness gage measurements taken.

c) For new pressure-retaining items or PRIs for which service conditions are being changed, one of the following methods shall be employed to determine the probable rate of corrosion from which the remaining wall thickness, at the time of the next inspection, can be estimated:

1) The corrosion rate as established by data for pressure-retaining items in the same or similar service; or

2) If the probable corrosion rate cannot be determined by the above method, on-stream thickness determinations shall be made after approximately 1,000 hours of service. Subsequent sets of thickness measurements shall be taken after additional similar intervals until the corrosion rate is established.

d) Corrosion-Resistant Lining

When part or all of the pressure-retaining items have a corrosion-resistant lining, the interval between inspections of those sections so protected may be based on recorded experience with the same type of lining in similar service, but shall not exceed ten years, unless sufficient data has been provided to establish an alternative inspection interval. If there is no experience on which to base the interval between inspections, performance of the liner shall be monitored by a suitable means, such as the use of removable corrosion probes of the same material as the lining, ultrasonic examination, or radiography. To check the effectiveness of an internal insulation liner, metal temperatures may be obtained by surveying the pressure-retaining item with temperature measuring or indicating devices.

e) Two or More Zones

When a pressure-retaining item has two or more zones of pressure or temperature and the required thickness, corrosion allowance, or corrosion rate differ so much that the foregoing provisions give significant differences in maximum periods between inspections for the respective zones (e.g., the upper and lower portions of some fractionating towers), the period between inspections may be established individually for each zone on the basis of the condition applicable thereto, instead of being established for the entire vessel on the basis of the zone requiring the more frequent inspection.

f) Above-Ground Pressure Vessels

All pressure vessels above ground shall be given an external examination after operating the lesser of five years, or one quarter of remaining life, preferably while in operation. Alternative intervals resulting in longer periods may be assigned provided the requirements of this section have been followed. Inspection shall include determining the condition of the exterior insulation, the supports, and the general alignment of the vessel on its supports. Pressure vessels that are known to have a remaining life of over ten years or that are prevented from being exposed to external corrosion (such as being installed in a cold box in which the atmosphere is purged with an inert gas, or by the temperature being maintained sufficiently low or sufficiently high to preclude the presence of water), need not have the insulation removed for the external inspection. However, the condition of the insulating system and/or the outer jacketing, such as the cold box shell, shall be observed periodically and repaired if necessary.

g) Interrupted Service

1) The periods for inspection referred to above assume that the pressure-retaining item is in continuous operation, interrupted only by normal shutdown intervals. If a pressure-retaining item is out of service for an extended interval, the effect of the environmental conditions during such an interval shall be considered.

2) If the pressure-retaining item was improperly stored, exposed to a detrimental environment or the condition is suspect, it shall be given an inspection before being placed into service.

3) The date of next inspection, which was established at the previous inspection, shall be revised if damage occurred during the period of interrupted service.

h) Circumferential Stresses

For an area affected by a general corrosion in which the circumferential stresses govern the MAWP, the least thicknesses along the most critical plane of such area may be averaged over a length not exceeding:

1) The lesser of one-half the pressure vessel diameter, or 20 in. (500 mm) for vessels with inside diameters of 60 in. (1.5 m) or less; or

2) The lesser of one-third the pressure vessel diameter, or 40 in. (1 m), for vessels with inside diameters greater than 60 in. (1.5 m), except that if the area contains an opening, the distance within which thicknesses may be averaged on either side of such opening shall not extend beyond the limits of reinforcement as defined in the applicable section of the ASME Code for ASME Stamped vessels and for other vessels in their applicable codes of construction.

i) Longitudinal Stresses

If because of wind loads or other factors the longitudinal stresses would be of importance, the least thicknesses in a length of arc in the most critical plane perpendicular to the axis of the pressure vessel may be averaged for computation of the longitudinal stresses. The thicknesses used for determining corrosion rates at the respective locations shall be the most critical value of average thickness. The potential for buckling shall also be considered.

j) Local Metal Loss

These acceptance criteria may not meet API 579-1/ASME FFS-1, including near welds, supports, structural discontinuities, for less than 0.1-inch vessel-wall remaining, if brittle fracture is a concern, or possibly other circumstances.

Corrosion pitting shall be evaluated in accordance with NBIC Part 2, 4.4.8.7. Widely scattered corrosion pits may be left in the pressure-retaining item in accordance with the following requirements:

1) Their depth is not more than one-half the required thickness of the pressure-retaining item wall (exclusive of corrosion allowance);

2) The total area of the pits does not exceed 7 sq. in. (4,500 sq mm) within any 50 sq. inches (32,000 sq. mm); and

3) The sum of their dimensions (depth and width) along any straight line within this area does not exceed 2 in. (50 mm).

k) Weld Joint Efficiency Factor

When the surface at a weld having a joint efficiency factor of other than one is corroded as well as surfaces remote from the weld, an independent calculation using the appropriate weld joint efficiency factor shall be made to determine if the thickness at the weld or remote from the weld governs the maximum allowable working pressure. For the purpose of this calculation, the surface at a weld includes ~~1 in. (25 mm) on either side of the weld, or two times the minimum thickness on either side of the weld, whichever is greater~~ its heat-affected zone and also includes at least a weld band, centered on the weld, that has width of 2 in. (50.8 mm) or twice the furnished plate thickness,

whichever is greater. For components with closely spaced openings and for background, see API 579-1/ASME FFS-1, Annex 2C.2.5 (2021 or later edition).

l) Formed Heads

1) When evaluating the remaining service life for ellipsoidal, hemispherical, torispherical or toriconical shaped heads, the minimum thickness may be calculated by:

a. Formulas used in original construction; or

b. Where the head contains more than one radii of curvature, the appropriate strength formula for a given radius.

2) When either integral or non-integral attachments exist in the area of a knuckle radius, the fatigue and strain effects that these attachments create shall also be considered.

m) Adjustments in Corrosion Rate

If, upon measuring the wall thickness at any inspection, it is found that an inaccurate rate of corrosion has been assumed, the corrosion rate to be used for determining the inspection frequency shall be adjusted to conform with the actual rate found.

n) Riveted Construction

For a pressure-retaining item with riveted joints, in which the strength of one or more of the joints is a governing factor in establishing the maximum allowable working pressure, consideration shall be given as to whether, and to what extent, corrosion will change the possible modes of failure through such joints. Also, even though no additional thickness may have originally been provided for corrosion allowance at such joints, credit may be taken for the corrosion allowance inherent in the joint design.

4.4.8 EVALUATING INSPECTION INTERVALS OF PRESSURE-RETAINING ITEMS EXPOSED TO INSERVICE FAILURE MECHANISMS

Pressure-retaining items are subject to a variety of inservice failure mechanisms that are not associated with corrosion. The following provides a summary of evaluation processes that may require a technical evaluation to assess resultant inspection intervals.

Some acceptance criteria in this section may not meet API 579-1/ASME FFS-1, including near welds, supports, structural discontinuities, for less than 0.1-inch vessel-wall remaining, if brittle fracture is a concern, or possibly other circumstances.

S7.8 ACCEPTANCE CRITERIA

The acceptance criteria for LPG pressure vessels is based on successfully passing inspections without showing conditions beyond the limits shown below. These acceptance criteria may not meet API 579-1/ASME FFS-1, including near welds, supports, structural discontinuities, for less than 0.1-inch vessel-wall remaining, if brittle fracture is a concern, or possibly other circumstances.

...

S7.8.2 DENTS

a) Shells

The maximum mean dent diameter in shells shall not exceed 5% of the shell diameter, and the maximum depth of the dent shall not exceed 5% of the mean dent diameter. The mean dent diameter is defined as the average of the maximum dent diameter and the minimum dent diameter. If any portion of the dent is closer to a weld than 5% of the shell diameter, the dent shall be treated as a dent in a weld area, see b) below.

b) Welds

The maximum mean dent diameter on welds (i.e., part of the deformation includes a weld) shall not exceed ~~10%~~ 5% of the shell diameter. The maximum depth shall not exceed 5% of the mean dent diameter.

c) Head

The maximum mean dent diameter on heads shall not exceed ~~10%~~ 5% of the shell diameter. The maximum depth shall not exceed 5% of the mean dent diameter. The use of a template may be required to measure dents on heads.

[Explanation for reviewers (not proposed text):
Allowed dent diameter near welds and in heads (higher risk locations) should not be twice the 5% allowed for shells, in paragraph (a) above.
Alternative: replace these acceptance criteria with a reference to API 579-1/ASME FFS-1.]

...

S7.8.4 CUTS OR GOUGES

When a cut or a gouge exceeds 25% of the original wall thickness of the pressure vessel, the pressure vessel shall be removed from service until it is repaired by a qualified repair organization or permanently removed from service.

...

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	**Relief valve differential percentage conflict.**
NBIC Location:	Part 2, S8.2
Statement of Need:	Clarification is needed to ensure a correct assessment of the recommended differential pressure percentage between the operating pressure and lifting pressure of the pressure relief valve. When making formal recommendations for corrective action due to high operating pressure differentials observed during inspections, the correct recommended value is needed to guide the adjustments necessary.
Background Information:	HWH boilers observed in the field sometimes operate in excess of this differential and close to the relief valve setpoint. The conflict in example b) shows a 20 percent differential, not the apparently intended 25 percent in the introductory paragraph.

Proposed Text:

S8.2 HOT-WATER HEATING BOILERS

For hot-water heating boilers, the recommended pressure differential between the pressure relief valve set pressure and the boiler operating pressure should be at least 10 psi (70 kPa), or 25% of the boiler operating pressure, whichever is greater. Two examples follow:

a) If the pressure relief valve of a hot-water heating boiler is set to open at 30 psi (200 kPa), the boiler operating pressure should not exceed 20 psi (140 kPa).

b) If the pressure relief valve of a hot water heating boiler is set to open at 100 psi (700 kPa), the boiler operating pressure should not exceed 75~~80~~ psi (~~550~~ 515 kPa). Section IV of the ASME Code does not require that pressure relief valves used on hot water heating boilers have a specified blowdown. Therefore, to help ensure that the pressure relief valve will close tightly after opening and when the boiler pressure is reduced to the normal operating pressure, the pressure at which the valve closes should be well above the operating pressure of the boiler.

FORM NB-4
NEW BUSINESS OR DISCONTINUANCE
USED BY AUTHORIZED INSPECTION AGENCIES

To: _____ _____
JURISDICTION 1. DATE OF SERVICE

2. Notice of: ☐ New business ☐ Discontinuance or cancellation ☐ Refusal to inspect

3. Effective date _____

4. Type of object: ☐ High pressure boiler ☐ Low pressure boiler ☐ Pressure vessel

5. OBJECT	6. OWNER'S NO.	7. JURISDICTION NO.	8. NATIONAL BOARD NO.	9. NAME OF MANUFACTURER

10. NAME OF OWNER

11. NAME OF OWNER INCLUDING COUNTY

12. LOCATION OF OBJECT INCLUDING COUNTY

13. USER OF OBJECT (IF SAME AS OWNER SHOW "SAME")

14. DATE OF LAST CERTIFICATE INSPECT., IF ANY	15. CERTIFICATE ISSUED	16. REASON FOR DISCONTINUANCE OR CANCELLATION
	☐ Yes ☐ No	☐ Phys. Condition ☐ Out of use ☐ Other

17. ~~REMARKS~~ (USE REVERSE SIDE)

INSPECTORS NARRATIVE

18. BY: _____
INSPECTION AGENCY REP. BRANCH OFFICE

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

NB-4 Rev. 2

FORM NB-5 BOILER OR PRESSURE VESSEL DATA REPORT
FIRST INTERNAL INSPECTION
Standard Form for Jurisdictions Operating Under the ASME Code

Complete When Not Registered National Board

1

DATE INSPECTED MO | DAY | YEAR	CERT EXP DATE MO | YEAR	CERTIFICATE POSTED ☐ Yes ☐ No	OWNER NO.	JURISDICTION NUMBER	NAT'L BD NO. ☐	OTHER NO. ☐

2

OWNER	NATURE OF BUSINESS	KIND OF INSPECTION ☐ Int ☐ Ext	CERTIFICATE INSPECTION ☐ Yes ☐ No

OWNER'S STREET ADDRESS NUMBER	OWNER'S CITY	STATE	ZIP

3

USER'S NAME - OBJECT LOCATION	SPECIFIC LOCATION IN PLANT	OBJECT LOCATION - COUNTY

USER'S STREET ADDRESS NUMBER	USER'S CITY	STATE	ZIP

4

CERTIFICATE COMPANY NAME	CERTIFICATE COMPANY CONTACT NAME	EMAIL

CERTIFICATE COMPANY ADDRESS	CERTIFICATE COMPANY CITY	STATE	ZIP

5

TYPE ☐ FT ☐ WT ☐ CI ☐ AIR TANK ☐ WATER TANK Other	YEAR BUILT	MANUFACTURER	YEAR INST	☐ New ☐ Secondhand

6

USE ☐ Power ☐ Process ☐ Steam Htg ☐ HWH ☐ HWS ☐ Storage ☐ Heat Exchange ☐ Other	FUEL (BOILER)	METHOD OF FIRING (BOILER)	PRESSURE GAGE TESTED ☐ Yes ☐ No

7

PRESSURE This Inspection ____ Prev. Inspection ____	SAFETY-RELIEF VALVES Set at ____	EXPLAIN IF PRESSURE CHANGED

8

IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED? ☐ Yes ☐ No (If no, explain fully on back of form - listing code violation)	PRESSURE TEST ☐ Yes ____ psi Date ____ ☐ No

9

SHELL No.	DIAMETER in. ☐ ID ☐ OD	OVERALL LENGTH ft. in.	THICKNESS in.	TOTAL HTG SURFACE (BOILER) Sq. Ft.	MATERIAL ASME Spec Nos

10

ALLOWABLE STRESS psi	BUTT STRAP Thks in ☐ Single ☐ Double	HEADERS - WT BOILERS Thickness in.	TYPE ☐ Box ☐ Sinuous ☐ Wtr Wall ☐ Other

11

TYPE LONGITUDINAL SEAM ☐ Lap ☐ Butt ☐ Welded ☐ Brazed ☐ Riveted	RIVETED Dia Hole in.	PITCH in. X in. X in.	SEAM EFF %

12

HEAD THICKNESS in.	HEAD TYPE ☐ Fixed ☐ Movable ☐ Plus ☐ Minus ☐ Flat ☐ Quick Opening	RADIUS DISH in.	ELLIP RATIO	BOLTING No. Dia. in. Material

13

TUBE SHEET THICKNESS in.	TUBES No. Dia. in. Length ft. in.	PITCH (WT BLRS) in. X in.	LIGAMENT EFF %

14

FIRE TUBE BOILERS	DISTANCE UPPER TUBES TO SHELL Front in. Rear in.	STAYED AREA FRONT HEAD { Above Tubes ____ Below Tubes ____	REAR HEAD { Above Tubes ____ Below Tubes ____

STAYS ABOVE TUBES Front No. Rear No.	TYPE ☐ Head to Head ☐ Diagonal ☐ Welded ☐ Weldless	AREA OF STAYS Front Rear

STAYS BELOW TUBES Front No. Rear No.	TYPE ☐ Head to Head ☐ Diagonal ☐ Welded ☐ Weldless	AREA OF STAYS Front Rear

15

FURNACE - TYPE Adamson (No. Sect ____.) ☐ Corrugated ☐ Plain ☐ Other	THICKNESS in.	TOTAL LENGTH ft. in.	TYPE LONG. SEAM ☐ Welded ☐ Riveted ☐ Seamless

16

STAYBOLTS - TYPE Threaded Welded Hollow Drilled (Size Hole ____ in.)	DIAMETER in.	PITCH in. X in.	NET AREA sq. in.

17

SAFETY-RELIEF VALVES No. Size	TOTAL CAPACITY ____ Cfm ____ Lb/Hr ____ Btu/Hr	OUTLETS No. Size	PROPERLY DRAINED ☐ Yes ☐ No (*If no, explain on back of form*)

18

STOP VALVES	ON STEAM LINE ☐ Yes ☐ No	ON RETURN LINES ☐ Yes ☐ No	OTHER CONNECTIONS ☐ Yes ☐ No	STEAM LINES PROPERLY DRAINED ☐ Yes ☐ No (*If no, explain on back of form*)

19

FEED PIPE Size in.	FEED APPLIANCES No.	TYPE DRIVE ☐ Steam ☐ Motor	**CHECK VALVES**	FEED LINE ☐ Yes ☐ No	RETURN LINE ☐ Yes ☐ No

20

WATER GAGE GLASS No.	TRY COCKS No.	BLOWOFF PIPE Size in. Location	INSPECTION OPENINGS COMPLY WTH CODE ☐ Yes ☐ No (*If no, explain on back of form*)

21

CAST-IRON BOILERS Length ____ in. Width ____ in. Height ____ in.	SECTIONS No.	DOES WELDING ON STEAM, FEED BLOWOFF AND OTHER PIPING COMPLY WITH CODE? ☐ Yes ☐ No (*If no, explain on back of form*)

22

SHOW ALL CODE STAMPING ON BACK OF FORM. Give details (use sketch) for special objects NOT covered above - such as double wall vessels, etc.	DOES ALL MATERIAL OTHER THAN AS INDICATED ABOVE COMPLY WITH CODE? ☐ Yes ☐ No (*If no, explain on back of form*)

23

NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED:

24

I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION Signature of Inspector	IDENT NO.	EMPLOYED BY	IDENT NO.

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229 NB-5 Rev. 1

OTHER CONDITIONS AND REQUIREMENTS

INSPECTORS NARRATIVE

CODE STAMPING

(BACK)

FORM NB-6 BOILER-FIRED PRESSURE VESSEL REPORT OF INSPECTION

Standard Form for Jurisdictions Operating Under the ASME Code

1. DATE INSPECTED: _____ (Month/Day/Year) CERTIFICATE EXPIRATION DATE: _____ (Month/Day/Year) CERTIFICATE POSTED: ☐ YES ☐ NO

   USER NUMBER: _____ NAT'L BD NUMBER ☐ OR SERIAL # (IF CAST IRON) ☐ _____

   FIRST INSPECTION: YES ☐ NO ☐ JURISDICTION NUMBER: _____

   NATIONAL BOARD NUMBER: _____ OTHER NUMBER: _____

2. EQUIPMENT LOCATION NAME: _____

   EQUIPMENT LOCATION ADDRESS: _____ (Equipment Location Street) _____ (Equipment Location City)

   _____ (Equipment Location State) _____ (Equipment Location Zip Code)

   NATURE OF BUSINESS: _____

   KIND OF INSPECTION: ☐ INTERNAL ☐ EXTERNAL CERTIFICATE RENEWAL: ☐ YES ☐ NO

3. CERTIFICATE BUSINESS NAME: _____

   CERTIFICATE CONTACT: _____ (NAME) _____ (Email)

   CERTIFICATE MAILING ADDRESS: _____ (Certificate Mailing Street) _____ (Certificate Mailing City)

   _____ (Certificate Mailing State) _____ (Certificate Mailing Zip Code)

4. INVOICE BUSINESS: _____ (Name)

   CERTIFICATE INVOICE CONTACT: _____ (Name) _____ (Email)

   INVOICE ADDRESS: _____ (Invoice Address Street) _____ (Invoice Address City)

   _____ (Invoice Address State) _____ (Certificate Mailing Zip Code)

5. TYPE: ☐ FT ☐ WT ☐ CI ☐ OTHER: _____ ASME/OTHER CODE: _____

   MANUFACTURER: _____ YEAR BUILT: _____

   MANHOLE ☐ HANDHOLE ☐ NEITHER ☐ CERTIFICATE DURATION (MONTHS): _____

6. USE: ☐ POWER ☐ PROCESS ☐ STEAM HEATING ☐ HWH ☐ HWS ☐ OTHER

   FUEL TYPE: _____ METHOD OF FIRING: _____

   LOCATION IN PLANT: _____

7. LOW WATER CUTOFF INSTALLED: YES ☐ NO ☐ TESTED: YES ☐ NO ☐

HIGH LIMIT TEMP/PRESSURE INSTALLED: YES ☐ NO ☐ WAS BOILER FIRED: YES ☐ NO ☐

COMBUSTION CONTROLS: CSD-1 ☐ NFPA ☐ OTHER ☐ _____

COMBUSTION AIR VERIFIED: YES ☐ NO ☐

8. ARE THERE ANY KNOWN OUTSTANDING (OPEN) VIOLATIONS FOR THIS EQUIPMENT? ☐ YES ☐ NO (IF YES, EXPLAIN FULLY UNDER ADVERSE CONDITIONS FOUND)

LOG/RECORD REVIEW: YES ☐ NO ☐

PRESSURE TEST: ☐ YES PSI: _____ DATE: _____ ☐ NO

9. STAMPED MAWP: _____ MINIMUM PRD REQUIRED CAPACITY: _____

NUMBER OF PRD'S: _____ TOTAL CAPACITY: _____

SET PRESSURE: _____ CAPACITY: _____

SET PRESSURE: _____ CAPACITY: _____

SET PRESSURE: _____ CAPACITY: _____

10. ~~INSPECTORS COMMENTS~~: (Verify any repairs were completed by a qualified repair company, and when applicable, the proper repair/ alterations forms are completed.)

INSPECTORS NARRATIVE

11. ~~ADVERSE CONDITIONS FOUND~~: _____

CONDITIONS TO BE ADDRESSED

12. REQUIREMENTS: _____

13. PERSON TO WHOM REQUIREMENTS WERE EXPLAINED: _____ (Name) _____ (Title)

_____ (Email) _____ (Phone Number)

14. I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION:

NB COMMISSION NUMBER: _____ EMPLOYED BY: _____

IDENTIFICATION NUMBER: _____ SIGNATURE OF INSPECTOR: _____

FORM NB-7 PRESSURE VESSELS
REPORT OF INSPECTION

Standard Form for Jurisdictions Operating Under the ASME Code

1. DATE INSPECTED: _____ (Month/Day/Year) m/d/yyyy CERTIFICATE EXPIRATION DATE: _____ (Month/Day/Year) m/d/yyyy CERTIFICATE POSTED: ☐ YES ☐ NO

   USER NUMBER: _____ JURISDICTION NUMBER: _____

   NATIONAL BOARD NUMBER: ☐ OR SERIAL NUMBER: (IF CAST IRON) ☐ _____

   FIRST INSPECTION: YES ☐ NO ☐

2. EQUIPMENT LOCATION NAME: _____

   NATURE OF BUSINESS: _____

   KIND OF INSPECTION: ☐ INTERNAL ☐ EXTERNAL CERTIFICATE RENEWAL: ☐ YES ☐ NO

3. EQUIPMENT LOCATION ADDRESS: _____ (Equipment Location Street) _____ (Equipment Location City)

   _____ (Equipment Location State) _____ (Equipment Location Zip Code)

4. CERTIFICATE BUSINESS NAME: _____

   CERTIFICATE CONTACT: _____ (NAME) _____ (Email)

5. CERTIFICATE MAILING ADDRESS: _____ (Certificate Mailing Street) _____ (Certificate Mailing City)

   _____ (Certificate Mailing State) _____ (Certificate Mailing Zip Code)

6. INVOICE BUSINESS: _____ (Name)

   CERTIFICATE INVOICE CONTACT: _____ (Name) _____ (Email)

7. INVOICE ADDRESS: _____ (Invoice Address Street) _____ (Invoice Address City)

   _____ (Invoice Address State) _____ (Certificate Mailing Zip Code)

8. TYPE: AIRTANK ☐ WATER TANK ☐ OTHER: ☐ _____ ASME/OTHER CODE: _____

   MANUFACTURER: _____ YEAR BUILT: _____

   MANHOLE ☐ HANDHOLE ☐ NEITHER ☐ CERTIFICATE DURATION (MONTHS): _____

9. USE: ☐ STORAGE ☐ PROCESS ☐ HEAT EXCHANGE ☐ OTHER: _____

   HORIZONTAL ☐ VERTICAL ☐ LENGTH: _____ DIAMETER: _____

10. STAMPED MAWP: _____ MINIMUM PRD REQUIRED CAPACITY:

_____

NUMBER OF PRD'S: _____ TOTAL CAPACITY: _____

SET PRESSURE: _____ CAPACITY: _____

SET PRESSURE: _____ CAPACITY: _____

SET PRESSURE: _____ CAPACITY: _____

OVERPRESSURE PROTECTION BY SYSTEM DESIGN: ☐ SIZE (ft^3 or Gallons):

_____

11. ARE THERE ANY KNOWN OUTSTANDING (OPEN) VIOLATIONS FOR THIS EQUIPMENT? ☐ YES ☐ NO (IF YES, EXPLAIN FULLY UNDER ADVERSE CONDITIONS FOUND)

PRESSURE TEST: YES ☐ PSI _____ Date _____ (m/d/yyyy) NO ☐

INSPECTORS NARRATIVE

12. ~~INSPECTORS COMMENTS~~: (Verify any repairs were completed by a qualified repair company, and when applicable, the proper repair/alterations forms are completed.)

13. ~~ADVERSE CONDITIONS FOUND~~: **CONDITIONS TO BE ADDRESSED**

14. REQUIREMENTS:

15. PERSON TO WHOM REQUIREMENTS WERE EXPLAINED: _____ (Name) _____ (Title)

_____ (Email) _____ (Phone Number)

16. I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION:

NB COMMISSION NUMBER: _____ EMPLOYED BY: _____

IDENTIFICATION NUMBER: _____ SIGNATURE OF INSPECTOR: _____

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	NDE in lieu of hydrotest
NBIC Location:	2023 NBIC Part 3, 4.4.1 e) and 4.4.2 c)
Statement of Need:	Performing a hydrotest of these "Parts" presents a contamination risk as mentioned in Part 3, paragraph 4.4.2.c. During the installation phase, the authorized inspection agency (AIA) performing the installation inspection determined that the Part was required to have been hydrotested. Despite the clear allowance of NDE per Part 3, paragraphs 4.4.1.e and 4.4.2.c, the AIA stated that the only means to allow NDE is if hydrotest is not practicable. The installation AIA refused to allow the equipment to be installed without a hydrotest prior to installation so the fabricator incurred significant costs performing a hydrotest to meet the demands by the installation AIA. This is a typical repair scenario and clarity as to the requirements is necessary to avoid future instances of this issue.
Background Information:	Economizers (and Boiler Banks) are fabricated in a manner that allows for shipping by truck, train, boat, etc. These economizers are modularized into portions that are sized properly and are composed of a stack of platens and a portion of the main header that will be welded together at the mill during installation. Historically, fabricators have performed hydro testing on the individual platens before they are assembled into the finished module and before the main header segment is welded in place. This means that feeder tube connections to the main header are subject to RT (volumetric NDE) and are not hydro tested. This is done for several reasons: • Draining the water completely and drying the interior is not possible when the complete module is assembled. Drying is necessary as a precursor to blowing in the desiccant for corrosion prevention during shipping and storage prior to installation. 1. Shops do not have the crane capacity to lift the module that is half-full of water to an adequate height for complete draining. 2. The nature of these economizers does not allow for safely maneuvering, or manipulating the module to allow the hydro water to access a tube for gravity draining. • If a hydro is performed on a completed module and a leak is detected on an internal platen, repair is not possible without serious amounts of work to remove welds and disassemble the module (lifting lugs, air seal, stitch welds, main header).

	• The main header segment is not hydro tested either due to the large number of plugs that are required to be welded into place and removed. Properly beveling the feeder tubes for buttweld is difficult/impossible when installed to the main header segment.
Proposed Question:	In the scenario where a Part is fabricated under the “S” certificate of authorization and not hydro tested (indicated on the P-4 as “hydro test by others”) and that same company has the “R” certificate of authorization and is signing the Design portion of the R-2, could the Part then be NDE tested in the shop under the provisions of the NBIC by that company prior to the Part being sent to the client for “Field Construction” by another “R” certificate holder? Further, in the event of a disagreement between AIA's as to what testing is required and permitted, who determines what is and is not "practicable" per Part 3, paragraph 4.4.2.c?
Proposed Reply:	Yes, per the requirements of Section 4, regardless of if it is a Repair or an alteration, NDE is permissible in lieu of a hydrostatic test. The determination of what is "practicable" is not in the purview of the installation AIA to determine if a signed and certified data report has been supplied with the equipment.
Committee’s Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee’s Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	External Weld Metal Buildup - Proximity to Major Structural Discontinuities
NBIC Location:	2025 NBIC Part 3, 3.3.4.3 e) 3) m.
Statement of Need:	NBIC Part 3 Section 3.3.4.3 e) 3) m provides clarity on the spacing between adjacent buildups but does not provide clarity on the required spacing between a buildup and other major structural discontinuities which could also interact with the stress concentration created by the buildup.
Background Information:	NBIC Part 3 Section 3.3.4.3 e) 3) m limits the proximity between adjacent external buildup sites as a repair. This makes sense as the buildups introduces a change in the normal hoop stress profile and if they are too close to each other then these stress concentrations will interact. However, there is no restriction between the spacing of a buildup and other major discontinuities such as nozzles or integral tubesheets, which also have significant stress concentrations associated with them and which could interact with the buildup if spaced too close. If the spacing proximity is too close then it should be treated as an alteration and not a repair.
Proposed Question:	Does the minimum distance between the weld toes of external weld metal buildup in 3.3.4.3 e) 3) m also apply to the distance between the toe of the weld buildup and other major structural discontinuities?
Proposed Reply:	Yes.
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Fillet welds using alternative welding method #2
NBIC Location:	2023 NBIC, Part 3, 2.5.3.2
Statement of Need:	Welding on non-pressure parts (P11B Pads) to the outside of a VIII Div 1 P11B Pressure Vessel.
Background Information:	Welding method #4 speaks specifically about fillet welds, when welding method #2 does not specifically reference fillet welds. Is this a potential oversight and it can be done, or is it written this way to exclude fillet welds using welding method #2.
Proposed Question:	Can you perform fillet welds using Welding method #2?
Proposed Reply:	Yes or no. If yes, consider including verbiage in 2.5.3.2 I) that references fillet welds. Similar to how paragraph 2.5.3.4 g)5) is written regarding welding method #4.
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Pressure testing for re-rating: waiving requirements
NBIC Location:	2023 NBIC, Part 3, 3.4.1
Statement of Need:	Composing an Alteration Plan for future service work.
Background Information:	Owner/user would like to increase a drying cylinder MAWP from 150 psi steam pressure to 160 psi.
Proposed Question:	I have a scenario with a cast iron paper machine dryer certified to 150 psi and hydrotested by the manufacturer to 300 psi. The owner/user would like this dryer re-rated for 160 psi. Due to the in-service environment conditions, a pneumatic pressure test is to be performed to 1.1x desired MAWP, or 176 psi, per ASME VIII Div 1 UG-100. Since the required re-rate air pressure test is less than the original water pressure test, could this be grounds for waiving pressure testing so long as vessel physical condition, NDE results and engineering data are deemed favorable?
Proposed Reply:	Yes.
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	**Clarify Alteration for transition from rigid to flexible bolts.**
NBIC Location:	Part 3, S1.2.3 k)
Statement of Need:	
Background Information:	This is omission from the code.

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Proposed Text:

S1.2.3 BALL SOCKET-TYPE FLEXIBLE STAYBOLTS, SLEEVES, AND CAPS

i) Substitution of one type of flexible staybolt sleeve by another type shall be considered a repair, provided it does not affect the pressure retaining capability in accordance with Part 3, 3.4.4.

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j) Where necessary for boiler expansion, ball socket-type flexible staybolts shall be positioned in such a manner as to not interfere with boiler expansion. Where individual bolts are replaced, care should be taken to ensure that the stress load of the new bolt is compatible to the loading on adjacent bolts.

Note: Some locomotive boiler designs positioned the bolts by backing the bolt head away from the sleeve socket bottom a certain amount.

k) When the installation of a flexible staybolt and/or sleeve affects the pressure retaining capability, in accordance with Part 3, 3.4.4, the change shall be considered an alteration.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	**Value of Default Tensile Strength**
NBIC Location:	**Part 3, S1.1.1 b)**
Statement of Need:	FRA mandates default of 50,000 psi but boilers built after 1921 have better than 55,000 psi steel.
Background Information:	

Proposed Text:

S1.1.1 FEDERAL RAILROAD ADMINISTRATION (FRA)

a) The Federal Railroad Administration (FRA) rules for steam locomotive boilers are published in the *Code of Federal Regulations* (CFR) 49CFR Part 230, dated November 17,1999, which may be obtained on the FRA website. All locomotives under FRA jurisdiction are documented on FRA Form 4 as defined in 49CFR Part 230. This document is the formal documentation of the steam locomotive boiler and is required to be completed prior to the boiler being placed in service. This document shall be used as the data report for the boiler, applicable to all repairs and alterations performed. National Board "R" Certificate Holders shall document their repairs and/or alterations on National Board Forms R-1 or R-2. These reports shall be distributed to the owner-user of the boiler, who is required to incorporate them into an FRA Form 19, which becomes an attachment to the FRA Form 4. The design margin for all such repairs or alterations shall not be less than four, based on ultimate tensile strength of the material.

b) The use of Tensile Strength of 55,000 psi is acceptable for boilers built after 1921. For locomotives prior to 1921, validation of the material specification or material physical properties is required to use a tensile strength value greater than 50,000 psi.

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Item Number 24-81
R. Franzen
7/30/24

Part 3
S1.1.3.1 MATERIAL LIST FOR STEAM LOCOMOTIVE BOILERS

Table S1.1.3.1 is intended as a basic guideline only and covers basic carbon steel and some alloy steel material specifications. Other alloy materials may be available for these applications if necessary.

a) SA-516 steel is recommended for firebox repairs. It is a fine grain steel that accepts flanging and bending with less tendency to crack than coarse grain steels such as SA-515 or SA-285 Grade C. Coarse grain steels have, on occasion, been found to crack or split after complicated flanging, bending, and forming.

b) SA-36 shall not be used to make any pressure-retaining part such as shells, staybolt sleeves, or caps.

c) When rivets are made from SA-675, the finished rivets must meet the physical requirements of the original rivet specification or SA-31 Grade A or B.

d) When staybolt material tensile strength is greater than that of the firebox sheets, the firebox sheets deflect instead of the staybolts, which can result in the sheets developing cracks and leaking staybolts. In addition, high tensile strength steels are difficult to drive. Maximum allowable tensile stress shall be 7,500 psi (51.71 MPa).

TABLE S1.1.3.1

Application	**Specification**
Boiler Tubes & Flues~~,~~, Arch Tubes ~~Superheater Units~~	SA-178 Grade A, SA-192, SA-210, SA-106-B
Boiler & Firebox Plate, Pressure Retaining Plate	SA-285 Grade C, SA-515, SA-516, SA-203, SA-204
Exterior & Internal Firebox Plate, Front Flue Sheet Corners & Flanges	SA-285 Grade C, SA-515, SA-516, SA-203, SA-204, SA-106-B
Welded Staybolts	SA-675, SA-36, SA-31
Threaded Staybolts and Patch Bolts	SA-31 Grade A, SA-675 ~~g~~Grade 45, 50, 55
Staybolt Sleeves and Caps	SA-105 ~~Forging~~, SA-675, SA-696, SA-216 WCA, SA-217 WC1
Boiler Braces	SA-675, SA-36
Rivets	SA-675, SA-31
Forged Parts & Fittings	SA-105, SA-181
Pressure-Retaining Steel Castings	SA-216, A-217
Hollow Cylindrical Pressure-Retaining Parts	SA-216, A-217, SA-178 Grade A, SA-192, SA-210, SA-106-B, SA-105 ~~Forgings~~, SA-675 ~~Bar Stock~~, SA-696
Superheater Units: ~~Bolts & Nuts~~	~~Bolts - SA-193, Nuts - SA-194~~
Bolts & Nuts	Bolts - SA-193, Nuts - SA-194
Pressure Retaining Parts & Tubing	SA-216, A-217, SA-178 Grade A, SA-192, SA-210, SA-106-B, SA-105, SA-675, SA-696
Pipe Flanges	SA-181, SA-105
Bolts & Studs	SA-307 Grades A&B, SA-675 ~~g~~Grade 60, 65, 70
Pipe	SA-106, SA-53 S~~s~~eamless
Bronze Castings~~, &~~ Washout Plugs	SB-61, SB-62, B-148. SA-696

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	S1.2.2 Threaded Staybolts, change wording concerning reduced body staybolts
NBIC Location:	Part 3, S1.2.2
Statement of Need:	Clarification on staybolts over 8" long is needed whether they need telltale holes or not in ridgid, flexible, radial and crown bolts
Background Information:	

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Proposed Text:

S1.2.2 THREADED STAYBOLTS

b) All staybolts shorter than 8 in. (200 mm) in length shall have telltale holes. Staybolt telltale holes in existing staybolts shall be 3/16 in. (5 mm) to 7/32 in. (5.5 mm) in diameter and at least 1-1/4 in. (3 2 mm) deep in the outer end. When staybolts shorter than 8 in. (200 mm) ~~or less~~ in length are replaced, they shall be replaced with staybolts that have a telltale hole 3/16 in. (5 mm) to 7/32 in. (5.5 mm) in diameter their entire length, or with ones that have a 3/16 in. (5 mm) to 7/32 in. (5.5 mm) diameter hole in each end, drilled a minimum of 1-1/4 in. (32 mm) deep. On reduced body staybolts, shorter than 8 in. (200 mm) in length, the telltale hole shall extend beyond the fillet and into the reduced section of the staybolt. ~~Ball socket-type flexible staybolts may have telltale holes that extend from the threaded end of the bolt into the bolt head for a distance of onethird the spherical bolt head diameter.~~

g) Ball socket-type flexible staybolts may have telltale holes that extend from the threaded end of the bolt into the bolt head for a distance of one third the spherical bolt head diameter. Ball socket-type flexible staybolts shall not be braced for driving the staybolt by inserting a spacer under the cap.

Supplement SXX

Pressure Retaining Parts Fabricated using Additively Manufactured (AM) Material

Section XX.1 Scope

Additively Manufactured (AM) parts are those that have been fabricated from material made by direct energy deposition (DED) using the gas metal arc welding (GMAW) process. The requirements listed under Section XX.2 for installation of AM parts are based on references to other known international Codes and Standards (e.g., ASME Boiler and Pressure Vessel Code).

Section XX.2 Installation of AM Pressure Retaining Parts

The use of AM parts that are being installed by a National Board R-Certificate Holder shall be considered an alteration and shall require a Form R-2. If production of AM parts is performed by a National Board R-Certificate Holder, this activity shall be documented on a Form R-3. AM parts that are installed shall be limited to service temperatures below the creep range (e.g. where time independent properties govern).

In addition to the requirements for an alteration, the following information shall be provided for the AM part and attached to the applicable NBIC Form(s) referenced above:

(a) A copy of the Additive Manufacturing Specification (AMS). As a minimum the following information shall be included in the AMS:

a). 1). The original code of construction for the AM component.

a). 2). File names with current revision for all model data describing the geometry and build strategy needed to fabricate the physical component.

a). 3). The applicable Material Specification listed in the original code of construction for the pressure retaining item.

a). 4). The applicable Filler Metal Specification and AWS Classification.

a). 5). Allowable ranges of process variables from Section IX Article VI “Material Manufacturing using Wire Additive Welding”.

a). 6). The nondestructive evaluation and testing requirements being applied to the AM Material from the applicable original code of construction.

a). 7). Supplemental examination requirements identified by the Additive Manufacturer, the User or in contract specification requirements.

a). 8). Post-processing requirements identified by the Additive Manufacturer, the User or in contract specification requirements.

a). 9). Thermal treatment requirements for the AM Material identified by the Additive Manufacturer, the User or in contract specification requirements.

a).10). Supplemental requirements identified by the Additive Manufacturer, the User or in contract specification requirements (e.g., corrosion testing).

a). 11). Documentation that shows prior to fabrication, the AMS has been reviewed and accepted by the Inspector, and the Jurisdiction, if required.

(b) A copy of the design calculations for the AM pressure part which shall be based on the original code of construction requirements.

(c) A copy of the welding procedure specification(s) followed for AM Material fabrication and welding operator qualification record(s).

(d) A copy of the Material Test Report. The data recorded on the Material Test Report shall reflect the test results from the witness specimen. The following criteria are applicable to and shall be addressed in the Material Test Report:

d). 1). At least one AM product witness tension test specimen shall be manufactured and tested from each production build.

d). 2). At least one AM product witness chemical composition test specimen shall be manufactured and tested from each production build.

d). 3). When toughness testing is required by the original code of construction, at least one AM product witness toughness test sample shall be manufactured and tested from each production build.

d). 4). All mechanical testing shall be performed on specimens in the final heat-treated condition identified in the AMS.

d). 5). When a production component requires the use of multiple heats of filler metal, AM product witness specimens for chemical composition, tension and other required testing shall be manufactured and tested from each heat of filler metal.

d.) 6). The witness specimens shall be produced using bounding heat inputs and interpass temperature that provide limiting values for tensile and toughness properties as determined by the Additive Manufacturer.

d). 7). The witness specimens shall be manufactured either immediately before, during, or immediately after each production build.

d). 8). All chemical composition, tension and toughness testing shall be performed in accordance with the requirements of Sections f), g), h), and j) below.

d). 9). Following any production test non-compliance, components fabricated during the build shall be dispositioned using the Additive Manufacturer's Quality Control Program.

d). 10). The results of the required witness specimen testing shall be documented in a Material Test Report certified by the Additive Manufacturer.

d). 11). The Material Test Report shall be included in the Additive Part Producer's construction records.

e) Chemical Composition Testing Requirements

e). 1). One AM witness specimen shall be subjected to chemical composition testing.

e). 2). The analytical method for chemical composition testing shall be in accordance with the Material Specification.

e). 3). The chemical composition of the specimens shall conform to the ASME filler metal specification identified in the AMS.

f) Mechanical Property Test Locations

f). 1). The build x, y, and z axes are defined in Figure 1.

f). 2). The z-axis is defined as normal to deposition layers (Parallel to Build Direction) as shown in Figure 1.

g) Tension Testing Requirements

g). 1). Tension test specimens shall be constructed with their long direction parallel to the z-axis as shown in Figure 1.

g). 2.) All room temperature tension testing shall be in accordance with ASTM E8 (see Appendix A and B).

g). 3). All elevated temperature tension testing shall be in accordance with ASTM E21 (see Appendix A and B).

h) Hardness Testing Requirements

h). 1). Hardness testing shall be performed on the witness specimen when required by the Material Specification, the original code of construction, or the AMS.

h). 2). Hardness testing shall comply with ASTM E10, ASTM E18 or ASTM E92.

i) Toughness Testing Requirements

i). 1). Toughness testing shall be performed when required by the Material Specification, original code of construction, or the AMS.

i). 2). When toughness testing is required, toughness testing shall be performed on the witness specimen.

i). 3). Toughness testing shall be performed in the orientation as shown in Figure 1.

i). 4). The acceptance criteria for toughness testing shall be as specified by the original code of construction.

j). A copy of nondestructive test reports as required by the original code of construction and any Owner/User contract specification requirements, if applicable.

k). Results of the hydrostatic test, when required, as performed in accordance with the rules of the original code of construction.

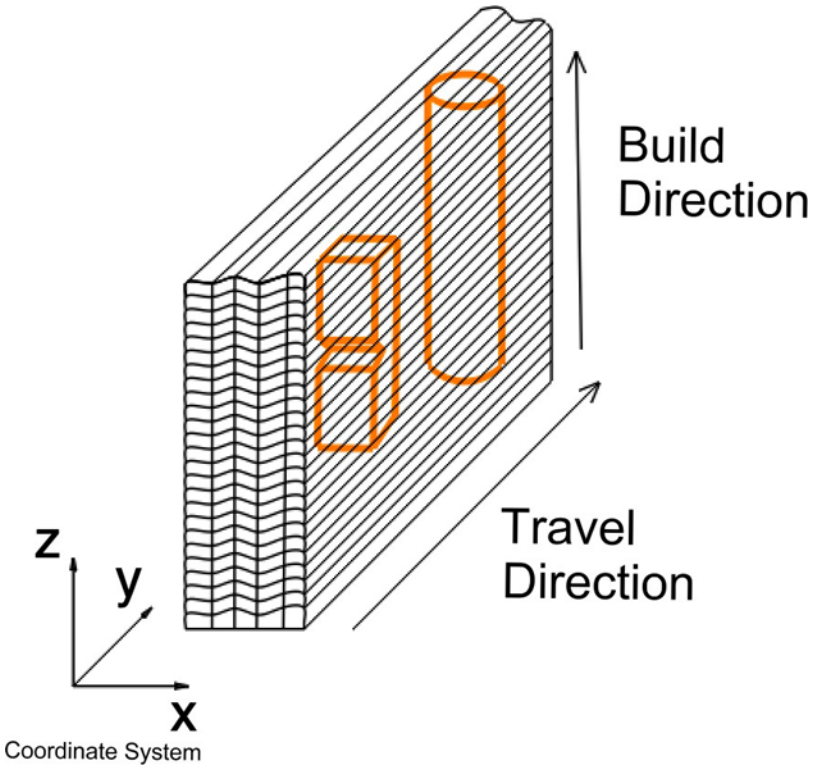

Figure 1 Material Manufacturing Coordinate System and Material Test Specimen Orientation

Appendix A Control Points and Data Point Definitions and Nomenclature

Point	Temperature	Strength	Description	Criteria
C1	Room	TS	Specified Minimum Tensile Strength	Specified Minimum Tensile Stre Material Specification
C2	Room	TS	The measured elongation from the tensile specimen is equal to the specified minimum elongation value in the Material Specification.	Specified Minimum Elongation Material Specification. Note: If the elongation in all the specimens exceeds the specifie elongation it is not required tha Point C2 be determined.
C3	Design	TS	Value from Table U at Design Temperature	Tensile Strength from ASME BP Part D, Table U at Design Temp
C4	Design	TS	Minimum Acceptable Value of Tensile Strength for High Temperature Test	Point C3/1.1 (See Paragraph 6(from Table U at Design Tempera by 1.1
C5	Room	YS	Specified Minimum Yield Strength	Specified Minimum Yield Streng Material Specification
C6	Room	YS	The measured elongation from the tensile specimen is equal to the specified minimum elongation value in the Material Specification.	Specified Minimum Elongation Material Specification. Note: If the elongation in all the specimens exceeds the specifie elongation it is not required tha Point C6 be determined.
C7	Design	YS	Minimum Acceptable Value of Yield Strength for High Temperature Test	Yield Strength from ASME BPVC Part D Table Y-1 at Design Tem
D1	Room	TS	Minimum value of tensile strength from ASME BPVC Section IX, Part QW, Article VI tension test data	Tensile strength and elongation ASME BPVC Section IX, Part QW tension tests shall equal or exc specified minimum values in th Specification (Point C1) The elongation from the tensio exceed the specified minimum the Material Specification
D2	Design	TS	Tensile strength value from elevated temperature tension test.	Tensile strength value from ASI Section IX, Part QW, Article VI t shall equal or exceed value calc Point C4
D3	Room	YS	Minimum value of yield strength from ASME BPVC Section IX, Part QW, Article VI tension test data	Yield strength and elongation fr BPVC Section IX, Part QW, Artic tests shall equal or exceed the minimum values in the Materia (Point C5) The elongation from the tensio exceed the specified minimum the Material Specification
D4	Design	YS	Yield strength value from high temperature tension test	Yield strength value from ASME IX, Part QW, Article VI tension t or exceed value for Point C7

Appendix B Example Section IX, Part QW, Article VI Data Analysis

Given the test data shown below determined from a QW-600 bracketed weld qualification testing, calculate the allowable minimum yield and tensile strength values to be used for acceptance of the tensile test specimens for qualification and production witness specimens.

Target Material Specification - ASME SA-403 Grade 316L
Filler Material Specification - ER316LSi

Control Points - Example Data SA 403 Grade 316L (ksi)

C1	C2	C3	C4	C5	C6	C7
70	Elongation Controlled	59.7	59.7/1.1=54.3	25	Elongation Controlled	14.1

Example 1
Data Point D1 = 74 ksi
Data Point D2 = Control Point
C4 = 54.3 ksi
Data Point D3 =
30 ksi
Data Point D4 = Control Point C7= 14.1 ksi

Calculate the Minimum Allowable Tensile Strength and Yield Strength for the Qualification Build Specimen and the Production Witness Specimens Builds Specimen using Equation 1 and 2.

$AMTS_{Minimum}$ = Max [C1, D1 x C4/D2] = Max [70, 74 x 54.3/54.3] = 74

$AMYS_{Minimum}$= Max [C5, D3 x C7/D4] = Max [25, 30 x 14.1/14.1] = 30 ksi

Example 2
Data Point D1 = 74 ksi
Data Point D2 = Control Point
C3 = 59.7 ksi Data Point D3 =
30 Ksi
Data Point D4 = 17 ksi
Calculate the Minimum Allowable Tensile Strength and Yield Strength for the Qualification Build Specimen and the Production Witness Specimens Builds Specimen using Equation 1 and 2.

$AMTS_{Minimum}$ = Max [C1, D1 x C4/D2] = Max [70, 74 x 54.3/59.7] = 70 ksi

$AMYS_{Minimum}$= Max [C5, D3 x C7/D4] = Max [25, 30 x 14.1/17] = 25 ksi

PROPOSED REVISION OR ADDITION

Item No.

A23-24

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject/Title

GENERAL REQUIREMENTS FOR REPAIRS TO QUICK-ACTUATING/QUICK-OPENING CLOSURES

NBIC Location

New SUPPLEMENT XX

Project Manager and Task Group

Tim McBee (PM), Chuck Becker, Matt Schaser, Robert Smith, Aziz Khssassi

Source (Name/Email)

Kathy Moore (kathymoore@joemoorecompany.com)

Statement of Need

There are many small stamp holders (which I am one of them) that do not understand the "uniqueness" of these repairs. I would like to see some engineering controls as part of this "section".

Background Information

The NBIC currently has no specific safe guidelines for Quick-Actuating/Quick-Opening repairs.

Existing Text	**Proposed**
None	**See attached**

A23-24
SUPPLEMENT XX
GENERAL REQUIREMENTS FOR REPAIRS TO QUICK-ACTUATING/QUICK-OPENING CLOSURES

SXX.1 SCOPE

This supplement provides additional requirements and guidelines above and beyond those cited in the main body of the NBIC code for repairs to quick-actuating/quick-opening closure pressure-retaining components referred throughout this supplement as "Quick Closures". Special consideration shall be given to meet the requirements set forth in NBIC Part 3, Section 2 through 5 as appropriate and inspection requirements identified in paragraph 2.3.6.5 in NBIC Part 2.

This supplement applies to the general component terminology and does not include all quick-~~actuating/quick-opening~~ closure designs. For details refer to the quick-~~actuating/quick-opening~~ closure manufacturer's partial data report, manufacturing drawings, service and maintenance ~~guidance~~documentation. ~~This list of manufacturer records should be consistent with ASME UG-35 required records~~Additional documents required by the original code of construction may be available for reference. No components furnished or specified by the Manufacturer of the quick closure shall be omitted~~removed~~ unless the Manufacturer's concurrence is received or good engineering judgement is obtained.

The components of quick closures include but are not limited to the following:
a) Cover (Head, Flat Plate, etc.)
b) Support Elements (Davit Hinge, Post Davit, Vertical/Slide Sides, etc.)
c) Locking Elements (Wedges, Latch, etc.)
d) Locking Mechanism (Rotating Locking Ring, Seal Flanges, Lugs etc.)
e) Holding Elements (Pins)
f) Interlock Device (Pressure Indicating Device)
g) Seal design

SXX.2 REPLACEMENT PARTS FOR QUICK CLOSURES

~~a) No components furnished or specified by the Manufacturer of the quick closure shall be removed unless Manufacturer's concurrence is received. In the event the original Manufacturer is no longer available, components shall not be removed.~~

b) Replacement pressure retaining parts shall be identical to the original equipment furnished. Substitutions may be allowed if they are approved by the Manufacturer or if the substitution has been determined acceptable through an engineering evaluation. The engineering evaluation shall be documented, ~~and~~ reviewed and accepted by an Repair Inspector and Jurisdiction, where required.

c) Quick closure replacement pressure-retaining parts shall be fabricated in accordance with the Manufacturer's design and the original code of construction.

d) Replacement of the nonpressure-retaining load bearing parts, when different from the Manufacturer's design, shall be evaluated for any possible effect on the pressure-retaining parts.

e) Replacement materials, including welding materials, shall be consistent with the original materials of construction, including heat treatment.

SXX.3 REPAIR GUIDE FOR QUICK CLOSURES

a) The Manufacturer's Data Report or Manufacturer's drawings when available, shall be carefully reviewed to determine the material of construction of each quick closure. If material data is not

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available, positive material identification (PMI) to identify the material's chemistry and hardness testing shall be performed.

b) Weld repairs performed in accordance with NBIC Part 3 are permitted on quick closure pressure-retaining components that are manufactured from steel. Hinge pins or bolts shall not be welded. Special attention shall be paid to any requirements for the finished weld profile and PWHT.

c) Structural deterioration or damage caused by corrosion, thinning, or cracking shall not be repaired until its extent has been determined by suitable nondestructive examination.

d) The Certificate Holder shall have a plan covering the scope of the repair. The plan shall ensure that the work involved is compatible with the original design specification and good engineering practices.

e) Removing the quick closure mechanism components from one vessel for the installation on another vessel is STRICTLY PROHIBITED.

(f) When quick closures are repaired, the locking mechanism or locking device shall be operational per the quick closure Manufacturer's specifications.

SXX.4 ROUTINE REPAIRS

The following examples of repairs do not require stamping or nameplate attachment provided the repair procedure has been accepted by the Repair Inspector and the R-Certificate Holder has verified there will be no effect on the pressure-retaining capability of the quick closure.

a) Replacement of consumable parts, for example wedges.

b) Alignment adjustments

SXX.5 REPAIR OF DAMAGE

SXX.5.1 REPAIR OF QUICK CLOSURE WELDS

All welds associated with the quick closure pressure-retaining components should be repaired in accordance with the original manufacturer's design specifications. Special attention shall be paid to any requirements for the finished weld profile and PWHT.

SXX.5.2 REPAIR OF QUICK CLOSURE SURFACES

The repair of quick closure surfaces shall be limited to the restoration of wasted areas through weld build-up. The final surface shall be flush with nominal surface. Seating surfaces shall be machined back to original design specifications. External weld build-up is prohibited on closure components. Alternatively, Fitness-for Service (FFS) may be used to qualify local thin areas.

SXX.5.3 REPAIR OF QUICK CLOSURE MECHANISM

a) The designs of quick closure locking mechanisms are typically proprietary; therefore, all repairs shall be performed to restore the closure to the original design specifications. If design specifications, such

as original quick closure configuration and nominal thicknesses are not available, then all repairs shall be performed by the original manufacturer. If this is not practicable, the Certificate Holder shall contact an organization competent in quick ~~-actuating/quick-opening~~ closure design and construction to approve or establish a repair plan prior to implementing any repairs.

b) Safety devices (sensors, interlocks, etc.) removed during maintenance or repair shall be reinstalled per the original manufacturer's specifications.

c) Repairs shall avoid damaging gasket materials. If damage occurs to gasket materials, the gaskets shall be replaced before returning system back into service.

SXX.6 EXAMINATIONS AND TEST METHODS

NBIC Part 3, Section 4 is applicable for all post construction activities pertaining to examination and testing.

SXX.7 CERTIFICATION/DOCUMENTATION AND STAMPING

NBIC Part 3, Section 5 is applicable for all post construction activities pertaining to certification/documentation and stamping.

Stamping may also be waived per SXX.4 of this Supplement.

PROPOSED REVISION OR ADDITION

Item No.

A24-96

Subject/Title

Add examples of repairs and alterations specific to Electrochemical Stacks (ECS)

NBIC Location

Part: 3; Supplement 11; Paragraph: S11.2.x, S11.3.x, S11.4

Project Manager and Task Group

PM – A. Triplett, R. Collins, R. Miletti

Source (Name/Email)

Matthew Sweetland / msweetland@plugpower.com

Statement of Need

With inclusion of electrochemical stacks as "U" stamped pressure vessels under ASME BPVC Section VIII Division 1 and Code Case 3078, these stacks are starting to be shipped and registered with the National Board. Lists of allowed repairs and alterations, akin to those provided for plate heat exchangers, are needed to help guide an understanding of limitations for electrochemical stacks. Based on discussion at the January 2025 Subgroup R&A meeting, and due to the complex nature of electrochemical stack construction/operation, the best place to include this information would be in the new Supplement 11 – Engineered Repairs and Alterations.

Background Information

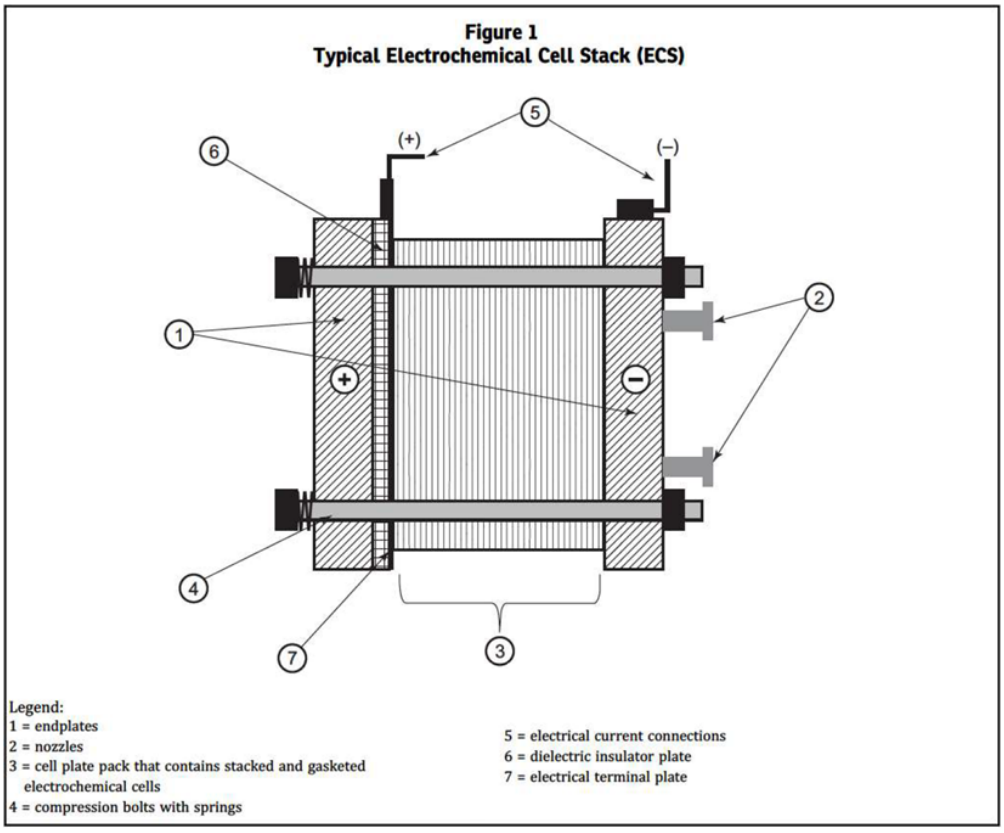
Electrochemical stacks are being built and registered with the National Board under Code Case 3078. Once deployed, if some modification is required by the end user, having repair and alteration lists in NBIC Part 3 will help guide decisions by Owners, Inspectors, and Jurisdictions. Illustrations of a typical electrochemical stack, as well as related NBIC language for plate heat exchangers, are included in this Action Item.

Important note: Robert Underwood and Terry Hellman have confirmed with Gary Scribner, NBBI Assistant Executive Director – Technical, that the National Board has no issue with the addition of definitions in Supplement 11 which are specific to engineered repairs and alterations, and which will not appear in Section 9 of Parts 1-4.

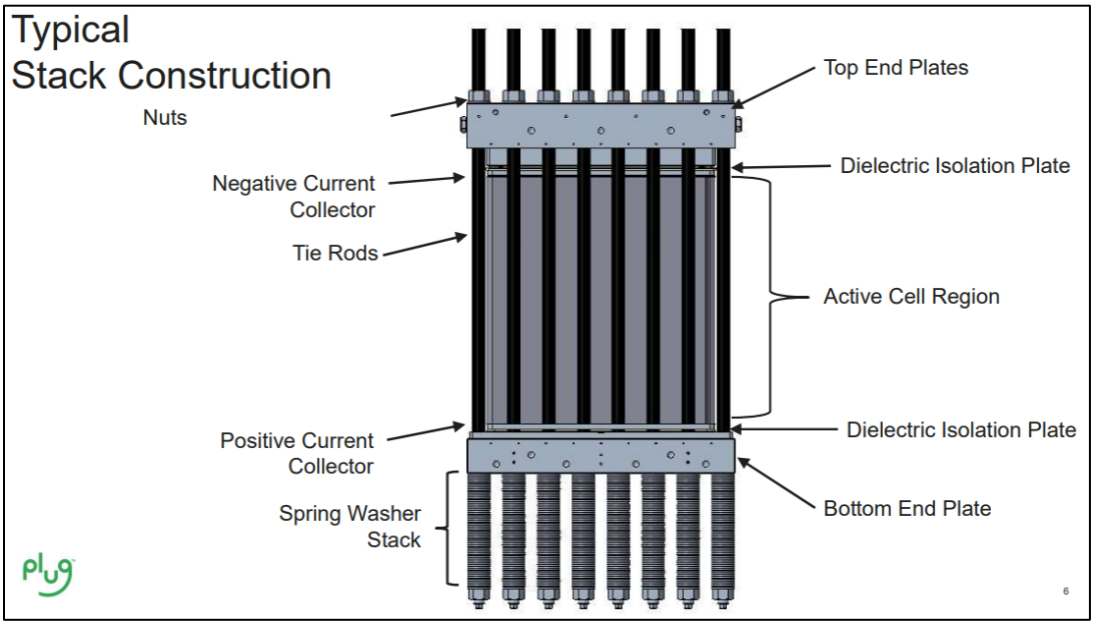
Existing Text	Proposed Text
None.	**S11.2.x REPAIR OF ELECTROCHEMICAL STACK (ECS) UNITS** a) Due to the complex operating nature of ECS units, competent technical advice should be obtained from the Manufacturer or another qualified source for repairs to an ECS unit. b) Repairs to ECS units are limited to the following: 1) Those listed for plate heat exchangers in Part 3, 3.3.3 u); and 2) The replacement of active cell components to restore the item's physical, electrical, or electrochemical performance. c) See S11.4 for the definition of "active cell component". **S11.3.x ALTERATION OF ELECTROCHEMICAL STACK (ECS) UNITS** a) Due to the complex operating nature of ECS units, competent technical advice should be obtained from the Manufacturer or another qualified source for alterations to an ECS unit. b) Alterations to ECS units are limited to the following: 1) Applicable alterations listed in Part 3, 3.4.4, including those listed for plate heat exchangers in 3.4.4 j) 2); and

	2) The following changes from what is listed on the Manufacturer's Data Report (MDR) or described on the Original Equipment Manufacturer (OEM) drawing: a. A change in size, material grade, nominal thickness, compressibility, or orientation of any active cell component; b. A reduction in number of cells below any minimum, or when no minimum is specified; and c. An increase in number of cells above any maximum, or when no maximum is specified. c) See S11.4 for the definition of "active cell component". **S11.4 DEFINITIONS SPECIFIC TO ENGINEERED REPAIRS AND ALTERATIONS** **Active Cell Component** – Any component located completely between the end plates of an electrochemical stack (ECS) unit which plays an active role in the physical, electrical, or electrochemical function of a cell. Examples include insulator plates (e.g., dielectric plates), separator plates, cell frames, current collectors, membrane electrode assemblies (MEA), fluid isolators, compressive force elements (e.g., internal springs), and gaskets.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date



Typical ECS configuration (from ASME Code Case 3078)



Typical ECS configuration (from Plug Power)

2025 NBIC Part 3, 3.3.3 u)

u) Repairs to plate heat exchangers (PHE) are limited to the following:
    1) Welding on any pressure part, i.e. not limited to a flange, nozzle, or endplate;
    2) In kind replacement of endplates, or welded nozzles;
    3) Replacement of any failed connection or frame bolting, representing the replacement parts described in Part 3, 3.2.2-a), with no change of material or grade as described on the Manufacturer's Data Report (MDR) or Original Equipment Manufacturer's (OEM) drawing;
    4) The addition or repair of load bearing attachments (e.g., welded supports or lifting lugs) to the endplates; and
    5) Replacement of parts bearing certification or manufacturer's stamping with no-change in material allowed as described on the MDR or verifiable OEM drawing.

2025 NBIC Part 3, 3.4.4 j) 2)

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:
    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;
        b. A change in material grade or nominal dimensions of any end plates or nozzles.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Requirements for Stamping and Nameplates
NBIC Location:	2025 Part 3, 5.7.5
Statement of Need:	When performing repairs or alterations on boilers and pressure vessels, the industry standard is to affix a repair nameplate near the master nameplate, which contains critical identification information. However, HRSG boilers differ in that they have multiple master nameplates for different sections (e.g., HP, LP, economizer), all located on the outer casing of the boiler. Currently, NBIC repair nameplates do not provide a way to indicate which specific section was repaired. This limitation creates confusion for future inspections and maintenance, as there is no clear indication of which section underwent repairs. Adding a requirement for repair nameplates to include the specific HRSG boiler section being repaired will enhance clarity and traceability.
Background Information:	Our company specializes in repairs and alterations on boilers, including HRSG boilers. The current NBIC nameplate requirements are designed for traditional boilers, where a single master nameplate exists. However, in HRSG units, multiple nameplates exist for different sections, leading to challenges in documenting repairs effectively. This proposal ensures alignment with industry needs and prevents ambiguity in identifying repaired sections.

Proposed Text:

5.7.5 SPECIFIC REQUIREMENTS FOR STAMPING AND NAMEPLATES

a) Required data shall be in characters of at least 5/32 in. (4 mm) high, except that characters for pressure relief valve repair nameplates may be smaller. Markings may be produced by casting, etching, embossing, debossing, stamping, or engraving. The selected method shall not result in any harmful contamination, or sharp discontinuities to, the pressure-retaining item. See NBIC Part 3, Figures 5.7.5–a through 5.7.5-e.

b) The National Board Code Symbols (“R”, “VR”, and “NR”) are to be stamped; do not emboss.

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

d) The certificate holder shall use its full name as shown on the *Certificate of Authorization* or an abbreviation acceptable to the National Board.

e) The letters "RP" shall be stamped below the "R" Symbol Stamp to indicate organizations accredited for performing repairs or alterations to fiber-reinforced plastic items.

f) The letter "G" shall be stamped below the "R" Symbol Stamp to indicate organizations accredited for performing repairs or alterations to graphite pressure equipment.

g) When a repair or alteration is performed on a Heat Recovery Steam Generator (HRSG), where multiple master nameplates exist for different sections of the unit (e.g., HP, LP, economizer), the repair or alteration nameplate shall include an additional marking to specify the section where the work was performed. This information shall be clearly identified on the nameplate to ensure proper traceability for future inspections and maintenance.

h) The subject nameplate shall be securely attached using a method compatible with the structure or stand-off bracket supporting the nameplate, in a manner that will impede easy removal. The method of attaching this nameplate, as permitted by the original code of construction, may include, but is not limited to:

    1) Welding
    2) Adhesive, bonding or cementing
    3) Tamper-resistant mechanical fasteners of suitable metal construction

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Adoption of reinforcement/fillet welded patches from PCC-2
NBIC Location:	2025 Part 3, 3.3.4.6
Statement of Need:	Oil refineries are scant on shutdown opportunities and vital to the fuel needs of the community. At times inspection departments will detect corrosion on an in-service piece of equipment and be unable to clean it up for internal entry without a planned outage. Fillet welded patches are a safer alternative to external weld metal build up, or fitness for service.
Background Information:	The Jurisdiction only allows repairs explicitly listed in National Board Part 3. ASME PCC-2 is a well-established document with sound repair options that is not currently being utilized.

Proposed Text:

3.3.4.6 PATCHES

c) Fillet-Welded Patches

The application of fillet welded patches is permitted, provided they conform to the specifications and requirements outlined in ASME PCC-2, Article 212. Fillet welded patches shall be classified as alterations and shall require the completion and submission of an R-2 Form in accordance with the National Board Inspection Code (NBIC) and jurisdictional requirements.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Synchronize/Revise Repairs & Alterations of VIII-2, VIII-3 PRIs
NBIC Location:	2025 Part 3, S11.2.3 b) and S11.3.2 a)
Statement of Need:	Mr. Tim Gardner, NBBI Senior Staff Engineer/Instructor Training, plans to create an online course for repairs of ASME Sect VIII-2 and VIII-3 PRIs but the current requirements in 3.3.5 and 3.4.5 do not seem to agree.
Background Information:	In discussion with Mr. Tim Gardner, NBBI Senior Staff Engineer/Instructor Training, he asked why 3.4.5.1 a) does not have the same opening sentence for alterations as exists for repairs in 3.3.5.2. Furthermore, it is recommended for the current 3.3.5.2 sentence to read, "The user shall prepare, or cause to have prepared, detailed specifications covering the scope of the repair/alteration". The reason is to be consistent with the VIII-2/VIII-3 terms and phrases. The user provides the specifications, and the certificate holder then provides the plan.

Proposed Text:

S11.2.3 REPAIR OF ASME SECTION VIII, DIVISION 2 OR 3, PRESSURE VESSELS

a) 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.

b) Repair Plan

The user shall prepare, or cause to have prepared, ~~a detailed pla~~detailed specifications~~n~~ covering the scope of the repair.

S11.3.2 ALTERATION OF ASME SECTION VIII, DIVISION 2 OR DIVISION 3, PRESSURE VESSELS

a) Alteration Plan
The user shall prepare, or cause to have prepared, detailed specifications covering the scope of the alteration.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Revise Part 3, Table 2.5.1
NBIC Location:	2025 Part 3, Table 2.5.1
Statement of Need:	There have been changes to materials in the ASME Code that have made a review/revision of Table 2.5.1 necessary. If anything, the obsolete group numbers should be deleted. It will be up to the committee to decide whether to add the missing P/group numbers and the associated temperatures.
Background Information:	An NBBI student challenged a question on an exam which referenced Table 2.5.1. The research of the table revealed there are some material group numbers that no longer exist and some new ones (P No & Gr No) that are not addressed.

Proposed Text:

TABLE 2.5.1

MINIMUM TEMPERATURES FOR PREHEATING

Thicknesses referenced are nominal at the weld for the parts to be joined.	
a) P-No. 1 Group Nos. 1, 2, ~~and~~ 3, and 4	1) 175°F (79°C) for material that has both a specified maximum carbon content in excess of 0.30% and a thickness at the joint in excess of 1 in. (25 mm). 2) S0°F (10°C) for all other materials in this P-Number.
b) P-No. 3 Group Nos. 1, 2, and 3	1) 175°F (79°C) for material that has either a specified minimum tensile strength in excess of 70,000 psi (480 MPa) or a thickness at the joint in excess of 5/8 in. (16 mm). 2) S0°F (10°C) for all other materials in this P-Number.
c) P-No. 4 Group Nos. 1 and 2	1) 250°F (120°C) for material that has either a specified minimum tensile strength in excess of 60,000 psi (410 MPa) or a thickness at the joint in excess of 1/2 in. (13 mm). 2) S0°F (10°C) for all other materials in this P-Number.
d) P-No. 5A Group 1 and 5B, Group 1, 5C Group 1, 3, 4, and 5, and P-No. 15E Group 1	1) 400°F (205°C) for material that has either a specified minimum tensile strength in excess of 60,000 psi (410 MPa) or has both a specified minimum chromium content above 6.0% and thickness at the joint in excess of 1/2 in. (13 mm). 2) 300°F (150°C) for all other materials in this P-Number.
e) P-No. 6 Group Nos. 1, 2, ~~and~~ 3, and 4	400°F (205°C)
f) P-No. 7 Group Nos. 1 and 2	None
g) P-No. 8 Group Nos. 1, ~~and~~ 2, 3, and 4	None
h) P-No. 9 Group	1) 250°F (120°C) for P-9A Gr. 1 materials 2) 300°F (150°C) for P-9B Gr. 1 materials 3) XXX° F (XXX°C) for P-9C Gr.1 materials *(insert applicable values)*

i) P-No. 10 Group	1) 175°F (79°C} for P-l0A Gr. 1 materials 2) 250°F(120°C} for P-10B Gr. ~~2~~ 1 materials ~~3) 175°F(79°C) for P-l0C Gr. 3 materials~~ ~~4) 250°F (120°C} for P-l0F Gr. 6 materials~~ 5) XXXXXXXXX for P-10H Gr. 1 materials 6) XXXXXXXXXf for P-10I Gr. 1 materials 7) XXXXXXXXX for P-10J Gr. 1 materials 8) XXXXXXXXX for P-10K Gr. 1 materials ~~5) For P-l0C Gr. 3 materials, preheat is neither required nor prohibited, and consideration shall be given to the limitation of interpass temperature for various thicknesses to avoid detrimental effects on the mechanical properties of heat treated material.~~ ~~6) For P-10D Gr. 4 and P-l0E Gr. 5 materials, 300°F(150°C) with interpass temperature maintained between 350°F and 450°F (175°C and 230°C).~~
j) P-No. 11 Group	1) P-11A Group Group 1 - None (Note 1) Group 2 - Same as for P-No. 5 (Note 1) Group 3 - Same as for P-No. 5 (Note 1) Group 4 - 250°F(120°C) Group 5 - XXXXX 2) P-11B Group Group 1- Same as for P-No. 3 (Note 1) Group 2 - Same as for P-No. 3 (Note 1) Group 3 - Same as for P-No. 3 (Note 1) Group 4 - Same as for P-No. 3 (Note 1) Group ~~5~~ 8 - Same as for P-No. 3 (Note 1) Group ~~6~~ 9 - Same as for P-No. 5 (Note 1) Group ~~7~~10 - Same as for P-No. 5 (Note 1) 3) P- 11C Group Group 1 - XXXXXX

These 2 are the same

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Repair of PRIs Without Complete Removal of Defect
NBIC Location:	2025 Part 3, S11.2.2
Statement of Need:	To clarify this repair activity can be used for welded or non-welded repairs. This proposal will remove reference to welded repairs in S11.2.2 and only refer to "repair."
Background Information:	The intent of S11.2.2 (formerly 3.3.4.8) is that this activity be permitted in conjunction with a welded or non-welded repair activity. However, the current wording appears to permit it only when performing a welded repair activity.

Proposed Text:

To be determined.

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

PROPOSED REVISION OR ADDITION

Item No. A 25-26 Rev 00
Subject/Title **Stamping of Parts and Distribution of Form R-3**
NBIC Location **Part 3, Section 5, para. 5.7.4**
Project Manager and Task Group P Gilston & R Underwood
Source (Name/email) D Kaehn (douglas_kaehn@hsb.com)
Statement of Need No requirements are given for distribution of Form R-3 unlike those given for Forms R-1 and R-2. While 3.2.2 c) and d) providing stamping requirements when the Code of construction is ASME or some other Code where stamping requirements are addressed, no instruction are given where this is not provided or the part is fabricated by an R certificate holder who is not using that part themselves in a repair or alteration as addressed in 3.2.2 c)..
Background Information

Existing Text	**Proposed Text**
3.2.2 REPLACEMENT PARTS d) When the original code of construction is other than ASME Code, replacement parts subject to internal or external pressure, fabricated by welding, shall be manufactured by an organization certified as required by the original code of construction. The item shall be inspected and stamped as required by the original code of construction. Certification to the original code of construction, as required by the original code of construction or equivalent, shall be supplied with the item. When this is not possible or practicable, the organization fabricating the part shall have a National Board "R" Certificate of Authorization; replacement parts shall be documented on Form R-3 and the "R" Symbol Stamp applied as described in NBIC Part 3, Section 5. **DISTRIBUTION F FORM R-3** *No existing text.* **5.7.4 STAMPING REQUIREMENTS FOR PARTS** Stamping or nameplate shall be applied in a conspicuous location on the part.	**3.2.2 REPLACEMENT PARTS** d) When the original code of construction is other than ASME Code, replacement parts subject to internal or external pressure, fabricated by welding, shall be manufactured by an organization certified as required by the original code of construction. The item shall be inspected and stamped as required by the original code of construction. Certification to the original code of construction, as required by the original code of construction or equivalent, shall be supplied with the item. 1) When ~~this is not~~the above requirements are not possible ~~or practicable~~, the organization fabricating the part shall have a National Board "R" Certificate of Authorization; replacement parts shall be documented on Form R-3 and the "R" Symbol Stamp applied as described in NBIC Part 3, Section 5 paragraphs 5.2.3 and 5.7.4 b) respectively. **5.X DISTRIBUTION F FORM R-3** a) Legible copies of completed Form R-3, together with attachments, shall be distributed to the owner or user and Jurisdiction, if required, and shall be provided to the

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	Inspector and the inservice Authorized Inspection Agency of the pressure retaining item upon request. b) Distribution of Form R-3 and attachments shall be the responsibility of the organization manufacturing the part. **5.7.4 STAMPING REQUIREMENTS FOR PARTS** a) For replacement parts subject to internal or external pressure fabricated by welding, stamping shall be as required per paragraph 3.2.2 c) or d). b) For parts fabricated in accordance with 3.2.2 d) 1), the organization who fabricated the part having a National Board "R" Certificate of Authorization, shall stamp the part or attach a nameplate (see Figure 5.7.5-d) in a conspicuous location on the part. The marking shall include: a. The Certificate Holders name. b. The Manufacturers National Board 'R' Certificate Number c. The "R" symbol stamp. d. The M.A.W.P. at temperature. e. The manufacturers serial number. f. The year manufactured. ~~Stamping or nameplate shall be applied in a conspicuous location on the part.~~

	VOTE						
Committee	**Approved**	**Disapproved**	**Abstained**	**Not Voting**	**Passed**	**Failed**	**Date**

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THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Repair of PRIs Without Complete Removal of Defect
NBIC Location:	2025 Part 3, 1.3 b) and AIA definition
Statement of Need:	FIA's are to be a scope under OUIO. Definitions have been removed from RCI-1. This will remove references in the: Introduction; 1.3 b); and in the definition of an Inservice AIA.
Background Information:	FIA's are to be a scope under OUIO. Definitions have been removed from RCI-1. This will remove references in the: Introduction; 1.3 b); and in the definition of an Inservice AIA.

Proposed Text:

1.3 INSPECTOR

a) Inspection and certification shall be performed by an Inspector holding a National Board Commission with the National Board "R" Endorsement who is employed by an Authorized Inspection Agency in accordance with NB-263, RCI-1, *Rules for Commissioned Inspectors*. (See NBIC Part 3, Section 9, *Glossary of Terms* for definition of Authorized Inspection Agency.)

b) An Inspector employed by an Owner-User Inspection Organization ~~or Federal Inspection Agency~~ may authorize and accept work only on pressure-retaining items owned or used by the respective organization. Each accredited Owner-User Inspection Organization's Quality Management System (QMS) shall have specific approval of the jurisdiction as required.

9.1 DEFINITIONS

Authorized Inspection Agency (AIA)

Inservice: An Authorized Inspection Agency is either:

a) a Jurisdictional authority as defined in the National Board Constitution; or

b) an entity that is accredited by the National Board meeting NB-369, *Accreditation of Authorized Inspection Agencies Performing Inservice Inspection Activities*; or NB-371, *Accreditation of Owner-User Inspection Organizations (OUIO)*.~~; or NB-390, *Accreditation of Federal Inspection Agencies (FIA).*~~

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

PROPOSED REVISION OR ADDITION

Item No. A 25-29 Rev 00
Subject/Title **Referencing for Weld Metal, Filler Metal etc.**
NBIC Location
Project Manager and Task Group P Gilston (PM), J. Siefert, W. Sperko, M. Vance, T Melfi
Source (Name/email) January 2023, Sub-Committee Discussion
Statement of Need Within Part 3, welding consumables are referred to in several different ways e.g., filler metal, weld metal etc. This item is to review these references and identify if a single reference description is beneficial for users of the Code.
Background Information When discussing weld metal, references can be made to the weld consumable itself, or the deposited weld metal. Often we describe the 'nominal composition' for the weld, this is normally based on the actual weld metal deposited in a weld joint. Various factors can influence the chemistry of a deposited weld metal, including, but not limited to dilution with the base metal, protective fluxes, shielding gas etc. Definitions of Weld Metal, Filler Metal and Weld Filler Material have been approved under item A23-13 and will be published in 2025.

Paragraph	Current Text	Proposed Text
2.5.3.1 e) 1)	Provided the carbon equivalent of the base material to be welded is determined to be 0.40 or less.	Provided the carbon equivalent of the base ~~material~~ metal to be welded is determined to be 0.40 or less.
2.5.3.1 e) 2)	The electrodes and filler metals are classified by the filler metal specification with a diffusible hydrogen designator of H4 or lower.	The ~~electrodes and filler metals~~weld consumables are classified ~~by the filler metal specification~~ with a diffusible hydrogen designator of H4 or lower
2.5.3.2 i)	For the welding process in NBIC Part 3, 2.5.3.2 c), use of austenitic or ferritic filler metals is permitted. For ferritic filler metals, use only electrodes and filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes. When shielding gases are used with a process, the gas shall exhibit a dew point that is below -60°F (-50°C). Surfaces on which welding will be done shall be maintained in a dry condition during welding and	For the welding process in NBIC Part 3, 2.5.3.2 c), use of austenitic or ferritic filler metals is permitted. For ferritic filler metals, use only ~~electrodes and filler metals~~those that are classified by the ~~filler metal~~weld consumable specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes. When shielding gases are used with a process, the gas shall exhibit a dew point that is below -60°F (-50°C). Surfaces on which welding will be done shall be maintained in a dry condition

	be free of rust, mill scale, and hydrogen producing contaminants such as oil, grease, and other organic materials;	during welding and be free of rust, mill scale, and hydrogen producing contaminants such as oil, grease, and other organic materials;
2.5.3.2 k)	For welds made by SMAW and FCAW, after completion of welding and without allowing the weldment to cool below the minimum preheat temperature, the temperature of the weldment shall be raised to a temperature of 450°F (232°C) minimum for a minimum period of two hours. This hydrogen bake-out treatment may be omitted provided the electrode used is classified by the filler metal manufacturer with a diffusible-hydrogen designator of H4 (e.g., E7018-H4); and	For welds made by SMAW and FCAW, after completion of welding and without allowing the weld~~ment~~ to cool below the minimum preheat temperature, the temperature of the weld~~ment~~ shall be raised to a temperature of 450°F (232°C) minimum for a minimum period of two hours. This hydrogen bake-out treatment may be omitted provided the electrode used is classified by the ~~filler metal~~weld consumable manufacturer with a diffusible-hydrogen designator of H4 (e.g., E7018-H4); and
2.5.3.2 l)	After the finished repair weld has cooled to ambient temperature, the surface temper reinforcing layer shall be removed substantially flush with the surface of the base material.	After the finished repair weld has cooled to ambient temperature, the surface temper reinforcing layer shall be removed substantially flush with the surface of the base ~~material~~metal.
2.5.3.3 d)	The test material for the welding procedure qualification shall be of the same P-No. and Group No. as the base material specification of the repair. In the event that the original material specification is obsolete, the test material used should conform to the nominal composition and carbon equivalent (IIW Formula CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15; elements are expressed in Weight Percent Amounts), as the material being repaired, but in no case shall the material be lower in strength;	The test material for the welding procedure qualification shall be of the same P-No. and Group No. as the base ~~material~~ metal specification of the repair. In the event that the original ~~material~~ base metal specification is obsolete, the test material used should conform to the nominal composition and carbon equivalent (IIW Formula CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15; elements are expressed in Weight Percent Amounts), as the ~~material~~ base metal being repaired, but in no case shall the material be lower in strength;
2.5.3.3 g) 2)	For the welding processes in NBIC Part 3, 2.5.3.3 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only electrodes or filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes;	For the welding processes in NBIC Part 3, 2.5.3.3 c), use of austenitic or ferritic filler metal is permitted. For ferritic ~~filler~~ weld metals, use only electrodes or filler metals that are classified by the ~~filler metal~~weld consumable specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes;
2.5.3.3 g) 3)	After completion of welding using SMAW and without allowing the weldment to cool below the minimum preheat temperature, the temperature of the weldment shall be raised to a temperature of 450°F (232°C) minimum for a minimum period of two hours. This hydrogen bake-out treatment may be omitted, provided the electrode used is classified by the filler metal manufacturer with a diffusible- hydrogen designator of H4 (e.g., E7018-H4); and	After completion of welding using SMAW and without allowing the weld~~ment~~ to cool below the minimum preheat temperature, the temperature of the weld~~ment~~ shall be raised to a temperature of 450°F (232°C) minimum for a minimum period of two hours. This hydrogen bake-out treatment may be omitted, provided the electrode used is classified by the ~~filler metal~~weld consumable manufacturer with a diffusible- hydrogen designator of H4 (e.g., E7018-H4); and
2.5.3.3 g) 4)	After the finished repair weld has cooled to ambient temperature, the final temper bead reinforcement layer shall be removed substantially flush with the surface of the base material.	After the finished repair weld has cooled to ambient temperature, the final temper bead reinforcement layer shall be removed substantially flush with the surface of the base ~~material~~metal.
2.5.3.4 c)	The welding shall be limited to the SMAW, FCAW, GMAW or GTAW processes using low-hydrogen electrodes and filler metals classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower, and suitably controlled by maintenance procedures	The welding shall be limited to the SMAW, FCAW, GMAW or GTAW processes using low-hydrogen ~~electrodes and filler metals~~weld consumables classified by the ~~filler metal~~ specification with a diffusible-hydrogen designator of H8 or lower, and suitably controlled by maintenance procedures to

	to avoid contamination by hydrogen producing sources. The surface of the metal prepared for welding shall be free of contaminants;	avoid contamination by hydrogen producing sources. The surface of the metal prepared for welding shall be free of contaminants;
2.5.3.4 d)	The test material for the welding procedure qualification shall be of the same P-No. and Group No. as the base material specification of the repair. In the event that the original material specification is obsolete, the test material used should conform to the nominal composition and carbon equivalent (IIW Formula CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15; elements are expressed in Weight Percent Amounts), as the material being repaired, but in no case shall the material be lower in strength;	The test material for the welding procedure qualification shall be of the same P-No. and Group No. as the base ~~material~~ metal specification of the repair. In the event that the original ~~material~~ base metal specification is obsolete, the test material used should conform to the nominal composition and carbon equivalent (IIW Formula CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15; elements are expressed in Weight Percent Amounts), as the ~~material~~ base metal being repaired, but in no case shall the material be lower in strength;
2.5.3.4 g) 2)	For the welding processes in NBIC Part 3, 2.5.3.4 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only electrodes or filler metals that are classified by the filler metal specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes;	For the welding processes in NBIC Part 3, 2.5.3.4 c), use of austenitic or ferritic filler metal is permitted. For ferritic filler metals, use only ~~electrodes or filler metals~~those that are classified by the ~~filler metal~~ weld consumable specification with a diffusible-hydrogen designator of H8 or lower for the FCAW and SMAW processes;
2.5.3.4 g) 4)	For welds made by the SMAW and FCAW processes, after completion of welding and without allowing the weldment to cool below the minimum preheat temperature, the temperature of the weldment shall be raised to 450°F (232°C) minimum for a minimum period of two hours. This hydrogen bake-out treatment may be omitted, provided the electrode used is classified by the filler metal manufacturer with a diffusible-hydrogen designator of H4 (e.g., E7018 H4); and	For welds made by the SMAW and FCAW processes, after completion of welding and without allowing the weld~~ment~~ to cool below the minimum preheat temperature, the temperature of the weld~~ment~~ shall be raised to 450°F (232°C) minimum for a minimum period of two hours. This hydrogen bake-out treatment may be omitted, provided the electrode used is classified by the ~~filler metal~~weld consumable manufacturer with a diffusible-hydrogen designator of H4 (e.g., E7018 H4); and
2.5.3.5 c)	The welding shall be limited to the SMAW, FCAW, GMAW and machine or automatic GTAW processes. The filler metal used for joining the dissimilar materials shall be either A-No 8 or Nickel-Chrome alloy classification (F-No 43). When selecting a filler metal for dissimilar metal weld joints, determine if the weld joint will be exposed to elevated temperature service. A-No 8 filler metals exposed to service temperatures greater than 800°F (427°C) will exhibit reduced creep life along the fusion zone of the ferritic material due to carbon diffusion. Instead, a low hydrogen, Nickel-Chromium alloy classification filler metal shall be used for dissimilar weld joints exposed to service temperatures at or above 800°F (427°C);	The welding shall be limited to the SMAW, FCAW, GMAW and machine or automatic GTAW processes. The ~~filler metal~~weld consumable used for joining the dissimilar materials shall be either deposit an A-No 8 weld metal in Section IX Table QW-442 or Nickel-~~Chrome~~ Chromium alloy classification ~~(~~of F-No 43~~)~~ in Section IX, QW-432. When selecting a ~~filler metal~~weld consumable for dissimilar metal weld joints, determine if the weld joint will be exposed to elevated temperature service. A-No 8 (per Section IX Table QW-442) ~~filler~~ chemistry weld metal~~s~~ exposed to service temperatures greater than 800°F (427°C) will exhibit reduced creep life along the fusion zone of the ferritic material due to carbon diffusion. Instead, a low hydrogen, Nickel-Chromium alloy classification ~~filler metal~~weld consumable shall be used for dissimilar weld joints exposed to service temperatures at or above 800°F (427°C);
2.5.3.6 c) 5) 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;	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~~ weld consumable diameter~~size~~ is to be shown on the WPS;

2.5.3.6 c) 5) d.	The filler metal shall be limited to an austenitic, nickel-base filler metal to those assigned to F-number 43 in 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., INCOWELD A), UNS N08087;	The ~~filler metal~~weld consumable shall be limited to a~~n austenitic,~~ nickel-base type~~filler metal to those~~ assigned to F-~~number~~ Number 43 in Section IX, QW-432 and limited to the following ~~consumables~~classifications: A or SFA-5.14 ERNiCr-3 ~~(e.g., Filler Metal 82)~~, A or SFA-5.11 ENiCrFe-3 ~~(e.g., INCONEL Welding Electrode 182)~~, ENiCrFe-2 ~~(e.g., INCOWELD A), UNS N08087~~or ENiCrFe-4;
2.5.3.6 c) 5) e.	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; and	A martensitic, iron-base ~~filler metal~~weld consumable ~~to those~~ assigned to F-~~number~~ Number 4 or F-~~number~~ Number 6 in ASME Section IX, QW-432 and limited to the following ~~consumables~~classifications: A or SFA-5.5 E8015-B8, E8018-B8 or A or SFA-5.28 ER80S-B8; and
2.5.3.6 c) 5) 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.	For weld build-up repairs due to wastage, the ~~filler metal~~weld consumable shall be limited to those assigned to F-~~number~~ Number 43 in ASME Section IX, QW-432.
2.5.3.7 i) 2)	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.	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~~weld consumable diameter is to be shown on the WPS.
2.5.3.7 i) 4)	For the joining of ASME P-No. 15E, Group 1 to P-No. 5A, the filler metal shall be limited to a martensitic, iron-base filler metal to those assigned to F-No. 4 or F-No. 6 in ASME Section IX, QW-432 and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.	For the joining of ASME P-No. 15E, Group 1 to P-No. 5A, the ~~filler metal~~weld consumable shall be limited to a martensitic, iron-base filler metal to those assigned to F-No. 4 or F-No. 6 in ASME Section IX, QW-432 and limited to the following ~~consumables~~classifications: A of SFA-5.5 E8015-B8, E8018-B8 or A or SFA-5.28 ER80S-B8.
2.5.3.7 i) 5)	For the joining of ASME P-No. 15E, Group 1 to P-No. 8, P-No. 42, P-No. 43 or P-No. 45, the filler metal shall be limited to an austenitic, nickel-base filler metal to those assigned to F-No. 43 in ASME Section IX, QW-432 and limited to the following consumables: ERNiCr-3, ENiCrFe-3, ENi-CrFe-2, UNS N08087.	For the joining of ASME P-No. 15E, Group 1 to P-No. 8, P-No. 42, P-No. 43 or P-No. 45, the filler metal shall be limited to a~~n austenitic,~~ nickel-base ~~filler metal to those~~weld consumable assigned to F-No. 43 in ASME Section IX, QW-432 and limited to the following ~~consumables~~classifications: A of SFA-5.14 ERNiCr-3, A or SFA-5.11 ENiCrFe-3, ENi-CrFe-2~~,~~ or ~~UNS N0808~~ENiCrFe-4~~7~~.
3.3.3 a)	Weld repairs or replacement of pressure parts or attachments that have failed in a weld or in the base material;	Weld repairs or replacement of pressure parts or attachments that have failed in a weld or in the base ~~material~~metal;
3.3.4.1	Except as provided in NBIC Part 3, 3.3.4.8, a repair of a defect in a welded joint or base material shall not be made until the defect has been removed. A suitable nondestructive examination (NDE) method, such as magnetic particle (MT) or liquid penetrant (PT), may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to	Except as provided in NBIC Part 3, 3.3.4.8, a repair of a defect in a welded joint or base ~~material~~ metal shall not be made until the defect has been removed. A suitable nondestructive examination (NDE) method, such as magnetic particle (MT) or liquid penetrant (PT), may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing

Commented [PG1]: Why do we not consider the use of -B3 type consumables as well for this application?

	removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required, by the Jurisdiction.	the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required, by the Jurisdiction.
3.3.4.2 a)	Cracks Except as provided in NBIC Part 3, 3.3.4.8, a repair of a crack in a welded joint or base material shall not be made until the defect has been removed. A suitable nondestructive examination method such as MT or PT may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or single buttweld with or without backing, as allowed by the original code of construction.	Cracks Except as provided in NBIC Part 3, 3.3.4.8, a repair of a crack in a welded joint or base ~~material~~ metal shall not be made until the defect has been removed. A suitable nondestructive examination method such as MT or PT may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or single buttweld with or without backing, as allowed by the original code of construction.
3.3.4.3 e) 2) d.	The WPS followed shall be qualified for weld metal buildup in accordance with ASME Section IX. The nominal chemical analysis of the deposited weld metal shall be equivalent to the base material that is to be repaired. In addition, the nominal tensile strength of the deposited weld metal shall be equal to or exceed the specified minimum tensile strength and shall be based on the requirements of the welding consumable. If butt welds in the component being overlaid required postweld heat treatment by the code of construction, the WPS followed for the weld buildup shall be qualified with PWHT;	The WPS followed shall be qualified for weld metal buildup in accordance with ASME Section IX. The nominal chemical analysis of the deposited weld metal shall be equivalent to the base ~~material~~ metal that is to be repaired. In addition, the nominal tensile strength of the deposited weld metal shall be equal to or exceed the specified minimum tensile strength and shall be based on the requirements of the weld~~ing~~ consumable classification or specification. If butt welds in the component being overlaid required postweld heat treatment by the code of construction, the WPS followed for the weld buildup shall be qualified with PWHT;
4.2 a)	All nondestructive examination (NDE) requirements, except for NDE personnel qualification requirements, shall be in accordance with the original code of construction, standard, or specification selected for the repair or alteration of the pressure-retaining item (see NBIC Part 3, 1.2). Weld repairs and alterations shall be subjected to the same NDE requirements as the original welds. Where this is not possible or practicable, or where there is insufficient information available to determine the original NDE requirements, alternative NDE methods that provide meaningful results to verify the integrity of the repair or alteration, if acceptable to the Inspector, and where required, the jurisdiction where the pressure-retaining item is installed, may be used, provided all other requirements of this section are met. For welds that were subject to volumetric NDE during construction, repairs may be made to the base material and welded joints without volumetric examination, under the following conditions: 1) The repair depth does not exceed the lesser of 1/8 in. (3 mm) or 25% of the nominal base material thickness;	All nondestructive examination (NDE) requirements, except for NDE personnel qualification requirements, shall be in accordance with the original code of construction, standard, or specification selected for the repair or alteration of the pressure-retaining item (see NBIC Part 3, 1.2). Weld repairs and alterations shall be subjected to the same NDE requirements as the original welds. Where this is not possible or practicable, or where there is insufficient information available to determine the original NDE requirements, alternative NDE methods that provide meaningful results to verify the integrity of the repair or alteration, if acceptable to the Inspector, and where required, the jurisdiction where the pressure-retaining item is installed, may be used, provided all other requirements of this section are met. For welds that were subject to volumetric NDE during construction, repairs may be made to the base ~~material~~ metal and welded joints without volumetric examination, under the following conditions: 1) The repair depth does not exceed the lesser of 1/8 in. (3 mm) or 25% of the nominal base ~~material~~ metal thickness;

Commented [PG2]: As drafted for 2025

	2) The aggregate repair length is no longer than 6 in. (150 mm); and 3) The repair cavity and each layer of deposited weld, including the final weld surface, have been examined by magnetic particle (MT) or liquid penetrant (PT).	2) The aggregate repair length is no longer than 6 in. (150 mm); and 3) The repair cavity and each layer of deposited weld metal, including the final weld surface, have been examined by magnetic particle (MT) or liquid penetrant (PT).
S1.2.10 a)	Except as provided in NBIC Part 3, 3.4.4.8, a repair of a defect in a welded joint or base material shall not be made until the defect is removed. A suitable nondestructive examination (NDE) method such as magnetic particle (MT) or liquid penetrant (PT) may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or a single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required by the Jurisdiction.	Except as provided in NBIC Part 3, 3.4.4.8, a repair of a defect in a welded joint or base ~~material~~ metal shall not be made until the defect is removed. A suitable nondestructive examination (NDE) method such as magnetic particle (MT) or liquid penetrant (PT) may be necessary to ensure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a full penetration weld such as a double buttweld or a single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required by the Jurisdiction.
S2.13 c)	Except as provided in NBIC Part 3, 3.3.4.8, a repair of a defect, such as a crack in a welded joint or base material, shall not be made until the defect has been removed. A suitable nondestructive examination method such as magnetic particle (MT) or liquid penetrant (PT) may be necessary to assure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a complete penetration weld such as a double buttweld or a single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required, the Jurisdiction.	Except as provided in NBIC Part 3, 3.3.4.8, a repair of a defect, such as a crack in a welded joint or base ~~material~~metal, shall not be made until the defect has been removed. A suitable nondestructive examination method such as magnetic particle (MT) or liquid penetrant (PT) may be necessary to assure complete removal of the defect. If the defect penetrates the full thickness of the material, the repair shall be made with a complete penetration weld such as a double buttweld or a single buttweld with or without backing. Where circumstances indicate that the defect is likely to recur, consideration should be given to removing the defective area and installing a flush patch or taking other corrective measures acceptable to the Inspector, and when required, the Jurisdiction.
S5.6.3 e)	The plug material shall conform in all respects to the material specification of the base material;	The plug material shall conform in all respects to the material specification of the base ~~material~~metal;
S6.11 b)	For hydrogen control when low alloy steel filler metals are used, the filler metal classification shall include an H4 supplemental diffusible hydrogen designator (maximum 4 ml [H2]/100 g deposited metal) for each of the following welding processes: 1) electrodes for shielded- metal arc welding (SMAW) conforming to SFA-5.5; 2) electrodes and fluxes for submerged arc welding (SAW) conforming to SFA-5.26; 3) electrodes and rods for gas- shielded metal arc welding (GMAW) conforming to SFA-5.28; 4) electrodes for flux-cored arc welding (FCAW) conforming to SFA 5.29.	For hydrogen control when low alloy steel ~~filler metals~~weld consumables are used, the ~~filler metal~~ classification shall include an H4 supplemental diffusible hydrogen designator (maximum 4 ml [H_2]/100 g deposited metal) for each of the following welding processes: 1) ~~electrodes for~~ shielded- metal arc welding (SMAW) conforming to SFA-5.5; 2) ~~electrodes and fluxes for~~ submerged arc welding (SAW) conforming to SFA-5.26; 3) ~~electrodes and rods for~~ gas- shielded metal arc welding (GMAW) conforming to SFA-5.28; 4) ~~electrodes for~~ flux-cored arc welding (FCAW) conforming to SFA 5.29.
S6.11 c)	Practices used for controlling storage and exposure of filler metals shall be those	Practices used for controlling storage and exposure of ~~filler metals~~weld consumables shall

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	developed by the “R” Certificate Holder or those recommended by the filler metal manufacturer.	be those developed by the “R” Certificate Holder or those recommended by the ~~filler metal~~weld consumable manufacturer.
S8.2.1 a)	9Cr-1Mo-VNbN Filler Metal (i.e. matching to Grade 91) + Controlled Fill + Low PWHT (Minimum temperature is 1250°F, 675°C). Acceptable filler materials are referenced in Table S8.2.1. The minimum time and maximum heat treatment temperature shall be in accordance with the original code of construction. For reference, where the Ni+Mn content of the filler metal is not known, the maximum PWHT temperature shall be 1425°F (775°C). This maximum shall be enforced to avoid over-tempering or exceeding the absolute maximum PWHT temperature. PWHT hold times at temperature shall be as follows:	9Cr-1Mo-VNbN Filler Metal ~~(i.e.~~ designed to match~~ing to~~ Grade 91 base metals~~)~~ + Controlled Fill + Low PWHT (Minimum temperature is 1250°F, 675°C). Acceptable ~~filler materials~~weld consumables are referenced in Table S8.2.1. The minimum time and maximum heat treatment temperature shall be in accordance with the original code of construction. For reference, where the Nickel + Manganese content of the ~~filler metal~~weld consumable is not known, the maximum PWHT temperature shall be 1425°F (775°C). This maximum shall be enforced to avoid over-tempering or exceeding the absolute maximum PWHT temperature. PWHT hold times at temperature shall be as follows:
S8.2.1 b)	9Cr-1Mo Filler Metal + Controlled Fill and No PWHT. Acceptable filler materials are detailed in Table S8.2.1.	9Cr-1Mo Filler Metal + Controlled Fill and No PWHT. Acceptable ~~filler materials~~weld consumables are detailed in Table S8.2.1.
S8.2.1 c)	Ni-base Filler Metal + Controlled Fill and No PWHT. Acceptable nickel base consumables include selected ASME F No. 43 filler metals as detailed in Table S8.2.1.	Ni~~-~~ckel base Filler Metal + Controlled Fill and No PWHT. Acceptable nickel base weld consumables include selected ~~ASME F~~ F-No. 43 types per ASME Section IX, QW-432 ~~filler metals~~ as detailed in Table S8.2.1.
Table S8.2.1	See Attachment A	
S8.2.2 a)	For repairs in P-No. 15E, Group 1, Grade 91, CSEF steel 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, the filler metal shall be limited to an austenitic, nickel-base filler metal having a designation F-No. 43 and limited to the following consumables: ERNiCr-3, ENiCrFe-3, ENiCrFe-2, ERNiCrFe-4, ENiCrFe-4, ENiCr3Tx-y, ENiCrFe2Tx-y, or ENiCrFe3Tx-y. UNS N08087. This weld repair option does not require PWHT.	For repairs in P-No. 15E, Group 1, Grade 91, CSEF steel ~~joined~~ welded 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, the filler metal shall be limited to an austenitic, nickel-base ~~filler metal~~weld consumable having a designation F-No. 43 per ASME Section IX, QW-432 and limited to the following weld consumable classifications: A or SFA-5.14 ERNiCr-3~~,~~ or ERNiCrFe-4, A or SFA-5.11 ENiCrFe-3, ENiCrFe-2, or~~ERNiCrFe-4~~, ENiCrFe-4, A or SFA 5.34 ENiCr3Tx-y, ENiCrFe2Tx-y, or ENiCrFe3Tx-y. This weld repair option does not require PWHT.
S8.2.2 b)	b) For repairs in P-No. 15E, Group 1, Grade 91, CSEF steel joined to P-No. 4, Group 1, or P-No. 5A, Group 1, the filler metal shall be limited to: 1) 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. This weld repair option does not require PWHT; or 2) A martensitic, iron-base filler metal having a designation F-No. 4 or F-No. 6 and limited to the following consumables: E9015-B91, E9016-B91, E9018-B91, E91T1-B91, or ER90S-B91. This weld repair option requires PWHT at a minimum temperature of 1250°F (675°C).	b) For repairs in P-No. 15E, Group 1, Grade 91, CSEF steel joined to P-No. 4, Group 1, or P-No. 5A, Group 1, the filler metal shall be limited to: 1) A martensitic, iron-base ~~filler metal~~weld consumable having a designation F-No. 4 or F-No. 6 per ASME Section IX, QW-432 and limited to the following ~~consumables~~weld consumable classifications: A or SFA-5.4 E8015-B8, E8018-B8, or A or SFA-5.28 ER80S-B8. This weld repair option does not require PWHT; or 2) A martensitic, iron-base ~~filler metal~~weld consumable having a designation F-No. 4 or F-No. 6 per ASME Section IX, QW-432 and limited to the following weld consumable classifications: A or SFA-5.5 E9015-B91, E9016-B91, E9018-B91, A

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		or SFA 5.29 E91T1-B91, or A or SFA-5.28 ER90S-B91. This weld repair option requires PWHT at a minimum temperature of 1250°F (675°C).
S8.3 e)	When the SMAW process is specified, the weld beads deposited onto the base material shall not exceed an electrode diameter of 1/8 in. (3.2 mm). The remaining fill passes shall not exceed an electrode diameter of 5/32 in. (4.0 mm). When the GTAW process is specified, any limits for filler metal size shall be reflected in the qualified PQR and WPS.	When the SMAW process is specified, the weld beads deposited onto the base ~~material~~ metal shall not exceed an ~~electrode~~ weld consumable diameter of 1/8 in. (3.2 mm). The remaining fill passes shall not exceed an electrode diameter of 5/32 in. (4.0 mm). When the GTAW process is specified, any limits for ~~filler metal~~weld consumable size shall be reflected in the qualified PQR and WPS.
9.1	**Brazing** — A group of metal joining processes which produce coalescence of materials by heating them to a suitable temperature, and by using a filler metal having a liquidus above 840°F (450°C) and below the solidus of the base materials. The filler metal is distributed between the closely fitted surfaces of the joint by capillary action.	**Brazing** — A group of metal joining processes which produce coalescence of materials by heating them to a suitable temperature, and by using a ~~filler metal~~brazing consumable having a liquidus above 840°F (450°C) and below the solidus of the base materials. The filler metal is distributed between the closely fitted surfaces of the joint by capillary action.
9.1	**Welding** — A group of processes which produce a localized coalescence of metallic or nonmetallic materials by heating the materials to the suitable temperature, with or without the application of pressure, and with or without the use of filler material.	**Welding** — A group of processes which produce a localized coalescence of metallic or nonmetallic materials by heating the materials to the suitable temperature, with or without the application of pressure, and with or without the use of ~~filler material~~a weld consumable.

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Attachment A

TABLE S8.2.1

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ALTERNATIVE WELD REPAIR METHODS, ~~FILLER METALS~~WELD CONSUMABLES AND WELDING PROCESSES FOR GRADE 91 STEEL.

Acceptable Weld Repair Method		**Welding Process and ~~Filler Metal~~Weld Consumable AWS or ASME SFA Classification**
Filler Metal	**Welding Procedure**	
Matching (9Cr-1Mo-VNbN)	Controlled Fill + Low PWHT	• SMAW – E9015-B91, E9016-B91 or E9018-B91 • FCAW – E91T1-B91 • GTAW – ER90S-B91
9Cr-1Mo	Controlled Fill	• SMAW – E8015-B8, E8016-B8 or E8018-B8 • FCAW – E81T1-B8 • GTAW – ER80S-B8
Ni-ckel base	Controlled Fill	• SMAW – ENiCrFe-2, ENiCrFe-3, ENiCrFe-4 • FCAW – ENiCr3Tx-y[1], ENiCrFe2Tx-y[1], or ENiCrFe3Tx-y[1] • GTAW – ERNiCr-3, ERNiCrFe-4

[1]Clarification on the 'x-y' Designators may be found in ASME BPVC Section IIC, SFA-5.34/SFA-5.34M Specification for Nickel-Alloy Flux Cored and Metal Cored Welding Electrodes.

PROPOSED INTERPRETATION

Item No.

24-38

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject/Title

T&P relief device installation on modular HWH supply header

Project Manager and Task Group

Source (Name/Email)

Terrence Hellman / thellman@nationalboard.org

Statement of Need

The NBIC does not address the installation or location of a common T&P valve for modular HWH's. Clarification is needed on whether the common supply header can be considered part of the HWH, and whether T&P valves can be installed in the horizontal position with the outlet pointed down, if installed directly to the header with no more than 4 in. maximum interconnecting piping.

Background Information

ASME Section IV, Article 9 addresses Modular Water Heater Requirements, and allows for multiple units to be certified as a single water heater with a single pressure relief valve on the supply header per HLW-903(g)(1). NBIC does not address the installation or location of a common T&P valve for modular HWH's.

Proposed Question

For an assembled modular water heater certified as a single water heater, with the temperature and pressure relief device located on the supply header as permitted in ASME Sect. IV, para. HLW-903(g)(1), may it be installed in the horizontal position with the outlet pointed down as allowed in NBIC Part 1, 3.9.1.6 c), 3.9.4.2, and Part 4, 2.5.4.2?

Proposed Reply

Yes.

Committee's Question 1

For an assembled modular water heater certified as a single water heater, with the temperature and pressure relief device located on the supply (i.e. distribution) header, may it be installed in the horizontal position with the outlet pointed down as allowed in NBIC Part 1, 3.9.1.6 c), 3.9.4.2, and Part 4, 2.5.1.6 c)~~.4.2~~?

Committee's Reply 1

Yes.

Rationale

Part 1, 3.9.1, 3.9.4.2, and Part 4 2.5.1 do not exclude modular design. The term supply header is defined as distribution from the heater in ASME Sec IV. It is not intended to refer to the cold water inlet supply.

Committee's Question 2

Committee's Reply 2

Rationale

PROPOSED INTERPRETATION

Item No.

24-46

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject/Title

Replacement of Bodies and Transfer of Nameplates During Repair

Project Manager and Task Group

Source (Name/Email)

Benjamin Atwell / Ben.Atwell@puffer.com

Statement of Need

Clarity on what defines "the valve". Is "the valve" the nameplate solely or the nameplate and serialized base; and subsequent ability to divorce the nameplate and base during repair when the base requires replacement.

Background Information

We on occasion run into issues where a body needs replaced and lead time on a new valve drives necessity. Since the body carries the manufacturer/assembler nameplate with the Code stamp and is the serialized part of the valve it could be viewed as "the valve". Replacing the base would require transferring the original nameplates to the new body, grinding off any serial numbers on the new body, and restamping/etching the new body with the original serial number. Driving factor for this question is the discussion around what distinguish "the valve". If replacement of bodies and transfer of nameplates is acceptable it leads to the hypothetical situation where all or nearly all parts in a valve could be replaced with new components. Effectively replacing a valve with a "new valve" and circumventing the assembler requirements per ASME as the original nameplate carries a valid code stamp and now lives on the "new valve".

Proposed Question

Is it permissible to replace the body of a valve during a repair and transfer the nameplate from the original body to the new body?

Proposed Reply

Yes or no on ability to transfer a nameplate to a new base and adopt all markings/code stamps onto the new base.

Committee's Question 1

Is it permissible to replace the body of a valve during a repair and transfer the nameplate from the original body to the new body?

Committee's Reply 1

Yes

Rationale

Under the current text of Part 4, 4.3.1, this activity is not prohibited.

Committee's Question 2

Committee's Reply 2

Rationale

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Changes to the original pressure relief device nameplate.
NBIC Location:	2023 NBIC Part 4, 4.7.3 a) and b)
Statement of Need:	Clarification is needed on the correct way to communicate changes to a relief device through nameplate stamping.
Background Information:	A VR certificate holder has been audited and has received corrective actions for only stamping out the items of a relief device's part number that have been changed. The shop was given guidance to update their quality control manual to stamp out the entire part number even when not all components have been changed.
Proposed Question:	Part 4, paragraph 4.7.3 (a) second sentence states "For these repairs, the invalidated information on the original nameplate or stamping shall be marked out but left legible." Is the invalidated information considered the to be the entire field (for example entire model number or only a portion of model number)?
Proposed Reply:	No. Only the portion that is invalidated shall be marked out but left legible. However, the entire new model number shall be marked on the VR nameplate.
Committee's Question:	Part 4, paragraph 4.7.3 (a) second sentence states "For these repairs, the invalidated information on the original nameplate or stamping shall be marked out but left legible." Is the invalidated information considered to be the entire field?
Committee's Reply:	Yes, the intention is to mark out the entire field, but leave the old information legible.
Rationale:	

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Is a Pressure Relief Device the only Relief Method for Pressure Vessels?
NBIC Location:	2023 NBIC, Part 4, 2.6
Statement of Need:	The jurisdiction is claiming the NBIC implies that a pressure relief device is the only acceptable relief method for a pressure vessel since Part 4 Section 2.6 only addresses pressure relief devices.
Background Information:	NBIC Part 4 Section 2.6 only provides requirements for the pressure relief devices that protect pressure vessels. This does not mean that a pressure relief device is the only relief method for pressure vessels. ASME Section VIII Div 1 permits the use of open flow paths and overpressure protection by system design which do not have pressure relief devices.
Proposed Question:	NBIC Part 4 Section 2.6 only provides requirements for the pressure relief devices that protect pressure vessels. Is NBIC Part 4 Section 2.6 declaring that a pressure relief device is the only relief method for pressure vessels?
Proposed Reply:	No.
Committee's Question:	<Question(s) the committee will interpret. Can be the same wording as the proposed question>
Committee's Reply:	<Yes or no response>
Rationale:	<Additional clarification for response>

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Add Requirements for Qualification of Mobile Test Equipment
NBIC Location:	2023, Part 4, 4.6.1
Statement of Need:	The current working in 4.6.1 only addresses performance test equipment. We do not address mobile test equipment. I believe we need to add a new paragraph 4.6.1 c) that addresses test equipment other than just the performance test equipment.
Background Information:	Per T. Tarbay: The reason I think we need so address test equipment is I am finding shops that are using low volume tests stands for field testing (i.e. nitrogen bottle with an air hose). As you know, using these low volume stands, you cannot "pop" a valve.

Proposed Text:

4.6.1 TEST MEDIUM AND TESTING EQUIPMENT

c) All equipment used in testing of pressure relief valves must have the information required by 4.6.1. b) 2) and must be qualified before use. This qualification may be done by comparing the results of two valves, for each test media, tested on the performance test equipment and then tested on the other equipment. The results must be within ASME Code tolerances.

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Association of Repair for Pilots and Main Valves
NBIC Location:	2025, Part 4, 4.7.2 b) 3)
Statement of Need:	There is currently not language tying the pilot and main valve of a pilot-operated pressure relief valve to one another following repair.
Background Information:	ASME Section XIII 3.9 (f) (1) mandates that the pilot and main valve of a pilot-operated pressure relief valve each be marked with the same unique identifier to establish association of both components. This would create a similar requirement in NBIC to establish association of the pilot and main valve of pilot-operated pressure relief valves as being part of a single VR repair.

Proposed Text:

4.7.2 REPAIR NAMEPLATES

When a pressure relief valve is repaired, a metal repair nameplate stamped with the information required below shall be securely attached to the valve adjacent to the original manufacturer's stamping or nameplate. If not installed directly on the valve, the nameplate shall be securely attached to the valve independent of the external adjustment seals in a manner that does not interfere with valve operation and sealed in accordance with the quality system.

a) Prior to attachment of the repair nameplate, the previous repair nameplate, if applicable, shall be removed from the repaired valve.

b) As a minimum, the information on the valve repair nameplate (see Figure 4.7.2-a) shall include:

1) The name of the repair organization preceded by the words "repaired by";
2) The "VR" repair symbol stamp and the "VR" certificate number;
3) Unique identifier (e.g., repair serial number, shop order number, etc.);

a. For pilot operated pressure relief valves, the pilot and main valve shall each bear a repair nameplate marked with the same unique identifier to establish association of repair of both components under a single application of the "VR" stamp.

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject:	Address Testing of Pilot Valves as Complete Assembly
NBIC Location:	2025, Part 4, 3.2.5.1 and 4.6.1
Statement of Need:	ASME CC 3057 requires that pilot operated valves be tested at least once as a complete assembly to verify all components are properly connected, leak tight, and that the pilot actuates the main valve. This also verifies freedom of operation of the main valve.
Background Information:	Pilot operated valves in service have been field tested by checking pilot set point without verification that the main valve will open.

Proposed Text:

3.2.5.1 TESTING AND OPERATIONAL INSPECTION OF PRESSURE RELIEF VALVES

In addition to the requirements of 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 for these operating requirements specified 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 when it is impractical to test at full pressure due to system design. 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 occur for valves which are leaking excessively or otherwise damaged.

c) If valves are not tested on the system using the system fluid, the following test media 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; and
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.

d) For pilot-operated pressure relief valves freedom of operation of the main valve shall be tested in addition to pilot set point.

~~d)~~e) As an alternative to performing a pressure test, the owner may check the valve for freedom of operation by activating the test or "try" lever (i.e., 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, otherwise the lifting device may be damaged. This test will indicate only that the valve is free to operate; it does not provide any information on the actual set pressure. All manual checks should be performed with some pressure under the valve to flush out debris from the seat. (Debris may 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 is capable of being lifted without pressure.

~~e)~~f) 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 when the valve is at or near the test temperature, the test clamps are applied in accordance with the valve manufacturer's instructions; application should be hand-tight only to avoid damage to the valve stem or spindle.

~~f)~~g) 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).

4.6.1 TEST MEDIUM AND TESTING EQUIPMENT

Valves marked for steam service, or having special internal parts for steam service, shall be tested on steam. Valves marked for air, gas, or vapor service shall be tested with air or gas. Valves marked for liquid service shall be tested with water or other suitable liquid. ASME BPV Code Section IV hot-water valves shall be tested on water, steam, or air.

a) Each valve shall be tested to demonstrate the following:

1) Set pressure (as defined by the valve manufacturer and listed in NB-18, *Pressure Relief Device Certification*);

2) Response to blowdown when required by the original code of construction;

3) Seat tightness; and

4) For valves designed to discharge to a closed system, the tightness of the secondary pressure zone shall be tested as required by the original code of construction.

5) For pilot operated pressure relief valves, the testing conducted in 1) through 4) shall be performed as a complete assembly in accordance with the original construction standard.

b) The equipment used for the performance testing prescribed above shall meet the following requirements:

1) The performance testing equipment shall include a pressure vessel of adequate volume and pressure source capacity to ensure compliance with 4.6.1 a) 1);

2) Prior to use, all performance testing equipment shall be qualified by the Certificate Holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment. This qualification may be accomplished by benchmark testing, comparisons to equipment used for verification testing as specified in the QMS, or comparisons to field performance. This qualification shall be documented. Documentation of this qualification shall be retained in accordance with Table 4.8.5.4 s). Documentation of this qualification shall include but not be limited to the following:

a. Schematic of the performance test equipment;
b. Size and pressure ranges of valves to be tested and the test fluid to be used;
c. Dimensions of test vessels;
d. Accuracy of pressure measuring equipment;
e. Size and design type of valves used to control flow; and
f. Method of qualifying.

3) Prior to the implementation of any addition or modification to the testing equipment that would alter the contents of the document required in 4.6.1 b) 2), the Certificate Holder shall re-qualify the performance test equipment in accordance with 4.6.1 b) 2). If the equipment changed was used to satisfy the requirements of verification testing, the Certificate Holder shall notify the National Board. Additional verification testing in accordance with the QMS may be required.