Date Distributed:

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE SUBGROUP REPAIRS & ALTERATIONS

AGENDA

Meeting of July 8, 2025
Cincinnati, OH

The National Board of Boiler & Pressure
Vessel Inspectors 1055 Crupper Avenue
Columbus, Ohio 43229-1183
Phone: (614)888-8320
FAX: (614)847-1828

1. **Call to Order**
   The meeting will be called to order at 8:00 a.m. Eastern Time in Madisonville B on the 4th floor of the hotel.

2. **Roll call of Members and Introduction of Visitors**

3. **Check for a Quorum**

4. **Announcements**
   - This meeting marks the end of Cycle B for the 2027 NBIC edition.
   - The National Board will be hosting a reception on Wednesday evening from 5:30 p.m. to 7:30 p.m. at Ault Park, on the 4th floor of the hotel.
   - The National Board will be hosting breakfast and lunch on Thursday for those attending the Main Committee meeting. Breakfast will be served from 7:00 a.m. to 8:00 a.m. in Madisonville A/B, and lunch will be served from 11:30 a.m. to 12:30 p.m. in Madisonville A/B.
   - Meeting schedules, meeting room layouts, and other helpful information can be found on the National Board website under the **NBIC** tab → NBIC Meeting Information.
   - The NBIC Committee has transitioned from NB File Share to SharePoint. Remember to add any attachments that you'd like to show during the meeting (proposals, reference documents, powerpoints, etc.) to the NBIC SharePoint site (nationalboard.sharepoint.com/sites/NBIC) **prior to the meeting**.
     - Note that access to the NBIC SharePoint site is limited to committee members only.
     - ALL powerpoint attachments/presentations must be sent to the NBIC Secretary for approval prior to the meeting.
     - Contact Jonathan Ellis (*nbicsecretary@nbbi.org*) for any questions regarding NBIC SharePoint access.
   - When possible, please submit proposals in Word format showing "strike through/underline." Project Managers: please ensure any proposals containing text from previous NBIC editions are updated with text from the most current edition.
   - If you'd like to request a new Interpretation or Action item, do so on the National Board Business Center.
     - Anyone, member or not, can request a new item.
   - As a reminder, anyone who would like to be considered for membership of a group or committee:
     - Should attend at least two meetings prior to being put on the agenda for membership consideration. The nominee may be placed on the agenda for voting during their third meeting, pending the Chair's approval.
     - The nominee must submit the formal request along with their resume to the NBIC Secretary **PRIOR TO** the meeting. *nbicsecretary@nbbi.org*
     - If elected by the membership, the member will serve a term of three years.
   - Thank you to everyone who registered online for this meeting. The 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.

5. **Awards and Special Recognitions**
   Mr. Paul Davis – 5 years on SG R&A

6. **Adoption of the Agenda**

7. **Approval of the Minutes of the January 2025 Meeting**
   The minutes from the January 2025 meeting can be found on the NBIC Committee information page on the National Board's website, nbbi.org.

8. **Review of Rosters**
   a. **Membership Nominations**

   b. **Membership Reappointments**

   c. **Officer Nominations**

   d. **Resignations**

9. **Action Items**

Item Number: A21-45	**NBIC Location: Part 3, Supplements**	**No Attachment**

General Description: Engineered Repairs and Alterations Supplement

Subgroup: Repairs and Alterations

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

Explanation of Need: : In an effort to simplify the main body of NBIC Part 3, we are proposing a new Supplement called Engineered Repairs and Alterations which will import some existing, more complex activities from the main body and then eventually add new repair and alteration activities that are not currently addressed in the Part 3.

SG R&A Jan. 2025 Meeting Action: M Schaser presented a PR and is on hold until the new engineered repairs scope is approved by BOT.

Item Number: A21-53	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.

SG R&A Jan. 2025 Meeting Action: P. Gilston presented Rev. 3 of his proposal to show changes from previous version. After discussion, Mr. Gilston decided to revise further and submit the proposal via LB to the SG. This was a **PR**.

Item Number: A23-09	NBIC Location: Part 3, New Supplement	Attachment Page 1

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

Subgroup: Repairs and Alterations

Task Group: T. Melfi (PM), G. Galanes, 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.

SG R&A Jan. 2025 Meeting Action: G. Galanes presented a status update. This proposal passed SG LB (18-0) and will be on SC R&A's agenda. **Status Update.**

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: S. Lombardo (PM), P. Gilston, K. Moore, A. Triplett T. White, J. Ferriera

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.

SG R&A Jan. 2025 Meeting Action: S. Lombardo was selected as the new PM to replace E. Cutlip. This was a **PR**.

Item Number: A23-24	NBIC Location: Part 3	Attachment Page 8

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.

SG R&A Jan. 2025 Meeting Action: This proposal is currently being balloted to Main Committee – Status update

NOTE: This item is currently out for an SC R&A ballot, which is scheduled to close on July 2, 2025.

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.

SG R&A Jan. 2025 Meeting Action: T. White presented a PR.

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, S. Marks

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

SG R&A Jan. 2025 Meeting Action: T. LeBeau presented a proposal, and discussions regarding de-coupling the "Pressure Testing" section of the form from the Construction portion led to this to be revised further. Stacey Marks was added to the TG. This was a **PR**.

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, P. Davis

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.

SG R&A Jan. 2025 Meeting Action: M. Schaser presented a **PR**. The proposal led to discussions on the need to revise the definition of "Alteration". P. Davis was added to the TG to assist with revising the format/content of the examples of alterations further. Mr. Lane Baker requested to be removed from the TG.

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, P. Lentzer, A. Triplett

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.

SG R&A Jan. 2025 Meeting Action: T. White presented that a proposal based on the 2025 Ed. will be worked on. This was a **PR**.

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, L. Dutra, M. Toth, A. Khssassi, M. Vogt

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.

SG R&A Jan. 2025 Meeting Action: M. Quisenberry presented. Discussions regarding liability led to this being pulled back as a **PR**. The following were added to the TG: L. Dutra, M. Toth, A. Khssassi, M. Vogt.

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: B. Schaefer (PM), B. Schaefer, A. Khssassi, J. Ferreira and T. LeBeau

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.

SG R&A Jan. 2025 Meeting Action: B. Schaefer selected as PM (replaces E. Cutlip). J. Ferreira and T. LeBeau added to the TG. This was a **PR**.

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.

SG R&A Jan. 2025 Meeting Action: P. Gilston presented. 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. This was a **PR**.

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.

SG R&A Jan. 2025 Meeting Action: M. Schaser presented a **PR** until BOT allows for the revisions in NB-415 to be accepted.

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).

July 2024 Meeting Action: M. Schaser presented a PR.

SG R&A Jan. 2025 Meeting Action: M. Schaser presented a **PR**.

Item Number: A24-96 **NBIC Location: Part 3, 5.5 a)** **Attachment Page 12**

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

Subgroup: Repairs and Alterations

Task Group: A. Triplett (PM), R. Collins, R. Miletti

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.

SG R&A January 2025 Meeting Action: A. Triplett presented and discussion was held regarding that this proposal was predicated on the existing language dealing with PHE, however there is no definition of "active cell components" as used in the proposal. Mr. Triplett indicated he would work with Mr. Matt Sweetland (gave presentation on ECS and is originator of this Code revision) to address the concerns of the TG. Riley Collins and Ray Miletti were added to the TG. This was a **PR**.

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), M. Schaser, W. Sperko

Explanation of Need: Simplify PWHT requirements in 2.5.2.

January 2025 Meeting Action: P. Gilston presented a **PR** - that he will be revising to simplify Heat Band and Soak Band dimensions and will be submitting a Rvw & Comment LB in the coming days. M. Schaser and W. Sperko were added to the SG.

Item Number: A25-04	NBIC Location: Part 3, 2.5.3	No 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.

January 2025 Meeting Action: P. Gilston presented a new proposal (added today) that was revised and **UA** by the SG.

New Action Items:

Item Number: A25-18	NBIC Location: Part 3, 5.7.5	Attachment Page 16

General Description: Requirements for Stamping and Nameplates

Subgroup: Repairs and Alterations

Task Group: B. McGuire (PM)

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 18**

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

Subgroup: Repairs and Alterations

Task Group: M. Schaser (PM)

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 19**

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

Subgroup: Repairs and Alterations

Task Group: R. Collins (PM)

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 20**

General Description: Revise Part 3, Table 2.5.1

Subgroup: Repairs and Alterations

Task Group: L. Dutra (PM)

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 23**

General Description: Repair of PRIs Without Complete Removal of Defect

Subgroup: Repairs and Alterations

Task Group: T. McBee (PM)

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 24**

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

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM)

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.

Update: SG LB in progress (6/10/25 - 7/2/25)
July 2025 Meeting Action:

Item Number: A25-28 **NBIC Location: Part 3, 1.3 b) and 9.1** **Attachment Page 26**

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

Subgroup: Repairs and Alterations

Task Group: A. Khssassi (PM)

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 28

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:

10. Future Meetings

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

11. Adjournment

Respectfully submitted,

Terrence Hellman

Terrence Hellman

Engineered Alterations

NB23-09 Rev 12

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.

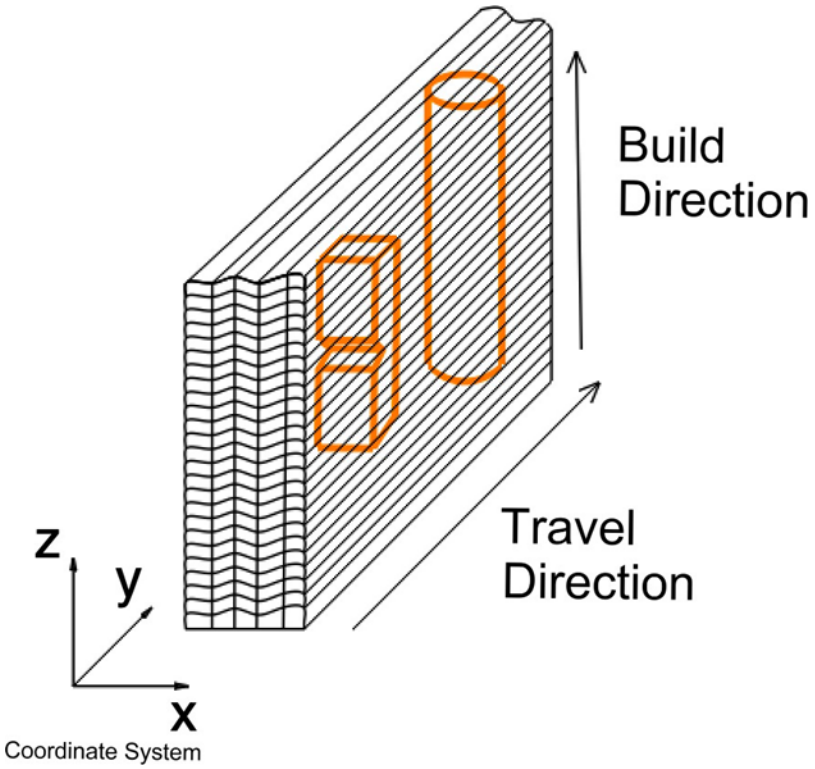

Figure 1 Material Manufacturing Coordinate System and Material Test Specimen Orientation

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

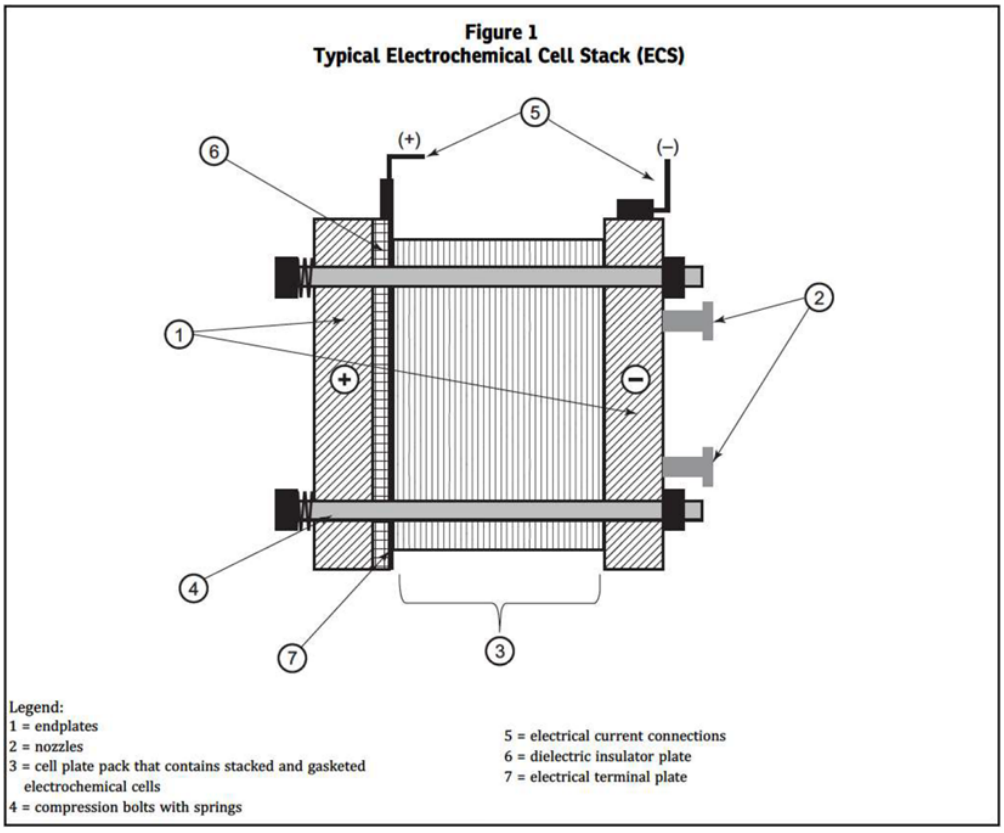
Electrochemical stacks are being built and registered with the National Board under Code Case 3078. Once deployed, if some modification is required by the end user, having repair and alteration lists in NBIC Part 3 will help guide decisions by Owners, Inspectors, and Jurisdictions. Illustrations of a 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.

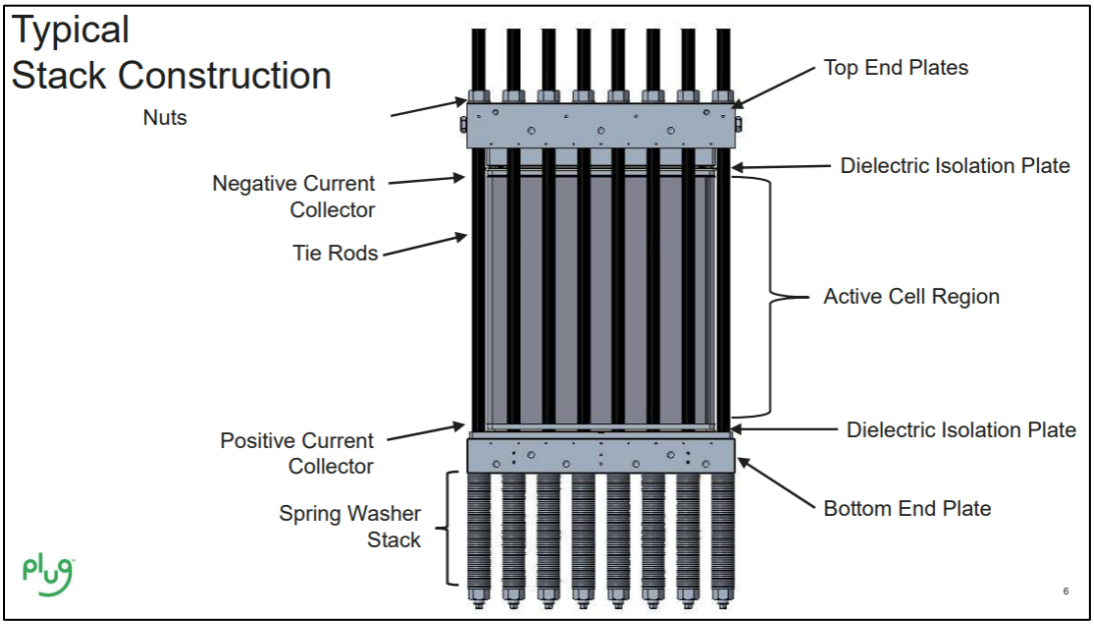
Existing Text	**Proposed Text**
None.	**S11.2.x REPAIR OF ELECTROCHEMICAL STACK (ECS) UNITS** a) Due to the complex operating nature of ECS units, competent technical advice should be obtained from the Manufacturer or another qualified source for repairs to an ECS unit. b) Repairs to ECS units are limited 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.

NBIC Action Item A25-18
Submitted by TEI Construction Services, Inc. (efeeney@teiservices.com)
June 12, 2025

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

NBIC Action Item A25-20
Submitted by Martin Johnson (kodierer@gmail.com)
June 12, 2025

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.

NBIC Action Item A25-21
Submitted by Luis Ponce (LPonce@nbbi.org)
June 12, 2025

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.

NBIC Action Item A25-22
Submitted by Luis Ponce (LPonce@nbbi.org)
June 12, 2025

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.

NBIC Action Item A25-22
Submitted by Luis Ponce (LPonce@nbbi.org)
June 12, 2025

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

NBIC Action Item A25-25
Submitted by Bob Underwood (robert_underwood@hsb.com)
June 12, 2025

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.~~

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	VOTE						
Committee	**Approved**	**Disapproved**	**Abstained**	**Not Voting**	**Passed**	**Failed**	**Date**

NBIC Action Item A25-28
Submitted by Terry Hellman (THellman@nbbi.org)
June 12, 2025

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).*~~

NBIC Action Item A25-28
Submitted by Terry Hellman (THellman@nbbi.org)
June 12, 2025

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

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	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;

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	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.