Date Distributed: June 27, 2023

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE COMMITTEE

MAIN SESSION AGENDA

Meeting of July 13th, 2023
St. Louis, MO

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

2. **Introduction of Members and Visitors**

3. **Check for a Quorum**

4. **Awards/Special Recognition**

5. **Announcements**
   - The National Board will be hosting lunch on Thursday for those attending the Main Committee meeting. Lunch will be served from 11:30 a.m. to 12:30 p.m. in Cardinal C.
   - Representatives from the U.S. Chemical Safety Board will be giving a presentation on the Loy Lange Box Company pressure vessel explosion that occurred in 2017.
   - If you'd like to request a new Interpretation or Action item, this should be done on the National Board Business Center.
     - Anyone, member or not, can request a new item.
   - As a reminder, anyone who would like to become a member of a group or committee:
     - Should attend at least 2 meetings prior to being put on the agenda for membership consideration. The nominee will be on the agenda for voting during their 3rd meeting.
     - The nominee must submit the formal request along with their resume to the NBIC Secretary **PRIOR TO** the meeting. *nbicsecretary@nbbi.org*
     - If needed, we can also create a ballot for voting on a new member between meetings.
   - Thank you to everyone who registered online for this meeting. The online registration is very helpful for planning our reception, meals, room set up, etc. Please continue to use the online registration for each meeting.

6. **Adoption of the Agenda**

7. **Approval of the Minutes of the January 2023 Meeting**
   The minutes are available for review online at https://www.nationalboard.org/Index.aspx?pageID=13&ID=18.

8. **U.S. Chemical Safety Board Presentation**

9. **Items Approved for 2025 NBIC**
   See Attachment Page 2 for a summary of items currently approved for the 2025 NBIC edition.

10. **Main Committee Task Group on Developing Rules for Additive Manufacturing Pressure Parts (Item 23-09)**
    a. **TG Members** – G. Galanes (PM), J. Siefert, B. Schaefer, W. Sperko, J. Ferreira, J. Getter, T. Seime, and M. Wadkinson.

11. Report of Subcommittees

a. Subcommittee Inspection

i. Interpretations

Item Number: 22-40	NBIC Location: Part 2, 4.4.7.2	No Attachment
General Description: Allowable stresses for t(required) calculation **Subgroup:** Inspection **Task Group**: T. Clark (PM), B. Ray, B. Wilson, J. Petersen **Submitted by**: Tom Chen **Explanation of Need:** For the purpose of setting up inspection plans, especially with older equipment, we are calculating t(required) per Part 2, para 4.4.7.2. However, we would like to know if it is permissible to use the higher allowable stresses in later editions of ASME BPV Code.		
January 2023 Meeting Action: Mr. Jim Getter reported that a task group has been assembled to develop a proposal for this item.		

ii. Action Items – Old Business

TG FRP Items:

Item Number: NB16-1402	NBIC Location: Part 2, New Supplement	No Attachment
General Description: Life extension for high pressure FRP vessels above 20 years **Subgroup:** FRP **Task Group:** M. Gorman (PM) **Background:** In 2016, when this item was first opened, it was assigned as an item for Part 3. Recent discussions with SC R&A and the FRP Task Group have revealed that this item is better suited for Part 2. This item has been approved by the FRP Task Group. **Scope:** The goal of this proposal is to provide a method to evaluate whether the service life of high-pressure fiber reinforced plastic pressure vessels can be extended for an additional lifetime. **January 2023 Meeting Action:** Mr. Getter stated that the FRP Task Group plans to have a proposal to present at the July 2023 meeting.		

TG Historical Items:
There are currently no Historical items open for Part 2.

TG Locomotive Items:
There are currently no Locomotive items open for Part 2.

SG Inspection Items:

Item Number: 20-57	NBIC Location: Part 2, 4.4.1 a)	No Attachment
General Description: Evaluate revision to Part 2, 4.4 FFS scope roles and responsibilities (submitted by Mr. George Galanes). **Subgroup:** Inspection **Task Group:** M. Horbaczewski (PM) and B. Ray. **Explanation of Need:** Currently, there is confusion surrounding implementation of FFS for Part 2 inspection activities, where the FFS form is located and Part 3 activities regarding Part 3, 3.3.4.8 because it references Part 2 for FFS. In addition, we need to have a Part 2 Inspection member to be assigned to assist in the development of roles and responsibilities. **January 2023 Meeting Action:** Mr. Getter stated that the task group is still working on a proposal for this item.		

Item Number: 21-25	NBIC Location: Part 2	Attachment Page 3
General Description: Autoclave/Quick opening device PP (submitted by Kevin Hawes) **Subgroup:** Inspection **Task Group:** V. Scarcella (PM), T. Bolden, M. Horbaczewski, J. Peterson, J. Clark, W. Hackworth, M.A. Shah, C. Becker, J. Morgan **Explanation of Need:** Upon our AIA (Intact) QRR I produced a Power point presentation on Autoclave inspections. Your NB team leader Gary Scribner suggested I forward this inspection presentation to the NB for review of content as mention of good reference material for next NBIC edition. I have attached a copy of this PP for your considerations.		
January 2023 Meeting Action: Mr. Getter said that the proposal for this item will be sent to SG Inspection for a Review and Comment Ballot.		

Item Number: 21-47	NBIC Location: Part 2, 2.2.4 & 2.2.5	No Attachment
General Description: To provide better guidance as it relates to carbon monoxide **Subgroup:** Inspection **Task Group:** W. Hackworth (PM), V. Scarcella, D. Buechel, T. Barker, T. Bolden, M. Sansone, H. Henry, J. Castle, J. Morgan, J. Clark **Explanation of Need:** Need to provide more comprehensive items to be reviewed to guide the inspector on carbon monoxide and combustion air. **January 2023 Meeting Action:** Mr. Getter stated that the task group is still working on a proposal for this item.		

Item Number: 22-06	NBIC Location: Part 2, 3.4.9 e)	No Attachment
General Description: Part 2 task group to review Part 3 Item 21-53 **Subgroup:** Inspection **Task Group:** M. Horbaczewski (PM), J. Clark, B. Wilson, J. Mangas, P. Polick **Submitted by:** D. Graf **Explanation of Need:** Part 2 task group to investigate further changes to Part 2/Part 3 that could be needed because of action item 21-53.		
January 2023 Meeting Action: Mr. Getter stated that the task group is working on a proposal for this item.		

Item Number: 22-22	NBIC Location: Part 2, 4.2	No Attachment
General Description: Changes and additions to align with part III with in service inspections **Subgroup:** Inspection **Task Group:** T. Bolden (PM), J. Clark, J. Petersen, M. Sansone, B. Ray, D. Graf, and J. Mangas **Submitted By**: V. Scarcella **Background Information:** Several areas where part III after repair in service inspections should be aligned with part II.		
January 2023 Meeting Action: Mr. Getter shared that the proposal will be sent to SG Inspection for a Review and Comment Ballot.		

Item Number: 22-26	NBIC Location: Part 2, 2.3.6.8	No Attachment
General Description: Addition of cast acrylic as a pressure vessel material **Subgroup:** Inspection **Task Group:** J. Calvert (PM), V. Newton, D. Buechel, D. Rose **Submitted by:** J. Calvert **Explanation of Need:** Provide inspectors with the criteria necessary to competently inspect vessels like acrylic chromatography columns.		
January 2023 Meeting Action: Mr. Getter stated that the task group is still working on a proposal for this item.		

Item Number: 22-39	NBIC Location: Part 2, 4.4.8.7 g)	No Attachment
General Description: Recommended clarification of requirements for Evaluating Local Thin Areas **Subgroup:** Inspection **Task Group:** V. Newton (PM), T. Barker **Submitted by:** L. Ponce **Explanation of Need:** The existing text may lead to confusion due to a misplaced comma after 'specified' in the first sentence and no reference to what is being specified in the paragraph. The proposed text is a way to tie in the specified requirement in paragraph (f).		
January 2023 Meeting Action: Mr. Getter stated that the task group is working on a proposal for this item.		

Item Number: 23-08	NBIC Location: Part 2	No Attachment
General Description: Part 2 task group to review Part 3 Item 21-67 **Subgroup:** Inspection **Task Group:** M. Horbaczewski (PM), J. Clark, B. Wilson, J. Mangas, P. Polick **Submitted by:** D. Graf **Explanation of Need:** Part 2 task group to investigate further changes to Part 2/Part 3 that could be needed because of action item 21-67.		
January 2023 Meeting Action: Mr. Horbaczewski gave a progress report stating a task group was created in the SG meeting.		

iii. New Items:

Item Number: 23-16	NBIC Location: Part 2	No Attachment
General Description: Part III is adding requirements for inservice inspectors for repair F/U **Subgroup:** Inspection **Task Group:** None assigned. **Submitted by:** V. Scarcella **Explanation of Need:** Part III has items pending for mechanical repairs and post repair work inspections and the SG needs to make sure we have adequate instructions for the inspector.		
July 2023 Meeting Action:		

Item Number: 23-17	NBIC Location: Part 2, 2.3.6.4 and 4.4.8.7	Attachment Page 6
General Description: Steel-loss acceptance criteria for pressure-retaining items **Subgroup:** Inspection **Task Group:** None assigned. **Submitted by:** J. Hadley **Explanation of Need:** (1) Resolve inconsistencies between the 2021 NBIC's air, ammonia, LPG, and general acceptance criteria. (2) Provide screening criteria that, if met, would ensure that a pressure-retaining item also meets the conservative criteria in API 579-1/ASME FFS-1, Fitness-For-Service, 2021 edition, "ASME FFS-1", Part 3 Level 1 (brittle fracture) and either Part 4 Level 2 or Part 5 Level 1 (wall thinning). If not met, an owner/user could fall back on more complex, less conservative, ASME FFS-1 assessments. (3) Describe steel-loss screening criteria in one location within NBIC, and reference this location when needed, to facilitate future revisions. (4) Coordinate NBIC with ASME FFS-1. They have been referencing each other for some years, so coordinating them seems worthwhile.		
July 2023 Meeting Action:		

Item Number: 23-19	NBIC Location: Part 2, S6.13.6	Attachment Page 29

General Description: DOT Transport Tank Pressure Testing (Part 2, Supplement 6)

Subgroup: Inspection
Task Group: None assigned.
Submitted by: R. Underwood

Explanation of Need: The table in 49CFR180.407(g)(1)(iv) appears to have been revised at some point to add "The test pressure on the nameplate or specification plate" to the beginning of each specification pressure test requirement. Table S6.13.6 needs to be revised to reflect the current DOT requirements.

July 2023 Meeting Action:

Item Number: 23-26	NBIC Location: Part 2	No Attachment

General Description: Adding verbiage in Part 2 to mention a time limit on tube plugs in vessels

Subgroup: Inspection
Task Group: None assigned.
Submitted by: K. Moore

Explanation of Need: Part 3 is currently revamping 3.3.4.9. We feel like there should be a statement in the NBIC that the Chief or the in-service Inspector can address the operational issues and concerns of plugged tubes.

July 2023 Meeting Action:

Item Number: 23-27	NBIC Location: Part 2, 1.5.1	Attachment Page 31

General Description: Addition of requirement for Inspector to be present for inspections.

Subgroup: Inspection
Task Group: None assigned.
Submitted by: D. Kinney

Explanation of Need: While it has always been standard industry practice for inspections to be performed in-person, and there are requirements for remote inspection, currently there is no language in Part 2 or RCI-1 requiring the Inspector to be present at the location of installation while performing an inspection. This requirement is implied, but not stated.

July 2023 Meeting Action:

Item Number: 23-28	NBIC Location: Part 2, 5.3.3	No Attachment

General Description: Revision to NB-136

Subgroup: Inspection
Task Group: None assigned.
Submitted by: D. Kinney

Explanation of Need: For Line #3, "R" should be added, and should match Line #13.
For Line #13, when filling out the form, there is confusion between Owner or User, and Owner-User. These are two different terms defined in the NBIC. I believe the intention is to use "Owner or User" and not "Owner-User, and this should be clarified on the form.

July 2023 Meeting Action:

Item Number: 23-30	NBIC Location: Part 2, S7. 10 and Table S9.4	No Attachment

General Description: References to change of service for LPG vessels incorrectly use "altered"

Subgroup: Inspection
Task Group: None assigned.
Submitted by: T. Vandini

Explanation of Need: Conversion of service for LPG tanks (typically from above ground to underground service) typically involves changes to the vessel covered under Part 3, Paragraph 3.3.3 and, as such, are considered repairs. As such, the language referring to these conversions that uses the word "altered" or "alteration" may be confusing to an inspector or other user of NBIC. I suggest changing the word "altered" to "converted" and removing the specific reference to "alterations".

July 2023 Meeting Action:

Item Number: 23-37	NBIC Location: Part 2, 1.4	Attachment Page 32

General Description: Add comment to further define responsibility of the owner user

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

Explanation of Need: Specifically, if the inspector is going to a location where for instance H2S of some harmful pathogen is being handled, those locations have and should provide safety training and equipment needed to complete the inspection. For internals this is already touched on in 1.5.3. "Requirements of occupational safety and health regulations (i.e., federal, state, local, or other), as well as the owner-user's own program and the safety program of the Inspector's employer are applicable."

July 2023 Meeting Action:

Item Number: 23-42	NBIC Location: Part 2, 1.4 a)	No Attachment
General Description: Change for consistency **Subgroup:** Inspection **Task Group:** None assigned. **Submitted by:** L. Ponce **Explanation of Need:** Inconsistencies add confusion and increase liabilities of all parties.		
July 2023 Meeting Action:		

b. Subcommittee Repairs & Alterations

i. New Interpretation Requests:

Item Number: I23-10	NBIC Location: Part 3, 3.3.4.6 and 3.4.3	Attachment Page 35
General Description: Seamless Head Flush Patch - Repair vs Alteration **Subgroup:** Repairs and Alterations **Task Group:** B. Boseo (PM), L. Dutra, B. Schaefer **Explanation of Need:** Is the use of a flush patch on the center portion of a seamless head of an ASME Sect. VIII Div. 1 vessel considered a repair or alteration per the 2011 NBIC? **July 2023 Meeting Action:**		

Item Number: I23-11	NBIC Location: Part 3, 5.1 and 5.11	Attachment Page 33
General Description: Correcting duplicate nameplate that is not affixed to directly the vessel **Subgroup:** Repairs and Alterations **Task Group:** M. Quisenberry (PM), R. Derby **Explanation of Need:** Part 3 seems to contain no method for correcting errors on a name plate. Section 5 is not clear on what requirements apply to a duplicate name plate when the actual name plate is still affixed to the vessel and hidden under insulation. Since the duplicate name plate is not the actual name plate and is not affixed directly to the ASME pressure vessel, an R stamp holder should not be required to correct or replace a duplicate name plate. If a duplicate name plate were welded directly to the vessel, one could argue that Part 3 applies since interaction with the vessel could be required. **July 2023 Meeting Action:**		

Item Number: I23-15 **NBIC Location: Part 3, 3.3.2** **Attachment Page 36**

General Description: Routine Repairs Using Parts With Different Nominal Composition

Subgroup: Repairs and Alterations

Task Group: T. McBee (PM), M. Schaser

Explanation of Need: As written, Paragraph 3.3.2 implies that routine repairs require repair or replacement with "like material"...as in 3.3.3 r). This is supported by Interpretation 01-19. Allowing "material upgrades"...as in 3.3.3 s)...will reduce costs and labor associated with the growing number of repairs requiring in-process inspection and stamping due solely to material availability.

July 2023 Meeting Action:

Item Number: I23-20 **NBIC Location: Part 3, 3.3.4.8** **Attachment Page 37**

General Description: Boiler tube plug installation time consideration

Subgroup: Repairs and Alterations

Task Group: M. Quisenberry (PM), L. Dutra

Explanation of Need: 3.3.4.8 does imply that the defect should be known in regards to characteristics such as orientation, nature, depth, configuration but does not fully state this.

January 2023 Meeting Action:

Item Number: I23-47 **NBIC Location: Part 3, 3.4.4 d)** **Attachment Page 38**

General Description: Interpretation of Alteration for dimensional change.

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: The inquirer is looking to change a vessel nozzle flange from 150# to 300# to allow them to increase the torque value to reduce flange leaks that have been occurring.

January 2023 Meeting Action:

Item Number: I23-48	NBIC Location: Part 3, 3.3.2	Attachment Page 39

General Description: Plugging of tube hole without welding.

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: An Air-Cooled Heat Exchanger where the tube was expanded to the tube sheet needs to be repaired due to a tube leak. The repair will be done by plugging without removing the tube from the tube sheet. Is this considered a Routine Repair?

January 2023 Meeting Action:

ii. Action Items – Old Business

TG Graphite Items:

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

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

Subgroup: Graphite

Task Group: Greg Becherer (PM)

January 2023 Meeting Action: Ms. Kathy Moore stated that the Graphite Task Group is still developing a proposal for this item.

Item Number: 19-73	NBIC Location: Part 3, S3	No Attachment

General Description: Requirements for who can make hole plugging repairs on graphite blocks

Subgroup: Graphite

Task Group: C. Cary (PM), A. Viet, A. Stupica

Explanation of Need: Performing hole plugging repairs in graphite blocks is a common repair for graphite pressure vessels, but the NBIC currently has no formal requirements for this type of repair.

January 2023 Meeting Action: Ms. Moore stated that the Graphite Task Group is still working on the proposal for this item.

Item Number: A23-43	**NBIC Location: Part 3, S3.3 a)**	**Attachment Page 40**

General Description: Gasket surface repair

Subgroup: Graphite

Task Group: A. Viet (PM)

Explanation of Need: Occasionally, minor damage can occur along the gasket surface on parts of a graphite pressure vessel. Currently, repairing these minor damages is not a routine repair, but in certain instances it would make sense for the repair to be considered routine. This proposal adds language to allow for cement-only repair of a gasket surface where the damage is no more than 3/16" deep to be considered a routine repair.

TG Graphite April 2023 Meeting Action: During the Task Group's meeting, they determined that performing a cement-only repair to a damaged gasket surface on a graphite pressure vessel could be considered a routine repair, if the depth of the damage did not exceed 3/16". This proposed change was unanimously approved by the group.

Item Number: A23-44	**NBIC Location: Part 3, S3.5.4**	**Attachment Page 41**

General Description: Revision to Part 3, S3.5.4 m) to clarify requirements

Subgroup: Graphite

Task Group: F. Brown (PM)

Explanation of Need: Task Group discussion noted that S3.5.4 m) applies to all of S3.5.4, not only to the tube plugging proposal in S3.5.4 f). The TG agreed that the existing language in S3.5.4 f) 3) is not sufficiently specific where it says: "The "R" Certificate Holder shall note on Line 8 of the R-1 Form the installation of cemented graphite tube plugs in accordance with this section." ("this section" is ambiguous).

TG Graphite April 2023 Meeting Action: The Task Group worked on Mr. Brown's proposal for changing S3.5.4 m) to specifically say that "R" stamp holders without the G designator would need to specify on Form R-1 that they are using the provisions of S3.5.4 f). This proposal was unanimously approved by the Task Group.

Item Number: A23-45	NBIC Location: Part 3, S3.3	Attachment Page 42

General Description: Graphite plate replacement as Routine repair

Subgroup: Graphite

Task Group: J. Wince (PM)

Explanation of Need: In many cases, replacing a plate in a graphite plate heat exchanger is something that can be considered routine, but it is not currently defined as such. This proposal seeks to add this procedure to the list of routine repairs for graphite pressure vessels.

TG Graphite April 2023 Meeting Action: The Task Group worked on Mr. Wince's proposal, and then voted to unanimously approve the proposed changes.

Item Number: A23-46	NBIC Location: Part 3, S3.3	Attachment Page 43

General Description: Requirements for Inlays as Routine repairs

Subgroup: Graphite

Task Group: J. Clements (PM)

Explanation of Need: The one cubic inch limit for inlays in S3.3 a) 6) is impractically small and "never happens". There is a need to increase this limit to something more practical while staying within the scope of a routine repair.

TG Graphite April 2023 Meeting Action: The Task Group worked on Mr. Clement's proposal, and through discussion decided on increasing the limit for inlays as a routine repair from one cubic inch to no greater than 64 cubic inches or 10% of total volume. This proposed change was unanimously approved by the Task Group.

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

TG Historical Items:

Item Number: 20-25	NBIC Location: Part 3, S2.13	No Attachment

General Description: Repair Procedure for Fire Boxes

Subgroup: SG Historical

Task Group: M. Wahl (PM), Robin Forbes, T. Dillon, L. Moedinger, & F. Johnson

Explanation of Need: In NBIC Part 3, S2.13.10.3, S2.13.11 do not define what to do at a riveted joint. On the tubesheet, or firedoor sheet, where it is flanged to rivet to the firebox, the repairs are silent on what to do at the riveted joint.

January 2023 Meeting Action: Mr. Seime reported that the task group is still working on the proposal for this item.

TG Locomotive Items:

There are currently no Locomotive items open for Part 3.

NR Task Group Items:

There are currently no NR Task Group items open for Part 3.

SG Repairs & Alterations Items:

Item Number: 21-12	**NBIC Location: Part 3, 3.3.3, 3.4.4, Section 9**	**No Attachment**

General Description: Clarify the definitions and examples of "Repair" and "Alteration"

Subgroup: Repairs and Alterations

Task Group: P. Becker (PM), K. Moore, P. Shanks, R. Underwood, M. Chestnut, T. Sieme

Explanation of Need: Clarify the definitions of "Repair" and "Alteration" in the Glossary and revise the list of examples of each to better define the allowable scope of activities.

History: This Item was created as a result of conversation regarding Interp. Item 20-78 and Action Item 20-54

January 2023 Meeting Action: Ms. Moore reported that the task group continues to work on a proposal for this item.

Item Number: 21-31	**NBIC Location: NBIC Glossary**	**No Attachment**

General Description: Revise definition of "Field"

Subgroup: Repairs and Alterations

Task Group: R. Miletti (PM), P. Gilston, M. Toth, J. Walker

Explanation of Need: A "Field" site under the current definition could be multiple rented or leased spaces used for repairs/alterations, where there is no single or specific customer or job, but rather the locations(s) are used for conducting repair/alteration activities by personnel employed by the Certificate Holder on a continual basis.

January 2023 Meeting Action: Ms. Moore stated that a proposal is still being developed for this item.

Item Number: 21-43	NBIC Location: Part 3, Glossary	No Attachment

General Description: Defining and revising "Practicable" and "Practical" within the NBIC

Subgroup: Repairs and Alterations

Task Group: M. Toth (PM)

Explanation of Need: Defining and revising Practicable and Practical within the NBIC and revising where applicable

January 2023 Meeting Action: Ms. Moore said that the task group will be seeking input from all four parts to determine better words that could be used in place of “practicable” and practical” within the NBIC.

Item Number: 21-44	NBIC Location: Part 3, Glossary	No Attachment

General Description: Defining "De-Rating" within Part 3

Subgroup: Repairs and Alterations

Task Group: M. Toth (PM)

Explanation of Need: Defining de-rating within Part 3

January 2023 Meeting Action: Ms. Moore reported that work is still being done on this item.

Item Number: 21-45	NBIC Location: Part 3, Supplements	Attachment Page 44

General Description: Add a supplement for engineered repairs and alterations

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

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

January 2023 Meeting Action: Ms. Moore stated that the scope of this item has been expanded to encompass a supplement that addresses engineered and advanced repairs.

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

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

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM)

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

January 2023 Meeting Action: Ms. Moore shared that the task group is still working on the proposal for this item.

Item Number: 21-67	NBIC Location: Part 3, 3.4.9	No Attachment

General Description: Add welding requirements to plugging firetubes

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM), K. Moore, Trevor Seime, M. Quisenberry

Explanation of Need: The current NBIC does not have enough direction or requirements for welding tube plugs in firetubes.

January 2023 Meeting Action: Ms. Moore reported that the task group is still working on the proposal for this item.

Item Number: 21-82	NBIC Location: Part 3, 3.3.3 s)	Attachment Page 45

General Description: Examples of Repairs

Subgroup: Repairs and Alterations

Task Group: P. Davis (PM), R. Underwood, P. Gilston, , J. Ferreira, J. Walker, E. Cutlip, P. Miller, L. Dutra

Explanation of Need: Adding "repair" to 3.3.3(s) would then address use of different weld material. Currently 3.3.3(s) only addresses replacement of the part, not repair (Repair is addressed in 3.3.3(r)).

January 2023 Meeting Action: Ms. Moore presented a proposal for this item and stated that it will be going out to Subgroup and Subcommittee R&A as a letter ballot.

Item Number: 22-18	NBIC Location: Part 3, 9.1 (and all other Parts)	No Attachment

General Description: Definition of blowdown and blowoff

Subgroup: Repairs and Alterations

Task Group: K. Moore (PM)

Explanation of Need: These terms are not consistently used throughout the industry. This is to provide guidance to use the correct term when addressing the equipment or the action.

January 2023 Meeting Action: Ms. Moore stated that the task group is working on the proposal for this item.

Item Number: 22-19	NBIC Location: Part 3, 5.5.2	No Attachment

General Description: R Certificate Holders with Design Only Scope

Subgroup: Repairs and Alterations

Task Group: J. Ferreira (PM), R. Valdez, G. Scribner, B. Schaefer, M. Schaser

Explanation of Need: To add new paragraphs 5.2.2 d) and 5.2.2 e) which will provide guidance for R Certificate Holders with "Design Only" on which activities they are permitted to perform and how they and the Inspectors shall complete the R-2 Form.

January 2023 Meeting Action: Ms. Moore reported that the task group is still working on a proposal for this item.

Item Number: 22-41	NBIC Location: Part 3, 1.5	No Attachment

General Description: Reference NB-415 in Quality System

Subgroup: Repairs and Alterations

Task Group: P. Davis (PM), M. Carlson, L. Ponce, J. Walker.

Explanation of Need: Requirements in the NB-415 should be included in the R Cert. Holder's QC Manual. Examples: a) Notifying the National Board when an organization changes scope, ownership, name, location, address, or Inspection Agreement and b) Return of the stamp.

January 2023 Meeting Action: Ms. Moore stated that the task group is working on a proposal for this item.

Item Number: A23-04	NBIC Location: Part 3, 3.3.4.6	Attachment Page 47

General Description: Addressing Flush Patch Plate Weld NDT

Subgroup: Repairs and Alterations

Task Group: J. Ferreira (PM), K. Moore, Added M. Schaser, T. McBee, and F. Johnson

Explanation of Need: NBIC Item to Address Flush Patch Plate Weld NDT.

January 2023 Meeting Action: Ms. Moore stated that the task group is working on a proposal for this item.

iii. New Items:

Item Number: A23-12	NBIC Location: Part 3	No Attachment

General Description: Inspector involvement for repairs of wasted areas

Subgroup: Repairs and Alterations

Task Group: R. Valdez (PM), J. Ferreira

Explanation of Need: Based on recommendations by CSB, should an Inspector be required to physically view equipment that is being repaired in a wasted area prior to any repair/alteration activity?

July 2023 Meeting Action:

Item Number: A23-13	NBIC Location: Part 3, 3.3.3 s)	Attachment Page 48

General Description: Consistent addressing of the term for weld metal

Subgroup: Repairs and Alterations

Task Group: P. Gilston (PM), W. Sperko, J. Siefert, T. Melfi, F. Johnson

Explanation of Need: Item for addressing consistent addressing of the term for weld metal is being opened based on discussions on A21-82. Weld Metal vs Filler Metal vs Filler Material, etc.

July 2023 Meeting Action:

Item Number: A23-14	NBIC Location: Part 3, Table S9.2	Attachment Page 49

General Description: Extension Instructions for Reports of Repair

Subgroup: Repairs and Alterations

Task Group: M. Quisenberry (PM)

Explanation of Need: Additional text should be added to Instruction (29) of Table S9.2 of Supplement 9 (listing the "R" Cert. of Auth expiration date), to provide instructions on how to document if the "R" Cert. Holder is operating under an extension.

July 2023 Meeting Action:

Item Number: A23-21	NBIC Location: Part 3, 3.3.4.9	Attachment Page 54

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

Subgroup: Repairs and Alterations

Task Group: E. Cutlip (PM), P. Gilston, K. Moore

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.

July 2023 Meeting Action:

Item Number: A23-22	NBIC Location: Part 3, 2.5.3.4	Attachment Page 55

General Description: Changes to Part 3, 2.5.3.4 to clarify intent

Subgroup: Repairs and Alterations

Task Group: T. White (PM)

Explanation of Need: As written, this paragraph is ambiguous and confusing. The rewrite clarifies the paragraphs intent.

July 2023 Meeting Action:

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

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.

July 2023 Meeting Action:

Item Number: A23-25	NBIC Location: Part 3, 5.11	No Attachment

General Description: Name Plate replacement

Subgroup: Repairs and Alterations

Task Group: R. Valdez (PM), J. Ferreira

Explanation of Need: This does not address missing name plates. NB136 is about the form not the name plate. This needs to address missing name plates as well. There should also be a reference to point the Stamp Holder Part 2 - 5.2

July 2023 Meeting Action:

Item Number: A23-29	NBIC Location: Part 3, 1.5.1 s)	Attachment Page 57

General Description: Clarification of Intent

Subgroup: Repairs and Alterations

Task Group: S. Chestnut (PM),

Explanation of Need: The sentence is unclear as it currently reads. With the new wording it clarifies the intent.

July 2023 Meeting Action:

Item Number: A23-33	NBIC Location: Part 3, Table 2.3	Attachment Page 58

General Description: Update Table 2.3 to remove dates

Subgroup: Repairs and Alterations

Task Group: J. Sekely (PM)

Explanation of Need: Since the use of all current and previous versions of the listed SWPS's is permitted, there is no reason to date the listed SWPSs.

July 2023 Meeting Action:

Item Number: A23-35	NBIC Location: All Parts, 9.1	Attachment Page 60

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

Subgroup: Repairs and Alterations

Task Group: None assigned.

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.

July 2023 Meeting Action:

Item Number: A23-36	NBIC Location: Part 3, 4.2 a) and 4.4 b)	Attachment Page 61

General Description: Clarifying Rules for Using Alternative NDE Methods

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: It has been determined that there may be some confusion regarding allowable NDE methods for repairs and alterations. The existing language of 4.2 a) tells the reader that alternative NDE methods acceptable to the Inspector and, where required, the Jurisdiction, may be used provided the requirements of Section 4 are met. However, it is possible that the reader is not familiarizing themselves with all of the requirements of Section 4 prior to proposing an alternative NDE method. This change should help clarify and reinforce the requirements for alternative NDE methods for repairs and alterations.

July 2023 Meeting Action:

Item Number: A23-38	NBIC Location: Part 3, 1.1 a)	Attachment Page 62

General Description: Scope Clarification for Part 3

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: The owner or user's need to return equipment to service must never compromise the operational safety of the equipment or the process by which the operational safety of the equipment is assured. There is an interpretation that supports this notion by describing subjects permitted to be considered when determining whether a repair or alteration activity is practicable.

July 2023 Meeting Action:

Item Number: A23-39	NBIC Location: Part 3, 3.3.1	Attachment Page 63

General Description: Strengthening Prevention of Defect Recurrence

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: The existing text recommends, but does not require an investigation of the cause, extent, and likelihood of recurrence of defects. The existing text also has no requirement for anyone to act to prevent the recurrence of defects. Where root and/or proximate causes of defects are known, or could be determined, someone needs to act to prevent catastrophic failure of equipment.

July 2023 Meeting Action:

Item Number: A23-40	NBIC Location: Part 3, 3.3.4.1	Attachment Page 65

General Description: Strengthening Requirements to Ensure Defect Removal

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: The existing text alludes to the potential need for nondestructive examination (NDE) to ensure complete removal of defects but does not require it. The means to ensure defects have been removed must be understood by all to ensure safety. There is an interpretation of the 2021 NBIC that compounds this issue permitting repair organizations to not follow the requirements of NBIC Part 3, 3.3.4.8 even when the characteristics of the defect cannot be fully established.

July 2023 Meeting Action:

Item Number: A23-41	NBIC Location: Part 3, 3.3.4.6 a) 2)	Attachment Page 67

General Description: Strengthening Requirements for Defect Removal When Patching

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: The existing text requires the removal of defective material until sound material is reached but provides no requirements or guidance on means to employ to ensure complete removal of defective material. The means to ensure defects have been removed must be understood by all to ensure safety. There is an interpretation of the 2021 NBIC that compounds this issue permitting repair organizations to not follow the requirements of NBIC Part 3, 3.3.4.8 even when the characteristics of the defect cannot be fully established.

July 2023 Meeting Action:

Item Number: A23-49	NBIC Location: Part 3, 3.2.1 a)	Attachment Page 69

General Description: Hardness testing of existing materials

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Field hardness testing of existing materials may be difficult and produce erroneous results. It is usually unnecessary for determining properties required for selection of welding procedures. Unless needed, it should not be required to be performed. The purpose of verifying existing materials in Paragraph 3.2.1 a) is not to confirm acceptability of existing design, but to determine nominal composition for welding.

July 2023 Meeting Action:

Item Number: A23-51	NBIC Location: Part 3, 1.5.1	Attachment Page 70

General Description: Replace "legal" with "company" in 1.5.1 a) Title Page

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: The National Board has not adopted the ASME policy regarding company and legal names. Per the ASME policy it is permissible to have two names on a Certificate of Authorization and the quality manual. The 2023 NBIC 1.5.1 a) "legal" term may cause confusion for certificate holders, their AIAs, and review teams.

July 2023 Meeting Action:

c. Subcommittee Pressure Relief Devices

i. Interpretations

Item Number: 22-36	NBIC Location: Part 4, 4.2.2	Attachment Page 71

General Description: Use of Code case 2787 in Repairs

Task Group: None assigned.

Explanation of Need: Code Case 2787 was approved by ASME to allow a manufacturer to develop valves that will work on multimedia applications without any required adjustments. These valves may have different components and will have multiple certified capacities. As these valves are entering the marketplace, some customers are requesting that their existing valves get converted to the multimedia type valves. This request would allow the NBIC Committee to adopt the Code Case for us in the VR program in accordance with NBIC Part 4.2.2 and allow the VR holder to convert a valve to a multimedia design that has more than one certified capacity on the valve nameplate.

January 2023 Meeting Action: Mr. Adam Renaldo presented the proposal for this item. A motion was made and seconded to approve the proposal as presented. A question was asked about where in the NBIC it is written that code cases can be adopted. Section 4.2.2 of Part 4 was then reviewed by the Committee members. Mr. Renaldo mentioned that a task group will be formed to reword section 4.2.2. A suggestion was made to letter ballot this item to Main Committee and include a copy of the code case in ballot. Mr. Paul Shanks felt that using an interpretation to approve a code case wouldn't be valid. Further discussion was held about approaching this as an intent interpretation. Ultimately, the motion to approve the proposal was withdrawn so that the subgroup and subcommittee could work more on the proposal.

Item Number: 23-34	NBIC Location: Part 4, Supp. 6	Attachment Page 72

General Description: Sealing of Nuclear Class Relief Valves

Task Group: None assigned.

Explanation of Need: Provisions in NBIC Part 4 for "test only" activities do not provide direction for the periodic testing, adjustment and sealing of nuclear class valves. As the practice of involving the ANI is not described or sealing of a nuclear class valve without ANI witnessing is not explicitly prohibited the process of testing and sealing of nuclear class valves that were not repaired needs to be clarified.

July 2023 Meeting Action:

ii. Action Items – Old Business

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

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

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

January 2023 Meeting Action: Mr. Renaldo reported that the proposal for this item will be sent out as a letter ballot to SG Installation and SG PRD.

Item Number: NB15-0307	NBIC Location: Part 4	Attachment Page 73

General Description: Create Guidelines for Repair of Pin Devices.

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

Meeting Action: Mr. Renaldo stated that the proposal for this item will be sent out as a letter ballot to SG Installation and SG PRD.

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

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

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

Meeting Action: Mr. Renaldo said that the task group is still working on the proposal for this item.

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

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

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

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

Meeting Action: Mr. Renaldo reported that the proposal for this item will be sent out as a letter ballot to SG Installation and SG PRD.

Item Number: 20-85	NBIC Location: Part 4, 3.2.6	Attachment Page 107

General Description: Add language to Part 4, 3.2.6 to define test intervals for thermal fluid heater PRDs

Subgroup: PRD

Task Group: B. Nutter (PM), T. Patel, D. Schirmer, J. Wolf

Explanation of Need: The proposed language comes from work done on action item 19-88.

Meeting Action: Mr. Renaldo reported that the proposal for this item will be sent out as a letter ballot to SG Inspection and SG PRD.

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

General Description: Additional guidance for tank vent repairs

Subgroup: PRD

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

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

Meeting Action: Mr. Renaldo stated that the task group is still working on the proposal for this item.

Item Number: 21-36	NBIC Location: Part 4, 3.3.3.4 i)	No Attachment

General Description: Add Test Details to NBIC Part 4, 3.3.3.4 i) Valve Adjustment and Sealing

Subgroup: PRD

Task Group: None assigned

Explanation of Need: There is no reference in the T/O requirements for Set Pressure Testing, use of proper Test Fluid or Seat Tightness unless and until a minor adjustment is required. This is surely the intent, but it is not clearly specified as it is in the current VR requirements.

Meeting Action: Mr. Renaldo reported that the task group is still working on the proposal for this item.

Item Number: 21-59	NBIC Location: Part 4, 3.2.6.1	No Attachment

General Description: Deferral of inspection due dates (pressure relieving devices NBIC PART IV)

Subgroup: PRD
Task Group: None assigned

Explanation of Need: Since the code has clearly recommended inspection frequency intervals for the different classes of pressure relief devices, it shall have the requirements related to the deferral of due dates. The inspection due date deferrals are usually not considered but in exceptional cases where operating plant may not be able to handover the device due to some practical limitations or the turnaround frequency of the plant is extended due to stakeholders' requirements etc. The owner is usually ensuring that a deferment is not posing any significant EHSS risk by proper risk analysis but a clarity from code on the minimum or maximum duration the device can be deferred will add a great value in decision making. There are some codes which have added deferment clauses such as API 510 but the NBIC is always having precedence in this subject and shall have statement added to its code.

Meeting Action: Mr. Renaldo reported that the item has been approved by SG and SC PRD but is being taken back for further work due to comments received from SC Inspection.

Item Number: 21-61	NBIC Location: Part 4, 3.3.4	Attachment Page 110

General Description: Audit Requirements for the T/O holder

Subgroup: PRD
Task Group: A. Donaldson (PM), A. Cox, J. Simms, P. Dhobi, T. Tarbay, D. Marek

Explanation of Need: Opened as a result of a Subgroup PRD ballot comment from item 21-05 (Shop audits for VR certificate holders). The comment recommended adding requirements specifically for organizations that are T/O only.

Meeting Action: Mr. Renaldo stated that the proposal for this item will be sent out as a letter ballot to SG PRD.

Item Number: 21-62	NBIC Location: Part 4, 4.8.5.4 i) 3)	No Attachment

General Description: Verification of existing spring during repair activities

Task Group: A. Donaldson (PM), B. Nutter, E. Creaser, P. Dhobi, T. Patel, J. Simms

Explanation of Need: This requirement has created an administrative requirement that potentially prevents a VR Stamp holder from applying the "VR" stamp to valves they have repaired. The requirement is negatively impacting owners, and jurisdictions that enforce the NBIC Part 4. This clause introduces a unique requirement in the BPV industry to confirm that code material in a Code stamped item be verified and traceable at all time after the item is ASME code stamped but the verification can only be provided by the manufacturer. Historically, any valve received or worked on that was sealed by a VR Stamp holder or in the case of an initial repair the ASME assembler was deemed to be Code compliant, and no further verification was needed recognizing the validity and continuity of the ASME and VR quality programs. It is clearly understood that if a spring, or any other critical part is deemed necessary to be replaced during a repair the manufactures verification is required and justifiable.

Meeting Action: Mr. Renaldo reported that the task group is still working on the proposal for this item.

Item Number: 22-08	NBIC Location: Part 4, 2.4.1.6 & 2.4.4.2; Part 1, 3.9.1.6 & 3.9.4.2	No Attachment

General Description: Review and improve guidance for T&P valve installation relating to probe.

Subgroup: PRD

Task Group: D. Marek (PM), J. Ball, J. Wolfe, T. Clark

Explanation of Need: Existing text refers to location of valve connection and does not give guidance that the temperature probe needs to be located in the hottest water in the tank for the valve to actuate at the specified temperature.

Meeting Action: Mr. Renaldo reported that the task group is still working on the proposal for this item.

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

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

Subgroup: PRD

Task Group: A. Donaldson (PM), R. Donalson, B. Nutter, T. Tarbay, J. Simms
Explanation of Need: There are no requirements to address valve repairs that were manufactured or assembled to Code Case 2787 (use of more than one certified capacity on the pressure relief valve or the nameplate).

Meeting Action: Mr. Renaldo said that the task group is still working on the proposal for this item.

Item Number: 22-15	NBIC Location: Part 4, 2.4.5 and Part 1, 3.9.5	Attachment Page 113

General Description: What is the meaning of "service limitations" as used in Part 4, 2.4.5?

Subgroup: PRD

Task Group: T. Beirne (PM), B. Nutter, T. Clark

Explanation of Need: Part 4, 2.4.5 (also Part 1, 3.9.5) references "service limitations set forth in Part 1, 3.2, Definitions" when establishing pressure relief requirements for tanks and heat exchangers. Part 1, 3.2 points readers to the glossary. As "service limitations" is not itself defined within the glossary, and the term does not appear elsewhere in the code, what specific service limitations are being referenced?

Meeting Action: Mr. Renaldo shared that the proposal for this item will be sent out as a letter ballot to SG Inspection and SG PRD.

Item Number: 22-16	NBIC Location: Part 4, 2.4.4 and Part 1, 3.9.4	Attachment Page 119

General Description: Allow the use of pressure relief valves on potable water heaters.

Subgroup: PRD

Task Group: D. Sullivan (PM), J. Ball, T. Clark

Explanation of Need: ASME Section IV, Part HLW-800.1 allows the use of pressure relief valves in place of temperature and pressure relief valves on potable water heaters. NBIC Parts 1 and 4 specifically require temperature and pressure relief valves, which is not consistent with the code of construction. Some manufacturers are shipping HLW stamped potable water heaters with pressure relief valves. Often the physical construction of these units is such that a temperature and pressure relief valve cannot be accommodated.

Meeting Action: Mr. Renaldo reported that the proposal for this item will be sent out as a letter ballot to SG Inspection and SG PRD.

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

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

Subgroup: PRD

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

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

Meeting Action: Mr. Renaldo stated that the task group is still developing a proposal for this item.

iii. New Items:

Item Number: 23-18	NBIC Location: Part 4, 4.2.2	Attachment Page 122

General Description: Revision and clarification of Part 4, 4.2.2 for use of ASME Code Cases

Subgroup: PRD

Task Group: A. Donaldson (PM)

Explanation of Need: 4.2.2 requires revision to clarify how ASME Code Cases are applied in the repair and conversion of pressure relief devices. Revision is also necessary to remove the requirement that the NBIC Main Committee adopt individual ASME Code Cases before they may be used in Jurisdictions that have adopted them. The current wording does not allow conversion of a device to no-longer comply with an ASME Code Case.

July 2023 Meeting Action:

Item Number: 23-31	NBIC Location: Part 4, 3.2.5 d) 5) and Part 2, 2.5.7 d) 5)	Attachment Page 123

General Description: Testing of liquid service valves to be water or other suitable liquid

Subgroup: PRD

Task Group: None assigned.

Explanation of Need: The intent is that liquid service valves be tested on liquid. The term fluid can mean either liquid or vapor.

July 2023 Meeting Action:

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

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

Subgroup: PRD

Task Group: None assigned.

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

July 2023 Meeting Action:

d. Subcommittee Installation

i. Interpretations

There are currently no open interpretation items for Part 1.

ii. Action Items – Old Business

Item Number: 20-62	NBIC Location: Part 1, 1.4.5.1	No Attachment

General Description: Update the National Board Boiler Installation Report

Subgroup: SG Installation

Task Group: T. Clark (PM), E. Wiggins, R. Spiker, T. Creacy, P. Jennings, G. Tompkins, and D. Patten.

January 2023 Meeting Action: Mr. Patten reported that a proposal for this item will be submitted to Subgroup Installation for letter ballot.

Item Number: 20-86	NBIC Location: Part 1, 2.10.1 a)	No Attachment

General Description: Testing and Acceptance: Boiling-out Procedure

Subgroup: SG Installation

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

January 2023 Meeting Action: Mr. Patten stated that the task group is still working on a proposal for this item.

Item Number: 22-28	NBIC Location: Part 1, 9.1	No Attachment

General Description: Pool Heater definition and requirements

Subgroup: SG Installation

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

Explanation of Need: The NBIC Installation and Inspection Codes do not have a definition for pool heaters. There is potential for confusion regarding which NBIC requirements, if any, should apply to pool heaters.

January 2023 Meeting Action: Mr. Patten stated that the task group is working on developing a proposal for this item.

Item Number: 22-30	NBIC Location: Part 1, 3.6.3	No Attachment

General Description: Drains in equipment rooms with heating boilers containing glycol

Subgroup: SG Installation

Task Group: P. Jennings (PM), R. Adams, D. Zalusky, D. Patten, and R. Smith

Explanation of Need: Glycol should be disposed of in accordance with regulations. The intent of this addition to the text is to identify that drains may not be the proper way to dispose of glycol.

January 2023 Meeting Action: Mr. Patten said that a task group has been assigned to this item, and that they are currently working on a proposal.

Item Number: 22-32	NBIC Location: Part 1, 3.8.1.4 b)	No Attachment

General Description: High pressure limit control requirements for fired jacketed steam kettles

Subgroup: SG Installation

Task Group: R. Adams (PM), D. Patten, T. Clark, and T. Creacy

Explanation of Need: As a safeguard to over pressurizing the fired jacketed steam kettle, the pressure range of the actuated high pressure limit control should not exceed the MAWP of the vessel.

January 2023 Meeting Action: Mr. Patten stated that the task group is currently working on a proposal for this item.

iii. Action Items – New Business

Item Number: 23-50	NBIC Location: Part 1, 2.8.5 and 3.8.1.5	Attachment Page 124
General Description: Require separate waterside piping connections for multiple LWCO devices **Subgroup:** SG Installation **Task Group:** None assigned. **Explanation of Need:** CSD-1 CW-120 (a) and CW-140 (a) address piping connection requirements for low-water fuel cutoff devices for low-pressure and high-pressure steam boilers. Specifically, both sections require each LWCO device to have a separate piping connection on the waterside. However, NFPA 85 does not address any installation requirements for LWCO devices, potentially allowing them to be installed in an unsafe manner.		
July 2023 Meeting Action:		

Item Number: 23-52	NBIC Location: Part 1, 2.5.3.2 and 3.5.3	Attachment Page 126
General Description: Harmonize electrical requirements for all types of boilers/water heaters **Subgroup:** SG Installation **Task Group:** None assigned. **Explanation of Need:** Electrical requirements for power boilers, heating boilers, and water heaters are inconsistent, particularly regarding remote emergency shutdown switches. In some cases the requirements are the same, but worded or ordered differently. In order to promote better understanding of code requirements and consistency in their application, I propose making sections 2.5.3 and 3.5.5 as uniform as possible.		
July 2023 Meeting Action:		

12. Liaison Activities

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

ii. American Welding Society (AWS)

13. Future Meetings

- January 8-11, 2024 – Charlotte, NC
- July 2024 – TBD

14. Adjournment

Respectfully submitted,

Jonathan Ellis

Jonathan Ellis
NBIC Secretary

THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE COMMITTEE

ATTACHMENTS

NBIC Main Committee

Last Name	First Name	Interest Category	Role	Exp. Date	More
Galanes	George	Users	Chair	07/30/2024	Details
Wadkinson	Melissa	Manufacturers	Vice Chair	07/30/2024	Details
Ellis	Jonathan		Secretary	12/30/2099	Details
Barker	Timothy	Authorized Inspection Agencies	Member	07/30/2025	Details
Getter	Jim	Manufacturers	Member	01/30/2026	Details
Hopkins	Craig	National Board Certificate Holders	Member	07/30/2025	Details
Moore	Kathy	National Board Certificate Holders	Member	07/30/2025	Details
Morelock	Brian	Users	Member	01/30/2026	Details
Newton	Venus	Authorized Inspection Agencies	Member	01/30/2026	Details
Patel	Thakor	Manufacturers	Member	01/30/2026	Details
Ray	Brent	Users	Member	07/30/2025	Details
Richards	H. Michael	General Interest	Member	07/30/2025	Details
Sansone	Matthew	Jurisdictional Authorities	Member	07/30/2023	Details
Schaefer	Benjamin	National Board Certificate Holders	Member	07/30/2025	Details
Seime	Trevor	Jurisdictional Authorities	Member	07/30/2023	Details
Sekely	James	General Interest	Member	08/30/2023	Details
Simmons	Timothy	Labor	Member	11/29/2024	Details
Toth	Marty	General Interest	Member	07/30/2025	Details
Underwood	Robert	Authorized Inspection Agencies	Member	07/30/2025	Details
Wiggins	Edward	Jurisdictional Authorities	Member	07/30/2024	Details

YTD Items Approved for the 2025 NBIC Edition				
Title	**Item Number**	**Cycle**	**NBICEdition**	**Assigned Committee**
Define "Fuel Loading" as it pertains to NR activities	21-02	A	2025	Subcommittee Repairs/Alterations
Inspection of through stays and diagonal stays	21-03	A	2025	Subcommittee Inspection
Incorporate new repair methods for through and diagonal stays	21-09	A	2025	Subcommittee Repairs/Alterations
Pressure Tests for Pressure Relief Valve Repair Parts	21-18	A	2025	Subcommittee Pressure Relief Devices
Parts used in NR Activities	21-37	A	2025	Subcommittee Repairs/Alterations
Create example inspection list	22-03	A	2025	Subcommittee Inspection
Lost or Destroyed UDS	22-12	A	2025	Subcommittee Repairs/Alterations
Lost or Destroyed UDS	22-12	A	2025	Subcommittee Repairs/Alterations
Align hot water boiler thermometer requirements with ASME Section IV	22-13	A	2025	Subcommittee Installation
Removal of the requirement of AIA audits from the NR program	22-29	A	2025	Subcommittee Repairs/Alterations
Removal of the requirement of AIA audits from the NR program	22-29	A	2025	Subcommittee Repairs/Alterations
Location of temperature controls	22-31	A	2025	Subcommittee Installation
Update duplicate nameplate marking requirements in Supplement 6	22-34	A	2025	Subcommittee Pressure Relief Devices
Update reference of Section VIII steam valves to UV designated steam valves	22-35	A	2025	Subcommittee Pressure Relief Devices
Clarify that stamping is required prior to signing R Form	23-05	A	2025	Subcommittee Repairs/Alterations
Editorial change for Section 3, Para. 3.3.4.8 c) 5 and 6	23-06	A	2025	Subcommittee Repairs/Alterations
2.2.4 updated to include not allowing combustibles	23-07	A	2025	Subcommittee Inspection
Revisions to Part 3, Supplement 6	20-67	B	2025	Subcommittee Repairs/Alterations
Working Pressure Calculations for Curved Stayed Surfaces	21-34	B	2025	Subcommittee Inspection

2.3.6.5 INSPECTION OF PRESSURE VESSELS WITH QUICK-ACTUATING CLOSURES

~~a)~~ This section describes guidelines for inspection of pressure vessels equipped with quick-actuating closures. Pressure vessels with less than five cubic feet of volume and a design pressure less than 50 psi are excluded from the requirements of this section. ~~Due to the many different designs of quick-actuating closures, potential failures of components that are not specifically covered should be considered. The scope of inspection should include areas affected by abuse or lack of maintenance and a check for inoperable or bypassed safety and warning devices.~~ Pressure vessels with quick actuating closures have a higher likelihood of personnel being in close proximity of the vessel during opening.

a. Accidents have occurred when gaskets became stuck and released suddenly when pried open. Wear and fatigue damage caused by the repetitive actuation of the mechanism and pressure cycles are also a source of accidents.

b) ~~Temperatures above that for which the quick actuating closure was designed can have an adverse effect on the safe operation of the device. If parts are found damaged and excessive temperatures are suspected as the cause, the operating temperatures may have exceeded those temperatures recommended by the manufacturer.~~ Rapid fluctuations in temperatures due to rapid start-up and shutdown may lead to cracks or yielding caused by excessive warping and high thermal stress. An ~~careful observation~~ inspection ~~should~~ shall be made of the condition of the complete installation~~,~~. Review shall ~~including~~ include maintenance, ~~and~~training, operation, and non-destructive examination records. This review shall serve as a guide ~~in forming an opinion of~~ for evaluating the care the equipment receives. The construction history of the vessel should be established, including~~:~~ year built, materials of construction, extent of postweld heat treatment, previous inspection results, and repairs or alterations performed. Any leak should be thoroughly investigated and the necessary corrective action ~~initiated~~taken by an "R" Certificate Holder.

1) Inspection of parts and appurtenances

The owner user shall adhere to the items below, and the items shall be verified by the inspector if applicable.

a. Seating surfaces of the closure device, including but not limited to the gaskets, O-rings, or any mechanical appurtenance, shall be inspected to ensure proper alignment. ~~of the closure to the seating surface, should be inspected. This inspection can be made by using powdered chalk or any substance that will indicate that the closure is properly striking the seating surface of the vessel flange. If this method is used, a check should be made to ensure that:~~

~~1. Material used shall not contaminate the gasket or material with which it comes into contact; and~~
~~2. The substance used shall be completely removed after the examination.~~

b. The closure mechanism of the device ~~should~~ shall be inspected for freedom of movement and proper contact with the locking elements. This inspection should indicate that the movable portions of the locking mechanism are striking the locking element in such a manner that full stroke can be obtained. Inspection should be made to ensure that the seating surface of the locking mechanism is free of metal burrs and deep scars, which would indicate misalignment or improper operation. A check should be made for proper alignment of the door hinge mechanisms to ensure that adjustment screws and locking nuts are properly secured.

c. When deficiencies are noted, the following corrective actions ~~should~~ shall be initiated:

Commented [JM1]: Can this sentence be changed? Since it is straight out of SECTION VIII, I wasn't sure if we could change it. I think the word "because" should be removed.

Also is this paragraph supposed to be "a."?

a. Accidents have occurred when gaskets became stuck and released suddenly when pried open.

Commented [JCP2R1]: I think the word BECAUSE could be removed.

Commented [JM3]: Editorial - I believe the colon can be removed here.

Commented [JCP4R3]: I agree

Commented [JM5]: I changed this to Certificate Holder

Commented [JCP6R5]: Ok Looks good.

1. If any ~~deterioration~~ defect of the gasket, O-ring, etc., is found, the gasket, O-ring, etc., ~~should~~ shall be removed from service and replaced immediately. Replacements ~~should~~ shall be in accordance with the vessel manufacturer's specifications;
2. If any cracking or excessive wear is discovered on the closing mechanism, the owner or user ~~should~~ shall contact the original manufacturer of the device for spare parts or repair information. If this cannot be accomplished, the owner or user should contact an organization competent in quick-actuating closure design and construction prior to implementing any repairs;
3. Defective safety or warning devices ~~should~~ shall be repaired or replaced prior to further operation of the vessel;
4. Deflections, wear, or warping of the sealing surfaces may cause out-of-roundness and misalignment. The manufacturer of the closure ~~should~~ shall be contacted for acceptable tolerances for out-of-roundness and deflection; and
5. The operation of the closure device through its normal operating cycle should be observed while under control of the operator. ~~This should indicate if the operator is following posted procedures and if the operating procedures for the vessel are adequate~~.

Commented [JCP7]: Jodi: This needs to be added back to this paragraph. Venus lined this out, but I think the working group wanted it left in.

2) Gages, safety devices, and controls

The owner user shall adhere to the items below, and the items shall be verified by the inspector as applicable.

~~a. The required pressure gage should be installed so that it is visible from the operating area located in such a way that the operator can accurately determine the pressure in the vessel while it is in operation. The gage dial size should be of such a diameter that it can be easily read by the operator. This gage should have a pressure range of at least 1 1/2 times, but not more than four times, the operating pressure of the vessel. There should be no intervening valve between the vessel and gage.~~

~~b.~~a. The pressure gage should be of a type that will give accurate readings, especially when there is a rapid change in pressure. It should be of rugged construction and capable of withstanding severe service conditions. Where necessary, the gage should be protected by a siphon or trap.

~~c.~~b. Pressure gages intended to measure the operating pressure in the vessel are not usually sensitive or easily read at low pressures approaching atmospheric. It may be advisable to install an auxiliary gage that reads inches of water (mm of mercury) and is intended to measure pressure from atmospheric through low pressures. This ensures that there is zero pressure in the vessel before opening. It would be necessary to protect the auxiliary ~~low-pressure~~low-pressure gage from the higher operating pressures.

~~d.~~c. Provisions should be made to calibrate pressure gages or to have them checked against a master gage as frequently as necessary.

~~e.~~d. A check should be made to ensure that the closure and its holding elements must be fully engaged in their intended operating position before pressure can be applied to the vessel. A safety interlock device ~~should~~ shall be provided that prevents the opening mechanism from operating unless the vessel is completely depressurized.

~~f.~~e. Quick-actuating closures held in position by manually operated locking devices or mechanisms, and which are subject to leakage of the vessel contents prior to disengagement of the locking elements and release of the closure, shall be provided with an audible and/or visible warning device to warn the operator if pressure is applied to the vessel before the closure and its holding elements are fully engaged, and to warn the operator if an attempt is made to operate the locking device before the pressure within the vessel is released. Pressure tending to force the closure clear of the vessel must be released before the closure can be opened for access.

3. A Risk Based Inspection Assessment (RBIA) program, managed by the owner/user, shall be developed by a professional familiar with the design and applications of quick actuating closures. See NBIC Part 2, Section 4. The RBIA shall be made available for review by the inspector.

January 17, 2023

TO: NBIC Secretary <nbicsecretary@nationalboard.org>
COPY: Luis Ponce <LPonce@nationalboard.org>
Jonathan Ellis <JEllis@nationalboard.org>

RE: NBIC Part 2 code-change request
Steel-loss acceptance criteria for pressure-retaining items

Dear NBIC Secretary,

Please consider the code-change request below.

Existing and Proposed Text
See strikeout and red text on the markup of the 2021 NBIC Part 2 attached to this letter, on pages: 2, 27, 30, 31, 65, 70, 72, 73, 74, 75 (and the next five new pages with the proposed section 4.4.9), 237, 291, 292, 293, 299, and 323.

No markup was made to Supplement 2, Historical Boilers, due to their unique requirements. Perhaps an optional reference to the proposed section 4.4.9 could be added.

Statement of Need

(1) Resolve inconsistencies between the 2021 NBIC's air, ammonia, LPG, and general acceptance criteria. See file (attached to the email that transmitted this letter):
Acceptance_criteria_in_2021_NBIC_Part_2_air_ammonia_LPG_comparison_2022-11-10.xls

(2) Provide screening criteria that, if met, would ensure that a pressure-retaining item also meets the conservative criteria in API 579-1/ASME FFS-1, Fitness-For-Service, 2021 edition, "ASME FFS-1", Part 3 Level 1 (brittle fracture) and either Part 4 Level 2 or Part 5 Level 1 (wall thinning). If not met, an owner/user could fall back on more complex, less conservative, ASME FFS-1 assessments.

(3) Describe steel-loss screening criteria in one location within NBIC, and reference this location when needed, to facilitate future revisions.

(4) Coordinate NBIC with ASME FFS-1. They have been referencing each other for some years, so coordinating them seems worthwhile.

Background Information

The proposed acceptance criteria simplify several 2021 NBIC Part 2 sections by dropping the critical-plane analysis with a 10-inch or longer thickness-averaging length. The thickness-averaging method in ASME FFS-1 has detailed figures for numerous types of components and requires math usually solved with computers, which typically results in an averaging length less than 10-inches for up to 120-inch diameter vessels, depending on the steel loss (shorter averaging length if more steel loss). The conservative screening in the proposed new NBIC Part 2, section 4.4.9, can be done without any critical-plane thickness-averaging effort.

I'd be happy to attend a committee meeting to present this request, either in person or via video call.

Sincerely,

James D. Hadley, P.E.
Member ACS, AIChE, ASCE, ASME

d) American Society of Mechanical Engineers- *ASME Boiler and Pressure Vessel Code Section VII* (Recommended Guidelines for the Care of Power Boilers)

e) American Society of Mechanical Engineers -*ASME B31G* (Manual for Determining the Remaining Strength of Corroded Pipelines)

f) American Society of Mechanical Engineers - *ASME PCC-1* (Guidelines for Pressure Boundary Bolted Joint Assembly)

g) American Society of Mechanical Engineers - *ASME PCC-2* (Repair of Pressure Equipment and Piping)

h) American Society of Mechanical Engineers - *ASME CRTD Volume 41,* (Risk-Based Inspection for Equipment Life Management: An Application Handbook)

i) American Petroleum Institute/American Society of Mechanical Engineers - *API 579-1/ASME FFS-1* (Fitness-For-Service)

j) American Petroleum Institute – *API-510* (Pressure Vessel Inspection Code: In-service Inspection, Rating, Repair and Alteration)

k) American Petroleum Institute - *API 570* (Piping Inspection Code: In-Service Inspection, Rating, Repair and Alteration of Piping Systems)

l) American Petroleum Institute - *API 572* (Inspection of Pressure Vessels)

m) American Petroleum Institute - (Inspection Practices for Piping System Components)

n) American Petroleum Institute - *API 576* (Inspection of Pressure-Relieving Devices)

o) American Petroleum Institute - *Recommended Practice 580* (Risk Based Inspection)

p) American Petroleum Institute - *Recommended Practice* 581 (Base Resource Document on Risk-Based Inspection)

q) Institute of Petroleum - *Model Code of Safe Practice in the Petroleum Industry Part 12 ,* Pressure Vessel Examination

r) Institute of Petroleum - *Model Code of Safe Practice in the Petroleum Industry Part 13,* (Pressure Piping Systems Examination)

s) Australian Standard - *AS 1210* (Unfired Pressure Vessel Code)

t) Australian Standard - *AS 4343* (Pressure Equipment - Hazard Levels)

u) Alberta Boilers Safety Association - *AB-506* (Pressure Equipment Inspection and Servicing Requirements)

1.4 PERSONNEL SAFETY

a) Personnel safety is the joint responsibility of the owner or user and the Inspector. All applicable safety regulations shall be followed. This includes federal, state, regional, and/or local rules and regulations. owner or user programs, safety programs of the Inspector's employer, or similar standards also apply. In the absence of such rules, prudent and generally accepted engineering safety procedures satisfactory to the Inspector shall be employed by the owner or user.

b) Inspectors are cautioned that the operation of safety devices involves the discharge of fluids, gases, or vapors. Extreme caution should be used when working around these devices due to hazards to

openings. UT thickness testing may be used where internal inspection access is limited or to determine actual thickness when corrosion is suspected;

a. ~~UT~~ Acceptance Criteria. See NBIC Part 2, 4.4.9.

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

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

~~3. For a corroded area of considerable size, the thickness along the most critical plane of such area may be averaged over a length not exceeding 10 in. (250 mm). The thickness at the thinnest point shall not be less than 75% of the required wall thickness.~~

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

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

2. The vessel shall be removed from service until the vessel is repaired by an “R” stamp holder.

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

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

5. The vessel is permanently removed from service.

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

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

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

2.3.6.3 EXPANSION TANKS

a) The purpose of an expansion tank is to provide an air cushion to a system that will allow for expansion and contraction, thus minimizing fluctuations in pressure due to temperature variances. These vessels are susceptible to corrosion due to the air and water interface.

b) Inspection shall consist of the following:

1) Design/operation — Verify from the nameplate the code of construction, temperature, and pressure ratings to ensure jurisdictional and system compatibility. It is common to find expansion tanks water logged due to leakage of air out of the tank; therefore, it is important to verify the water level either

Penetration locations in the insulation or fireproofing, such as saddle supports, sphere support legs, nozzles, or fittings should be examined closely for potential moisture ingress paths. When moisture penetrates the insulation, the insulation may actually work in reverse, holding moisture in the insulation and/or near the vessel shell.

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

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

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

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

f) Acceptance criteria

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

1) Cracks

Cracks in the pressure vessel boundary (e.g., heads, shells, welds) are unacceptable. When a crack is identified, the vessel shall be removed from service until the crack is repaired by an "R" Stamp holder or the vessel permanently removed from service. (See NBIC Part 3, *Repairs and Alterations*.) See also NBIC Part 2, 4.4.9.a.3.

2) Dents

When dents are identified that exceed the limits set forth below, the vessel shall be removed from service until the dents are repaired by an "R" Stamp holder, a fitness for service analysis is performed, or the vessel permanently retired from service.
See also NBIC Part 2, 4.4.9.a.8.

a. Dents in Shells

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

b. Dents in Welds

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

c. Dents in Heads

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

3) Bulges

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

a. Bulges in Shells

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

Bulges

b. ~~Dents~~ in Heads

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

See also NBIC Part 2, 4.4.9.a.4.

4) Cuts or Gouges

When a cut or gouge exceeds 25% of the thickness of the vessel, the vessel shall be removed from service until it is repaired by an “R” Stamp Holder or a fitness-for-service analysis is performed. The vessel may also be permanently retired from service. See also NBIC Part 2, 4.4.9.a.8.

5) Corrosion. See NBIC Part 2, 4.4.9.

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

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

~~c. For a corroded area of considerable size, the thickness along the most critical plane of such area may be averaged over a length not exceeding 10 in. (250 mm). The thickness at the thinnest point shall not be less than 75% of the required wall thickness. When general corrosion is identified that exceeds the limits set forth in this paragraph, the pressure vessel shall be removed from service until it is repaired by an “R” Stamp holder or a fitness-for-service analysis is performed, or the vessel may be permanently retired from service.~~

2.3.6.5 INSPECTION OF PRESSURE VESSELS WITH QUICK-ACTUATING CLOSURES

a) This section describes guidelines for inspection of pressure vessels equipped with quick-actuating closures. Due to the many different designs of quick-actuating closures, potential failures of components that are not specifically covered should be considered. The scope of inspection should include areas affected by abuse or lack of maintenance and a check for inoperable or bypassed safety and warning devices.

, such as API 579-1/ASME FFS-1

b) Various assessment methods (see NBIC Part 2, 1.3), including those mentioned in this section ~~(an example of guidelines for performing fitness for service assessments are referenced in API recommended practice API-579 "Fitness-for-Service")~~, can be used to establish the next inspection interval of a pressure-retaining item and to ensure safe operation. Condition assessment methods shall be subject to review and acceptance by the Jurisdiction.

c) Safe and adequate implementation of Fitness for Service Assessment (FFSA) programs is the responsibility of the owner or user. Responsibility includes verifying and understanding jurisdictional rules/regulations and inservice inspection requirements. Application of these programs may result in decisions that will deviate from or conflict with jurisdictional requirements (e.g., frequency or types of inspections, repairs and alterations, etc.). The Inspector and Jurisdiction shall be contacted for acceptance, as appropriate, prior to implementing decisions that deviate from or conflict with established requirements.

d) If required by the Jurisdiction, FFSA shall be documented on a Report of FFSA Form NB-403, as shown in NBIC Part 2, 5.3.7. Preparation of the Report of FFSA shall be the responsibility of the owner or user. An Inspector shall indicate acceptance by signing the Report of FFSA. Legible copies of the FFSA report shall be distributed to the Jurisdiction, and the Authorized Inspection Agency responsible for the inservice inspection. The owner or user shall maintain a copy of the FFSA report in the relevant equipment inspection history file.

4.4.2 GENERAL REQUIREMENTS

a) Organizations or qualified individuals with experience in inspection, design, construction, repairs, or failure analysis of pressure-retaining items should be consulted to assist in identifying damage mechanisms, and to evaluate condition assessment results of pressure-retaining items. Documentation and inspection data used for fitness for service assessment should be evaluated for compliance, with codes, industry standards/experience or good engineering practices, and shall be acceptable to the Jurisdiction. Understanding the operation of equipment or systems and interaction with their internal or external service environment is necessary to correctly identify damage mechanisms.

b) There are various condition assessment and fitness for service methods that can be used to determine inspection intervals, based on calculating the remaining service life of the pressure-retaining item. For items subject to corrosion or erosion, the method to determine or adjust inspection intervals is identified in NBIC Part 2, 4.4.7. Methods for assessing other types of inservice damage that affect remaining service life of pressure-retaining items are identified in NBIC Part 2, 4.4.8.

4.4.3 RESPONSIBILITIES

a) Owner or User

The owner or user of the pressure-retaining item is responsible for the selection and application of a suitable fitness for service or condition assessment methodology described in this section, subject to review and approval by the Jurisdiction, if required.

b) Inspector

The Inspector shall review the condition assessment methodology and ensure inspection data and documentation are in accordance with this section.

4.4.4 REMAINING SERVICE LIFE ASSESSMENT METHODOLOGY

a) An evaluation of inservice damage using one or more condition assessment methods is not intended to provide a precise determination of the actual time to failure for a pressure-retaining item. Instead, the extent of inservice damage should be estimated based on the quality of available information,

h) Circumferential Stresses After General Corrosion. See NBIC Part 2, 4.4.9.

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

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

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

i) Longitudinal Stresses After General Corrosion. See NBIC Part 2, 4.4.9.

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

j) Local Metal Loss

Corrosion pitting shall be evaluated in accordance with NBIC Part 2, 4.4.8.7 and 4.4.9. ~~Widely scattered corrosion pits may be left in the pressure-retaining item in accordance with the following requirements:~~

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

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

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

k) Weld Joint Efficiency Factor

When the surface at a weld having a joint efficiency factor of other than one is corroded as well as surfaces remote from the weld, an independent calculation using the appropriate weld joint efficiency factor shall be made to determine if the thickness at the weld or remote from the weld governs the maximum allowable working pressure. For the purpose of this calculation, the surface at a weld includes 1 in. (25 mm) on either side of the weld, or two times the minimum thickness on either side of the weld, whichever is greater.

l) Formed Heads

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

   a. Formulas used in original construction; or

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

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

measured in situ using ultrasonic techniques;

3) Metallographic examination to determine the extent of exposure to creep damage; and

4) After removal of a material sample for creep rupture testing, a test matrix is selected to yield the most meaningful results from the sample. Test specimens are machined from the sample and tested under representative loads and temperatures (as selected in the test matrix). Creep strain vs. time and temperature vs. time to rupture data are recorded.

See also NBIC Part 2, 4.4.9.a.5.

TABLE 4.4.8.1

TEMPERATURES ABOVE WHICH CREEP BECOMES A CONSIDERATION

Carbon steel and C-1/2 Mo and ferritic stainless steels	750°F (400°C)
Low alloy steels (Cr-Mo)	850°F (455°C)
Austenitic stainless Steel	950°F (510°C)
Aluminum alloys	200°F (93°C)

4.4.8.2 EXPOSURE TO BRITTLE FRACTURE

a) Determining susceptibility to brittle fracture should be required as part of the overall assessment for evaluating remaining service life or to avoid failure of the pressure-retaining item during a pressure test. In order to carry out brittle fracture assessment, mechanical design information, materials of construction and materials properties are to be determined. This information is required for pressure-retaining components in order to identify the most limiting component material that governs brittle fracture. Design information, maintenance/operating history, and information relating to environmental exposure shall be evaluated to determine if there is a risk of brittle fracture.

b) When brittle fracture is a concern, methods to prevent this failure shall be taken. These methods could include changes to operating conditions and further engineering evaluations to be performed by a qualified engineer (metallurgical/corrosion/mechanical). Engineering evaluation methods to prevent brittle fracture shall be reviewed and accepted by the owner or user, Inspector, and Jurisdiction, as required.

See also NBIC Part 2, 4.4.9.c.1.

4.4.8.3 EVALUATING CONDITIONS THAT CAUSE BULGES/BLISTERS/LAMINATIONS

a) Blistering in pressure-retaining items can result from laminations, inclusions in the metal, or damage mechanisms that occur in service. Procedures for evaluating bulges/blisters/laminations are referenced in applicable standards (see NBIC Part 2, 1.3).

b) An engineering evaluation shall be performed to ensure continued safe operation when bulges/blisters/laminations are identified. If a bulge/blister/lamination is within the specified corrosion allowance, further assessment shall be performed to evaluate any crack-like indications in surrounding base material.

Note: Proximity of crack-like indications in welds and HAZ is important. Cracks and blisters should be evaluated separately.

See also NBIC Part 2, 4.4.9.a.3, 4.4.9.a.4, and 4.4.9.a.9.

4.4.8.4 EVALUATING CRACK-LIKE INDICATIONS IN PRESSURE-RETAINING ITEMS

a) Crack-like indications in pressure-retaining items are planar flaws characterized by length and depth with a sharp root radius. Cracks may occur within material or on the surface and may be individual or multiple in nature. In some cases, a conservative approach is to treat aligned porosity, inclusions, undercuts, and overlaps as crack-like indications. It is important that the cause of cracking be identified prior to any further determination of inspection intervals.

b) If crack-like indications are on the surface and within the specified corrosion allowance, removal by blend grinding or air arc gouging can be performed. Measurements shall be taken to ensure minimum thickness is met, and effective monitoring techniques should be established. If a crack-like flaw is not completely removed and repaired, then an engineering fracture mechanics or other evaluation must be performed to verify continued safe operation.

c) There are various methods or approaches for evaluating crack-like indications, some of which are referenced in applicable standards (see NBIC Part 2, 1.3).

See also NBIC Part 2, 4.4.9.a.3.

4.4.8.5 EVALUATING EXPOSURE OF A PRESSURE-RETAINING ITEM TO FIRE DAMAGE

a) The extreme heat of a fire can produce visual structural damage and less apparent degradation of mechanical properties (decrease in yield strength or fracture toughness). Potential damage includes changes in mechanical properties, decrease in corrosion resistance, distortion, and cracking of pressure boundary components. Distortion of equipment extremities such as ladders and platforms does not necessarily mean that the pressure equipment is no longer suitable for continued service. Process fluid inside the vessel may serve as a cooling medium, thus preserving mechanical properties of the equipment. Instrumentation and wiring are commonly damaged during a fire. Data requirements and history information should be obtained as identified in NBIC Part 2, 4.4.5.

b) Recommended measurements and collection of data for evaluation of fire damage shall include but are not limited to:

1) Concentrated areas of fire damage versus overall fire damage as it relates to normal operation;

2) Determination of cause and origin of fire;

3) Temperature extremes;

4) Nature of the fuel;

5) Source of ignition;

6) Time at temperature;

7) Cooling rate;

8) Photographs taken;

9) Plant personnel interviewed; and

10) Actual strength and toughness properties of the material.

Note: It is important that evidence be maintained in order to perform a proper evaluation.

c) Components subjected to fire damage can exhibit altered mechanical properties, and should be evaluated to determine if the material has retained necessary strength and toughness as specified in the original code of construction. Heating above the lower critical temperature results in a phase transformation that, upon rapid cooling, can dramatically affect material properties. Evaluation methods may consist of:

1) Portable hardness testing;

2) Field metallography or replication;

3) Liquid pressure testing;

4) Magnetic particle testing;

5) Liquid penetrant testing;

6) Visual examination; or

7) Dimensional verification checks.

d) If visual distortion or changes in the microstructure or mechanical properties are noted, consider replacing the component, or a detailed engineering analysis shall be performed to verify continued safe operation.

See NBIC Part 2, 4.4.9.a.7.

e) Techniques for evaluating fire damage are referenced in applicable standards. ~~See NBIC Part 2, 1.3.~~

4.4.8.6 EVALUATING EXPOSURE OF PRESSURE-RETAINING ITEMS TO CYCLIC FATIGUE

a) A fatigue evaluation should be performed if a component is subject to cyclic operation. The allowable number of cycles (mechanical or thermal) at a given level of stress should be adequate for the specified duration of service to determine suitability for continued operation.

b) Data requirements and history information should be obtained as identified in NBIC Part 2, 4.4.5.

c) Techniques for evaluating fatigue are referenced in applicable standards. See NBIC Part 2, 1.3.

See also NBIC Part 2, 4.4.9.a.10.

4.4.8.7 EVALUATING PRESSURE-RETAINING ITEMS CONTAINING LOCAL THIN AREAS

a) Local thin areas can result from corrosion/erosion, mechanical damage, or blend/grind techniques during fabrication or repair, and may occur internally or externally. Types of local thin areas are grooves, gouges, and pitting. When evaluating these types of flaws, the following should be considered:

1) Original design and current operating conditions;

2) Component is not operating in the creep range;

3) Material has sufficient toughness;

4) Not operating in cyclic service;

5) Does not contain crack-like indications;

6) Flaws are not located in knuckle regions of heads or conical transitions;

7) Applied loads; and

8) The range of temperature or pressure fluctuation.

b) Where appropriate, crack-like indications should be removed by blend/grinding, and evaluated as a local thin area.

c) Data requirements and history information should be obtained as identified in NBIC Part 2, 4.4.5.

d) Required measurements for evaluation of local thin areas shall include:

1) Thickness profiles within the local region;

2) Flaw dimensions;

3) Flaw to major structural discontinuity spacing;

4) Vessel geometry; and

5) Material properties.

e) Required measurements for evaluation of pitting corrosion shall include:

1) Depth of the pit;

2) Diameter of the pit;

3) Shape of the pit; and

4) Uniformity.

NBIC Part 2, 4.4.9.

f) Widely scattered corrosion pits may be left in the pressure-retainig item in accordance with ~~the following requirements:~~

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

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

~~3) The sum of their dimensions (depth and width) along any straight line within this 50 in.^{2} (32,000 mm^2) area does not exceed 2 in. (50 mm).~~

g) If metal loss is less than specified, corrosion/erosion allowance and adequate thickness is available for future corrosion, then monitoring techniques should be established. If metal loss is greater than specified corrosion/erosion allowance and repairs are not performed, ~~and a detailed engineering evaluation shall be performed to ensure continued safe operation.~~ see NBIC Part 2, 4.4.9.

~~h) Techniques for evaluating local thin areas and pitting are referenced in applicable standards. See NBIC Part 2, 1.3.~~

[Insert proposed new section 4.4.9 here, see next 5 pages of this markup.]

4.5 RISK-BASED INSPECTION ASSESSMENT PROGRAMS

4.5.1 SCOPE

a) This section describes the basic elements, principles, and guidelines of a risk-based inspection (RBI) program. This section does not address any one method but is intended to clarify the elements associated with a RBI program. Risk assessment is a process to evaluate continued safe operation of a pressure-containing component. This process is based on sound engineering practices, proven risk assessment experience, and management principles. There are numerous risk-based assessment methods being applied throughout many industries. Details for developing and implementing risk-based inspection programs are defined in other referenced standards.

b) Implementation of a (RBI) assessment program allows an owner or user to plan inspection frequencies based on assessing probability of failure (POF) and consequence of failure (COF) (risk = POF x COF). Risk assessment programs involve a team concept based on knowledge, training, and experience between engineers, inspectors, operators, analysts, financial, maintenance, and management personnel. Appropriate and responsible decisions must be made from input by all team members to ensure safe operation of systems and their components. Organizational commitment and cooperation is required to successfully implement and maintain a RBI program.

4.5.2 DEFINITIONS

COF — Consequence of failure. Outcome from a failure. There may be one or more outcomes from a single failure.

POF — Probability of failure. Extent to which a failure is likely to occur within a specific time frame.

4.4.9 STEEL-LOSS ACCEPTANCE CRITERIA FOR PRESSURE-RETAINING ITEMS

(a) Scope and Limitations.

This section only applies to carbon steels and stainless steels that are currently in service for the pressure-retaining walls of vessels, piping, or other pressure-retaining items, such as the alloys listed in Table 4.1 of API 579-1/ASME FFS-1, Fitness-for-Service (2021 edition unless otherwise indicated in this section), "ASME FFS-1".

The following are not covered by this section. See NBIC Part 2, 4.4.8.7 for additional background and data requirements.

1) Supports damage, including steel loss from internal or external supports. This requires a separate engineering assessment. Pay particular attention to supports welded or fastened to vessels. Consider the earthquake, wind, nozzle reaction, and other forces that may act on the pressure-retaining item in the location where it is installed. See ASCE 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, American Society of Civil Engineers (ASCE) and the free, online, ASCE 7 Hazard Tool. See also NBIC Part 2, 2.2.5.c, 2.3.3.c, 2.3.3.e.5, and the additional NBIC support-inspection requirements for specific types of pressure-retaining items.

2) Buckling. Steel loss from the pressure-retaining item's wall, particularly near supports, may cause buckling. Criteria in NBIC Part 2, 4.4.9.c.2, 4.4.9.c.7, and 4.4.9.c.8 help avoid buckling, but they assume that the manufacturer-reported required thickness (t_min) is adequate to prevent buckling under operating and environmental conditions, which may not always be the case due to earthquakes, wind, snow, people stepping on piping, and so forth. Any steel loss near supports will reduce the buckling-prevention safety margin. Finite element analysis is typically needed to reliably assess buckling risks. Buckling risks are higher for pressure vessels that are:
   A) horizontal with a length-between-supports to diameter ratio greater than 2.5 or a diameter greater than 10 ft. (3.0 m), or
   B) vertical with a height to diameter ratio greater than 3.0 or a height greater than 100 ft. (30 m).

   See NBIC Part 2, 4.4.7.2.i as well as ASME FFS-1 2D.4, Figure 4.3, and Figure 4.4.

3) Blisters, cracks, crack-like flaws, and grooves. See NBIC Part 2, 3.4.7, 3.4.8, 3.4.9, 4.4.8.3, and 4.4.8.4 as well as ASME FFS-1 Parts 5, 7, and 9. But, if the cause of the blisters, cracks, crack-like flaws, or grooves is identified and adequately resolved, this section may be used to assess steel loss after blend grinding out blisters, cracks, crack-like flaws, or grooves. See also NBIC Interpretation 98-30, Alteration Due to Grinding or Machining.

4) Weld misalignment or wall distortions. See NBIC Part 2, 2.3.3.c, 2.3.3.d, 2.3.3.e.3, 2.4.4.e, and 2.5.4.f as well as ASME FFS-1 Part 8.

5) Creep and operation above 650°F (343°C). See NBIC Part 2, 3.4.2 and 4.4.8.1 as well as ASME FFS-1 Part 10 and Table 4.1, Temperature Limit Used to Define the Creep Range.

6) Metallurgical changes, including embrittlement (loss of toughness), such as strain-age embrittlement of carbon steels operated above 300°F (149°C) and many other causes. See NBIC Part 2, 3.4.3 to 3.4.6 and ASME FFS-1 2B.4.6.

7) Fire damage. See NBIC Part 2, 3.4.8 and 4.4.8.5 as well as ASME FFS-1 Part 11.

8) Dents, gouges, and dent-gouge combinations. See the NBIC Part 2 dent and gouge requirements for specific types of pressure-retaining items as well as ASME FFS-1 Part 12. But, if the cause of the gouge is adequately resolved, such as by improving protection from mechanical damage, this section may be used to assess steel loss after blend grinding out gouges that are not in dents.

9) Laminations. See NBIC Part 2, 4.4.8.3 and ASME FFS-1 Part 13.

10) Fatigue from cyclic loading. See NBIC Part 2, 3.4.1 and 4.4.8.6 as well as ASME FFS-1 Part 14. For steel, typically, fatigue only occurs after at least 150 loading cycles, such as large pressure or temperature variations (ASME FFS-1 4.2.6.c and 5.2.5.c).

b) Notation definitions.

1) C_j means the joint clearance, the distance from the center of a joint to the edge of the zone where it affects steel-loss acceptability.
   A) For welded joints, C_j is 1 in. (25.4 mm) or t_nom, whichever is greater.
   B) For bolted or riveted joints, without flanges, C_j is the distance from the center of the joint to 6 in. (153 mm) beyond the outermost row of fasteners.
   C) For joints with flanges, the C_msd criteria apply; see NBIC Part 2, 4.4.9.c.7 and 4.4.9.c.8 below.

   These C_j definitions are based on the weld band and riveted-joint band definitions in ASME FFS-1 2C.2.5. For t_nom 5/8 in. (16 mm) or greater, the welded C_j defined here would be less conservative than NBIC Part 2, 4.4.7.2.k, 2021 edition, which used, "1 in. (25 mm) on either side of the weld, or two times the minimum thickness on either side of the weld, whichever is greater".

2) C_msd means the major-structural-discontinuity clearance, the distance from the edge of a major structural discontinuity to the edge of the zone where it affects steel-loss acceptability. C_msd is 1.8*(D*t_nom)^0.5, which means "1.8 multiplied by the square root of the product of D multiplied by t_nom". This C_msd definition is based on ASME FFS-1 Equation 5.10 (see also its Figures 4.6 and 5.5), with t_nom replacing the "corroded wall thickness, t_c" as a conservative simplification.

3) D is the inner diameter of an approximately cylindrical or spherical pressure-retaining item, at the time of inspection, increased by any allowance for post-inspection steel loss from the interior surface of its pressure-retaining wall. For a cylindrical vessel with elliptical heads, D is the inner diameter of the cylinder. For pressure-retaining items with other shapes, D and C_msd may be determined by an engineering assessment.

4) DCA is the design-corrosion allowance reported on the manufacturer's Data Report per the ASME Boiler and Pressure Vessel Code (B&PV Code), nameplate, shop drawing, or similar as-built documentation. Erosion may be treated like corrosion.

5) FCA means the future-corrosion allowance, which is the sum of any post-inspection steel-loss allowances for both the interior and exterior surfaces of the pressure-retaining item's wall, estimated during the post-inspection evaluation.

6) t_min is the required thickness, of the pressure-retaining item's wall at the steel-loss location, per its construction code or NBIC Part 2, 4.4.9(d) below. If the construction code calls for calculating more than one required thickness at the steel-loss location, such as longitudinal and circumferential, the thickest one is t_min.

7) t_m is a measured thickness, of the pressure-retaining item's wall, at the time of the inspection after any needed blend grinding to remove cracks or crack-like flaws and preferably other damage that may promote cracks or corrosion, such as blisters, gouges, grooves, or pitting. Typically, the thickness needs to be measured in more than one location; each location measured is a t_m. If a grid is used, its spacing should be not more than 1-inch (25 mm) or 2*t_nom, whichever is less (ASME FFS-1 Equation 4.2, conservatively simplified by using t_nom). See NBIC Part 2, 4.2 Nondestructive Examination Methods.

8) t_mm is the minimum-measured thickness (the lowest t_m), measured where needed to reasonably determine the minimum wall thickness, such as in pits.

9) t_nom is the nominal thickness, of the pressure-retaining item's wall (as designed prior to fabrication), or optionally a thinner minimum furnished (as built) wall thickness allowed by its construction code, considering mill undertolerance.

10) All of the above, (1) to (9), may be measured in inches (in.), millimeters (mm), or any consistent length unit.

11) - means "minus".

12) < means "is less than".

13) * means "multiplied by".

14) ^0.5 means "the square root of the items enclosed in the preceding parenthesis" in other words "raised to the 0.5 power".

c) Pressure-retaining items shall be evaluated per ASME FFS-1 latest edition, repaired per NBIC Part 3, or removed from service if any condition below is discovered.

1) t_mm < t_nom - DCA. Brittle Fracture. Promptly reassess brittle-fracture prevention after discovering any steel loss greater than the design-corrosion allowance (DCA). If no manufacturer's DCA documentation is found, assume the DCA is zero or reassess brittle-fracture prevention and t_min to estimate an acceptable corrosion allowance. If the pressure-retaining item is susceptible to brittle fracture, examine the entire steel-loss area with a method capable of detecting surface discontinuities, such as magnetic particle, dye/liquid penetrant, or angled/shear wave ultrasonic testing; see ASME FFS-1 5.3.4.3.a. The manufacturer may have relied on a wall

thickness greater than what its shop drawing reports as the "t_min" when the manufacturer determined the minimum temperature for avoiding brittle fracture, which is the nameplate Minimum Design Metal Temperature (MDMT) for ASME pressure vessels; see UCS-66, particularly Figure UCS-66.1, and UG-20(f) of the ASME B&PV Code, Section VIII, Division 1. See also NBIC Part 2, 4.4.8.2, Exposure to Brittle Fracture, and ASME FFS-1 Part 3, Assessment of Existing Equipment for Brittle Fracture.

2) t_mm < t_nom - DCA and designed by analysis. Reassess following an appropriate design method. Examples of deigned by analysis vessels and piping include:
   A) API 620 tanks -- designed to American Petroleum Institute (API), Standard 620, Design and Construction of Large, Welded, Low-Pressure Storage Tanks, any edition;
   B) Div. 2 pressure vessels -- designed to ASME B&PV Code, Section VIII, Division 2, any edition; and
   C) piping whose required thickness might be governed by supplemental loads (and not solely by internal pressure), such as piping with structural attachments, piping with nominal pipe sizes greater than 10 in. (250 mm), piping operated below -50°F (-46°C) or above 200°F (93°C), or piping built or supported in a way that does not allow for its thermal expansion and contraction or that causes unacceptable stress concentration at supports. For less conservative criteria, see ASME FFS-1 4.4.1.4, Table 4.2, and Figure 4.5.

3) t_mm - FCA < 0.1 in. (2.54 mm). Pinhole leak and measurement error, from the more conservative, vessel, criteria in ASME FFS-1 Table 4.4.

4) t_mm - FCA < 0.2*t_nom. Excessive loss from the original thickness, from ASME FFS-1 Table 4.4; also complies with ASME FFS-1 Equation 5.7.

5) t_mm - FCA < 0.5*t_min. Excessive local strain, from ASME FFS-1 Table 4.4.

6) t_m - FCA < 0.9*t_min at more than 7 sq. in. (4,500 sq. mm) within any 8 in. (200 mm) diameter circle, or if the sum of the lengths of these thinned areas along any straight line within the circle exceeds 2 in. (50 mm), or if any two of these circles is within an arc length of C_msd from each other. Local steel loss criteria based on the 2021 NBIC for ammonia and air that would pass an ASME FFS-1 Part 5 Level 1 assessment, after excluding situations failing the other criteria in NBIC Part 2, 4.4.9.c.

7) t_mm - FCA < 0.9*t_min within an arc length of C_msd from:
   A) a flange,
   B) a nozzle,
   C) a piping branch connection,
   D) a conical-transition reinforcement zone,
   E) a support that allows movement between the pressure-retaining item's wall and the support, such as typical saddle supports, or
   F) a reinforcing pad or plate for any of the above (A) to (E).

   Steel loss near components suitable for ASME FFS-1 Part 4 Level 2 analysis, including Type A and some Type B components; see ASME FFS-1 4.4.1.2.b, Table 4.2, and Figure 5.5, which includes reinforcing pads.

8) t_mm - FCA < t_min within an arc length of C_msd from:
   A) a support welded or fastened to the wall of the pressure-retaining item, or the reinforcing pad/plate for these -- such as legs, lugs/brackets, or skirts on some pressure vessels (Type C component per ASME FFS-1 Table 4.2; Figure 5.5 includes reinforcing pads),
   B) a cylinder to flat head junction (Type B Class 2 component but not suitable for Level 2 per ASME FFS-1 4.4.1.2.b),
   C) an integral tubesheet connection (Type B Class 2 component but not suitable for Level 2 per ASME FFS-1 4.4.1.2.b),
   D) a stiffening ring attached to the shell of a pressure vessel (Type C component per ASME FFS-1 Table 4.2), or
   E) a head to shell junction of a pressure vessel, except for steel loss located on the shell side of the circumferential weld between a shell and a 2-to-1 elliptical-ratio head if both the shell and the head have required thicknesses governed only by internal pressure (Type C component per ASME FFS-1 Table 4.2, except as noted).

   Steel loss near components that otherwise would require an ASME FFS-1 Part 4 Level 3 assessment.

9) t_mm - FCA < t_min within an arc length of C_j from the center of a welded joint, unless this portion of the welded joint and its heat-affected zone have been volumetrically examined via radiography or shear-wave/angled ultrasonic testing, t_min verified or recalculated based on the results, and any discovered flaws assessed per the guidance referenced in NBIC Part 2, 4.4.9.a, Scope and Limitations. See also NBIC Part 2, 4.4.9.c.1 Brittle Fracture and 4.2 Nondestructive Examination Methods. Steel loss near welded joints, based in part on ASME FFS-1 5.3.4.3.

d) t_min may be recalculated per the pressure-retaining item's construction code but with a joint efficiency, E, of 1.0, if:
   1) this t_min recalculation accounts for brittle fracture and
   2) the steel loss is greater than an arc length of
      A) C_j from the center of a joint and
      B) C_msd from the edge of a major-structural discontinuity, such as those listed in NBIC Part 2, 4.4.9.c.7 and 4.4.9.c.8 above.

   For example, if the joint efficiency is 0.85 (spot tested longitudinal welded joint in a cylindrical shell), the recalculated cylindrical-shell t_min typically would be approximately 15% lower than t_min per the ASME B&PV Code, Section VIII, Division 1. This would allow an overall general steel loss to approximately 77% of t_min, at wall locations meeting the C_j and C_msd criteria in this paragraph, if brittle-fracture prevention is also acceptable at this thickness. 77% of t_min is similar to the 75% of t_min that formerly was allowed by the 2011 to 2023 editions of NBIC Part 2, for some types of pressure vessels. This paragraph is based on ASME FFS-1 2C.2.5, 4.4.1.2.b, Table 4.2, and 5.3.4.3.

e) The remaining life and future-inspection timing shall be assessed following NBIC Part 2, 4.4.1 to 4.4.8, as applicable. ASME FFS-1 also provides guidance on assessing remaining life and inspection timing.

3) Maximum material thickness: 38 mm (1-1/2 in.).

b) Transport tanks manufactured prior to the adoption of ASME Section XII by the Competent Authority were manufactured in accordance with ASME Section VIII, Div. 1. Transport tanks manufactured to this Code were required to be stamped with the “U” Code Symbol Stamp in accordance with Section VIII, Div. 1, if the design pressure of the transport tank was 241 kPa (35 psi) (depending on material being transported) and greater. If the design pressure was less than 241 kPa (35 psi) (depending on the media being transported), the transport tank was constructed in accordance with Section VIII, Div. 1, but not stamped with the “U” Code Symbol Stamp.

c) For these transport tanks, the requirements established in NBIC Part 2, for continued service inspection, repairs, or modifications shall apply, unless specifically exempted by the DOT.

S6.9 REFERENCES TO OTHER CODES AND STANDARDS

Other existing inspection codes, standards, and practices pertaining to the continued service inspection, i.e., CFR 49, Parts 100 through 185, ASME Section XII, etc., of transport tanks can provide useful information and references relative to the inspection techniques listed in this Appendix. Additionally, supplementary guidelines for assisting in the evaluation of inspection results and findings are also available. Some acceptable requirements and guidelines are as follows:

a) American Society of Mechanical Engineers — *ASME Boiler and Pressure Vessel Code*, Section VIII, Div. 1 (*Rules for Construction of Pressure Vessels*).

b) American Society of Mechanical Engineers:

1) ASME Section V (*Nondestructive Examination*).

2) ASME Section IX (*Welding and Brazing Qualifications*).

c) Code of Federal Regulations, Title 49, Parts 100 through 185, *Transportation*.

API 579-1/ASME FFS-1, Fitness-For-Service.

d) ~~American Petroleum Institute — API 579, *Fitness for Service*.~~

e) ADR 2003, *European Agreement Concerning the International Carriage of Dangerous Goods by Road*. (Published by the UN Economic Commission for Europe, Information Service, Palais des Nations, CH-1211 Geneve, Suisse.)

f) CGA 6-4.1, *Cleaning Equipment for Oxygen Service*.

g) CGA S-1.2, *Pressure Relief Device Standard*, Part 2: *Cargo and Portable Tanks for Compressed Gases*. (Published by the Compressed Gas Association, Inc. [CGA], 4221 Walney Road, Chantilly, VA 20151.)

h) IMDG Code 2002, *International Maritime Dangerous Goods Code* (including Amendment 31-02. (Published by the International Maritime Organization [IMO], 4 Albert Embankment, London, SE1 7SR England.)

i) RID 2003, *Carriage of Dangerous Goods*. (Published by the Intergovernmental Organization for International Carriage by Rail [OTIF], Gyphenhubeliweg 30, CH-3006 Bern, Switzerland.)

j) *United Nations Recommendations on the Transport of Dangerous Goods – Modal Regulations.* (Published by the United Nations Publications, 2 UN Plaza, New York, New York 10017.)

k) SSPC Publication #91-12, *Coating and Lining Inspection Manual*. (Published by Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15212-2683.)

S7.7 FIRE DAMAGE

a) Pressure vessels in which bulging exceeds the limits of NBIC Part 2, S7.8.3 or distortion that exceeds the limits of the original code of construction (e.g., ASME Section VIII, Div. 1), shall be removed from service until repaired by a qualified repair organization or permanently removed from service.

b) Common evidence of exposure to fire is:

1) Charring or burning of the paint or other protective coat;

2) Burning or scarring of the metal;

3) Distortion; or

4) Burning or melting of the valves.

c) A pressure vessel that has been subjected to action of fire shall be removed from service until it has been properly evaluated. The general intent of this requirement is to remove from service pressure vessels which have been subject to action of fire that has changed the metallurgical structure or the strength properties of the steel. Visual examination with emphasis given to the condition of the protective coating can be used to evaluate exposure from a fire. This is normally determined by visual examination as described above with particular emphasis given to the condition of the protective coating. If there is evidence that the protective coating has been burned off any portion of the pressure vessel surface, or if the pressure vessel is burned, warped, or distorted, it is assumed that the pressure vessel has been overheated. If, however, the protective coating is only smudged, discolored, or blistered, and is found by examination to be intact underneath, the pressure vessel shall not be considered affected within the scope of this requirement. Pressure vessels that have been involved in a fire and show no distortion shall be requalified for continued service by retesting using the liquid pressure test procedure applicable at the time of original fabrication.

d) Subject to the acceptance of the Jurisdiction and the Inspector, alternate methods of pressure testing may be used.

See also NBIC Part 2, 4.4.9.a.7.

S7.8 ACCEPTANCE CRITERIA

The acceptance criteria for LPG pressure vessels is based on successfully passing inspections without showing conditions beyond the limits shown below.

S7.8.1 CRACKS

Cracks in the pressure boundary (e.g., heads, shells, welds) are unacceptable. When a crack is identified, the pressure vessel shall be removed from service until the crack is repaired by a qualified repair organization or permanently retired from service. (See NBIC Part 3, Repairs and Alterations).

See also NBIC Part 2, 4.4.9.a.3.

S7.8.2 DENTS

a) Shells

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

b) Welds

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

c) Head

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

d) When dents are identified which exceed the limits set forth in these paragraphs, the pressure vessel shall be removed from service until the dents are repaired by a qualified repair organization or permanently retired from service.

See also NBIC Part 2, 4.4.9.a.8.

S7.8.3 BULGES

a) Shells

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

b) Heads

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

2) When bulges are identified that exceed the limits set forth in these paragraphs, the pressure vessel shall be removed from service until the bulges are repaired by a qualified repair organization or permanently retired from service.

See also NBIC Part 2, 4.4.9.a.4.

S7.8.4 CUTS OR GOUGES

When a cut or a gouge exceeds 25% of the thickness of the pressure vessel, the pressure vessel shall be removed from service until it is repaired by a qualified repair organization or permanently removed from service. See also NBIC Part 2, 4.4.9.a.8.

S7.8.5 CORROSION

See NBIC Part 2, 4.4.9.

a) ~~Line and Crevice Corrosion~~

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

~~b) Isolated Pitting~~

~~1) Isolated pits may be disregarded provided that:~~

~~a. Their depth is not more than 25% the required thickness of the pressure vessel wall;~~

~~b. The total area of the pits does not exceed 7 sq. in. (4,500 sq. mm) within any 8 in. (200 mm) diameter circle; and~~

~~c. The sum of their dimensions along any straight line within this circle does not exceed 2 in. (50 mm).~~

c) ~~General Corrosion~~

~~For a corroded area of considerable size, the thickness along the most damaged area may be averaged over a length not exceeding 10 in. (250 mm). The thickness at the thinnest point shall not be less than 75% of the required wall thickness, and the average shall not be less than 90% of the required wall thickness. When general corrosion is identified that exceeds the limits set forth in this paragraph, the pressure vessel shall be removed from service until it is repaired by a qualified "R" Stamp holder or permanently removed from service unless an acceptable for service evaluation is performed in accordance with NBIC Part 2, 4.4.~~

a)

b ~~d~~) When general, localized or pitting corrosion exceeds the specified corrosion/erosion allowance, but meets the requirements of ~~b) and c~~), consideration should be given to previous inspections. Patterns of corrosion and damage that are expected to occur over the future service life should be used to determine a specific inspection plan. Repairs may be necessary to maintain a safe and satisfactory operating condition.

S7.8.6 ANHYDROUS AMMONIA SERVICE

Pressure vessels of 3000 gal. (11.4 m^3) water capacity or less used to store anhydrous ammonia, except for pressure vessels used in cargo tank vehicle service, shall not be converted to LPG service.

Cargo tank pressure vessels less than 3000 gal. (11.4 m^3) water capacity to be converted from ammonia to LPG service shall be wet-fluorescent magnetic particle tested (WFMT) on all internal surfaces (see NBIC Part 2, 2.3.6.4).

Blue coloring of the brass valves is one indication that the pressure vessel has been in anhydrous ammonia service.

S7.9 ASME LPG PRESSURE VESSELS LESS THAN 2000 GALLONS BEING REFURBISHED BY A COMMERCIAL SOURCE (21)

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

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

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

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

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

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

4) Existing or additional loads imposed on nozzles and highly stressed areas.

5) Change in pressure or temperature, and cycling.

API 579-1/ASME FFS-1

6) Compliance to product or industry standards, such as ANSI K61, ~~API 579~~, or NFPA 58.

b) Material Consideration:

1) Chemical and mechanical properties of existing material or any new material to be added or replaced to ensure it has the required strength and toughness to withstand the pressure and temperature effects of the new environment.

2) Effects of erosion or corrosion.

3) Time dependent effects on service life - creep or fatigue, or both effects combined.

c) Environment

1) Physical condition of the pressure-retaining item.

2) Overpressure protection needs.

3) Regulatory environment – Verification of compliance to new or existing jurisdictional rules or regulations.

4) Vessel cleanliness – When changing lading fluids or contents consideration should be given to cleaning or decontaminating the vessel as appropriate.

d) Operational History

1) A review of current and past operational logs or records should be made to ensure that no conditions existed where any further use would render the pressure-retaining item hazardous or otherwise unsafe.

2) Records to be obtained and reviewed would include Manufacturer's Data Reports, Repair and Alteration Forms, Inspection reports, etc.

e) Repairs and Alterations Made:

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

f) Proposed Rework

1) Any physical work to be performed to restore the material to the existing or intended state or to meet any requirements for the new operating conditions.

2) Repairs and alterations shall be performed in accordance with NBIC Part 3, *Repair and Alterations*.

3) The effects of heat applied as a result of welding or heat treatment on the material or shaped parts.

4) The method and extent of any physical or non destructive examination should be considered.

5) Any physical testing or pressure testing to be performed to determine or verify leak tightness or structural integrity of the pressure-retaining item.

6) The pressure-retaining item shall meet the code requirements for the new environment at the time of change.

b) Describe the accuracy of the model digitization either by use of convergence or to the accuracy of previous successful models.

S11.4.2.6 RESULTS

For each model the following should be presented:

a) Give temperature plots.

b) Give deformed geometry plots.

c) Give stress classification line results and comparison to code allowable.

d) Relate the results of the model to the defined allowable stresses of the original code of construction.

e) Refer to ASME Section VIII, Division 2, Part 2, 2.3.3.1 (c) (2) Documentation requirements of design-by-analysis calculations in Part 5.

S11.4.2.7 REFERENCE DOCUMENTS USED

Typical reference documents could include:

a) ASME BPVC II-D;

b) ASME BPVC Section VIII Division 1;

c) ASME BPVC Section VIII Division 2;

d) ~~ASME/API 579;~~ API 579-1/ASME FFS-1, Fitness-For-Service;

e) Drawings;

f) User Design Specification (UDS); and

g) ASCE.

EXISTING TEXT

TABLE S6.13.6
PRESSURE TEST REQUIREMENTS

Cargo Tank Specification	Test Pressure
MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306	20.7 kPa (3 psig) or design pressure, whichever is greater
MC 304 and MC 307	275.8 kPa (40 psig) or 1.5 times design pressure, whichever is greater
MC 310, MC 311, and MC 312	20.7 kPa (3 psig) or 1.5 times design pressure, whichever is greater
MC 330 and MC 331	1.5 times either MAWP or the re-rated pressure, whichever is applicable
MC 338	1.25 times either MAWP or the re-rated pressure, whichever is applicable
DOT 406	34.5 kPa (5 psig) or 1.5 times the MAWP, whichever is greater
DOT 407	275.8 kPa (40 psig) or 1.5 times the MAWP, whichever is greater
DOT 412	1.5 times the MAWP

PROPOSED TEXT

TABLE S6.13.6
PRESSURE TEST REQUIREMENTS

Transport Tank Specification	Test Pressure
MC 300, 301, 302, 303, 305, 306	The test pressure on the name plate or specification plate, 20.7 kPa (3 psig) or design pressure, whichever is greater.
MC 304, 307	The test pressure on the name plate or specification plate, 275.8 kPa (40 psig) or 1.5 times design pressure, whichever is greater.
MC 310, 311, 312	The test pressure on the name plate or specification plate, 20.7 kPa (3 psig) or 1.5 times design pressure, whichever is greater.
MC 330, 331	The test pressure on the name plate or specification plate, 1.5 times either MAWP or the re-rated pressure, whichever is applicable. DOT Transport Tanks constructed in accordance with Part UHT in Section VIII, Division I of the ASME Code shall be tested at a pressure at least twice the design pressure.
MC 338	The test pressure on the name plate or specification plate or 1.5 times the design pressure, plus static head of lading, plus 101.3 kPa (14.7 psi) if subjected to external vacuum. DOT Transport Tanks constructed in accordance with Part UHT in Section VIII, Division I of the ASME Code shall be tested at a pressure at least twice the design pressure.
DOT 406	The test pressure on the name plate or specification plate, 34.5 kPa (5 psig) or 1.5 times the MAWP, whichever is greater.
DOT 407	The test pressure on the name plate or specification plate, 275.8 kPa (40 psig) or 1.5 times the MAWP, whichever is greater.
DOT 412	The test pressure on the name plate or specification plate, 1.5 times the MAWP, whichever is greater.

Current Table in 180.407(g)(1)(iv)

ECFR CONTENT

49CFR180.407(g)(1)(iv)

Table 1 to Paragraph (g)(1)(iv)

Specification	Test pressure
MC 300, 301, 302, 303, 305, 306	The test pressure on the name plate or specification plate, 20.7 kPa (3 psig) or design pressure, whichever is greater.
MC 304, 307	The test pressure on the name plate or specification plate, 275.8 kPa (40 psig) or 1.5 times the design pressure, whichever is greater.
MC 310, 311, 312	The test pressure on the name plate or specification plate, 20.7 kPa (3 psig) or 1.5 times the design pressure, whichever is greater.
MC 330, 331	The test pressure on the name plate or specification plate, 1.5 times either the MAWP or the re-rated pressure, whichever is applicable.
MC 338	The test pressure on the name plate or specification plate, 1.25 times either the MAWP or the re-rated pressure, whichever is applicable.
DOT 406	The test pressure on the name plate or specification plate, 34.5 kPa (5 psig) or 1.5 times the MAWP, whichever is greater.
DOT 407	The test pressure on the name plate or specification plate, 275.8 kPa (40 psig) or 1.5 times the MAWP, whichever is greater.
DOT 412	The test pressure on the name plate or specification plate, or 1.5 times the MAWP, whichever is greater.

PROPOSED REVISION OR ADDITION

Item No.

A 23-27

Subject/Title

Addition of requirement for Inspector to be present for inspections.

NBIC Location

Part: Inspection; Section: 1; Paragraph: 1.5.1

Project Manager and Task Group

Source (Name/Email)

Donald Kinney / don.kinney@labor.nc.gov

Statement of Need

While it has always been standard industry practice for inspections to be performed in-person, and there are requirements for remote inspection, currently there is no language in Part 2 or RCI-1 requiring the Inspector to be present at the location of installation while performing an inspection. This requirement is implied, but not stated.

Background Information

An Inspector's state commission was recently revoked due to accepting photographs for the purpose of conducting certificate inspections, in lieu of going to the location and inspecting in-person. While the inspector clearly violated the jurisdictional and NBIC Part 2 requirements for remote inspection, it was discovered that no language actually exists to require the inspections be performed in-person.

Existing Text

Proposed Text

Visual examination is the basic method used when conducting an inservice inspection of pressure-retaining items. Except as provided for remote visual inspection, the Inspector shall be present at the location of installation and in direct contact with the pressure-retaining item during inspections. (Added to the beginning of the paragraph)

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED REVISION OR ADDITION

Item No.

A 23-37

Subject/Title

Add comment to further define responsability of the owner user

NBIC Location

Part: Inspection; Section: 1.4; Paragraph: d

Project Manager and Task Group

Source (Name/Email)

Vincent Scarcella / Vincent.Scarcella@cna.com

Statement of Need

Specificall if the inspector is going to a location where for instance H2S of some harmful pathogen is being handled, those locations have and should provide safety training and equipment needed to complete the inspection. For internals this is already touched on in 1.5.3. "Requirements of occupational safety and health regulations (i.e., federal, state, local, or other), as well as the owner-user's own program and the safety program of the Inspector's employer are applicable."

Background Information

This came up during the review for the BOT WG for NB 380

Existing Text

Proposed Text

d) Where the expsoure exists that cannot be mitigated and/or for which the inspector has not been trained, the owner user shall provide training and safety equipment neccesary to complete the inspection.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED INTERPRETATION

Item No.

23-11

Subject/Title

Correcting duplicate nameplate that is not affixed to directly the vessel

Project Manager and Task Group

Source (Name/Email)

Adam Renaldo / adam_renaldo@praxair.com

Statement of Need

Part 3 seems to contain no method for correcting errors on a name plate. Section 5 is not clear on what requirements apply to a duplicate name plate when the actual name plate is still affixed to the vessel and hidden under insulation. Since the duplicate name plate is not the actual name plate, and is not affixed directly to the ASME pressure vessel, an R stamp holder should not be required to correct or replace a duplicate name plate. If a duplicate name plate were welded directly to the vessel, one could argue that Part 3 applies since interaction with the vessel could be required.

Background Information

During inspection, a vessel was found with a duplicate ASME name plate that incorrectly indicated the MDMT. A check of the U-1A form, and communication with the manufacturer, confirmed that the duplicate name plate had a typo that requires correction. The actual ASME name plate is welded directly to the vessel and hidden under insulation. The duplicate is welded to a support leg.

Proposed Question

(1) Does the correction or replacement of a duplicate ASME name plate with a typographical error fall under the scope per Section 5.1 when the duplicate name plate is not affixed directly to the pressure vessel? (2) Does the NBIC contain any procedures for correcting a typographical error on a duplicate ASME nameplate that is affixed to a structural support or non-pressure-retaining part of the ASME pressure vessel? (3) Do the requirements of Section 5.11 apply to the correction or replacement of an inaccurate duplicate ASME nameplate that is affixed to a structural support or non-pressure-retaining part of the ASME pressure vessel? (4) Do the requirements of Section 5.11 apply to the correction or replacement of an inaccurate ASME name plate or duplicate name plate that is affixed directly to the pressure vessel?

Proposed Reply

(1) No (2) No. If a duplicate name plate is not affixed directly to the pressure vessel, corrections of typographical errors on the duplicate name plate fall outside the scope of Part 3 and are left to the discretion of the owner working in conjunction with the manufacturer. (3) No (4) Yes

Committee's Question 1

Committee's Reply 1

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED INTERPRETATION

Item No.

23-10

Subject/Title

Seamless Head Flush Patch - Repair vs Alteration

Project Manager and Task Group

Source (Name/Email)

Terrence Hellman / thellman@nationalboard.org

Statement of Need

Is the use of a flush patch on the center portion of a seamless head of an ASME Sect. VIII Div. 1 vessel considered a repair or alteration per the 2011 NBIC?

Background Information

A seamless bottom head of a vertical ASME Sect. VIII Div. 1 vessel is corroded and needs to be repaired per the 2011 NBIC. The “R” Certificate Holder will use a full penetration flush patch to replace the center corroded area of the head (in lieu of replacing the entire head). As a result of the flush patch, there is now a weld seam in a previously “seamless” head. Since welding will be performed on the head, the required thickness may be affected because the possible reduction in joint efficiency due to the new seam on the patch, and the strength and composition of the weld metal. Consequently, the repair organization has the responsibility to consider all design aspects. Per the 2011 NBIC, 3.4.3, Examples of Alterations: h) Replacement of a pressure-retaining part in a pressure-retaining item with a material of different allowable stress or nominal composition from that used in the original design;

Proposed Question

Question 1 When replacing any part of a seamless head with a full penetration flush patch, is the repair organization responsible for any changes in design? Question 2 Is the use of a flush patch on a seamless head an Alteration?

Proposed Reply

Reply 1 Yes. Reply 2 Yes.

Committee's Question 1
When replacing any part of a pressure retaining item, in an ASME Section VIII Div. 1 pressure vessel with a full penetration flush patch, is the repair organization responsible for any changes in design?

Committee's Reply 1

Yes

Rationale

Committee's Question 2

Is the installation of a full penetration flush patch in an ASME Section VIII Div. 1 pressure vessel considered an Alteration?

Committee's Reply 2

No, provided the original design requirements are satisfied.

Rationale

PROPOSED INTERPRETATION

Item No.

23-15

Subject/Title

Routine Repairs

Project Manager and Task Group

Source (Name/Email)

Mark Kincs / mark.r.kincs@xcelenergy.com

Statement of Need

As written, Paragraph 3.3.2 implies that routine repairs require repair or replacement with "like material"...as in 3.3.3 r). This is supported by Interpretation 01-19. Allowing "material upgrades"...as in 3.3.3 s)...will reduce costs and labor associated with the growing number of repairs requiring in-process inspection and stamping due solely to material availability.

Background Information

Oftentimes, original materials of construction are no longer available or cost-prohibitive to obtain. Replacement of pressure-retaining components with those of different nominal composition is commonplace. The required in-process Inspector involvement and stamping of these common repairs is believed unnecessary.

Proposed Question

May repair or replacement of tubes, pipes, butt-welded fittings, or nonload bearing attachments with a code-acceptable material having a nominal composition and strength equivalent to or greater than the original material with equal-or-greater material thickness, that is suitable for the intended service, be considered a routine repair if the requirements of NBIC Part 3, 3.3.2 and the categories of 3.3.2 e) are met?

Proposed Reply

Yes, with concurrence of the Inspector and Jurisdiction, as applicable.

Committee's Question 1

1: May the replacement or repair of a pressure-retaining item using code-acceptable material suitable for the intended service, that has a different nominal composition, strength and thickness equivalent to or greater than the original material, be considered a routine repair if it meets the requirements of NBIC Part 3, 3.3.2 and one or more of the categories listed in 3.3.2 e)?

Committee's Reply 1

1: Yes

Rationale

2021 NBIC Part 3, 3.3.3, r) and 3.3.3, s), Interpretation 21-08.

Committee's Question 2

Committee's Reply 2

Rationale

PROPOSED INTERPRETATION

Item No.

23-20

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject/Title

Boiler tube plug installation time consideration

Project Manager and Task Group

Source (Name/Email)

David Starr / dave.starr@starrcompanies.com

Statement of Need

No specific guidance is provided within the code in regard to the length of time a boiler tube plug can be left in place. Agreement by owner, inspector, and when required, Jurisdiction is ambiguous.

Background Information

Currently owners, inspectors, repair companies and Jurisdictions are applying this rule inconsistently. Often boiler tube (s) remain plugged for the life of the boiler and in some Jurisdictions this is an acceptable practice. In other cases plugged boiler tubes are required to be removed as soon as possible. Currently inconsistency in the industry is causing confusion.

Proposed Question

May a boiler be returned to service permanently with plugged tubes if agreed upon by the owner, the inspector, and when required, the Jurisdiction?

Proposed Reply

No, a plugged tube or tubes is not considered a permanent repair.

Committee's Question 1

Does the NBIC specify the time period a boiler may be placed back in service after firetubes are plugged per NBIC Part 3, 3.3.4.9?

Committee's Reply 1

No.

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

PROPOSED INTERPRETATION

Item No.

23-47

Subject/Title

Interpretation of Alteration for dimensional change.

Project Manager and Task Group

Source (Name/Email)

Corey Mccon / cmccon@cfindustries.com

Statement of Need

Just need some clarification as we have gotten conflicting responses from different parties.

Background Information

We are looking to change a vessel nozzle flange from 150# to 300# to allow us to increase the torque value to reduce flange leaks that have been occurring.

Proposed Question

Section 3.4.4 d) states an example of an alteration is a change in the dimensions or contour of a pressure retaining item. Would this include a change a flange OD? For example if you are changing a nozzle flange from a 150# flange to a 300# flange would that fall under this section due to the added flange thickness and OD, even though the ID is remaining the same.

Proposed Reply

Yes.

Committee's Question 1

Committee's Reply 1

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

PROPOSED INTERPRETATION

Item No.

23-48

Subject/Title

Plugging of tube hole without welding.

Project Manager and Task Group

Source (Name/Email)

Djoni Pratomo / djoni_pratomo@yahoo.com

Statement of Need

Paragraph 3.3.3.f of NBIC Part 3 describes only when welding is involved.

Background Information

This question is different from Interpretation No 21-17, Question No 2, where the tube was removed and can not be considered as Routine Repair.

Proposed Question

An Air Cooled Heat Exchanger where the tube was expanded to the tube sheet needs to be repaired due to a tube leak. The repair will be done by plugging without removing the tube from the tube sheet. Is this considered as Routine Repair?

Proposed Reply

Yes.

Committee's Question 1

Committee's Reply 1

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

S3.3 ROUTINE REPAIRS

a) The following repairs shall be considered routine, and shall comply with NBIC Part 3, 3.3.2.

1) Machining — routine repair shall not include the machining of pressure-retaining parts with the exception of minor machining for cleaning and joint preparation not to exceed 1/32 in. (0.8 mm) of material thickness.

2) Repair of Gasket Surfaces

a. ~~—~~ R~~r~~e-machining of gasket surfaces, re-serrating, or flattening is permitted if the design thickness is maintained.

b. Gasket surface damage repair by cement only is permitted, provided that the damaged area is no deeper than 3/16 in. (5 mm).

m) The scope of the work completed shall be described and reported on ~~a~~ Form R-1. When the work is performed in accordance with S3.5.4 f), the “R” Certificate Holder shall note on Form R-1 in “Remarks”: “Repaired in accordance with NBIC Part 3, S3.5.4 f).”

S3.2 Repairs

k) Blind cracks and delaminations ~~may~~ shall not be repaired by cement injection only.

l) Cracks and porosity in tubes ~~may~~ shall not be repaired. Cracked and porous sections may be removed so that the remainder of the tube may be used. Individual tube sections shall not be less than 24 in. (610 mm) in length, and the number of segments in a tube shall not exceed the quantity listed in NBIC Part 3, Table S3.2.

~~r)~~m) Cracks and porosity in graphite plates used in plate and frame exchangers shall not be repaired.

S3.3 Routine Repairs

a)

8) Replacing graphite plate(s) with new plate(s) in a plate and frame exchanger. Only certified materials shall be used for this repair.

S3.3 ROUTINE REPAIRS

a) The following repairs shall be considered routine, and shall comply with NBIC Part 3, 3.3.2.

1) Machining — routine repair shall not include the machining of pressure-retaining parts with the exception of minor machining for cleaning and joint preparation not to exceed 1/32 in. (0.8 mm) of material thickness.

2) Repair of Gasket Surfaces — re-machining of gasket surfaces, re-serrating, or flattening is permitted if the design thickness is maintained.

3) Replacing Individual Tubes — drilling out and replacing tubes with new tubes or repaired tubes. Only certified materials shall be used for this repair.

4) Nozzle Replacement — replacement of nozzles by removing the old nozzle and cementing a new nozzle in place. This is applicable for nozzles with inside diameters not exceeding 6 inches (152 mm).

5) Plugging Tubes — plugging individual tubes using accepted procedures.

6) Surface Repair — surface repair by installation of ~~plugs or~~ inlay material shall not exceed 64~~1~~ $in.^3$ (1049~~16~~ cm^3) in total or ten percent of the total volume of the part, whichever is less. Surface repair does not include plug stitching.

7) Replacement or Addition of Non-Load Bearing Attachments to Pressure-Retaining Item — For attachment of non-load bearing attachments to pressure-retaining items, the cementing procedure specification need only be qualified for the pressure part and cement to be used.

Item 21-45 Review and Comment for the general "Scope" of the proposed supplement "Engineered Repairs and Alterations"

Note: Each Repair and Alteration activity that will be added to this supplement (such as fillet welded patches, FEA, Encapsulation, etc…) will have its own detailed Scope.

SUPPLEMENT XX – ENGINEERED REPAIRS AND ALTERATIONS

SXX.1 SCOPE

a) This supplement provides general and specific requirements for engineered repairs and alterations to pressure retaining items. These requirements shall be considered as supplemental requirements to those set forth in the main Parts of the NBIC.

b) Engineered repairs and alterations contained in this supplement will require acceptance by the Inspector and when required by the Jurisdiction. Procedures and methodologies established and proven in the industry are leveraged through references to published documents. Supplemental requirements are provided as necessary.

c) Implementation of engineered repairs and alterations will typically require specific inspection procedures, material identification and/or testing, a complete characterization of damage assessment, and knowledge of process conditions, etc. The remaining life and monitoring requirements of any engineered repair or alteration should be established prior to implementation.

d) Careful consideration shall be given to repair or alteration of pressure-retaining items that have been fabricated of either creep strength enhanced ferritic steel materials or ferritic steel materials enhanced by heat treatment. The tensile and creep strength properties of these materials can be degraded by not following specific welding procedure specifications and heat treatment requirements. The user is cautioned to seek technical guidance for welding and heat treating requirements for these materials in accordance with the original code of construction.

e) A safety analysis may be necessary for certain engineered repairs and alteration activities to ensure safe operation of equipment and minimal risk to personnel.

PROPOSED REVISION OR ADDITION

Item No.

A 21-82

Subject/Title

Selection of Filler Metal used for Repairs and Alterations

NBIC Location

Part 3: Section: 2, paragraph 2.1.1(c) and Section 3; Paragraph: 3.3.3(s)

Project Manager and Task Group

Paul Davis, Subcommittee Repairs/Alterations

Source (Name/Email)

Paul Davis / paul.davis22@woodplc.com

Statement of Need

The NBIC does not address the selection of welding consumables to be used when performing repairs and alterations.

Background Information

We have had some recent questions from repair firms about using different weld metal when performing repairs of pressure retaining items. The NBIC does not directly address use of weld metal that is different than the original design. This proposal would create a new 2.1.1(c) with words taken from ASME Section I that addresses who is responsible for selecting the filler metal and how they are selected. A new paragraph 3.3.3(s) adds a new repair example that addresses adding filler metal equal to or greater in TS than the base metal with some exceptions.

Existing Text	Proposed Text
See next page	See next page for proposal.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

Revision to 2.2.1

- *add letters "a" and "b" to existing paragraphs and add new "c" paragraph which is wording from ASME Section I*

2.2.1 PROCEDURE SPECIFICATIONS

a) A procedure specification is a written document providing direction to the person applying the material joining process. Welding, brazing and fusing shall be performed in accordance with procedure specifications for welding (WPS), brazing (BPS), and fusing (FPS) qualified in accordance with the original code of construction or the construction standard or code selected. When this is not possible or practicable, the procedure specification may be qualified in accordance with ASME Section IX.

b) Welding procedures may be simultaneously qualified by more than one organization under the rules of ASME Section IX QG-106.4. The "R" Certificate Holder's written quality control program shall include requirements for addressing the rules of Section IX QG-106.4.

c) The "R" Certificate Holder is responsible for the selection of welding consumables and the welding process. Welding electrodes and filler metal shall be selected to provide deposited weld metal of chemical composition and mechanical properties compatible with the materials to be joined and the service conditions anticipated.

Revision to 3.3.3 (Examples of Repairs)

- *Insert a new paragraph (s) with the old (s) and subsequent paragraphs being re-lettered (t, u, v…). This paragraph essentially states that any filler metal with equivalent or greater tensile strength as the base metal (with noted exceptions) is considered a repair.*

r) The repair or replacement of a pressure part with a code-accepted material that has a nominal composition and strength that is equivalent to the original material and is suitable for the intended service.

s) A repair of a pressure part where, with the exception of the root pass, the nominal tensile strength of the weld metal, not considered to be corrosion resistant overlay, equals or exceeds the minimum specified tensile strength of the base metals being repaired or joined unless the original weldment was fabricated using a weld metal with a lower tensile strength of the base metals to be repaired or joined.

t) Replacement of a pressure-retaining part with a material of different nominal composition and, equal to or greater in allowable stress from that used in the original design, provided the replacement material satisfies the material and design requirements of the original code of construction under which the vessel was built. The minimum required thickness shall be at least equal to the thickness stated on the original Manufacturer's Data Report;

Item A-23-04 (Revised Proposal after hearing feedback from several people)

New proposed 2025 changes

3.3.4.6 PATCHES

a) Flush Patches

1) The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush where required by the applicable original code of construction. Examples of welded flush patches are shown in NBIC Part 3, Figure 3.3.4.6-a.

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

3) Nondestructive examination shall be performed in accordance with the requirements from NBIC Part 3, Section 4.2. As an alternative to volumetric examination, when required, for flush patches, in P-No 1, 3 and 8 materials only, progessive liquid penetrant or magnetic particle examination as described in paragraph 3.3.4.6 (a)(3)(a) may be used. This alternative NDE method is subject to the acceptance of the Inspector, owner and when required, the Jurisdiction where the pressure-retaining item is installed, provided that all other requirements of this section are met.

a) Liquid penetrant or magnetic particle examination shall be performed on each layer of the weld to be examined, including the final weld. Prior to performing PT or MT the surface of each layer of weld should be ground. The final weld may be examined with without grinding. The NDE report shall include the number of layers examined.

PROPOSED REVISION OR ADDITION

Item No.

A 23-13

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Subject/Title

New item for consistent addressing of the term for weld metal

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraph: 3.3.3(s)

Project Manager and Task Group

Source (Name/Email)

Terrence Hellman / thellman@nationalboard.org

Statement of Need

New item for addressing consistent addressing of the term for weld metal is being opened based on discussions on A21-82. Weld Metal vs Filler Metal vs Filler Material, etc.

Background Information

New item for addressing consistent addressing of the term for weld metal is being opened based on discussions on A21-82. Weld Metal vs Filler Metal vs Filler Material, etc.

Existing Text

Proposed Text

New item for addressing consistent addressing of the term for weld metal is being opened based on discussions on A21-82. P. Gilston (PM); J. Siefert (other TG members TBD)

Frank Johnson's proposal:

Weld Metal – Weld Metal is the material that has melted and re-solidified as the result of the weld operation. In cases where no filler is added (resistance, electron beam, lazer and some autogenous arc welding) The weld metal has the same composition as the parent metal.

Filler Metal – Filler metal is the metal or alloy that is added to making a welded, brazed, or soldered joint' The filler is melted or drawn into the joint during the welding process. It serves to join two pieces of metal together and fill any gaps that may be present.

Weld Filler Maternal – There are many different types of filler that can be used in welding, and the type that is used will depend on the metal being welded, the strength of the joint that is needed and the appearance of the finished weld. The welding filler material can be made of a variety of metals alloys and fluxes, to make a strong reliable joint.

S9.2 FORM R-1, REPORT OF REPAIR, NB-66

FIGURE S9.2.1
FORM R-1, PAGE 1 OF 2

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NB-66, Rev. 16, (02/04/21)

FORM R-1 REPORT OF REPAIR

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

(1) (Authorized Rep. initials)

(2) (Inspectors initials)

(3) (Form "**R**" Registration no.)

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

1. WORK PERFORMED BY: (5) (name of repair organization)

(address)

2. OWNER: (6) (name)

(address)

3. LOCATION OF INSTALLATION: (7) (name)

(address)

4. ITEM IDENTIFICATION: (8) (boiler, pressure vessel, or piping) NAME OF ORIGINAL MANUFACTURER: (9)

5. IDENTIFYING NOS: (10) (mfg. serial no.) (11) (National Board no.) (12) (jurisdiction no.) (13) (other) (14) (year built)

6. NBIC EDITION/ADDENDA: (15) (edition) (addenda)

Original Code of Construction for Item: (16) (name / section / division) (edition / addenda)

Construction Code Used for Repair Performed: (17) (name / section / division) (edition / addenda)

7. REPAIR TYPE: (18) ☐ welded ☐ graphite pressure equipment ☐ FRP pressure equipment ☐ DOT

8. DESCRIPTION OF WORK: (use Form R-4, if necessary) ☐ Form R-4, Report Supplement Sheet is attached ☐ FFSA Form (NB-403) is attached

(19)

(20) (Liquid, Pneumatic, Vacuum, Leak) Pressure Test, if applied (21) psi MAWP (22) psi

9. REPLACEMENT PARTS: (Attached are Manufacturer's Partial Data Reports or Form R-3's properly completed for the following items of this report):

(name of part, item number, data report type or Certificate of Compliance, mfg's. name and identifying stamp)

(23)

10. REMARKS: (24)

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors •1055 Crupper Avenue, Columbus, Ohio 43229-1183 Page 1 of 2

SUPPL. 9

FIGURE S9.2.2

FORM R-1, PAGE 2 OF 2

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NB-66, Rev. 16, (02/04/21)

(25) (Form "**R**" Registration no.)

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

CERTIFICATE OFCOMPLIANCE

I, (27) , certify that to the best of my knowledge and belief the statements made in this report are correct and that all material, construction, and workmanship on this Repair conforms to the *National Board Inspection Code*. National Board "**R**" *Certificate of Authorization* No. (28) Expiration date: (29)

Repair Organization: (30)

Signed: (31) (authorized representative)

Date: (32)

CERTIFICATE OF INSPECTION

I, (33) , holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency, where required, issued by the Jurisdiction of (34) and employed by (35) of (36)

have inspected the work described in this report on (37), and state that to the best of my knowledge and belief, this work complies with the applicable requirements of the *National Board Inspection Code*. By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage, or loss of any kind arising from or connected with this inspection.

Commissions: (38) (National Board and Jurisdiction no. including endorsement)

Signed: (39) (Inspector)

Date: (40)

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, Ohio 43229-1183 Page 2 of 2

TABLE S9.2

GUIDE FOR COMPLETING FORM R-1, REPORT OF REPAIR, NB-66

Reference to Circled Numbers in the Form	Description
(1)	Initials of the authorized representative of the "R" Certificate Holder.
(2)	Initials of the Inspector reviewing the "R" Certificate Holders work.
(3)	When registering a Form R-1 Report with the National Board, this line is solely designated for a unique sequential number assigned by the "R" Certificate Holder. When the “R” Form is not to be registered, indicate so by “N/A”. As described in NBIC Part 3, 5.6, a log shall be maintained identifying sequentially, any Form “R” registered with the National Board.
(4)	If applicable, document the unique purchase order, job, or tracking number assigned by the organization performing the work.
(5)	The name and address of the National Board “R” Certificate Holder performing the work as it appears on the “*Certificate of Authorization*”.
(6)	Name and address of the owner of the pressure-retaining item.
(7)	Name and address of plant or facility where the pressure-retaining item is installed.
(8)	Description of the pressure-retaining item, such as boiler or pressure vessel, or piping. Include the applicable unit identification.
(9)	Name of the original manufacturer of the pressure-retaining item. If the original manufacturer is unknown, indicate by, “unknown.”
(10)	Document the serial number of the pressure-retaining item if assigned by the original manufacturer. If there is no serial number assigned or is unknown, indicate “unknown.”
(11)	When the pressure-retaining item is registered with the National Board, document the applicable registration number. If the pressure-retaining item is installed in Canada, indicate the Canadian design registration number (CRN), and list the drawing number under “other.” If the item is not registered, indicate, “none.”
(12)	Indicate the jurisdiction number assigned to the pressure retaining item, if available.
(13)	Indicate any other unique identifying nomenclature assigned to the pressure retaining item by the owner or user.
(14)	Identify the year in which fabrication/construction of the pressure retaining item was completed.
(15)	Indicate edition and addenda of the NBIC under which this work is being performed.
(16)	Indicate the name, section, division, edition, and addenda (if applicable) of the original code of construction for the pressure-retaining item.

TABLE S9.2 CONT'D

Reference to Circled Numbers in the Form	Description
(17)	Indicate the name, section, division, edition, and addenda (if applicable) of the construction code used for the work being performed. If code cases are used, they shall be identified in the "Remarks" section.
(18)	Check the repair type performed on the pressure retaining item.
(19)	Provide a detailed summary describing the scope of work that was completed to a pressure retaining item (PRI). The information to be considered when describing the scope of work should include such items as, the nature of the repair (i.e. welding, bonding, cementing), the specific location of the work performed to the PRI, the steps taken to remove a defect or as allowed by 3.3.4.8 to remain in place, the method of repair described as listed in the examples of Part 3, Section 3 or supplemental section if applicable, and the acceptance testing and or examination method used in accordance with the NBIC. When additional space is required to describe the scope of work, a Form R-4 shall be used and attached (check box). If a FITNESS FOR SERVICE Form (NB-403) is part of the Form R-1 repair package, check box and attach the form. Information determined to be of a proprietary nature need not be included, but shall be stated on the form.
(20)	Indicate type of pressure test applied (Liquid, Pneumatic, Vacuum, Leak). If no pressure test applied, indicate "none."
(21)	Indicate test pressure applied.
(22)	Indicate maximum allowable working pressure (MAWP) for the pressure retaining item, if known.
(23)	As applicable, identify what Replacement Parts manufactured by welding or bonding were introduced as needed to complete the scope of work. Indicate part, item number, manufacturer's name, stamped identification, and data report type or Certificate of Compliance.
(24)	Indicate any additional information pertaining to the work involved (e.g., routine repairs, code cases).
(25)	When registering a Form R-1 Report with the National Board, this line is solely designated for a unique sequential number assigned by the "R" Certificate Holder. When the "R" Form is not to be registered, indicate so by "N/A". As described in NBIC Part 3, 5.6, a log shall be maintained identifying sequentially, any Form "R" registered with the National Board.
(26)	If applicable, document the unique purchase order, job, or tracking number assigned by organization performing work.
(27)	Type or print name of authorized representative of the "R" Certificate Holder attesting to accuracy of the work described.
(28)	Indicate National Board "R" *Certificate of Authorization* number.
(29)	Indicate month, day, and year that the "R" *Certificate of Authorization* expires. If an Extension of your *Certificate of Authorization* has been granted by the National Board, and during the extension period, work is performed under your *Certificate of Authorization*, you must insert "Under Extension" after the Certificate expiration date on the "R" forms.

TABLE S9.2 CONT'D

Reference to Circled Numbers in the Form	Description
(30)	Record name of "R" Certificate Holder who performed the described work, using full name as shown on the *Certificate of Authorization* or an abbreviation acceptable to the National Board.
(31)	Signature of "R" Certificate Holder authorized representative.
(32)	Enter month, day, and year repair certified.
(33)	Type or print name of Inspector.
(34)	Indicate Inspector's Jurisdiction.
(35)	Indicate Inspector's employer.
(36)	Indicate address of Inspector's employer (city and state or province).
(37)	Indicate month, day, and year of final inspection by Inspector. For routine repairs this shall be the month, day, and year the Inspector reviews the completed routine repair package.
(38)	Inspector's National Board commission number and endorsement that qualifies the Inspector to sign this report, and when required by the Jurisdiction, the applicable State or Provincial numbers.
(38)	Signature of Inspector.
(40)	Indicate month, day, and year of Inspector signature

PROPOSED REVISION OR ADDITION

Item No.

A 23-21

Subject/Title

Boiler tube plug guidelines and inclusion or watertube boilers

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraph: 3.3.4.9

Project Manager and Task Group

Source (Name/Email)

David Starr / dave.starr@starrcompanies.com

Statement 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.

Background Information

Boilers of both types require a boiler tube to be plugged on occasion whereas a more permanent option is not available. Current code seems to limit the use of plugs to firetube and fail to address watertube boilers. This change would provide guidance for both types of boilers.

Existing Text	Proposed Text
3.3.4.9 TUBE PLUGGING IN FIRETUBE BOILERS	3.3.4.9 TUBE PLUGGING IN FIRETUBE AND WATERTUBE BOILERS

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

PROPOSED REVISION OR ADDITION

Item No.

23-

Subject/Title

Welding Method 4

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraphs: 2.5.3.4 a)

Project Manager and Task Group

PM – Tom White

Source (Name/email)

Tom White/thomas.white@nrg.com

Statement of Need

Reading up on Welding Method 4 in Part 3 I found the wording ambiguous and confusing. I have proposed the following rewrite for 2.5.3.4 – a)

Background Information

The second sentence states repair welds shall not penetrate the full thickness. The next sentence contradicts that statement and permits under the certain conditions. I propose the following rewrite for clarity.

Existing Text – 2.5.3.4	**Proposed Text – 3.3.3**
When using this method, the following is required: a) This method is limited to repair welds in pressure retaining items for which the applicable rules of the original code of construction did not require notch toughness testing. The repair depth for temper bead repairs to pressure retaining items is limited to welds not penetrating though the full thickness. Full thickness temper bead weld repairs are permitted under the following conditions: 1) ASME Section VIII, Division 2 pressure vessels, where application of PWHT on in-service vessels has been demonstrated to cause harm to vessel material. 2) For tube-to-header welds in steam service. Full thickness weld repairs shall be completed per NBIC Part 3, 3.3.5 with the following requirements: 1) The full thickness repair shall be verified as being full penetration. 2) Volumetric examination of the full thickness weld shall be performed.	When using this method, the following is required: a) This method is limited to repair welds in pressure retaining items for which the applicable rules of the original code of construction did not require notch toughness testing. The repair depth for temper bead repairs to pressure retaining items shall not penetrate the full thickness except as permitted below. ~~is limited to welds not penetrating though the full thickness.~~ ~~Full thickness temper bead weld repairs are permitted under the following conditions:~~ 1) ASME Section VIII, Division 2 pressure vessels, where application of PWHT on in-service vessels has been demonstrated to be detrimental ~~cause harm~~ to the vessels material, or 2) ~~For t~~Tube-to-header welds in steam service. Full thickness weld repairs, as permitted above, shall be completed ~~per~~ in accordance with NBIC Part 3, 3.3.5 and ~~with~~ the following additional requirements: 1) The full thickness repair shall be verified as being full penetration. 2) Volumetric examination of the full thickness weld shall be performed.

Thomas White - SG R&A **2/28/2023**

When I read the current verbiage of 2.5.3.4 – a) it was not clear. I have made some editorials changes I would like to see.

Current Wording:

2.5.3.4 WELDING METHOD 4

When using this method, the following is required:

a) This method is limited to repair welds in pressure retaining items for which the applicable rules of the original code of construction did not require notch toughness testing. The repair depth for temper bead repairs to pressure retaining items is limited to welds not penetrating though the full thickness.

Full thickness temper bead weld repairs are permitted under the following conditions:

1) ASME Section VIII, Division 2 pressure vessels, where application of PWHT on in-service vessels has been demonstrated to cause harm to vessel material.

2) For tube-to-header welds in steam service.

Full thickness weld repairs shall be completed per NBIC Part 3, 3.3.5 with the following requirements:

1) The full thickness repair shall be verified as being full penetration.

2) Volumetric examination of the full thickness weld shall be performed.

Proposed Wording:

2.5.3.4 WELDING METHOD 4

When using this method, the following is required:

a) This method is limited to repair welds in pressure retaining items for which the applicable rules of the original code of construction did not require notch toughness testing. The repair depth for temper bead repairs to pressure retaining items shall not penetrate the full thickness except as permitted below: ~~is limited to welds not penetrating though the full thickness.~~

~~Full thickness temper bead weld repairs are permitted under the following conditions:~~

1) ASME Section VIII, Division 2 pressure vessels, where application of PWHT on in-service vessels has been demonstrated to be detrimental ~~cause harm~~ to the vessels material, or

2) ~~For t~~Tube-to-header welds in steam service.

Full thickness weld repairs as permitted above shall be completed ~~per~~ in accordance with NBIC Part 3, 3.3.5 and ~~with~~ the following additional requirements:

1) The full thickness repair shall be verified as being full penetration.

2) Volumetric examination of the full thickness weld shall be performed.

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

s) Exhibits

Forms referenced in the Quality System shall be included ~~and may be a~~as part of the referencing document or ~~included~~ as an exhibit or appendix. For clarity, the forms may be completed and identified as examples. Different forms may be utilized without the need for acceptance by the Inspector as long as they contain the same information as the exhibited forms.

a) One or more SWPSs from NBIC Part 3, Table 2.3 may be used as an alternative to one or more WPS documents qualified by the organization making the repair or alteration, provided the organization accepts by certification (contained therein) full responsibility for the application of the SWPS in conformance with the Requirements for Application as stated in the SWPS. When using SWPSs, all variables listed on the Standard Welding Procedure are considered essential and, therefore, the repair organization cannot deviate, modify, amend, or revise any SWPS. US Customary Units or metric units may be used for all SWPSs in NBIC Part 3, Table 2.3, but one system shall be used for application of the entire SWPS in accordance with the metric conversions contained in the SWPS. The user may issue
supplementary instructions as allowed by the SWPS. Standard Welding Procedures Specifications shall not be used in the same product joint together with the other Standard Welding Procedure Specifications or other welding procedure specifications qualified by the organization. SWPSs may be purchase at the AWS Bookstore at https://pubs.aws.org.

b) The AWS reaffirms, amends or revises SWPSs in accordance with ANSI procedures.

c) The use of previous versions of the listed SWPSs is permitted. Previous versions include Reaffirmed, Amended, or Revised SWPSs regardless of the publication date.

TABLE 2.3

SWPS DESIGNATION: ~~YEAR~~

~~B2.1-1-001: 2020~~	~~B2.1-1-201: 2019~~	~~B2.1-8-215: 2012~~	~~B2.1-1/8-229: 2013~~
~~B2.1-1-002: 2020~~	~~B2.1-1-202: 2019~~	~~B2.1-8-216: 2012~~	~~B2.1-1/8-230: 2013~~
~~B2.1-1-016: 2018~~	~~B2.1-1-203: 2019~~	~~B2.1-4-217: 2021~~	~~B2.1-1/8-231: 2015~~
~~B2.1-1-017: 2018~~	~~B2.1-1-204: 2019~~	~~B2.1-4-218: 2021~~	~~B2.1-1-232: 2020~~
~~B2.1-1-018: 2020~~	~~B2.1-1-205: 2019~~	~~B2.1-4-219: 2021~~	~~B2.1-1-233: 2020~~
~~B2.1-1-019: 2018~~	~~B2.1-1-206: 2019~~	~~B2.1-4-220: 2021~~	~~B2.1-1-234: 2020~~
~~B2.1-1-020: 2018~~	~~B2.1-1-207: 2019~~	~~B2.1-4-221: 2021~~	~~B2.1-1-235: 2020~~
~~B2.1-1-021: 2018~~	~~B2.1-1-208: 2019~~	~~B2.1-5A-222: 2022~~	
~~B2.1-1-022: 2018~~	~~B2.1-1-209: 2019~~	~~B2.1-5A-223: 2022~~	
~~B2.1-8-023: 2018~~	~~B2.1-1-210: 2012~~	~~B2.1-5A-224: 2022~~	
~~B2.1-8-024: 2012~~	~~B2.1-1-211: 2012~~	~~B2.1-5A-225: 2022~~	
~~B2.1-8-025: 2012~~	~~B2.1-8-212: 2012~~	~~B2.1-5A-226: 2022~~	
~~B2.1-1-026: 2018~~	~~B2.1-8-213: 2012~~	~~B2.1-1/8-227: 2013~~	
~~B2.1-1-027: 2018~~	~~B2.1-8-214: 2012~~	~~B2.1-1/8-228: 2013~~	

TABLE 2.3

SWPS DESIGNATION:

B2.1-1-001	B2.1-8-024	B2.1-1-207	B2.1-4-217	B2.1-1/8-227
B2.1-1-002	B2.1-8-025	B2.1-1-208	B2.1-4-218	B2.1-1/8-228
B2.1-1-016	B2.1-1-026	B2.1-1-209	B2.1-4-219	B2.1-1/8-229
B2.1-1-017	B2.1-1-027	B2.1-1-210	B2.1-4-220	B2.1-1/8-230
B2.1-1-018	B2.1-1-201	B2.1-1-211	B2.1-4-221	B2.1-1/8-231
B2.1-1-019	B2.1-1-202	B2.1-8-212	B2.1-5A-222	B2.1-1-232
B2.1-1-020	B2.1-1-203	B2.1-8-213	B2.1-5A-223	B2.1-1-233
B2.1-1-021	B2.1-1-204	B2.1-8-214	B2.1-5A-224	B2.1-1-234
B2.1-1-022	B2.1-1-205	B2.1-8-215	B2.1-5A-225	B2.1-1-235
B2.1-8-023	B2.1-1-206	B2.1-8-216	B2.1-5A-226	

2.4 AWS REFERENCE STANDARDS

The following AWS Standards have been adopted by the NBIC for use as referenced below:

a) AWS B2.1 - Specification for Welding Procedure and Performance Qualification

PROPOSED REVISION OR ADDITION

Item No.

A 23-35

Subject/Title

Definition of "nonload bearing attachment" (All Parts)

NBIC Location

Part: Repairs and Alterations; Section: 9; Paragraph: 9.1

Project Manager and Task Group

Source (Name/Email)

Donald Kinney / don.kinney@labor.nc.gov

Statement of Need

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

Background Information

A Certificate Holder replaces/repairs internal rails/supports for trays or bins that get rolled into an autoclave. These rails/supports are (typically) stitch welded along the inside of the shell. The Certificate Holder believes this is a nonload bearing attachment and performs this work as a routine repair. The attachment of internals is a loading design consideration for ASME Sect. VIII Div.1.

Existing Text	Proposed Text
	"nonload bearing attachment"- Any welded attachment that is not required to be considered a design loading by the original code of construction.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED REVISION OR ADDITION

Item No.

A 23-36

Subject/Title

Clarifying Rules for Using Alternative NDE Methods

NBIC Location

Part: Repairs and Alterations & Repairs and Alterations; Section: 4 & 4; Paragraph: 4.2 a) & 4.4 b)

Project Manager and Task Group

Source (Name/Email)

Gary Scribner / gscribner@nbbi.org

Statement of Need

It has been determined that there may be some confusion regarding allowable NDE methods for repairs and alterations. The existing language of 4.2 a) tells the reader that alternative NDE methods acceptable to the Inspector and, where required, the Jurisdiction, may be used provided the requirements of Section 4 are met. However, it is possible that a reader may not familiarize themselves with all of the requirements of Section 4 prior to proposing an alternative NDE method. This change will help clarify and reinforce the requirements for alternative NDE methods for repairs and alterations.

Background Information

This change is being proposed as a result of the U.S. Chemical Safety Bureau's investigation of the Loy Lange Box Company pressure vessel explosion.

Existing Text

4.2 NONDESTRUCTIVE EXAMINATION
a) Nondestructive examination (NDE) requirements, including technique, extent of coverage, procedures, personnel qualification, and acceptance criteria, shall be in accordance with the original code of construction, 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 nondestructive examination requirements as the original welds. Where this is not possible or practicable, alternative NDE methods acceptable to the Inspector and the Jurisdiction where the pressure-retaining item is installed, where required, may be used, provided that all other requirements of this section are met.

4.4 Examination and Test for Repairs and Alterations
a) The integrity of repairs, alterations, and replacement parts used in repairs and alterations shall be verified by examination or test;

b) Testing methods used shall be suitable for providing meaningful results to verify the integrity of the repair or alteration. Any insulation, coatings, or coverings that may inhibit or compromise a meaningful test method shall be removed, to the extent identified by the Inspector;

Proposed Text

4.2 NONDESTRUCTIVE EXAMINATION
a) Nondestructive examination (NDE) requirements, including technique, extent of coverage, procedures, personnel qualification, and acceptance criteria, shall be in accordance with the original code of construction, 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 nondestructive examination requirements as the original welds. Where this is not possible or practicable, alternative NDE methods acceptable to the Inspector and the Jurisdiction where the pressure-retaining item is installed, where required, may be used, provided that the following requirements are met:~~provided that all other requirements of this section are met.~~
1) Testing methods used shall be suitable for providing meaningful results to verify the integrity of the repair or alteration;

2) Alternative NDE methods used for repairs shall be limited to those listed in Part 3, 4.4.1; and

3) Alternative NDE methods used for alterations shall be limited to those listed in Part 3, 4.4.2.

4.4 Examination and Test for Repairs and Alterations
a) The integrity of repairs, alterations, and replacement parts used in repairs and alterations shall be verified by examination or test;

b) ~~Testing methods used shall be suitable for providing meaningful results to verify the integrity of the repair or alteration.~~ Any insulation, coatings, or coverings that may inhibit or compromise a meaningful test method shall be removed, to the extent identified by the Inspector;

PROPOSED REVISION OR ADDITION

Item No.

A 23-38

Subject/Title

Scope Clarification for Part 3

NBIC Location

Part: Repairs and Alterations; Section: 1; Paragraph: 1.1(a)

Project Manager and Task Group

Source (Name/Email)

Adam Henson / adam.henson@csb.gov

Statement of Need

The owner or user's need to return equipment to service must never compromise the operational safety of the equipment or the process by which the operational safety of the equipment is assured. There is an interpretation that supports this notion by describing subjects permitted to be considered when determining whether a repair or alteration activity is practicable.

Background Information

On April 3, 2017, an explosion occurred at the Loy-Lange Box Company in St. Louis, Missouri. The incident occurred when the bottom head of a pressure vessel called a semi-closed receiver (SCR), which was used in the company's steam generation system, catastrophically failed. The SCR was launched in the air as the result of the explosion and landed on a neighboring business. One employee of the Loy Lange Box Company and three members of the public were fatally injured. The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated this incident and learned during the investigation that the SCR was repaired by an R stamp organization in 2012 five years prior to the incident. During the repair a wasted area of the bottom head of the SCR was flush patched. The cause of the defect was determined to be oxygen pitting corrosion. Evidence gathered during the investigation suggests that the defects in the head were not fully removed during the repair activity. The R stamp organization stated during the investigation that Loy-Lange requested an "emergency repair" following the discovery of a leak from the SCR. The R stamp organization stated further that they interpreted this to mean the repair needed to be completed immediately, presumably so production could resume as normal. The full effect of the R stamp organization's understanding of an "emergency repair" and what bearing that had on the decision they made were not able to be established through the investigation. External pressure to work faster is however understood anecdotally to be determinantal to safety. Full details of the Loy-Lange Box Company Pressure Vessel Explosion are available at this link: https://www.csb.gov/loy-lange-box-company-pressure-vessel-explosion-/ INTERPRETATION 17-01 Subject: Application of Term "Practicable Edition: 2017 Question: May the desire to save time and/or expense be used solely in determining if a repair and/or alteration activity is practicable? Reply: No. The determination of "practicable" shall be based on technical consideration of the nature and scope of repair and/or alteration activities.

Existing Text	Proposed Text
This part provides requirements and guidelines that apply when performing repairs and alterations to pressure-retaining items.	This part provides requirements and guidelines that apply when performing repairs and alterations to pressure-retaining items. The financial and/or operational concerns of the owner or user associated with loss of use of equipment in need of repair or alteration shall have no bearing on the application of the requirements of this part.

PROPOSED REVISION OR ADDITION

Item No.

A 23-39

Subject/Title

Strengthening Prevention of Defect Recurrence

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraph: Paragraph 1 (3.3.1)

Project Manager and Task Group

Source (Name/Email)

Adam Henson / adam.henson@csb.gov

Statement of Need

The existing text recommends, but does not require an investigation of the cause, extent, and likelihood of recurrence of defects. The existing text also has no requirement for anyone to act to prevent the recurrence of defects. Where root and/or proximate causes of defects are known, or could be determined, someone needs to act to prevent catastrophic failure of equipment.

Background Information

On April 3, 2017, an explosion occurred at the Loy-Lange Box Company in St. Louis, Missouri. The incident occurred when the bottom head of a pressure vessel called a semi-closed receiver (SCR), which was used in the company's steam generation system, catastrophically failed. The SCR was launched in the air as the result of the explosion and landed on a neighboring business. One employee of the Loy Lange Box Company and three members of the public were fatally injured. The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated this incident and learned during the investigation that the SCR was repaired by an R stamp organization in 2012 five years prior to the incident. During the repair, a wasted area of the bottom head of the SCR was flush patched. The cause of the defect was determined to be oxygen pitting corrosion. Evidence gathered during the investigation suggests that the defects in the head were not fully removed during the repair activity. The R stamp organization stated during the investigation that Loy-Lange requested an "emergency repair" following the discovery of a leak from the SCR. The R stamp organization stated further that they interpreted this to mean the repair needed to be completed immediately, presumably so production could resume as normal. This was not the first time the SCR leaked. The vessel leaked previously in April 2004, August 2012, and November 2012. In addition to causing these leaks oxygen pitting corrosion was also discovered in other parts of Loy Lange's steam system. During the investigation, the CSB noted that no effort was made to determine the extent of the oxygen pitting corrosion in the steam generation system, including the SCR, and that Loy Lange's operating practices up to the date of the incident were such that oxygen levels within the steam generation system were not effectively managed. Had the level of oxygen within the steam generation system been effectively managed following any of the leaks repaired over the years the 2017 incident would not have happened. Full details of the Loy-Lange Box Company Pressure Vessel Explosion are available at this link:
https://www.csb.gov/loy-lange-box-company-pressure-vessel-explosion-/

Existing Text	Proposed Text
Before a repair is made to a defect in a welded joint or base metal, care should be taken to investigate its cause and to determine its extent and likelihood of recurrence.	Before a repair is made to a defect in a welded joint or base metal, an investigation to determine the cause, extent, and likelihood of recurrence of the defect shall be made by the owner or user of the pressure retaining item. This investigation shall be sufficiently thorough to determine the root cause(s) of the defect. The owner or user shall supply a statement as to how the likelihood of recurrence of the defect shall be reduced. For instance, if the cause of the defect is vehicular impact to equipment bollards may need to be installed in accordance with NBIC Part 1 Section ???, if the cause of the damage is oxygen pitting corrosion operating practices may need adjustment, etc. The time limit for implementing these measures shall be included in the owner or user's statement. This statement shall be signed by a senior member of management of the owner or user of the pressure retaining item. The R Certificate Holder shall attach the statement to the appropriate Form R and shall file the Form R with the National Board. If the cause of the defect cannot be determined through investigation the pressure retaining item should be inspected more frequently until the cause of the defect can be determined in accordance with NBIC Part 2, Section 4.4.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED REVISION OR ADDITION

Item No.

A 23-40

Subject/Title

Strengthening Requirements to Ensure Defect Removal

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraph: 4.1

Project Manager and Task Group

Source (Name/Email)

Adam Henson / adam.henson@csb.gov

Statement of Need

The existing text alludes to the potential need for nondestructive examination (NDE) to ensure complete removal of defects but does not require it. The means to ensure defects have been removed must be understood by all to ensure safety. There is an interpretation of the 2021 NBIC that compounds this issue permitting repair organizations to not follow the requirements of NBIC Part 3, 3.3.4.8 even when the characteristics of the defect cannot be fully established.

Background Information

On April 3, 2017, an explosion occurred at the Loy-Lange Box Company in St. Louis, Missouri. The incident occurred when the bottom head of a pressure vessel called a semi-closed receiver (SCR), which was used in the company's steam generation system, catastrophically failed. The SCR was launched in the air as the result of the explosion and landed on a neighboring business. One employee of the Loy Lange Box Company and three members of the public were fatally injured. The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated this incident and learned during the investigation that the SCR was repaired by an R stamp organization in 2012 five years prior to the incident. During the repair a wasted area of the bottom head of the SCR was flush patched. The cause of the defect was determined to be oxygen pitting corrosion. Evidence gathered during the investigation suggests that the defects in the head were not fully removed during the repair activity. The R stamp organization stated during the investigation that Loy-Lange requested an "emergency repair" following the discovery of a leak from the SCR. The R stamp organization stated further that they interpreted this to mean the repair needed to be completed immediately, presumably so production could resume as normal. To make the repair the R stamp organization cut the SCR shell from the bottom head, leaving the bottom head attached to the skirt. An employee who oversaw the repair stated that they observed pitting corrosion damage in the bottom head. They cut a hole in the center of the head where they believed the corrosion was isolated and applied a flush patch. They believed they removed all corrosion damage through this process. When asked what techniques they relied upon to determine the complete removal of defects the employee replied that they would have been able to see additional pitting and that with the hole cut in the head they were able to match up the patch with the existing metal to verify the thickness of the remaining metal of the head. Besides being able to see differences in the thickness of the patch and the remaining metal of the head, this employee also reported that they would have been able to feel the difference too. Another employee reported measuring the thicknesses of the two pieces with a tape measurer and verified the thickness of both pieces to be ¼ inch. The evidence the CSB gathered demonstrating the likeliness that repair did not remove all defective material from the SCR is discussed in Section 1.6 SCR Post-Failure Examination starting on page 26 of the report. Had all defective material been removed during this repair the incident may not have happened. Full details of the Loy-Lange Box Company Pressure Vessel Explosion are available at this link: https://www.csb.gov/loy-lange-box-company-pressure-vessel-explosion-/ INTERPRETATION 21-13 Subject: Repair of pressure-retaining items without complete removal of defect Edition: 2021 Question: If the characteristics of the defect cannot be fully established, would the provisions of NBIC Part 3, 3.3.4.8 be applicable? Reply: No.

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

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED REVISION OR ADDITION

Item No.

A 23-41

Subject/Title

Strengthening Requirements for Defect Removal When Patching

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraph: a)2)

Project Manager and Task Group

Source (Name/Email)

Adam Henson / adam.henson@csb.gov

Statement of Need

The existing text requires the removal of defective material until sound material is reached but provides no requirements or guidance on means to employ to ensure complete removal of defective material. The means to ensure defects have been removed must be understood by all to ensure safety. There is an interpretation of the 2021 NBIC that compounds this issue permitting repair organizations to not follow the requirements of NBIC Part 3, 3.3.4.8 even when the characteristics of the defect cannot be fully established.

Background Information

On April 3, 2017, an explosion occurred at the Loy-Lange Box Company in St. Louis, Missouri. The incident occurred when the bottom head of a pressure vessel called a semi-closed receiver (SCR), which was used in the company's steam generation system, catastrophically failed. The SCR was launched in the air as the result of the explosion and landed on a neighboring business. One employee of the Loy Lange Box Company and three members of the public were fatally injured. The U.S. Chemical Safety and Hazard Investigation Board (CSB) investigated this incident and learned during the investigation that the SCR was repaired by an R stamp organization in 2012 five years prior to the incident. During the repair a wasted area of the bottom head of the SCR was flush patched. The cause of the defect was determined to be oxygen pitting corrosion. Evidence gathered during the investigation suggests that the defects in the head were not fully removed during the repair activity. The R stamp organization stated during the investigation that Loy-Lange requested an "emergency repair" following the discovery of a leak from the SCR. The R stamp organization stated further that they interpreted this to mean the repair needed to be completed immediately, presumably so production could resume as normal. To make the repair the R stamp organization cut the SCR shell from the bottom head, leaving the bottom head attached to the skirt. An employee who oversaw the repair stated that they observed pitting corrosion damage in the bottom head. They cut a hole in the center of the head where they believed the corrosion was isolated and applied a flush patch. They believed they removed all corrosion damage through this process. When asked what techniques they relied upon to determine the complete removal of defects the employee replied that they would have been able to see additional pitting and that with the hole cut in the head they were able to match up the patch with the existing metal to verify the thickness of the remaining metal of the head. Besides being able to see differences in the thickness of the patch and the remaining metal of the head, this employee also reported that they would have been able to feel the difference too. Another employee reported measuring the thicknesses of the two pieces with a tape measurer and verified the thickness of both pieces to be ¼ inch. The evidence the CSB gathered demonstrating the likeliness that repair did not remove all defective material from the SCR is discussed in Section 1.6 SCR Post-Failure Examination starting on page 26 of the report. Had all defective material been removed during this repair the incident may not have happened. Full details of the Loy-Lange Box Company Pressure Vessel Explosion are available at this link: https://www.csb.gov/loy-lange-box-company-pressure-vessel-explosion-/ INTERPRETATION 21-13 Subject: Repair of pressure-retaining items without complete removal of defect Edition: 2021 Question: If the characteristics of the defect cannot be fully established, would the provisions of NBIC Part 3, 3.3.4.8 be applicable? Reply: No.

Existing Text	Proposed Text
Before installing a flush patch, defective material shall be removed until sound material is reached. The patch shall be formed to the proper shape or curvature. The edges shall align without overlap. In stayed areas, the weld seams should come between staybolt rows or riveted seams. Patches shall be made from a material whose composition and thickness meet the intended service. Patches may be any shape or size. If the patch is rectangular, a minimum radius of not less than three times the material thickness shall be provided at the corners. Square corners are not permitted. The completed welds shall meet the requirements of the original code of construction.	Before installing a flush patch, defective material shall be removed until sound material is reached. The soundness of the remaining material shall be verified through nondestructive testing such as ultrasonic thickness measurement testing. The patch shall be formed to the proper shape or curvature. The edges shall align without overlap. In stayed areas, the weld seams should come between staybolt rows or riveted seams. Patches shall be made from a material whose composition and thickness meet the intended service. Patches may be any shape or size. If the patch is rectangular, a minimum radius of not less than three times the material thickness shall be provided at the corners. Square corners are not permitted. The completed welds shall meet the requirements of the original code of construction.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED REVISION OR ADDITION

Item No.

A 23-49

Subject/Title

Hardness testing of existing materials

NBIC Location

Part: Repairs and Alterations; Section: 3; Paragraph: 3.2.1 a)

Project Manager and Task Group

Source (Name/Email)

Mark Kincs / mark.r.kincs@xcelenergy.com

Statement of Need

Field hardness testing of existing materials may be difficult and produce erroneous results. It is usually unnecessary for determining properties required for selection of welding procedures. Unless needed, it should not be required to be performed. The purpose of verifying existing materials in Paragraph 3.2.1 a) is not to confirm acceptability of existing design, but to determine nominal composition for welding.

Background Information

Field hardness testing is often negatively affected by such factors as material thickness, surface preparation, and vibration. Chemical analysis has a clear correlation to selection of proper welding procedures by determining nominal material composition. Hardness testing has no such clear correlation, and Paragraph 3.2.1 a) does not explain its need. If the intent is that the hardness reading be used to approximate material tensile strength for welding considerations, the need for such information is rare.

Existing Text

The materials used in making repairs or alterations shall conform insofar as possible to the original code of construction or construction standard or code selected, including the material specification requirements used for the work planned. Carbon or alloy steel having a carbon content of more than 0.35% shall not be welded unless permitted by the original code of construction. The "R" Certificate Holder is responsible for verifying identification of existing materials from original data, drawings, or pressure-retaining item records, and identification of the materials to be installed. Consideration shall be given to the condition of the existing material, especially in the weld preparation area. If the existing material cannot be verified (unknown), the "R" Certificate Holder shall perform a chemical analysis and hardness testing, as a minimum, of the unknown material to verify its weldability and strength or may elect to qualify a weld procedure. If there is a question with regard to the weldability characteristics of the material, then competent technical advice should be obtained.

Proposed Text

The materials used in making repairs or alterations shall conform insofar as possible to the original code of construction or construction standard or code selected, including the material specification requirements used for the work planned. Carbon or alloy steel having a carbon content of more than 0.35% shall not be welded unless permitted by the original code of construction. The "R" Certificate Holder is responsible for verifying identification of existing materials from original data, drawings, or pressure-retaining item records, and identification of the materials to be installed. Consideration shall be given to the condition of the existing material, especially in the weld preparation area. If the existing material cannot be verified (unknown), the "R" Certificate Holder shall, at a minimum, perform a chemical analysis of the unknown material to determine its nominal composition for welding considerations. Hardness testing of the material shall additionally be performed, if required to further discern material properties for weld procedure selection. As an alternative to material testing, the “R” Certificate Holder may elect to qualify a weld procedure using a sample of the material. Competent technical advice should be obtained when there are questions regarding material weldability based on test results. The “R” Certificate Holder shall provide information in the repair package satisfactory to the Inspector regarding material weldability and weld procedure selection.

PROPOSED REVISION OR ADDITION

Item No.

A 23-51

Subject/Title

Replace "legal" with "company" in 1.5.1 a) Title Page

NBIC Location

Part: Repairs and Alterations; Section: 1; Paragraph: 1.5.1

Project Manager and Task Group

Source (Name/Email)

Luis Ponce / lponce@nationalboard.org

Statement of Need

The National Board has not adopted the ASME policy regarding company and legal names. Per the ASME policy it is permissible to have two names on a Certificate of Authorization and the quality manual. The 2023 NBIC 1.5.1 a) "legal" term may cause confusion for certificate holders, their AIAs, and review teams.

Background Information

The ASME Guide on Legal Names is available for review.

Existing Text	**Proposed Text**
The title page shall contain the Certificate Holder's legal name, physical address, and scope of work.	The title page shall contain the Certificate Holder's company name, physical address, and scope of work.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

PROPOSED INTERPRETATION

Item No.

22-36

Subject/Title

Use of Code case 2787 in Repairs

Project Manager and Task Group

Source (Name/Email)

Alfred Donaldson / alfred.donaldson@bakerhughes.com

Statement of Need

Code Case 2787 was approved by ASME to allow a manufacturer to develop valves that will work on multimedia applications without any required adjustments. These valves may have different components and will have multiple certified capacities. As these valves are entering the marketplace, some customers are requesting that their existing valves get converted to the multimedia type valves. This request would allow the NBIC Committee to adopt the Code Case for us in the VR program in accordance with NBIC Part 4.2.2 and allow the VR holder to convert a valve to a multimedia design that has more than one certified capacity on the valve nameplate.

Background Information

This is a Part 4 issue but the system only shows Part 1 & 2

Proposed Question

Under the provisions of paragraph 4.2.2, is it permissible to apply Code Case 2787 and convert a pressure relief valve by adding more than one certified capacity on the pressure relief valve or nameplate?

Proposed Reply

Proposed Reply: Yes, provided that the “VR” Certificate Holder verifies that: 1. All of the requirements of ASME Code Case 278 are met, and 2. That all of the requirements of the NBIC concerning conversions, and specifically paragraph 4.7.3 are met.

Committee's Question 1

Committee's Reply 1

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

PROPOSED INTERPRETATION

Item No.

23-34

Subject/Title

Sealing of Nuclear Class Relief Valves

Project Manager and Task Group

Source (Name/Email)

Eben Creaser / eben.creaser@gnb.ca

Statement of Need

Provisions in NBIC Part 4 for “test only” activities do not provide direction for the periodic testing, adjustment and sealing of nuclear class valves. As the practice of involving the ANI is not described or sealing of a nuclear class valve without ANI witnessing is not explicitly prohibited the process of testing and sealing of nuclear class valves that were not repaired needs to be clarified.

Background Information

An owner user of a nuclear power plant having in-house repair program is mandated by the nuclear regulator to perform periodic set point verification and inspection of all relief valves both conventional and nuclear class. NBIC is not clear on the requirements for ANI involvement when a nuclear class valve has not been repaired but the seals were removed and the valve needs to be resealed.

Proposed Question

When an ASME nuclear class valve has been removed from service to perform a periodic set point check and for the purposes of removal radiological contamination the seals on the valve need to be removed. Is it a requirement that the ANI is present for the testing and resealing of the valve if the valve was not disassembled, repaired, or adjusted.

Proposed Reply

Yes

Committee's Question 1

Committee's Reply 1

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

ACCREDITATION PROGRAMS

The National Board administers four specific accreditation programs as shown below:

"**R**"…..Repairs and Alterations to Pressure-Retaining Items (NB-415)
"**VR**"… .....Repairs to Pressure Relief Valves and Pin Devices (NB-514)
"**NR**"… .....Repair and Replacement Activities for Nuclear Items (NB-417)
"**T/O**"… ....Testing of Pressure Relief Valves (NB-528)

The administrative requirements for the accreditation for these accreditation programs can be viewed on the National Board Website at www.nationalboard.org.

The National Board also administers accredits four specific inspection agency programs as shown below:

New Construction

National Board Acceptance of Authorized Inspection Agencies (AIA) *Accredited by the American Society of Mechanical Engineers* (ASME) (NB-360)

PART 4, SECTION 1
PRESSURE RELIEF DEVICES — GENERAL AND ADMINISTRATIVE REQUIREMENTS

1.1 SCOPE

This Part provides guidelines and requirements for the installation, in-service inspection and testing, and repairs of pressure relief devices.

1.2 CONSTRUCTION STANDARDS FOR PRESSURE RELIEF DEVICES

a) When the standard governing the original construction is the ASME Code, installation and repairs to pressure relief devices shall conform to the ASME Code section and edition most applicable to the work planned.

b) If the pressure relief device was not constructed to the ASME Code, then installation, inspection and repair shall wherever possible reference the original code of construction most applicable to the work.

c) If the pressure relief device was not constructed to any recognized construction code or standard, then installation, inspection, and repair shall reference a construction standard or specification most applicable to the work.

d) Where this is not possible or practicable, it is permissible to use other codes, standards, or specifications, including the ASME Code, provided there is concurrence of the Inspector (if applicable) and the Jurisdiction where the pressure relief device is installed.

1.3 PRESSURE RELIEF DEVICES — DEFINITIONS

Refer to Section 9, *Glossary* for definitions relating to pressure relief devices.

1.3.1 ADDITIONAL DEFINITIONS RELATING TO PRESSURE RELIEF DEVICES

Unless otherwise specified in the NBIC, the definitions relating to pressure relief devices in Section 2 of ASME PTC-25 shall apply.

1.4 ACCREDITATION

a) The National Board administers four specific accreditation

programs:

"**R**" — Repairs and Alterations to Pressure-Retaining Items

"**VR**" — Repairs to Pressure Relief Valves and Pin Devices

"**NR**" — Repair and Replacement Activities for Nuclear Items

"**T/O**" — In-service Testing Only of Pressure Relief Valves

b) Organizations performing repairs and in-service testing to pressure relief valves shall be accredited as described in this section, as appropriate for the scope of work to be performed.

c) Organizations performing repairs and in-service testing to pressure relief valves outside the scope of the NBIC may be accredited and shall meet any additional requirements of the Jurisdiction where the work is performed.

1.4.1 ACCREDITATION PROCESS

a) The National Board administers accreditation programs for authorization of organizations performing repairs and in-service testing to pressure relief valves and pin devices.

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

c) National Board procedures provide for the confidential review resulting in recommendations to issue or not issue a *Certificate of Authorization*.

d) The accreditation program provides requirements for organizations performing repairs and in-service testing to pressure relief valves and pin devices. Depending upon the expected scope of activities at the time of review, organizations may be authorized to perform repairs and in-service testing either in the shop only, field only, or shop and field. Repair and in-service testing activities shall be limited to the scope of work authorized.

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

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

3.2.3 (Also Part 2, 2.5.4) INSPECTION REQUIREMENTS FOR INSTALLATION CONDITION

a) Ensure all covers, caps, plugs, and/or lift lever wires utilized for shipping or transport are removed.

b) Inlet piping shall be inspected to ensure it meets the requirements of the original code of construction. For pressure relief valves and pin devices certified for capacity, the inlet pipe shall be checked to ensure the inlet pipe size is not smaller than the device inlet size. This requirement is not applicable for flow resistance certified pin devices

c) Discharge piping shall be inspected to ensure it meets the original code of construction. For pressure relief valves and pin devices certified for capacity, the discharge pipe shall be checked to ensure the discharge pipe size is not smaller than the device outlet size. This requirement is not applicable for flow resistance certified pin devices

d) The ~~valve~~ drain piping shall be checked to ensure the piping is open.

e) The discharge piping shall be checked to ensure it drains properly.

f) The inlet and discharge piping shall be checked to ensure they are not binding or placing excessive stress on the pressure relief valve or pin device body, which can lead to distortion of the body and leakage or malfunction.

g) The condition and adequacy of the pipe supports shall be inspected. Discharge piping should be supported independent of the device itself.

h) The ~~valve~~ discharge and discharge pipe shall be checked for possible hazards to personnel.

i) The installation shall be checked to ensure that there are no intervening isolation valves between the pressure source and the ~~valve~~ pressure relief device inlet or between the ~~valve~~ pressure relief device outlet and its point of discharge. Isolation valves may be permitted in some pressure vessel service. (See 2.5.6 e)), and Jurisdictional requirements. Isolation valves shall not be used for power boilers, heating boilers, or water heaters.

j) A change-over valve, which is used to install two pressure relief devices on a single vessel location for the purpose of switching from one device to a spare device, is not considered a block valve if it is arranged such that there is no intermediate position that will isolate both pressure relief devices

8) Rupture disks are often used to isolate pressure relief valves from services where fouling or plugging of the valve inlet occurs. This tendency should be considered in establishing the inspection frequency.

9) Since rupture disks are non-reclosing devices, a visual inspection is the only inspection that can be performed. A rupture disk that is removed from its holder shall not be reinstalled unless recommended by the manufacturer. A rupture disk contained in an assembly that can be removed from a system without releasing the force maintaining the contact between the disk and holder, such as pre-torqued, welded, soldered, and some threaded assemblies, may be suitable for reinstallation after visual inspection. The manufacturer should be consulted for specific recommendations.

10) It is recommended that all rupture disks be periodically replaced to prevent unintended failure while in service due to deterioration of the device. Rupture disks should be carefully checked for damage prior to installation and handled by the disk edges, if possible. Any damage to the surface of the ruptured disk can affect the burst pressure.

3.2.5 (Also Part 2, 2.5.7) TESTING AND OPERATIONAL INSPECTION OF PRESSURE RELIEF DEVICES

a) Pressure relief valves and pin devices shall be tested periodically to ensure that they are free to operate and will operate in accordance with the requirements of the original code of construction. Testing should include device set or opening pressure, reclosing pressure, where applicable, and seat leakage evaluation. Tolerances specified for these operating requirements in the original code of construction shall be used to deter- mine the acceptability of test results.

b) Testing may be accomplished by the owner on the unit where the valve is installed or at a qualified test facility. In many cases, testing on the unit may be impractical, especially if the service fluid is hazardous or toxic. Testing on the unit may involve the bypassing of operating controls and should only be performed by qualified individuals under carefully controlled conditions. It is recommended that a written procedure be available to conduct this testing.

1) The Inspector should ensure that calibrated equipment has been used to perform this test and the results should be documented by the owner.

2) If the testing was performed at a test facility, the record of this test should be reviewed to ensure the valve meets the requirements of the original code of construction. Valves which have been in toxic, flammable, or other hazardous services shall be carefully decontaminated before being tested. In particular, the closed bonnet of valves in these services may contain fluids that are not easily removed or neutralized. If a test cannot be safely performed, the valve shall be disassembled, cleaned, and decontaminated, repaired, and reset.

3) If a valve has been removed for testing, the inlet and outlet connections should be checked for blockage by product buildup or corrosion.

c) Valves may be tested using lift assist devices when testing at full pressure may cause damage to the valve being tested, or it is impractical to test at full pressure due to system design considerations. Lift assist devices apply an auxiliary load to the valve spindle or stem, and using the measured inlet pressure, applied load and other valve data allow the set pressure to be calculated. If a lift assist device is used to determine valve set pressure, the conditions of 4.6.3 shall be met. It should be noted that false set pressure readings may be obtained for valves which are leaking excessively or otherwise damaged.

d) If valves are not tested on the system using the system fluid, the following test mediums shall be used:

1) High pressure boiler pressure relief valves, high temperature hot-water boiler pressure relief valves, low pressure steam heating boilers: steam;

2) Hot-water heating boiler pressure relief valves: steam, air, or water;

3.2.6 (Also Part 2, 2.5.8) RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURERELIEF DEVICES

Frequency of test and inspection of pressure relief devices for pressure vessel and piping service is greatly dependent on the nature of the contents, external environment, and operation of the system, therefore only general recommendations can be given. Inspection frequency should be based on previous inspection history. If, during inspection, ~~valves~~ devices are found to be defective or damaged, intervals should be shortened until acceptable inspection results are obtained. Where test records and/or inspection history are not available, the following inspection and test frequencies are suggested:

3.2.6.1 ESTABLISHMENT OF INSPECTION AND TEST INTERVALS

Where a recommended test frequency is not listed, the ~~valve~~ pressure relief device user and Inspector must determine and agree on a suitable interval for inspection and test. Some items to be considered in making this determination are:

a) Jurisdictional requirements;

b) Records of test data and inspections from similar processes and similar devices in operation at that facility;

c) Recommendations from the device manufacturer. In particular, when the ~~valve~~ pressure relief device includes non-metallic parts such as a diaphragm or soft seat, periodic replacement of those parts may be specified;

d) Operating history of the system. Systems with frequent upsets where a ~~valve~~ pressure relief device pressure has actuated require more frequent inspection;

e) Results of visual inspection of the device and installation conditions. Signs of ~~valve~~ pressure relief device leakage, corrosion or damaged parts all indicate more frequent operational inspections;

f) ~~Installation of a valve in a system with a common discharge header. Valves~~ Pressure relief devices discharging into a common collection pipe may be affected by the discharge of other ~~valves~~ devices by the corrosion of parts in the outlet portion of the ~~valve~~ device or the buildup of products discharged from those ~~valves~~ devices;

g) Ability to coordinate with planned system shutdowns. The shutdown of a system for other maintenance or inspection activities is an ideal time for the operational inspection and test of a pressure relief device ~~valve~~;

h) Critical nature of the system. Systems that are critical to plant operation or where the effects of the discharge of fluids from the system are particularly detrimental due to fire hazard, environmental damage, or toxicity concerns all call for more frequent inspection intervals to ensure devices are operating properly; and

i) Where the effects of corrosion, blockage by system fluid, or ability of the ~~valve~~ pressure relief device to operate under given service conditions are unknown (such as in a new process or installation), a relatively short inspection interval, not to exceed one year or the first planned shutdown, whichever is shorter, shall be established. At that time the device shall be visually inspected and tested. If unacceptable test results are obtained, the inspection interval shall be reduced by 50% until suitable results are obtained.

3.2.6.2 ESTABLISHMENT OF SERVICE INTERVALS

a) The above intervals are guidelines for periodic inspection and testing. Typically, if there are no adverse findings, a pressure relief ~~valve~~ device would be placed back in service until the next inspection. Any unacceptable conditions that are found by the inspection shall be corrected immediately by repair or replacement of the device. Many users will maintain spare pressure relief devices so the process or system is not affected by excessive downtime.

PART 4, SECTION 4
PRESSURE RELIEF DEVICES — REPAIR OF PRESSURE RELIEF VALVES AND PIN DEVICES~~VALVES~~

4.1 SCOPE

This section provides requirements and guidelines that apply to repairs to pressure relief valves and pin devices.

a) Repairs may be required because of defects found during periodic inspection, testing, operation, or maintenance. Since pressure relief devices are provided for safety and the protection of personnel and property, repairs are often regulated by the Jurisdiction where the pressure relief device is installed. The Jurisdiction should be contacted for their specific requirements.

b) This section describes some of the administrative requirements for the accreditation of repair organizations. Additional administrative requirements can be found in NB-514, A*ccreditation of "VR" Repair Organizations*. Some Jurisdictions may independently administer a program of authorization for organizations to perform repairs within that Jurisdiction.

c) Requirements for repairs and alterations to pressure-retaining items and repair and replacement activities for nuclear items can be found in NBIC Part 3.

4.2 GENERAL REQUIREMENTS

a) Repair of a pressure relief valves or pin devices is considered to include the disassembly, replacement, re- machining, or cleaning of any critical part, lapping of a seat and disc, replace o-ring and seals reassembly, adjustment, testing, or any other operation that may affect the flow passage, capacity, function, or pressure-retaining integrity.

b) Conversions, changes, or adjustments (excluding those as defined in 3.2.5.2 a) or Part 2 Paragraph 2.5.7.2.a)) affecting critical parts are also considered repairs. The scope of conversions may include changes in service fluid and changes such as bellows, soft seats, and other changes that may affect Type/Model number provided such changes are recorded on the document as required for a quality system and the repair nameplate. (See 4.7.1)

c) The scope of repair activities shall not include changes in ASME Code status.

4.2.1 "VR" REPAIR

a) When a repair is being performed under the administrative requirements for National Board Accreditation, a repair shall consist of the following operations as a minimum:

   1) Complete disassembly, cleaning, and inspection of parts, repair or replacement of parts found to be defective, reassembly, testing as required by 4.6, sealing and application of a repair nameplate. When completed, the pressure relief valve's or pin device's condition and performance shall be equivalent to the standards for new valves.

   2) The administrative requirements for National Board Accreditation apply only to valves that are marked with the ASME Certification Mark and the "V", "UV", "UD" (for pin devices) "HV", or "NV" Designator or the sup- planted ASME "V", "UV", "UD"(for pin devices) "HV" or "NV" Code symbol and have been capacity certified on the applicable fluid by the National Board.

4.2.2 CONSTRUCTION STANDARDS FOR PRESSURE RELIEF DEVICES

For pressure relief devices, the applicable new construction standard to be used for reference during repairs is the ASME Code. ASME Code Cases shall be used for repairs when they were used in the original

construction of the valve. ASME Code Cases may be used when they have been accepted for use by the NBIC Committee and the Jurisdiction where the pressure-retaining item is installed.

a) For pressure relief devices, the Code Case number shall be noted on the repair document and, when required by the code case, stamped on the repair nameplate.

b) The Jurisdiction where the pressure retaining item is installed shall be consulted for any unique requirements it may have established.

4.2.3 INSTALLATION OF PRESSURE RELIEF DEVICES

Installation of a pressure relief device by mechanical methods is not considered to be a repair, as long as no changes or adjustments are made to the device. Seals installed by the device manufacturer or repair organization shall not be removed when the device is installed.

When a pressure relief device is to be installed by welding on an existing pressure retaining item, the requirements of Part 3 of the NBIC for welded repairs shall be followed.

If a pressure relief valve or pin device must be disassembled or its adjustments changed as part of the installation process, the reassembly, resetting, retesting or other such activities shall be done by a qualified organization which meets the requirements of NBIC Part 4. For a new pressure relief valve or pin device, the original ~~valve~~ manufacturer shall perform this activity as required by the original code of construction.

The installation of a non-reclosing pressure relief device or the replaceable element of a non-reclosing pressure relief device such as a rupture disk or pin is not considered to be a repair. The manufacturer's procedures and instruction shall be followed for the installation of these devices.

4.2.4 INITIAL ADJUSTMENTS TO PRESSURE RELIEF VALVES AND PIN DEVICES

The initial installation testing and adjustments of a new pressure relief valve and pin device on a boiler or pressure vessel are not considered a repair if made by the manufacturer or assembler of the valve and pin device.

4.3 MATERIALS FOR PRESSURE RELIEF VALVE AND PIN DEVICE REPAIR

The materials used in making repairs shall conform to the requirements of the original code of construction. The "VR" Certificate Holder is responsible for verifying identification of existing materials from original data, drawings, or unit records and identification of the materials to be installed.

4.3.1 REPLACEMENT PARTS FOR PRESSURE RELIEF DEVICES

a) Critical parts shall be fabricated by the pressure relief valve or pin device ~~-~~manufacturer or to the manufacturer's specifications. Critical parts are those that may affect the valve flow passage, capacity, function, or pressure-retaining integrity.

b) Critical parts not fabricated by the pressure relief valve or pin device manufacturer shall be supplied with material test certification
for the material used to fabricate the part.

c) Replacement critical parts receiving records shall be attached or be traceable to the pressure relief valve or pin device repair document (see 4.8.5.4 i)).These records shall conform to at least one of the following.

   1) Receiving records documenting the shipping origin of the part fabricated by the relief valve and pin device manufacturer (such as packing list) from the pressure relief valve and pin device ~~-~~ manufacturer or assembler of the pressure relief valve and pin device type.

   2) A document prepared by the "VR" Certificate Holder certifying that the replacement part used in the repair has the manufacturer's identification on the part or is otherwise labeled or tagged by the

manufacturer and meets the manufacturer's acceptance criteria (e.g., critical dimensions found in maintenance manual).

3) Receiving records for replacement critical parts obtained from a source other than the pressure relief valve or pin device ~~valve~~ manufacturer or assembler of the pressure relief valve or pin device ~~valve~~ type shall include a document that provides as a minimum:

   a. The part manufacturer and part designation.

   b. A certifying statement that either:

      1. The part was fabricated by the pressure relief valve and pin device ~~valve~~ manufacturer and meets the manufacturer's accep- tance criteria (e.g., critical dimensions found in maintenance manual), or

      2. The part meets the manufacturer's specifications and was fabricated from material as identified by the attached material test report.

   c. The signature of an authorized individual of the part source.

   d. The name and address of the part source for whom the authorized individual is signing.

d) Material for bolting shall meet the manufacturer's specification, but does not require material test certification if marked as required by the material specification.

4.4 WELDING FOR PRESSURE RELIEF VALVES AND PIN DEVICES

When welding is used as a repair technique during a pressure relief valve or pin device repair, the following requirements shall apply.

a) Welding shall be performed in accordance with the requirements of the original code of construction used for the pressure relief valve or pin device.

b) Cast iron and carbon or alloy steel having a carbon content of more than 0.35% shall not be welded.

c) Defects in pressure relief valve and pin device parts such as cracks, pits, or corrosion that will be repaired by welding shall be completely removed before the weld repair of the part is performed. Removal of the defect shall be verified by suitable NDE as required.

d) Consideration shall be given to the condition of the existing material, especially in the weld preparation area.

4.4.1 WELDING PROCEDURE SPECIFICATIONS

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

4.4.2 STANDARD WELDING PROCEDURE SPECIFICATIONS

A "VR" Certificate Holder may use one or more applicable Standard Welding Procedure Specifications shown in NBIC Part 3, 2.3.

4.4.3 PERFORMANCE QUALIFICATION

Welders or welding operators shall be qualified for the welding processes that are used. Such qualification shall be in accordance with the requirements of the original code of construction or Section IX of the ASME Code.

4.4.4 WELDING RECORDS

The "VR" Certificate Holder shall maintain a record of the results obtained in welding procedure qualifications, except for those qualifications for which the provisions of 4.4.2 are used, and of the results obtained in welding performance qualifications. These records shall be certified by the "VR" Certificate Holder and shall be available to the National Board.

4.4.5 WELDER'S IDENTIFICATION

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

4.4.6 WELDER'S CONTINUITY

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

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

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

4.4.7 WELD REPAIRS TO PRESSURE RELIEF VALVE AND PIN DEVICE PARTS BY AN "R" STAMP HOLDER

a) The quality system manual may include controls for the "VR" Certificate Holder to have the pressure relief valve part repaired by a National Board "R" Certificate Holder, per this section provided the following documentation is provided to the "R" Certificate Holder:

   1) Code of construction, year built;

   2) Part identification;

   3) Part material specified; and

   4) "VR" Certificate Holder's unique identifier for traceability as required by the repair inspection program.

b) Prior to performing weld repairs to pressure relief valve or pin device ~~(PRV)~~ parts, the "R" Certificate Holder shall receive repair information required by 4.4.7 a) from the "VR" Certificate Holder responsible for the pressure relief valve and pin device repair.

   1) Pressure relief valve and Pin Device ~~PRV~~ part weld repairs shall be performed under the "R" Certificate Holder's quality system; how- ever, the requirements for in-process involvement of the Inspector (see Part 3, 2.2.2) may be waived. The requirement for stamping is waived.

   2) The process of identifying and controlling repairs shall be documented in the "R" Certificate Holder's quality system.

3) Pressure relief valve and Pin Device ~~PRV~~ part repairs shall be documented on a Form R-1 with a statement under the "Remarks" section Pressure Relief Valve and Pin Device ~~"PRV~~ Part Repair." The owner's name and location of installation shall be that of the "VR" Certificate Holder. The information received from the "VR" Certificate Holder as required in 4.4.7 a) shall be noted under the "Description of Work" section.

4) Upon completion of the repair, the repaired part and completed Form R-1 shall be returned to the "VR" Certificate Holder responsible for completing the Pressure Relief Valve or Pin Device ~~PRV~~ repair.

4.5 HEAT TREATMENT

4.5.1 PREHEATING

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

4.5.2 POSTWELD HEAT TREATMENT

Postweld heat treatment shall be performed as required by the original code of construction in accordance with a written procedure. The procedure shall contain the parameters for postweld heat treatment. A time and temperature report or temperature record shall be maintained to document the work performed.

4.6 PRESSURE RELIEF VALVE AN PIN DEVICE PERFORMANCE TESTING AND TESTING EQUIPMENT

Each pressure relief valve and pin device to which the "VR" repair symbol stamp is to be applied shall be subjected to the following tests by the repair Certificate Holder.

4.6.1 TEST MEDIUM AND TESTING EQUIPMENT

Valves marked for steam service, or having special internal parts for steam service, shall be tested on steam. Valves marked for air, gas, or vapor service shall be tested with air or gas. Valves marked for liquid service shall be tested with water or other suitable liquid. ASME Code, Section IV hot-water valves, shall be tested on water, steam, or air. Pin devices shall be tested in accordance the manufacturer's specified procedures and test media.

a) Each pressure relief valve or pin device shall be tested to demonstrate the following:

1) Set pressure (as defined by the ~~valve~~ manufacturer and as listed in NB-18, *Pressure Relief Device Certifications);*

2) Response to blowdown, when required by the original code of construction;

3) Seat tightness; and

4) For pressure relief valves and pin devices designed to discharge to a closed system, the tightness of the secondary pressure zone shall be tested as required by the original code of construction.

b) The equipment used for the performance testing prescribed above shall meet the following requirements:

1) The performance testing equipment shall include a pressure vessel of adequate volume and

pressure source capacity to ensure compliance with 4.6.1 a) 1);

2) Prior to use, all performance testing equipment shall be qualified by the Certificate Holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment. This qualification may be accomplished by benchmark testing, comparisons to equipment used for verification testing as specified in the quality system, or comparisons to field performance. This qualification shall be documented. Documentation of this qualification shall be retained in accordance with Table 4.8.5.4 s). Documentation of this qualification shall include but not be limited to:

   a. Schematic of the performance test equipment;

   b. Size and pressure ranges of valves and pin devices to be tested and the test fluid to be used;

   c. Dimensions of test vessels;

   d. Accuracy of pressure measuring equipment;

   e. Size and design type of valves used to control flow; and

   f. Method of qualifying.

3) Prior to the implementation of any addition or modification to the testing equipment that would alter the contents of the document required in 4.6.1 b) 2), the Certificate Holder shall re-qualify the performance test equipment in accordance with 4.6.1 b) 2). If the equipment changed was used to satisfy the requirements of verification testing, the Certificate Holder shall notify the National Board and additional verification testing, in accordance with the quality system, may be required.

Commented [AC1]: You cannot TEST a Non-Reclosing PRD.
IS THIS GOING TO BE IN ACCORDANCE WITH ASME SEC VIII-1, UG-138(d)(4)?

Commented [CB2R1]: I hope I am not missing the point here - A non-reclosing "Buckling Pin" PRD can be manually closed and install a new pin for service or for VR testing.

Commented [CB3R1]:

4.6.2 OWNER-USER ASME CODE SECTION VIII STEAM TESTING

When ASME Code Section VIII valves are repaired by the owner for the owner's own use, valves for steam service may be tested on air for set pressure and, if possible, blowdown adjustment, provided the valve manufacturer's corrections for differential in set pressure between steam and air are applied to determine the test pressure as follows:

a) The test pressure using air as the test medium shall be the product of the Manufacturer's correction factor for the differential between steam and air multiplied by the set pressure. If a cold differential test pressure is applicable due to superimposed back pressure and/or service temperature, then the manufacturer's correction factor shall be applied to the cold differential test pressure. The test pressure shall be recorded on the valve repair document described in 4.8.5.4 i).

b) The correction factor between steam and air shall not be included in the cold differential test pressure marked on the valve repair nameplate per 4.7.2 b) 8).

4.6.3 LIFT ASSIST TESTING

a) A device may be used to apply an auxiliary lifting load on the spring of a repaired valve to establish the set pressure in lieu of the tests required in 4.6.1 a) 1) when such testing at full pressure:

   1) May cause damage to the valve being tested; or

   2) Is impractical when system design considerations preclude testing at full pressure.

b) While actual valve blowdown and valve performance characteristics cannot be verified using this testing technique, valve set pressure may be determined to an acceptable degree of accuracy if, as a mini- mum:

   1) Equipment utilized is calibrated as required in the quality system; including, but not limited to:

      a. System pressure measurement equipment;

      b. Lifting force measurement equipment; and

c. Other measuring elements required by the device manufacturer.

2) the device and test procedures that have proved to give accurate results are used and followed;

3) A static inlet pressure is applied with the test medium specified in 4.6.1; and

4) Adjustments are made in accordance with the valve manufacturer's recommendations to ensure proper lift and blowdown.

c) Prior to use, all lift assist devices shall be qualified by the Certificate Holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment used for verification testing as specified in the quality system or comparisons to field performance. This qualification shall be documented and provisions made to retain such documentation in accordance with Table 4.8.5.4 s). Documentation of this qualification shall include but not be limited to:

1) A description of the lift assist device including model number, serial number and manufacturer;

2) Size and pressure ranges of valves to be tested with the lift assist device and the test fluid to be used;

Note: Maximum set pressure is determined by available lift force and system pressure.

3) Accuracy of pressure measuring equipment; and

4) Method of qualifying.

d) After initial qualification of the device the device shall be re-qualified if:

1) Modifications or repairs to the device are made which would affect test results; or

2) The manufacturer issues a mandatory recall or modification to the device which will affect test results.

Commented [AC4]: Insert space between "and" & "manufacturer."

4.6.4 PRESSURE TEST OF PARTS

a) Parts used in repaired pressure relief valves and pin devices shall be pressure tested and documentation provided according to the following categories:

1) Replacement Parts

The "VR" Certificate Holder is responsible for documentation that the appropriate pressure test has been completed as required by the original code of construction.

2) Parts Repaired by Welding

These parts shall be subjected to a pressure test required by the original code of construction. The "VR" Certificate Holder shall be responsible for documentation of such test.

b) Parts repaired by re-machining within part specifications, lapping, or polishing do not require a pressure test.

4.7 STAMPING REQUIREMENTS FOR PRESSURE RELIEF DEVICES

4.7.1 NAMEPLATES

Proper marking and identification of tested or repaired pressure relief valves and pin devices is critical to ensuring acceptance during subsequent inspections, and also provide for traceability and identification of any changes made to the pressure relief valve and pin device. All operations that require pressure relief valve's and pin device's seals to be replaced shall be identified by a nameplate as described in 4.7.2 or 4.7.4.

(19) 4.7.2 REPAIR NAMEPLATE

When a pressure relief valve and pin device is repaired, a metal repair nameplate stamped with the information required below shall be securely attached to the valve and pin device adjacent to the original manufacturer's stamping or nameplate. If not installed directly on the pressure relief valves and pin device the nameplate shall be securely attached to the valve and pin device independent of the external adjustment seals in a manner that does not interfere with valve and pin device operation and sealed in accordance with the quality system.

a) Prior to attachment of the repair nameplate, the previous repair nameplate, if applicable, shall be removed from the repaired valve.

b) As a minimum, the information on the pressure relief valve and pin device repair nameplate (see Figure 4.7.2-a) shall include:

1) The name of the repair organization preceded by the words "repaired by";

2) The "VR" repair symbol stamp and the "VR" certificate number;

3) Unique identifier (e.g., repair serial number, shop order number, etc.);

4) Date of repair;

5) Set pressure;

6) Capacity and capacity units (if changed from original nameplate due to set pressure or service fluid change)

7) Type/Model number (if changed from original nameplate by a conversion. See 4.2); and

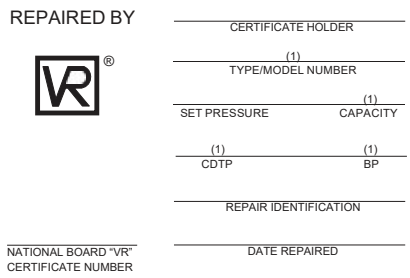
8) When an adjustment is made to correct for service conditions of superimposed back pressure and/or temperature or the differential between popping pressure between steam and air (see 4.6.2), the information on the valve repair nameplate shall include the:

a. Cold Differential Test Pressure (CDTP); and

b. Superimposed Back Pressure (BP) (only when applicable).

FIGURE 4.7.2-a

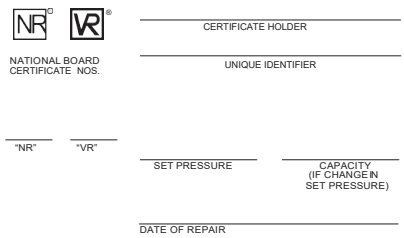
REQUIRED MARKINGS FOR REPAIR OF ASME/NATIONAL BOARD "V," "UV,", " UD" AND "HV"-STAMPED PRESSURE RELIEF VALVES **AND PIN DEVICES**



Note:. To be indicated only when changed.

FIGURE 4.7.2-b

REQUIRED MARKINGS FOR REPAIR OF NUCLEAR PRESSURE RELIEF VALVE **AND PIN DEVICE**



4.7.3 CHANGES TO ORIGINAL PRESSURE RELIEF VALVE AND PIN DEVICE NAMEPLATE INFORMATION

a) If the set pressure is changed, the set pressure, capacity, and blowdown, if applicable, on the original nameplate or stamping shall be marked out but left legible. The new capacity shall be based on that for which the pressure relief valve **or** pin device was originally certified.

b) If the service fluid is changed, the capacity, including units, on the original nameplate or stamping shall be marked out but left legible. The new capacity shall be based on that for which the pressure relief valve **or** pin device was originally certified, or if a conversion has been made, as described in 4.2 on the capacity certification for the pressure relief valve **or** pin device as converted. Similarly, the certified flow resistance for pin device shall be updated if effected by of change in service fluid.

c) If the Type/Model number is changed, the Type/Model number on the original nameplate or stamping shall be marked out but left legible.

d) If the blowdown is changed, the blowdown, if shown on the original nameplate or stamping, shall be marked out but left legible. The new blowdown may be based on the current ASME Code requirements.

e) Repair organizations shall verify the Type/Model number, inlet size, set pressure, and capacity on the original nameplate or stamping that is not marked out. Incorrect information on the original manufacturer's nameplate or stamping shall be marked out but left legible. Corrected information shall be indicated on the repair nameplate and noted on the document as required by the quality system.

4.7.4 REPLACEMENT OF ILLEGIBLE OR MISSING NAMEPLATES

The VR Certificate Holder shall not perform repairs under the VR Program on any pressure relief valve (PRV) or pin device that cannot be positively identified by the manufacturer or through in-house sources. Such identification shall include the verification of the original ASME Stamping. Pressure relief valves or Pin Devices that have missing or illegible nameplates and can be positively identified shall be equipped with a nameplate marked "DUPLICATE", which contains all original nameplate data. The duplicate nameplate shall not bear the "NB" Mark or the ASME Certification Mark with the "V", "HV", ~~or~~ "UV" or "UD" Designator or the supplanted "V", "HV", ~~or~~ "UV" or "UD" Symbol. Instead, the nameplate shall be stamped "Sec. I", "Sec. IV", or "Sec. VIII", as applicable, to indicate the original stamping. Illegible nameplates, if applicable, shall not be removed.

4.8 ACCREDITATION OF "VR" REPAIR ORGANIZATIONS

4.8.1 SCOPE

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

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

4.8.2 JURISDICTIONAL PARTICIPATION

The National Board member Jurisdiction in which the "VR" organization is located is encouraged to participate in the review and demonstration of the applicant's quality system. The Jurisdiction may require participation in the review of the repair organization and the demonstration and acceptance of the repair organization's quality system manual.

4.8.3 ISSUANCE AND RENEWAL OF THE "VR" *CERTIFICATE OF AUTHORIZATION*

4.8.3.1 GENERAL

Authorization to use the stamp bearing the official National Board "VR" symbol as shown in Figure 4.7.2-a, will be granted by the National Board pursuant to the provisions of the following administrative rules and procedures.

4.8.3.2 ISSUANCE OF CERTIFICATE

Repair organizations, manufacturers, assemblers, or users that make repairs to the ASME Code symbol stamped or marked pressure relief valves **and pin devices** and National Board capacity certified pressure relief valves **and pin devices** may apply to the National Board for a *Certificate of Authorization* to use the "VR" symbol.

4.8.4 USE OF THE "VR" *CERTIFICATE OF AUTHORIZATION*

4.8.4.1 TECHNICAL REQUIREMENTS

The administrative requirements of 4.8 for use of the "VR" stamp shall be used in conjunction with the technical requirements for valve repair as described in sections 4.1 through 4.7. Those requirements shall be mandatory when a "VR" repair is performed.

4.8.4.2 STAMP USE

Each "VR" symbol stamp shall be used only by the repair firm within the scope, limitations, and restrictions under which it was issued.

4.8.5 QUALITY SYSTEM

4.8.5.1 GENERAL

Each applicant for a new or renewed "VR" *Certificate of Authorization* shall have and maintain a quality system which shall establish that all of these rules and administrative procedures and applicable ASME Code requirements, including material control, fabrication, machining, welding, examination, setting, testing, inspection, sealing, and stamping will be met.

4.8.5.2 WRITTEN DESCRIPTION

A written description, in the English language, of the system the applicant will use shall be available for review and shall contain, as a minimum, the features set forth in 4.8.5.4. This description may be brief or voluminous, depending upon the projected scope of work, and shall be treated confidentially. In general, the quality system shall describe and explain what documents and procedures the repair firm will use to validate a valve repair.

4.8.5.3 MAINTENANCE OF CONTROLLED COPY

Each applicant to whom a "VR" *Certificate of Authorization* is issued shall maintain thereafter a controlled copy of the accepted quality system manual with the National Board. Except for changes that do not affect the quality system, revisions to the quality system manual shall not be implemented until such revisions are accepted by the National Board.

(19) 4.8.5.4 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM

The following establishes the minimum requirements of the written description of the quality system. It is required that each valve repair organization develop its own quality system that meets the requirements of its organization. For this reason it is not possible to develop one quality system that could apply to more than one organization. The written description shall include, as a minimum, the following features:

a) Title Page

The title page shall include the name and address of the company to which the National Board *Certificate of Authorization* is to be issued.

b) Revision Log

A revision log shall be included to ensure revision control of the quality system manual. The log should contain sufficient space for date, description and section of revision, company approval, and National Board acceptance.

c) Contents Page

The contents page shall list and reference, by paragraph and page number, the subjects and exhibits contained therein.

d) Statement of Authority and Responsibility

A statement of authority and responsibility shall be dated and signed by an officer of the company. It shall include:

1) A statement that the "VR" stamp shall be applied only to pressure relief valves and pin devices that meet both ofthe following conditions:

a. Are marked with the ASME Certification Mark and the "V", "UV", "HV"," UD" or "NV" Designator or the supplanted ASME "V", "UV", "HV", "UD" or "NV" Code symbol and have been capacity certified by the National Board; and

b. Have been disassembled, inspected, and repaired by the Certificate Holder such that the pressure relief valves and pin devices condition and performance are equivalent to the standards for new pressure relief valves and pin devices.

2) The title of the individual responsible to ensure that the quality system is followed and who has authority and freedom to effect the responsibility;

3) A statement that if there is a disagreement in the implementation of the written quality system, the matter is to be referred to a higher authority in the company for resolution; and

4) The title of the individual authorized to approve revisions to the written quality system and the method by which such revisions are to be submitted to the National Board for acceptance before implementation.

e) Organization Chart

A chart showing the relationship between management, purchasing, repairing, inspection, and quality control personnel shall be included and shall reflect the actual organization in place.

f) Scope of Work

1) The scope of work section shall indicate the scope and type of valve repairs, including conversions the organization is capable of and intends to perform. The location of repairs (shop, shop and field, or field only), ASME Code Section(s) to which the repairs apply, the test medium (air, gas, liquid, or

steam, or combinations thereof), and special processes (machining, welding, postweld heat treatment, or nondestructive examination, or combinations thereof) shall be specifically addressed.

2) The types and sizes of valves to be repaired, pressure ranges and other limitations, such as engineering and test facilities, should also be addressed.

g) Drawings and Specification Control

The drawings and specification control system shall provide procedures assuring that the latest applicable drawings, specifications, and instructions required are used for valve repair, including conversions, inspection, and testing.

h) Material and Part Control

The material and part control section shall describe purchasing, receiving, storage, and issuing of parts.

1) The title of the individual responsible for the purchasing of all material shall be stated.

2) The title of the individual responsible for certification and other records as required shall be stated.

3) All incoming material and parts shall be checked for conformance with the purchase order and, where applicable, the material specifications or drawings. Indicate how material or part is identified and how identity is maintained by the quality system.

i) Repair and Inspection Program

The repair and inspection program section shall include reference to a document (such as a report, traveler, or checklist) that outlines the specific repair and inspection procedures used in the repair of pressure relief valves and pin devices. Repair procedures shall require verification that the critical parts meet the pressure relief valves and pin devices manufacturer's specification. Supplement 4 outlines recommended procedures covering some specific items. This document shall be retained in accordance with Table 4.8.5.4s).

1) Each pressure relief **valves and pin devices** or group of pressure relief valves and pin devices shall be accompanied by the document referred to above for processing through the plant. Each pressure relief valves and pin devices shall have a unique identifier (i.e., repair serial number, shop order number, etc.) appearing on the repair documentation and repair nameplate such that traceability is established.

2) The document referred to above shall describe the original nameplate information, including the ASME Code symbol stamping and the repair nameplate information, if applicable. In addition, it shall include material checks, replacement parts, conversion parts (or both), reference to items such as the welding procedure specifications (WPS), fit up, NDE technique, heat treatment, and pressure test methods to be used. Application of the "VR" stamp to the repair nameplate shall be recorded in this document. Specific conversions performed with the new Type/Model number shall be recorded on the document. There shall be a space for "signoffs" at each operation to verify that each step has been properly performed.

3) The system shall include a method of controlling the repair or replacement of critical pressure relief valves and pin devices parts. The method of identifying each spring shall be indicated on the repair document describedin **4.8.5.4** i). Such identification shall be based on the Manufacturer's spring chart current at the time of the repair, except that the spring removed from the valve during the repair bearing different identification may be reinstalled provided the "VR" Certificate Holder has verified the spring is acceptable to the Manufacturer. Such verification shall be documented on the repair document described in 4.8.5.4 i).

4) The system shall also describe the controls used to ensure that any personnel engaged in the repair of pressure relief valves and pin devices are trained and qualified in accordance with this section.

j) Welding, NDE, and Heat Treatment (when applicable)

The quality system manual shall indicate the title of the person(s) responsible for and describe the system used in the selection, development, approval, and qualification of welding procedure specifications, and the qualification of welders and welding operators in accordance with the provisions of 4.4.

1) The quality system manual may include controls for the "VR" Certificate Holder to have the pressure relief valves and pin devices part repaired by a National Board "R" Certificate Holder, per 4.4.7.

2) The completed Form R-1 shall be noted on and attached to the "VR" Certificate Holder's document required in 4.8.5.4 i). Similarly, NDE and heat treatment techniques must be covered in the quality system manual. When outside services are used for NDE and heat treatment, the quality system manual shall describe the system whereby the use of such services meet the requirements of the applicable section of the ASME Code.

k) Pressure Relief valves and pin devices Testing, Setting, and Sealing

The system shall include provisions that each pressure relief valves and pin devices shall be tested, set, and all external adjustments sealed according to the requirements of the applicable ASME Code Section and the National Board. The seal shall identify the "VR" Certificate Holder making the repair. Abbreviations or initials shall be permit- ted, provided such identification is acceptable to the National Board.

l) Pressure relief valves and pin devices Repair Nameplates

An effective pressure relief valves and pin devices stamping system shall be established to ensure proper stamping of each pressure relief valves and pin devices as required by 4.7.2. The manual shall include a description of the nameplate or a drawing.

m) Calibration

1) The manual shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs. Documentation of these calibrations shall include the standard used and the results. Calibration records shall be retained in accordance with Table 4.8.5.4 s).

2) All calibration standards shall be calibrated against certified equipment having known valid relationships to nationally recognized standards.

n) Manual Control

The quality system shall include:

1) Measures to control the issuance of and revisions to the quality system manual;

2) Provisions for a review of the system in order to maintain the manual current with these rules and the applicable sections of the ASME Code;

3) The title(s) of the individual(s) responsible for control, revisions, and review of the manual;

4) Provision of a controlled copy of the written quality system manual to be submitted to the National Board; and

5) Revisions shall be submitted for acceptance by the National Board prior to being implemented.

o) Nonconformities

The system shall establish measures for the identification, documentation, evaluation, segregation, and disposition of nonconformities. A nonconformity is a condition of any material, item, product, or process in which one or more characteristics do not conform to the established requirements. These may include,

TABLE 4.8.5.4 s)

Reports, Records, or Documents for "VR" Certificate Holders	Instructions	Minimum Retention Period
Form "R" reports associated with a pressure relief valve that required welding as part of the repair	Record retention shall be in accordance with Part 3, Table 1.5.1	Refer to Part 3, Table 1.5.1
Record of repair or inspection	The repair and inspection program section shall include reference to a document (such as a report, traveler, or checklist) that outlines the specific repair and inspection procedures used in the repair of pressure relief valves and pin devices	5 years
Records related to equipment qualification and instrument calibration	Prior to use, all performance testing equipment shall be qualified by the certificate holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment. This qualification may be accomplished by benchmark testing, comparisons to equipment used for verification testing as specified in the quality system, or comparisons to field performance.	5 years after the subject piece of equipment or instrument is retired.
Record of lift assist device qualification	Prior to use, all lift assist devices shall be qualified by the certificate holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment used for verification testing as specified in the quality system or comparisons to field performance. This qualification shall be documented.	5 years after the lift assist device is retired.
Records of employee training and qualification	Each repair organization shall establish minimum qualification requirements for those positions within the organization as they directly relate to pressure relief valves and pin devices repair. Each repair organization shall document the evaluation and acceptance of an individual's qualification for the applicable position.	5 years after termination of employment.

4.8.6 FIELD REPAIR

Repair organizations may obtain a "VR" *Certificate of Authorization* for field repair, either as an extension to their in-shop/plant scope, or as a field-only scope, provided that:

a) Qualified technicians in the employ of the Certificate Holder perform such repairs;

b) An acceptable quality system covering field repairs, including field audits, is maintained; and

c) Functions affecting the quality of the repaired valves are supervised from the address of record where the "VR" certification is issued.

4.8.6.1 AUDIT REQUIREMENTS

Upon issuance of a *Certificate of Authorization*, provided field repairs are performed, annual audits of the work carried out in the field shall be performed to ensure that the requirements of the Certificate Holder's quality system are met. The audit shall include, but not be limited to performance testing in accordance with 4.6 of valve(s) that were repaired in the field. The audits shall be documented.

4.8.6.2 USE OF OWNER OR USER PERSONNEL

For the repair of pressure relief valves and pin devices at an owner or user's facility for the owner or user's own use, the "VR" Certificate Holder may utilize owner or user personnel to assist Certificate Holder technician(s) in the performance of repairs provided:

a) The use of such personnel is addressed in the "VR" Certificate Holder's quality system;

b) The owner or user personnel are trained and qualified in accordance with Supplement 3;

c) Owner or user personnel work under direct supervision and control of the "VR" Certificate Holder's technician(s) during any stage of the repair when they are utilized;

d) The "VR" Certificate Holder shall have the authority to assign and remove owner or user personnel at its own discretion; and

e) The names of the owner or user personnel utilized are recorded on the document as required for a quality system.

4.9 TRAINING AND QUALIFICATION OF PERSONNEL

4.9.1 CONTENTS OF TRAINING PROGRAM

The repair organization shall establish a documented in-house training program. This program shall establish training objectives and provide a method of evaluating training effectiveness. As a minimum, training objectives for knowledge level shall include:

a) Applicable ASME Code and NBIC requirements;

b) Responsibilities within the organization's quality system; and

c) Knowledge of the technical aspects and mechanical skills for the applicable position held.

SUPPLEMENT 4
RECOMMENDED PROCEDURES FOR REPAIRING PRESSURE RELIEF VALVES

S4.1 INTRODUCTION

a) It is essential that the repair organization establish basic, specific procedures for the repair of pressure relief valves and pin devices. The purpose of these recommended procedures is to provide the repair organization with guidelines for this important aspect of pressure relief valve and pin devices repair. It is realized that there are many types of pressure relief valves and pin devices and conditions under which they are repaired and, for this reason, the specific items in these recommended procedures may not apply, or they may be inadequate for each of those types or to the detailed repairs that may be required for each pressure relief valves and pin devices.

b) Prior to removal, repair, or disassembly of a pressure relief valve and pin device ensure that all sources of pressure have been removed.

c) S4.2 contains recommended procedures for the repair of spring-loaded pressure relief valves and pin devices and S4.3 contains recommended procedures for the repair of pilot operated types of pressure relief valves, S4.4 contains recommended procedures for the repair of pin devices. Information on packaging, shipping and transportation is included as S4.5.

S4.2 SPRING-LOADED PRESSURE RELIEF VALVES

a) Visual inspection as received

1) This information is to be recorded:

a. Record user (customer) identification number;

b. Complete original PRV nameplate data, previous repair nameplate data, plus any important information received from customer;

c. Check external adjustment seals for warranty repair;

d. Check bonnet for venting on bellows type valves; and

e. Check appearance for any unusual damage, missing, or misapplied parts.

2) If sufficient damage or other unusual conditions are detected that may pose a safety risk during preliminary testing, then proceed directly to S4.2 c).

3) Valves that are to be repaired in place proceed to S4.2 c) unless preliminary testing has been authorized by the owner.

b) Preliminary test as received

1) Information from the recommended preliminary performance test and subsequent disassembly and inspections will provide a basis for any repair interval change that should be necessary to ensure that the valve will function as intended.

2) Determine set pressure or Cold Differential Test Pressure (CDTP) in accordance with manufacturer's recommendations and appropriate ASME Code Section. Do not allow test pressure to exceed 116% of set pressure unless otherwise specified by the owner. A minimum of three tests is usually required to obtain consistent results.

3) If results do not correlate with field performance, then steps to duplicate field conditions (fluid and temperature) may be necessary.

4) Record preliminary test results and test bench identification data.

g) Nameplate

The repairer will place a repair nameplate on each repaired valve. The nameplate, as a minimum, shall meet the requirements of 4.7.1.

S4.4 Pin Devices:

Prior to removal of A pin device from a system for a repair or any disassembly, ensure that all sources of pressure have been removed from the pin device.

a) Visual inspection as received
   1. This information is to be recorded:
      a. Record user (customer) identification number.
      b. Complete original pin device nameplate data, previous repair nameplate data, plus any important information received from customer.
      c. Check tamper proof seals are intact.
      d. Check bonnet top, columns and buckling pin screw for any damage or bending. Bent columns will result in a misalignment of the upper and lower pin holders and cause valve to malfunction and shall be removed from service.
   2. Check appearance for any unusual damage, missing, or misapplied parts per manufacturers assembly drawing.
   3. If sufficient damage or other unusual conditions are detected that may pose a safety risk during preliminary testing, then proceed directly to S4.4 c)
   4. For Pin devices that are to be repaired in place, proceed to S4.4 c) unless preliminary testing has been requested by the owner.
b) Preliminary test as received
   1. Information from the recommended preliminary performance test and subsequent disassembly and inspections will provide a basis for any repair interval change that should be necessary to ensure that the pin device will function as intended.
   2. One of ~~T~~the following tests should be done on Pin Device.
      a. Measure lift force to move plug from closed position to open position. This can be done with pull gage or by using pressure WITHOUT pin.. Repeat 3 times and record the data. Review with manufacturer's original data.
      b. Reseat the plug fully into seat following manufacturer guidelines. Some manufacturers supply a tool for this purpose. This usually can be done by turning the adjuster Buckling Pin Screw on top by hand. If this cannot be done by hand, apply a torque wrench onto the pin adjuster hex and measure the torque required to fully seat. Compare the required torque to seat with manufacturer's original data.
      c. Conduct one(1) set pressure tests using the manufacturer's pin designated for this specific valve. Do not allow test pressure to exceed 110% of set pressure unless otherwise specified by the owner.
   3. If test results from S4.4b) 2 are outside the manufacturer's recommendation, and set pressure tests are outside the ASME limits or agreed upon tolerance as stated on tag, proceed to S4.4 c) Disassembly.
   4. Record test results and test bench identification data.

c) Disassembly
   1. Remove Buckling Pin Protective Cage(screen), if applicable

Commented [AC5]: *Is this for a PIN Device?*

Commented [AC6]: *Is this for a PIN Device?*

2. Prior to any disassembly, ensure that the plug is re-seated following manufacturer guidelines . Reseating may require torque wrench as specified in S4.4b)2.a Once seated, remove any gag or shipping pin if applicable.

3. Remove the required seals on bonnet flange bolts, if applicable.

~~3.~~4. 4. Remove the bonnet flange bolts.

5. Remove the bonnet "Flange Assembly - with bonnet flange, columns, upper pin holder top and buckling pin adjuster screw". Lift the bonnet Flange Assembly straight up vertically using a strap on the upper pin holder top.

6. Remove the bonnet/plug assembly out of seat using thread or nut on top of plug assembly. Be careful not to damage top of plug assembly where buckling pin sets.
    a. As the plug assembly is lifted out of body, handle the assembly carefully and lay it on clean surface. Be careful to not damage plug seat area during this step.

7. Remove the plug from the bonnet. Inspect all seals and replace per manufacturer's instructions. Check bonnet bore for cleanliness and for wear and scratches. In the event there is minor scratches you may polish this bore. Pay special attention as not to remove material from this bore as this is a critical dimension.

8. Remove plug seat, if applicable, in body and clean and replace seals per manufacturer's instructions.

d) Cleaning

1. Clean Adjusting screw or holding nut.
2. Thoroughly clean all small parts (Caution: do not use a cleaning method that will damage the parts.)
3. Do not clean in a chemical solution except under acceptable circumstances.
4. Protect seating surfaces and nameplates prior to cleaning.
5. Clean inside of valve body as needed.

e) Inspection

1. Check all parts for corrosion
2. Check nozzle for cracks (NDE as applicable) or unusual wear.
3. Check plug and stem assembly for cracks (NDE as applicable) or unusual wear.
4. Check bonnet guide for wear
5. Check adjusting screw or holding nut free of galling or damage.
6. Check flange gasket facings for wear and cuts.
7. Check pin bearing points for fit and engagement.

f. Assembly

1. Intall the Seat to the body.
2. Install the plug back into bonnet with new seals and ensure plug is moving freely per manufacturer's instructions. If moving freely install nut on the piston/plug and set aside for reinstalling the assembly back onto the valve body.
3. Install bonnet plug assembly back into the body carefully

Commented [AC7]: manufacturer

4. Make sure the plug is inserted and fully seated into the plug seat and moving freely after installing the bonnet flange and tightening up the flange studs. This is where centering is very important to get the free movement of plug inside the plug seat per manufacturer's instructions
5. Use pressure for measuring the open pressure without pin. The manufacturer to supply the original manufacturer's load or pressure measurements

g. Testing

1. Test data shall be recorded. Testing will be done in accordance with manufacturer's recommendations and appropriate ASME Code section. To preclude unsafe and unstable pin device ~~valve~~ operations or erroneous performance test results, it is recommended that low volume testing equipment (e.g., gas cylinders with- out a test vessel, hand pumps, tubing) should be avoided.

h .Sealing

1. After final adjusting and acceptance by quality control inspection, all external adjustments shall be sealed with a safety seal providing a means of identification of the organization performing the repair.

i. Nameplate

1. The repairer will place a repair nameplate on each repaired pin device ~~valve~~. The nameplate shall, as a minimum, meet the requirements of 4.7.1.

j. Installation of new pin

a. For pin devices with shipping pins, with zero pressure on the inlet or outlet, the shipping pin shall be removed and replaced with pin tagged and traceable to the manufacturer and matches the set pressure, service and pin device ~~valve~~ name plate information.

b. Install pins that are straight and without any deflection, visual defect or damage. c.

Ensure Pin device piston assembly moves freely without excessive resistance or force.

d. Piston assemble will be reseated and pin installed per manufacturer recommendations.

S4.~~5~~4 PACKAGING, SHIPPING AND TRANSPORTATION OF PRESSURE RELIEF DEVICES

a) The improper packaging, shipment, and transport of pressure relief devices can have detrimental effects on device operation. Pressure relief devices should be treated with the same precautions as instrumentation, with care taken to avoid rough handling or contamination prior to installation.

b) The following practices are recommended:

1) Pressure relief **valves and applicable pin devices** ~~Valves~~ should be securely fastened to pallets in the vertical position to avoid side loads on guiding surfaces except threaded and socket-weld pressure relief valves and pin device ~~valves~~ up to NPS 2 (DN 50) may be securely packaged and cushioned during transport.

2) Pressure relief **valves and pin devices** inlet and outlet connection, drain connections, and bonnet vents should be protected during shipment and storage to avoid internal contamination of the valve. Ensure all covers and/or plugs are removed prior to installation.

3) The pressure relief **valves and pin devices** should not be picked up or carried using the lifting lever. Lifting levers should be wired or secured so they cannot be moved while the valve is being shipped or stored. These wires shall be removed before the valve is placed in service.

4) Pilot valve tubing should be protected during shipment and storage to avoid damage and/or

Commented [AC8]: *Is this in accordance with UG-138(d)(4)? Will the VR Shop need to do the multiple PIN Tests?*

Commented [CB9R8]: Yes

Commented [CB10R8]:

Commented [AC11]: *Is this for Pin Devices?*

Commented [CB12R11]: Yes, this is for Pin Devices. However, I do not understand the issue with low volume test equipment and how this can produce unsafe or unstable operations or erroneous performance results. These tests are done in the VR shop.

Commented [CB13R11]:

Commented [CB14R11]:

Commented [AC15]: *Is this for a Pin Device?*

Commented [CB16R15]: Yes

Commented [CB17R15]:

Commented [AC18]: *Is this in Lieu of actual testing of the Device? If so, I do NOT agree. There is NO test performed.*

Commented [CB19R18]: No, this installation instruction is for installing a new buckling pin for service. The term "piston assembly" is the term used for reseating the valve prior to installing a new pin for service. If the valve seat is dirty or the plug is not aligned properly, this will affect the operation of the PRD.

Commented [CB20R18]:

Commented [AC21]: *Is this for a PIN Device?*

Commented [CB22R21]: Yes

Commented [CB23R21]:

breakage.

5) Pressure relief **valves and pin devices** for special services, including but not limited to oxygen, chlorine, and hydrogen perox-ide, should be packaged in accordance with appropriate standards and/or owner procurement requirements.

National Board Commissioned Inspector — An individual who holds a valid and current National Board Commission.

NBIC — The *National Board Inspection Code* published by The National Board of Boiler and Pressure Vessel Inspectors.

Nuclear Items — Items constructed in accordance with recognized standards to be used in nuclear power plants or fuel processing facilities.

Original Code of Construction — Documents promulgated by recognized national standards writing bodies that contain technical requirements for construction of pressure-retaining items or equivalent to which the pressure-retaining item was certified by the original manufacturer.

Overfire Air — Air admitted to the furnace above the grate surface /fuel bed. Used to complete the combustion of fine particles, in suspension. Also aids in reducing NOx formation.

Owner or User — As referenced in lower case letters means any person, firm, or corporation legally responsible for the safe operation of any pressure-retaining item.

Owner-User Inspection Organization — An owner or user of pressure-retaining items that maintains an established inspection program, whose organization and inspection procedures meet the requirements of the National Board rules and are acceptable to the Jurisdiction or Jurisdictional Authority wherein the owner or user is located.

Owner-User Inspector — An individual who holds a valid and current National Board Owner-User Commission.

Piecing — A repair method used to remove and replace a portion of piping or tubing material with a suitable material and installation procedure.

Pilot Operated Pressure Relief Valve — A pressure relief valve in which the disk is held closed by system pressure, and the holding pressure is controlled by a pilot valve actuated by system pressure.

Pin Device: A pin device is a nonreclosing pressure relief device actuated by inlet static or differential pressure and designed to function by the activation of a load bearing section of a pin that supports a pressure-containing member. A pin is the load bearing activation component of a pin device its crosssectional area is not limited to a circular shape. A pin device body is the structure that encloses the pressure-containing members.

Pin Device – Capacity Certified: Pin device certified in accordance with ASME BPVC Section XIII par 9.7.3 thru 9.7.6.

Pin Device – Flow Resistance certified: Pin device certified in accordance with ASME BPVC Section XIII par. 9.7.7

Plate Heat Exchanger (PHE) — An assembly of components consisting of heat transfer plates and their supporting frame. The frame provides structural support and pressure containment and may consist of fixed endplates, moveable endplates, an upper carrying bar and lower guide bar which provide plate alignment, and frame compression bolts.

Pneumatic Test — A pressure test which uses air or another compressible gas as the test medium.

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

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

Indirect Fired Water Heater — A potable water heater in which water is heated by an internal coil or heat exchanger that receives its heat from an external source. Indirect fired water heaters provide water

shortened until acceptable inspection results are obtained. Where test records and/or inspection history are not available, the following inspection and test frequencies are suggested:

TABLE 3.2.6 (21)

Service	Inspection Type/Frequency
Power boilers less than 400 psi (2.76 MPa)	Lift lever test every six months, set pressure test annually or prior to planned boiler shutdown
Power boilers 400 psi (2.76 MPa) or greater	Set pressure test every three years or prior to planned boiler shutdown
High-temperature hot water boilers (See Note 1)	Set pressure test annually
Low-pressure steam heating boilers	Lift lever test quarterly, set pressure test annually prior to heating season
Organic Fluid Vaporizers	Remove, inspect, and set pressure test annually
Hot water heating boilers (See Note 2)	Lift lever test quarterly, set pressure test annually prior to heating season
Water heaters (See Note 3)	Lift lever test every two months, remove and inspect temperature probe for damage, buildup or corrosion every three years.
Pressure vessels/piping-steam service	Set pressure test annually
Pressure vessels/piping-air/clean, dry gas	Set pressure test every three years
Pressure vessels/piping-propane/refrigerant	Set pressure test every five years
Pressure relief valves in combination with rupture disks	Set pressure test every five years
All Others	Per inspection history

Note 1:

For safety reasons, removal and testing on a steam test bench is recommended. Such testing will avoid damaging the pressure relief valve by discharge of a steam water mixture, which could occur if the valve is tested in place.

Note 2:

The frequencies specified for the testing of pressure relief valves on boilers is primarily based on differences between high pressure boilers that are continuously manned, and lower pressure automatically controlled boilers that are not monitored by a boiler operator at all times. When any boiler experiences an overpressure condition such that the pressure relief valves actuate, the valves should be inspected for seat leakage and other damage as soon as possible and any deficiencies corrected.

Note 3:

The temperature probe shall be checked for the condition of the coating material and freedom of movement without detaching. If the probe pulls out or falls off during inspection, the valve shall be repaired or replaced. Due to the relatively low cost of temperature and pressure relief valves for this service, it is recommended that a defective valve be replaced with a new valve if a repair or resetting is indicated.

Thermal fluid heaters | Remove, inspect, and set pressure test annually

acceptable inspection results are obtained. Where test records and/or inspection history are not available, the inspection frequencies in Table 2.5.8 are suggested.

(21) **TABLE 2.5.8**

Service	Inspection Frequency
Power boilers less than 400 psi (2.76 MPa)	Lift lever test every six months, set pressure test annually or prior to planned boiler shutdown
Power boilers 400 psi (2.76 MPa) or greater	Set pressure test every three years or prior to planned boiler shutdown
High-temperature hot water boilers (See Note 1)	Set pressure test annually
Low-pressure steam heating boilers	Lift lever test quarterly, set pressure test annually prior to heating season
Organic Fluid Vaporizers	Remove, inspect, and set pressure test annually
Hot water heating boilers (See Note 2)	Lift lever test quarterly, set pressure test annually prior to heating season
Water heaters (See Note 3)	Lift lever test every two months, remove and inspect temperature probe for damage, buildup or corrosion every three years.
Pressure vessels/piping-steam service	Set pressure test annually
Pressure vessels/piping-air/clean, dry gas	Set pressure test every three years
Pressure vessels/piping-propane/refrigerant	Set pressure test every five years
Pressure relief valves in combination with rupture disks	Set pressure test every five years
All others	Per inspection history

Note 1:

For safety reasons, removal and testing on a steam test bench is recommended. Such testing will avoid damaging the pressure relief valve by discharge of a steam water mixture, which could occur if the valve is tested in place.

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The frequencies specified for the testing of pressure relief valves on boilers is primarily based on differences between high pressure boilers that are continuously manned, and lower pressure automatically controlled boilers that are not monitored by a boiler operator at all times. When any boiler experiences an overpressure condition such that the pressure relief valves actuate, the valves should be inspected for seat leakage and other damage as soon as possible and any deficiencies corrected.

Note 3:

The temperature probe shall be checked for the condition of the coating material and freedom of movement without detaching. If the probe pulls out or falls off during inspection, the valve shall be repaired or replaced. Due to the relatively low cost of temperature and pressure relief valves for this service, it is recommended that a defective valve be replaced with a new valve if a repair or resetting is indicated.

2.5.8.1 ESTABLISHMENT OF INSPECTION AND TEST INTERVALS

Where a recommended test frequency is not listed, the valve user and Inspector must determine and agree on a suitable interval for inspection and test. Some items to be considered in making this determination are:

a) Jurisdictional requirements;

Thermal fluid heaters | Remove, inspect, and set pressure test annually

FOR REFERENCE ONLY (NOT PART OF THIS ACTION ITEM)

Excerpt from Item 19-88 (MC Approved)
Revision Date: January 6, 2021

2.2.12.7 THERMAL FLUID HEATERS

c) Inspection

f. Pressure relief valves — Pressure relief valves shall be a closed bonnet design with no manual lift lever. Pressure relief valves shall be periodically tested by a VR or T/O Certificate Holder with a frequency in accordance with jurisdictional requirements or an initial frequency of 1 year or less. Testing intervals shall be evaluated and may be adjusted based on inspection history up to a maximum of 3 years. The pressure relief valve installation shall meet the requirements of NBIC Part 4, 2.3. Inspection and testing of the pressure relief valve shall meet the requirements of NBIC Part 4, 3.0.

3.3.3.4 OUTLINE OF REQUIREMENTS FOR A QUALITY SYSTEM

o) Field Testing

If field testing is included in the scope of work, the system shall address any differences or additions to the quality system required to properly control this activity, including the following:

~~1) Provisions for annual audits of field activities shall be included;~~

~~2)~~1) Provisions for use of owner-user measurement and test equipment, if applicable, shall be addressed.

TABLE 3.3.3.4 P)

Reports, Records, or Documents for "T/O" Certificate Holders	Instructions	Minimum Retention Period
a) Record of testing or inspection	The testing and inspection program section shall include reference to a document (such as a report, traveler, or checklist) that outlines the specific testing and inspection procedures used in the testing of pressure relief valves.	5 years
b) Records related to equipment qualification and instrument calibration	Prior to use, all performance testing equipment shall be qualified by the certificate holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment. This qualification may be accomplished by benchmark testing, comparisons to equipment used for verification testing as specified in the quality system, or comparisons to field performance.	5 years after the subject piece of equipment or instrument is retired.
c) Record of lift assist device qualification	Prior to use, all lift assist devices shall be qualified by the certificate holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment used for verification testing as specified in the quality system or comparisons to field performance. This qualification shall be documented.	5 years after the lift assist device is retired.
d) Records of employee training and qualification	Each testing organization shall establish minimum qualification requirements for those positions within the organization as they directly relate to pressure relief valve testing. Each testing organization shall document the	5 years after termination of employment.

	evaluation and acceptance of an individual's qualification for the applicable position.	
e) Records of audits of the Quality Program	The testing organization shall audit the Quality System on an annual basis. Audit results and exceptions shall be documented ~~and any exclusions shall be noted.~~	5 Years

3.3.4 TESTING & ADJUSTMENT

a) Each Pressure Relief Valve to be tested shall be inspected in accordance with Section 3.2.2.
b) Pressure Relief Valves with missing or illegible nameplates shall not be tested under the T/O program and shall be referred to a "VR" Certificate Holder or replaced.
c) Pressure Relief Valves shall be tested to confirm that the Set Pressure (defined as the average of at least three consecutive tests) is within the allowable tolerance specified by the applicable ASME Code Section and NBIC. Test Results, including Test Gauge Identification, shall be recorded on the document referred to above. Pressure Relief Valve seals shall not be removed unless required for adjustment or testing using a lift assist device.
d) Testing organizations may obtain a "T/O" Certificate of Authorization for field testing, either as an extension to their in-shop/plant scope, or as a field-only scope, provided that the Quality System includes the following provisions:
    1) Qualified technicians in the employ of the certificate holder perform such testing;
    2) An acceptable quality system covering field testing, ~~including field audits~~ is maintained; and
    3) Functions affecting the quality of the tested valves are supervised from the address of record where the "T/O" certification is issued.

~~**3.3.4.1 AUDIT REQUIREMENTS**~~

~~Upon issuance of a *Certificate of Authorization*, provided field tests are performed, annual audits of the work carried out in the field shall be performed to ensure that the requirements of the certificate holder's quality system are met. The audit shall include, but not be limited to, performance testing, in accordance with paragraph 4.6, of valve(s) that were tested in the field. The audits shall be documented.~~

3.6 Annual Audits

Upon Issuance of a Certificate of Authorization, the testing organization shall audit the Quality System of the testing program on an annual basis. The quality manual shall define the auditing criteria, scope, frequency, and methods to ensure the requirements of the NBIC and Certificate Holder's Quality System are effectively implemented. The scope shall include but not be limited to:

a) Specification Control 3.3.3.4 g)
b) Inspection and Testing Program 3.3.3.4 h)
c) Valve Adjustment and Sealing 3.3.3.4 i)

d) Test Only Nameplates 3.3.3.4 j)
e) Calibration 3.3.3.4 k)
f) Manual Control/Procedures 3.3.3.4 l)
g) Nonconformities 3.3.3.4 m)
h) Testing Equipment 3.3.3.4 n)
i) Field Testing 3.3.3.4 o)
j) Records Retention 3.3.3.4 p)
k) Competency, Training and Qualification of Personnel 3.4

The audit results shall be documented. Mandatory items ~~outside~~ in the repair organization's scope ~~or items that have~~ not ~~been~~ performed during the annual audit period shall be documented as exceptions in the audit results.

Commented [DA1]: Note that the title of 3.4 is an approved change for the 2022 Edition

ITEM 22-15 1/10/23

PART 4

2.4.5 PRESSURE RELIEF VALVES FOR TANKS AND HEAT EXCHANGERS

2.4.5.1 STEAM TO HOT-WATER SUPPLY

When a hot-water supply is heated indirectly by steam in a coil or pipe ~~within the service limitations set forth in Part 1, 3.2, *Definitions*~~, the pressure of the steam used shall not exceed the safe working pressure of the hot water tank, and a pressure relief valve at least NPS 1 (DN 25), set to relieve at or below the maximum allowable working pressure of the tank, shall be applied on the tank.

2.4.5.2 HIGH TEMPERATURE WATER TO WATER HEAT EXCHANGER

When high temperature water is circulated through the coils or tubes of a heat exchanger to warm water for space heating or hot-water supply, ~~within the service limitations set forth in Part 1, 3.2, *Definitions*,~~ the heat exchanger shall be equipped with one or more National Board capacity certified pressure relief valves set to relieve at or below the maximum allowable working pressure of the heat exchanger, and of sufficient rated capacity to prevent the heat exchanger pressure from rising more than 10% above the maximum allowable working pressure of the vessel.

2.4.5.3 HIGH TEMPERATURE WATER TO STEAM HEAT EXCHANGER

When high temperature water is circulated through the coils or tubes of a heat exchanger to generate low pressure steam, ~~within the service limitations set forth in Part 1, 3.2, *Definitions*,~~ the heat exchanger shall be equipped with one or more National Board capacity certified pressure relief valves set to relieve at a pressure not to exceed 15 psig (100 kPa), and of sufficient rated capacity to prevent the heat exchanger pressure from rising more than 5 psig (34 kPa) above the maximum allowable working pressure of the vessel. For heat exchangers requiring steam pressures greater than 15 psig (100 kPa), refer to NBIC Part 1, Section 2 or Section 4.

PART 1

3.9.5 PRESSURE RELIEF VALVES FOR TANKS AND HEAT EXCHANGERS

3.9.5.1 STEAM TO HOT-WATER SUPPLY

When a hot-water supply is heated indirectly by steam in a coil or pipe ~~within the service limitations set forth in Part 1, 3.2, *Definitions*~~, the pressure of the steam used shall not exceed the safe working pressure of the hot water tank, and a pressure relief valve at least NPS 1 (DN 25), set to relieve at or below the maximum allowable working pressure of the tank, shall be applied on the tank.

3.9.5.2 HIGH TEMPERATURE WATER TO WATER HEAT EXCHANGER

When high temperature water is circulated through the coils or tubes of a heat exchanger to warm water for space heating or hot-water supply~~, within the service limitations set forth in Part 1, 3.2, *Definitions*~~, the heat exchanger shall be equipped with one or more National Board capacity certified pressure relief

valves set to relieve at or below the maximum allowable working pressure of the heat exchanger, and of sufficient rated capacity to prevent the heat exchanger pressure from rising more than 10% above the maximum allowable working pressure of the vessel.

3.9.5.3 HIGH TEMPERATURE WATER TO STEAM HEAT EXCHANGER

When high temperature water is circulated through the coils or tubes of a heat exchanger to generate low pressure steam, ~~within the service limitations set forth in Part 1, 3.2, *Definitions*,~~ the heat exchanger shall be equipped with one or more National Board capacity certified pressure relief valves set to relieve at a pressure not to exceed 15 psig (100 kPa), and of sufficient rated capacity to prevent the heat exchanger pressure from rising more than 5 psig (34 kPa) above the maximum allowable working pressure of the vessel. For heat exchangers requiring steam pressures greater than 15 psig (100 kPa), refer to NBIC Part 1, Section 2 or Section 4.

PART 1, SECTION 3
INSTALLATION — STEAM HEATING BOILERS, HOT-WATER HEATING BOILERS, HOT-WATER SUPPLY BOILERS, AND POTABLE WATER HEATERS

3.1 SCOPE

The scope of NBIC Part 1, Section 3 shall apply to those steam heating boilers, hot-water heating boilers, hot-water supply boilers, and potable water heaters as defined in NBIC Part 1, 3.2, *Definitions*. For installation of items that do not fall within the scope of this Section, refer to the applicable sections:

NBIC Part 1, Section 2 — *Power Boilers*
NBIC Part 1, Section 4 — *Pressure Vessels*
NBIC Part 1, Section 5 — *Piping*

3.2 DEFINITIONS

3.2.1 STEAM HEATING BOILERS

Steam heating boilers are steam boilers installed to operate at pressures not exceeding 15 psig (100 kPa).

3.2.2 HOT-WATER HEATING AND HOT-WATER SUPPLY BOILERS

Hot-water heating and hot-water supply boilers are hot water boilers installed to operate at pressures not exceeding 160 psig (1100 kPa) and/or temperatures not exceeding 250°F (121°C), at or near the boiler outlet.

3.2.3 POTABLE WATER HEATERS

A11 Water heaters are exempted from NBIC Part 1, Section 3 when none of the following limitations are exceeded:

a) Heat input of 200,000 Btu/hr (59 kW);

b) Water temperature of 210°F (99°C); and

c) Nominal water containing capacity of 120 gal. (454 l), except that they shall be equipped with safety devices in accordance with the requirements of NBIC Part 1, 3.9.4.

PART 1, SECTION 3
INSTALLATION — STEAM HEATING BOILERS, HOT-WATER HEATING BOILERS, HOT-WATER SUPPLY BOILERS, AND POTABLE WATER HEATERS

3.1 SCOPE

This section provides requirements and guidelines for the installation of steam heating boilers, hot-water heating boilers, hot-water supply boilers, and potable water heaters.

3.2 DEFINITIONS

See in NBIC Part 1, Section 9, *Glossary*.

3.3 GENERAL REQUIREMENTS

3.3.1 SUPPORTS

See NBIC Part 1, Section 1.6.1, *Supports, Foundations and Settings.*

3.3.1.1 METHODS OF SUPPORT FOR STEAM HEATING, HOT-WATER HEATING, AND HOT-WATER SUPPLY BOILERS

a) Loadings

1) The design and attachment of lugs, hangers, saddles, and other supports shall take into account the stresses due to hydrostatic head of fully flooded equipment in determining the minimum thicknesses required. Additional stresses imposed by effects other than working pressure or static head that increase the average stress by more than 10% of the allowable working stress shall also be taken into account. These effects include the weight of the component and its contents and the method of support.

2) In applying the requirements of 1) above, provision shall be made for localized stresses due to concentrated support loads, temperature changes, and restraint against movement of the boiler due to pressure. Lugs, hangers, brackets, saddles, and pads shall conform satisfactorily to the shape of the shell or surface to which they are attached or are in contact.

b) Horizontal Return Firetube Boilers

1) Boilers over 72 in. (1,800 mm) in diameter. A horizontal-return tubular boiler over 72 in. (1830 mm) in diameter shall be supported from steel hangers by the outside-suspension type of setting, independent of the furnace wall. The hangers shall be so designed that the load is properly distributed.

2) Boilers 14 ft. (4.3 m) or over in length, or over 54 in. (1370 mm) up to 72 in. (1,830 mm) in diameter: A horizontal-return tubular boiler over 54 in. (1,370 mm) and up to and including 72 in. (1,800 mm) in diameter shall be supported by the outside-suspension type of setting, or at four points by not less than eight steel brackets set in pairs, the brackets of each pair to be spaced not over 2 in. (50 mm) apart and the load to be equalized between them. See NBIC Part 1, Figure 3.3.1.1-a.

3) Boilers up to 54 in. (1,370 mm) in diameter
A horizontal-return boiler up to and including 54 in. (1,370 mm) in diameter shall be supported by the outside-suspension type of setting, or by not less than two steel brackets on each side. See NBIC Part 1, Figures 3.3.1.1-b.

Boiler — A boiler is a closed vessel in which water or other liquid is heated, steam or vapor generated, steam or vapor is superheated, or any combination thereof, under pressure for use external to itself, by the direct application of energy from the combustion of fuels or from electricity or solar energy. The term boiler also shall include the apparatus used to generate heat and all controls and safety devices associated with such apparatus or the closed vessel.

High-Temperature Water Boiler — A power boiler in which water is heated and operates at a pressure in excess of 160 psig (1.1 MPa) and/or temperature in excess of 250°F (121°C).

Hot-Water Heating Boiler — A hot water boiler installed to operate at pressures not exceeding 160 psig (1,100 kPa) and/or temperatures not exceeding 250°F (121°C), at or near the boiler outlet.

Hot-Water Supply Boiler — A boiler that furnishes hot water to be used externally to itself at a pressure less than or equal to 160 psig (1,100 kPa gage) or a temperature less than or equal to 250°F (120°C) at or near the boiler outlet.

Power Boiler — A boiler in which steam or other vapor is generated at a pressure in excess of 15 psig (100 kPa) for use external to itself. The term power boiler includes fired units for vaporizing liquids other than water, but does not include fired process heaters and systems. (See also High-Temperature Water Boiler).

Steam Heating Boiler — A steam boiler installed to operate at pressures not exceeding 15 psig (100 kPa).

Capacity Certification — The verification by the National Board that a particular valve design or model has successfully completed all capacity testing as required by the ASME Code.

Carbons Recycle — See Flyash Recycle.

CGA – Compressed Gas Association

Changeover Valve – A three-way stop (or diverter) valve with one inlet port and two outlet ports designed to isolate either one of the two outlet ports from the inlet port, but not both simultaneously during any mode of operation.

Chimney or Stack — A device or means for providing the venting or escape of combustion gases from the operating unit.

Confined Space — Work locations considered “confined” because their configurations hinder the activities of employees who must enter, work in and exit them. A confined space has limited or restricted means for entry or exit, and it is not designed for continuous employee occupancy. Confined spaces include, but are not limited to, underground vaults, tanks, storage bins, manholes, pits, silos, process vessels, and pipelines. Regulatory Organizations often use the term “permit-required confined space” (permit space) to describe a confined space that has one or more of the following characteristics: contains or has the potential to contain a hazardous atmosphere; contains a material that has the potential to engulf an entrant; has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant; or contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress. Confined space entry requirements may differ in many locations and the Inspector is cautioned of the need to comply with local or site- specific confined space entry requirements.

Conversion

Pressure Relief Devices — The change of a pressure relief valve from one capacity-certified configuration to another by use of manufacturer’s instructions.

Units of Measure — Changing the numeric value of a parameter from one system of units to another.

National Board — The National Board of Boiler and Pressure Vessel Inspectors.

National Board Commissioned Inspector — An individual who holds a valid and current National Board Commission.

NBIC — The *National Board Inspection Code* published by The National Board of Boiler and Pressure Vessel Inspectors.

Nuclear Items — Items constructed in accordance with recognized standards to be used in nuclear power plants or fuel processing facilities.

Original Code of Construction — Documents promulgated by recognized national standards writing bodies that contain technical requirements for construction of pressure-retaining items or equivalent to which the pressure-retaining item was certified by the original manufacturer.

Overfire Air — Air admitted to the furnace above the grate surface /fuel bed. Used to complete the combustion of fine particles, in suspension. Also aids in reducing NOx formation.

Owner or User — As referenced in lower case letters means any person, firm, or corporation legally responsible for the safe operation of any pressure-retaining item.

Owner-User Inspection Organization — An owner or user of pressure-retaining items that maintains an established inspection program, whose organization and inspection procedures meet the requirements of the National Board rules and are acceptable to the Jurisdiction or Jurisdictional Authority wherein the owner or user is located.

Owner-User Inspector — An individual who holds a valid and current National Board Owner-User Commission.

Piecing — A repair method used to remove and replace a portion of piping or tubing material with a suitable material and installation procedure.

Pilot Operated Pressure Relief Valve — A pressure relief valve in which the disk is held closed by system pressure, and the holding pressure is controlled by a pilot valve actuated by system pressure.

Plate Heat Exchanger (PHE) — An assembly of components consisting of heat transfer plates and their supporting frame. The frame provides structural support and pressure containment and may consist of fixed endplates, moveable endplates, an upper carrying bar and lower guide bar which provide plate alignment, and frame compression bolts.

Pneumatic Test — A pressure test which uses air or another compressible gas as the test medium.

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

> **Fired Storage Water Heater** — A potable water heater in which water is heated by electricity, the combustion of solid, liquid, or gaseous fuels and stores water within the same appliance.
>
> **Indirect Fired Water Heater** — A potable water heater in which water is heated by an internal coil or heat exchanger that receives its heat from an external source. Indirect fired water heaters provide water directly to the system or store water within the same appliance.
>
> **Circulating Water Heater** — A potable water heater which furnishes water directly to the system or to a separate storage tank. Circulating water heaters may be either natural or forced flow.

Potable Water Storage Tank — an unfired pressure vessel used to store potable hot water at temperatures not exceeding 210°F (99°C).

Part 4, 2.4.4 and Part 1, 3.9.4

Explanation of Need:
ASME Section IV, Part HLW-800.1 allows the use of pressure relief valves in place of temperature and pressure relief valves on potable water heaters. NBIC Parts 1 and 4 specifically require temperature and pressure relief valves, which is not consistent with the code of construction. Some manufacturers are shipping HLW stamped potable water heaters with pressure relief valves. Often the physical construction of these units is such that a temperature and pressure relief valve cannot be accommodated.

Suggested revisions to current text

Part 4

2.4.4 TEMPERATURE AND PRESSURE RELIEF VALVE REQUIREMENTS FOR POTABLE WATER HEATERS

a) Each water heater shall have at least one National Board capacity~~.~~ certified temperature and pressure relief valve~~.~~ or pressure relief valve. Note: Temperature and pressure relief valves are recommended because of the additional temperature relief function they provide, and other standards for this equipment may permit only temperature and pressure relief valves to be used. Low mass water heaters may use pressure relief valves due to space limitations and smaller amounts of stored energy. No temperature and pressure relief valve shall be smaller than NPS 3/4 (DN 20).

b) The pressure setting shall be less than or equal to the maximum allowable working pressure of the water heater. However, if any of the other components in the hot-water supply system (~~such as~~e.g., valves, pumps, expansion or storage tanks, or piping) have a ~~lesser~~ lower working pressure rating than the water heater, the pressure setting for the temperature and pressure relief valve(s) shall be based upon the component with the lowest maximum allowable working pressure rating. If more than one temperature and pressure relief valve is used, the additional valve(s) may be set within a range not to exceed 110% ~~above~~ of the set pressure of the first valve.

c) The required relieving capacity ~~in Btu/hr (W)~~ of the temperature and pressure relief valve in Btu/hr (W) shall not be less than the maximum allowable input unless the rated burner input capacity ~~the water heater~~ is marked on the water heater casing in a readily visible location~~with the rated burner input capacity of the water heater on the casing in a readily visible location~~, in which case the rated burner input capacity may be used as a basis for sizing the temperature and pressure relief valves. The relieving capacity for electric water heaters shall be 3500 Btu/hr (1.0 kW) per kW of input. In every case, the ~~following requirements shall be met. T~~temperature and pressure relief valve capacity for each water heater shall be such that, with the fuel burning equipment installed and operating at maximum capacity, the pressure cannot ~~rise more than~~ exceed 110% ~~above~~of the maximum allowable working pressure.

Many temperature and pressure relief valves have a National Board capacity~~.~~ certified

rating which was determined according to ASME Code requirements, and a lower Canadian Standards Association (CSA) rating value. Where the ASME Code is the only referenced code of construction the National Board capacity- -certified rating may be used. If the water heater is not an ASME vessel, or the CSA rating is required by another standard, (such as a plumbing or building code,) then that rating shall be used.

d) If operating conditions are changed or additional heating surface is installed, the temperature and pressure relief valve capacity shall be increased, if necessary, to meet the new conditions and shall be in accordance with the above provisions. In no case shall the increased input capacity exceed the maximum allowable input capacity. The Any additional valves required, on account ofresulting from changed conditions, may be installed on the outlet piping provided ing there is no intervening valve.

Part 1

3.9.4 PRESSURE RELIEF VALVE REQUIREMENTS FOR POTABLE WATER HEATERS

a) Each water heater shall have at least one National Board capacity- -certified temperature and pressure relief valve or pressure relief valve. Note: Temperature and pressure relief valves are recommended because of the additional temperature relief function they provide, and other standards for this equipment may permit only temperature and pressure relief valves to be used. Low mass water heaters may use pressure relief valves due to space limitations and smaller amounts of stored energy. No temperature and pressure relief valve shall be smaller than NPS 3/4 (DN 20).

b) The pressure setting shall be less than or equal to the maximum allowable working pressure of the water heater. However, if any of the other components in the hot-water supply system (such ase.g., valves, pumps, expansion or storage tanks, or piping) have a lowerlesser working pressure rating than the water heater, the pressure setting for the temperature and pressure relief valve(s) shall be based upon the component with the lowest maximum allowable working pressure rating. If more than one temperature and pressure relief valve is used, the additional valve(s) may be set within a range not to exceed 110% over of the set pressure of the first valve.

c) The required relieving capacity in Btu/hr (W) of the temperature and pressure relief valve in Btu/hr (W) shall not be less than the maximum allowable input unless the rated burner input capacity the water heater is marked on the water heater casing in a readily visible location with the rated burner input capacity of the water heater on the casing in a readily visible location, in which case the rated burner input capacity may be used as a basis for sizing the temperature pressure relief valves. The relieving capacity for electric water heaters shall be 3,500 Btu/hr (1.0 kW) per kW of input. In every case, the following requirements shall be met. Ttemperature and pressure relief valve capacity for each water heater shall be such that, with the fuel burning equipment installed and operated at

maximum capacity, the pressure cannot ~~rise more than~~exceed 110% ~~above~~ of the maximum allowable working pressure.

Many temperature and pressure relief valves have a National Board capacity~~-~~-certified rating which was determined according to ASME Code requirements, and a lower Canadian Standards Association (CSA) rating value. Where the ASME Code is the only referenced code of construction the National Board capacity~~-~~-certified rating may be used. If the water heater is not an ASME vessel, or the CSA rating is required by another standard, ~~(~~such as a plumbing or building code,~~)~~ then that rating shall be used.

d) If operating conditions are changed or additional heating surface is installed, the temperature and pressure relief valve capacity shall be increased, if necessary, to meet the new conditions and shall be in accordance with the above provisions. In no case shall the increased input capacity exceed the maximum allowable input capacity. ~~The~~ Any additional valves required~~, on account of~~ resulting from changed conditions~~,~~ may be installed on the outlet piping provided~~ing~~ there is no intervening valve.

4.2.2 CONSTRUCTION STANDARDS FOR PRESSURE RELIEF DEVICES

For the repair of pressure relief devices, the following construction standards shall apply:

a) T~~t~~he applicable new construction standard ~~to be~~ used for reference during repairs shall be the original code of construction.~~is the ASME Code.~~

b) Applicable ASME Code Cases shall be used for reference during repairs when:

1) The device complies with an ASME Code Case or, ~~they were used in the original construction of the valve.~~

2) The device undergoes a conversion to comply with and ASME Code Case. ~~ASME Code Cases may be used when they have been accepted for use by the NBIC Committee and the Jurisdiction where the pressure-retaining item is installed.~~

c) A device that complies with an ASME Code Case may be converted to comply with the original code of construction.

d) For pressure relief devices repaired per 4.2.2 b)1 or converted per 4.2.2 b)2, the ASME Code Case number shall be noted on the repair document and~~, when required by the code case,~~ stamped on the repair nameplate.

e) For pressure relief devices converted per 4.2.2 c), the ASME Code Case number shall be noted on the repair document but shall not be stamped on the repair nameplate. References to that ASME Code case shall be marked out but left legible on the original nameplate.

f) ~~b)~~ The Jurisdiction where the pressure retaining item is installed shall be consulted for any unique requirements it may have established including construction standards and ASME Code Cases.

PROPOSED REVISION OR ADDITION

Item No.

A 23-31

Subject/Title

Testing of liquid service valves to be water or other suitable liquid

NBIC Location

Part: Pressure Relief Devices & Inspection; Section: 3 & 2; Paragraph: 3.2.5 d) 5) & 2.5.7 d) 5)

Project Manager and Task Group

Source (Name/Email)

Thomas Beirne / tbeirne@nationalboard.org

Statement of Need

The intent is that liquid service valves be tested on liquid. The term fluid can mean either liquid or vapor.

Background Information

See statement of need.

Existing Text	**Proposed Text**
Liquid service process pressure relief valves: water or other suitable fluid;	Liquid service process pressure relief valves: water or other suitable liquid;

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date

2.8.5 AUTOMATIC LOW-WATER FUEL CUTOFF AND/OR WATER FEEDING DEVICE FOR STEAM OR VAPOR SYSTEM BOILERS

a) Each automatically fired steam-or vapor-system boiler shall have an automatic low-water fuel cutoff so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest visible part of the water-gage glass. If a water feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feedwater.

b) Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed in the tapped openings available for attaching a water glass directly to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than NPS 1/2 (DN 15) between the boiler and water glass so that the water glass is attached directly and as close as possible to the boiler; the run of the tee or Y shall take the water glass fittings, and the side outlet or branch of the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full-size diameter.

c) In addition to the requirements in a) and b) above, a secondary low-water fuel cutoff with manual reset shall be provided on each automatically fired steam or vapor system boiler.

d) When installed external to the boiler, fuel cutoffs shall be installed in separate water columns or chambers, which shall be connected to the boiler by piping connections below the waterline. A shared steam piping connection is permissible, though not required.

~~d)~~e) Fuel cutoffs and water feeding devices embodying a separate chamber shall have a vertical drain pipe, extended to a safe point of discharge, and a blowoff valve not less than NPS 3/4 (DN 20), located at the lowest point in the water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

~~e)~~f) Each electric steam boiler of the resistance element type shall be equipped with an automatic low-water cutoff so located as to automatically cut off the power supply to the heating elements before the surface of the water falls below the visible part of the glass. No low-water cutoff is required for electrode-type boilers.

3.8.1.5 AUTOMATIC LOW-WATER FUEL CUTOFF AND/OR WATER FEEDING DEVICE

a) Each automatically fired steam boiler shall have an automatic low-water fuel cutoff. The low-water fuel cutoffs must be located to automatically cut off the fuel supply when the surface of the water falls to a level not lower than the lowest visible part of the water-gage glass. If a water feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feedwater.

b) Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed in the tapped openings available for attaching a water-gage glass directly to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than NPS 1/2 (DN 15) between the boiler and water glass so that the water glass is attached directly and as close as possible to the boiler; the run of the tee or Y shall take the water glass fittings, and the side outlet or branch of the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full-size diameter.

c) In addition to the requirements in a) and b) above, a secondary low-water fuel cutoff with manual reset shall be provided on each automatically fired steam boiler.

d) When installed external to the boiler, fuel cutoffs shall be installed in separate water columns or chambers, which shall be connected to the boiler by piping connections below the waterline. A shared steam piping connection is permissible, though not required.

~~d)~~e) Fuel cutoffs and water feeding devices embodying a separate chamber shall have a vertical drain pipe and a blowoff valve not less than NPS 3/4 (DN 20), located at the lowest point in the water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

CW-120 Requirements for Water Level Controls for Low-Pressure Steam Boilers

(a) Each automatically fired, low-pressure steam boiler shall have at least two automatic low-water fuel cutoffs, one of which may be a combined feeder/cutoff device. When installed external to the boiler, each device shall be installed in individual chambers (water columns), which shall be attached to the boiler by separate pipe connections below the waterline. A common steam connection is permissible. Each cutoff device shall be installed to prevent start-up and to cut off the boiler fuel or energy supply automatically, prior to the fall of the surface of the water below the level of the lowest visible part of the gage glass (see CW-210).

EXCEPTION: Only one low-water cutoff is required on gravity return units installed in residences, as defined by the authority having jurisdiction.

A water feeding device, when used, shall be constructed and installed so that the water inlet valve cannot feed water into the boiler through the float chamber or its connections to the boiler. The water feeding device shall be located to maintain the operating water level.

CW-140 Requirements for Water Level Controls for High-Pressure Steam Boilers

(a) Each automatically fired, high-pressure steam boiler, except miniature boilers, shall have at least two automatic low-water fuel cutoff devices. When installed external to the boiler, each device shall be installed in individual chambers (water columns), which shall be attached to the boiler by separate pipe connections below the waterline. A common steam connection is permissible. Each cutoff device shall be installed to prevent start-up and cut off the boiler fuel or energy supply automatically when the surface of the water falls to a level not lower than the lowest visible part of the gage glass. One control shall be set to function ahead of the other.

2.5.3.2 REMOTE EMERGENCY SHUTDOWN SWITCHES

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

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

2) If there is more than one door to the equipment room, there should be a switch located at each door of egress.

3) Consideration should also be given to the type and location of the switch(es) in order to safeguard against tampering. Where approved by the Jurisdiction, alternate locations of remote emergency switch(es) may be provided.

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

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

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

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

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

Commented [TGC1]: This is consistent with CSD-1 CE-110 (b) (1).

Commented [TGC2]: As currently written in Part 1, 3.5.3. Note that it is a "should", not a "shall". The "shall" aspect of multiple shutoff switches is addressed in b).

Commented [TGC3]: This text was unnecessary. The forward already states that the NBIC in not meant to be retroactive. Nowhere else in Part 1 do we state that a requirement is not retroactive.

~~**3.5.3 ELECTRICAL**~~

~~**3.5.3.1 STEAM HEATING, HOT WATER HEATING, AND HOT WATER SUPPLY BOILERS**~~

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

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

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

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

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

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

~~3.5.3.2 POTABLE WATER HEATERS~~

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

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

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

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

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

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

3.5.3 ELECTRICAL

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

3.5.3.1 WIRING

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

2.5.3.2 REMOTE EMERGENCY SHUTDOWN SWITCHES

Commented [TGC4]: This section has been reordered to be consistent with 2.5.3.

Commented [TGC5]: Wiring requirements for both boilers and water heaters have been merged as they were identical.

Commented [TGC6]: Requirements for Remote Emergency Shutdown Switches for both boilers and water heaters have been merged as the exiting requirements were identical. The proposed text incorporates changes suggested for 2.5.3.2.

a) A manually operated remote shutdown switch(es) or circuit breaker shall be located just outside the equipment room door and marked for easy identification.

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

5) If there is more than one door to the equipment room, there should be a switch located at each door of egress.

6) Consideration should also be given to the type and location of the switch(es) in order to safeguard against tampering. Where approved by the Jurisdiction, alternate locations of remote emergency switch(es) may be provided.

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

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

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

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