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THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE COMMITTEE

AGENDA

Meeting of January 14th, 2021
San Antonio, TX

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

1. **Call to Order**
   8:00 AM

2. **Introduction of Members and Visitors**

3. **Check for a Quorum**

4. **Awards/Special Recognition**

5. **Announcements**

   A buffet lunch will be provided from 11:30 AM to 12:30 PM in Magnolia/Blue Bonnet on the 2nd Floor.

   The 2021 edition of the NBIC will be available for purchase on July 1st, 2021.

6. **Adoption of the Agenda**

7. **Approval of the Minutes of the July 16th, 2020 Meeting**

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

8. **Review of Rosters**

   The following membership actions were voted on during a Main Committee executive session. This session took place after all subcommittee and liaison reports were presented.

   a. **Membership Nominations**

      Subcommittee Members:

      - Mr. Marvin Byrum (AIA) – Subcommittee Installation
      - Mr. Gene Tompkins (Manufacturers) – Subcommittee Installation
      - Mr. Don Kinney (Jurisdictional Authorities) – Subcommittee Repairs & Alterations

   b. **Membership Reappointments**
      - Mr. Rob Troutt – Main Committee
      - Mr. Tim Barker – SC Inspection
      - Mr. Matt Sansone – SC Inspection

      A motion was made, seconded, and unanimously approved to reappoint the listed committee members to their respective committees.

   c. **Officer Positions**

9. **Items Approved for 2023 NBIC**

   See Attachment Page 2 for a full list of items approved for inclusion in the 2023 NBIC.

10. Report of Subcommittees

a. Subcommittee Installation

i. Interpretations

Item Number: 20-84	**NBIC Location: Part 1, 3.7.5.1 d) 4)**	**Attachment Pages 4**

General Description: Adjustable Packing on Low Pressure Boiler Stop Valves

Subgroup: SG Installation

Task Group: None assigned.

Explanation of Need: Jurisdictions need to know if this requirement applies to all low pressure boiler stop valves (steam, hot water heat, and hot water supply) so they can effectively communicate this requirement to their constituents and can enforce the code when new items are installed.

Background Information: Most new hot water heating boilers and hot water supply boilers are being installed with appropriately-pressure/temperature-rated butterfly valves as their outlet isolation valves. Most butterfly valves that are installed do not have adjustable pressure-type packing glands. Instead, these valves are supplied with EPDM or Viton seals inside the stem housing to prevent water escape. EPDM is rated to 275 F, and Viton is rated to 300 F. It is unclear whether or not the text of the referenced code is a requirement that is specifically intended to apply to water boilers, or if it is a requirement that has simply been in the code and has carried forward through the years. It is also unclear as to the safety basis for requiring adjustable packing for low pressure hot water boiler stop valves.

ii. Action Items – Old Business

Item Number: NB11-1901	**NBIC Location: Part 1**	**Attachment Page 5**

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

Subgroup: FRP

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

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 18-57	**NBIC Location: Part 1**	**Attachment Page 13**

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

Subgroup: SG Installation

Task Group: - P. Jennings (PM), R. Smith, -, T. Creacy, R. Spiker, M. Washington, and R. Adams

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-27	NBIC Location: Part 1, 1.6.9 & S6.3	No Attachment

General Description: Carbon Monoxide Detector/Alarm NBIC 2019

Subgroup: SG Installation

Task Group: None assigned.

Explanation of Need: These codes are being enforced by some jurisdictions on existing installations. Inspectors need to know what codes we need to enforce. Do the detectors have specific levels of CO when an alarm is to go off? Is there a requirement for an audible alarm or decibel level of the alarm? Where in the boiler room should the alarm/monitor be mounted?

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-33	NBIC Location: Part 1	No Attachment

General Description: Flow or Temp Sensing Devices forced Circulation Boilers

Subgroup: SG Installation
Task Group: M. Downs (PM), D. Patten, M. Wadkinson

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-34	NBIC Location: Part 1	No Attachment

General Description: Venting of gas train components

Subgroup: SG Installation
Task Group: P. Jennings (PM), M. Washington, R. Adams

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-35	NBIC Location: Part 1	No Attachment

General Description: Installation requirements for Fuel Oil Trains

Subgroup: SG Installation
Task Group: G. Tompkins (PM), D. Patten, M. Washington

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-39	NBIC Location: Part 1	No Attachment

General Description: Modular Boilers

Subgroup: SG Installation

Task Group: T. Clark (PM), M. Downs, M. Wadkinson, D. Patten, R. Austin

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-40	NBIC Location: Part 1	No Attachment

General Description: Gas Train Requirements

Subgroup: SG Installation

Task Group: R. Adams (PM), P. Jennings, G. Tompkins

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-41	NBIC Location: Part 1	Attachment Page 27

General Description: Safety and Safety Relief Valves for Steam and Hot Water Heating Boilers.

Subgroup: SG Installation

Task Group: E. Wiggins (PM), J. Brockman, G. Tompkins

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-43	NBIC Location: Part 1	Attachment Page 28

General Description: Safety Relief valve for Hot Water Supply Boilers

Subgroup: SG Installation

Task Group: W. Anderson (PM), E. Wiggins, J. Brockman

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Ms. Wadkinson reported that the proposal for this item is still in development.

Item Number: 20-44	NBIC Location: Part 1	Attachment Page 29

General Description: CW Vacuum Boilers

Subgroup: SG Installation

Task Group: K. Watson (PM), M. Washington, P. Jennings

Explanation of Need: Incorporation of applicable CSD-1 requirements.

July 2020 Meeting Action: Mr. Ron Spiker discussed the proposal and stated that the NBIC currently has no language on vacuum boilers. A motion was made and seconded to approve as presented. Mr. Wielgoszinski and Mr. Toth asked questions about the format of the proposal, the section references, and the proposed location in Part 1 for the new language. Discussion was held on these questions, resulting in the original motion being withdrawn. Ms. Wadkinson and Mr. Spiker agreed that the proposal would be taken back for further work to address the questions and discussion.

iii. Action Items – New 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: None assigned.

Explanation of Need: The form has not been updated in years. The form will be part of the National Boards Jurisdictional Reporting System which is currently under development.

January 2021 Meeting Action:

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: None assigned.

Explanation of Need: This was brought to my (Mr. Eddie Wiggins) attention by Ernest Brantley. Mr. Brantley indicated during an acceptance inspection, he found boiler with excessive oil on the tubes and tube sheet after boiler was delivered and installed. He could not find any reference to boil-out to remove this extraneous material.

January 2021 Meeting Action:

Item Number: 20-94	NBIC Location: Part 1	No Attachment

General Description: Make it mandatory to install a temperature sensor in the stack of a thermal fluid heater

Subgroup: SG Installation

Task Group: None assigned.

Explanation of Need: This request came about as a result of work done for action item 19-88.

January 2021 Meeting Action:

b. Subcommittee Inspection

i. Interpretations

ii. Action Items – Old Business

Item Number: NB16-1402	NBIC Location: Part 2, New Supplement	Attachment Page 30

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

Subgroup: FRP
Task Group: M. Gorman (PM)

Background:
In 2016, when this item was first opened, it was assigned as an item for Part 3. Recent discussions with SC R&A and the FRP Task Group have revealed that this item is better suited for Part 2. This item has been approved by the FRP Task Group.

Scope: The goal of this proposal is to provide a method to evaluate whether the service life of high pressure fiber reinforced plastic pressure vessels can be extended for an additional lifetime.

July 2020 Meeting Action: Mr. Jim Getter announced that the proposal for this item would be sent to Subcommittee Inspection as a letter ballot.

Item Number: 18-6	NBIC Location: Part 2, S1.4.2.9	No Attachment

General Description: Riveted stay bolt dimensions

Subgroup: Locomotive

Task Group: M. Janssen (PM)

July 2020 Meeting Action: Mr. Getter reported that a proposal for this item is still in development.

Item Number: 18-43	NBIC Location: Part 2, Section 5	Attachment Page 51

General Description: Permanent nameplate removal from pressure vessel being removed from service

Subgroup: Inspection

Task Group: J. Roberts (PM), J. Burgess, J. Calvert, , J. Clark, M. Sansone

July Meeting Action: Mr. Getter explained the changes being proposed. A motion was made and seconded to approve the proposal as presented. Mr. Getter explained that this new section is a non-mandatory section; if someone wants to use this form, this section provides guidelines to complete it. Mr. Venus Newton mentioned that this would act as a "death certificate" for a pressure vessel. Mr. Marty Toth asked if the use of "shall" in the new language would make the form mandatory. Mr. Getter said that this section would only be for owners that want to scrap their vessel. Mr. Rob Troutt asked if any changes have been made to the proposal based on letter ballot comments from the previous ballot. Mr. Getter said that no changes were made. Mr. Scribner mentioned that procedurally the comments need to be addressed before the proposal comes back for a vote. The original motion to approve the proposal was rescinded, and Mr. Getter confirmed the Subcommittee would address the letter ballot comments for the next meeting.

Item Number: 18-63	NBIC Location: Part 2	Attachment Page 54

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

Subgroup: Inspection

Task Group: V. Scarcella(PM), J. Mangas, J. Peterson, and J. Castle

July 2020 Meeting Action: Mr. Getter reported that a proposal for this item is still in development.

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

General Description: Revisions to Yankee dryer supplement in Part 2 (Scope)

Subgroup: Inspection

Task Group: V. Newton (PM), T. Barker, D. Lesage, J. Jessick

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

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 19-63	NBIC Location: Part 2, S5.2	No Attachment

General Description: Changes to the Yankee Dryer Supplement (ASSESSMENT OF INSTALLATION)

Subgroup: Inspection
Task Group: V. Newton (PM), T. Barker, D. Lesage, J. Jessick

Explanation of Need: Ensure that wording in Part 2, S5.2, is identical to that found in Part 1, S1.2. Note that wording will be the same, but paragraph numberings will be different.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 19-64	NBIC Location: Part 2, S5.2.1	No Attachment

General Description: Changes to the Yankee Dryer Supplement (DETERMINATION OF ALLOWABLE
OPERATING PARAMETERS)

Subgroup: Inspection

Task Group: V. Newton (PM), T. Barker, D. Lesage

Explanation of Need: Ensure that wording in Part 2, S5.2.1, is identical to that found in Part 1, S1.3. Note that wording will be the same, but paragraph numberings will be different.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 19-84	NBIC Location: Part 2, S2.10.7	Attachment Page 55

General Description: Inspecting riveted joints for failure

Subgroup: SG Historical

Task Group: F. Johnson (PM), M. Wahl, & R. Underwood

Explanation of Need: The text covers cracks parallel to a longitudinal joint, but there is no text covering inspection of plate material around a rivet.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 19-88	NBIC Location: Part 2, 2.2.12.7 c) 2)	Attachment Page 61

General Description: At NBIC Part II propose the following be added to Thermal Fluid Heater

Subgroup: Inspection

Task Group: assigned. Scarcella (PM), M. Sansone, T. Bolden, & M. Wadkinson

Explanation of Need: These items are essential to preventing catastrophic loss and are low cost items.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 20-5	NBIC Location: Part 2, 4.1 – 4.4	No Attachment

General Description: Add language in NBIC Pt2/Pt3 to minimize CSEs by allowing remote NDE.

Subgroup: Inspection

Task Group: V. Newton (PM), J. Morgan, M. Horbaczewski, D. Graf, D. LeSage, D. Rose

Explanation of Need: In order to minimize higher-risk work, specifically Confined Space Entries, remote NDE methodologies should be specifically allowed by the NBIC, at the discretion of the people performing the inspections.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 20-26	NBIC Location: Part 2, S2	No Attachment

General Description: Concern for Historical Boiler Inspections Nationwide

Subgroup: Inspection

Task Group: T. Dillon (PM), R. Underwood, L. Moedinger, M. Wahl, D. Rupert, & J. Wolf

Explanation of Need: Currently Jurisdictions are not uniform in adoption of how and when inspections are performed.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

Item Number: 20-46	NBIC Location: Part 2, 5.3.2	No Attachment

General Description: Updates to Forms NB-5, NB-6, & NB-7

Subgroup: Inspection

Task Group: D. Buechel (PM), M. Sansone, V. Scarcella

Explanation of Need: On the current forms NB-5, NB-6, & NB-7 there are fields that are already on the ASME Manufactures Data Report making them repetitive. Other fields that ask for in- depth technical information would be hard if not impossible for an inspector to determine and are irrelevant to the inspection process.

July 2020 Meeting Action: Mr. Getter reported that the proposal for this item is still in development.

iii. New 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: None assigned

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.

Item Number: 20-59	NBIC Location: Part 2, 5.2.1 a)	Attachment Page 64

General Description: Temporary nameplate removal for external inspection (submitted by Mr. Doug Biggar).

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: What is being added to NBIC part 2 (item 19-30) for NBIC 2021 edition: [(e) removal and re-attachment of the original manufacturer's nameplate shall only be done in accordance with NBIC Part 3, 5.11]. To have an inspector present onsite each time we need to have a nameplate temporarily removed has a cost that a commercial refurbisher such as ourselves would need to pass onto the customer as well as dramatically affect the efficiency of our assembly line.

Item Number: 20-70	NBIC Location: Part 2, S1.4.2.29	Attachment Page 65

General Description: Inspection of Furnace Slides (submitted by Mr. Mark Ray)

Subgroup: Locomotive

Task Group: M. Ray (PM)

Explanation of Need: Furnace slide supports which are locked in-place by corrosion will adversely impact the thermal expansion of the boiler and lead to staybolt breakage.

Item Number: 20-71	NBIC Location: Part 2, S1.6	Attachment Page 66

General Description: Safety Valve Sizing (Correct Use of Capacity Charts) (submitted by Mr. Mark Ray)

Subgroup: Locomotive

Task Group: M. Ray (PM)

Explanation of Need: This is to ensure safety valves provide the adequate relieving capacity for steam locomotive boilers.

Item Number: 20-79	NBIC Location: Part 2, S10.10.4 c)	Attachment Page 67

General Description: Add nomenclature to formula in S10.10.4 c) (originated from Public Review Comment PR20-0201)

Subgroup: FRP

Task Group: M. Gorman

Explanation of Need: The current formula has no nomenclature to define the variables. The change request came about from Public Review Comment PR20-0201. The Main Committee voted in October of 2020 to open a new action item to add nomenclature for this formula.

Variable definitions from Mr. Gorman: "U is the measured signal energy in joules. The signal is the captured waveform from, say, a fiber break source. V is the signal amplitude in volts point by point in the signal. Voltage must be corrected for gain (G). Z is in ohms. The (differential) time is dt in seconds."

Item Number: 20-82	NBIC Location: Part 2, 5.2.2 a) & 5.3.3	Attachment Page 68

General Description: Reporting of Form NB-136 (submitted by Mr. Bob Underwood)

Subgroup: Inspection

Task Group: None assigned

Explanation of Need: Revise NB-136 Reporting requirements to permit the original manufacturer of the pressure retaining item to prepare and submit the form.

Item Number: 20-93	NBIC Location: Part 2, S2.10.4	No Attachment

General Description: MAWP in the ogee curve (submitted by Mr. Tom Dillon)

Subgroup: Historical

Task Group: None assigned

Explanation of Need: There is some confusion of what is a stayed flat surface and what to do with the ogee curve.

c. Subcommittee Repairs & Alterations

i. Interpretations

Item Number: 20-3	NBIC Location: Part 3, Section 3 & 4	Attachment Page 73

General Description: Inspector involvement in Fitness-for Service assessments

Subgroup: Repairs and Alterations

Task Group: J. Siefert (PM), N. Carter

Explanation of Need: Which Inspector (i.e. "IS" Commissioned or "R" Endorsement) signs the FFSA Form NB-403 when an "R" Certificate Holder is involved with a repair in that region as well as determine what level of review of the Fitness-for-Service the Inspector is expected to complete?

July 2020 Meeting Action: Mr. Troutt reported that work is still being done on the proposal for this item.

Item Number: 20-11	NBIC Location: Part 3, 3.3.3	Attachment Page 75

General Description: Scope of Repairs

Subgroup: Repairs and Alterations

Task Group: K. Moore (PM)

Explanation of Need:
NBIC Part 3 lists several examples of repair but nowhere limits the scope or amount of these examples that can be utilized when performing repairs. This creates some uncertainty when performing some types of repairs, such as replacing the tubesheets of a fixed tubesheet type heat exchanger as listed in 3.3.3 e). According to ASME BPV Code Section VIII Division 1 Part UHX, Section 13, the length of the tubes is a design parameter and therefore replacing the tubesheet in accordance with its original design might require the replacement of the tubes as well to maintain the original design length.

July 2020 Meeting Action: Mr. Troutt reported that work is still being done on the proposal for this item.

ii. New Interpretation Requests:

Item Number: 20-66	NBIC Location: Part 3, 3.3.2 e)	Attachment Page 77

General Description: Possible contradictory interpretations of Part 3, 3.3.2 e) 2)

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

Explanation of Need:
Two previously issued interpretations, 95-14 and 95-21, seem to be contradictory with the NBIC itself. The reason for the interpretation request is that two previously published NBIC Interpretations and the NBIC itself seem to be contradictory. Interpretations 95-14 and 95-21 lead the reader to conclude that if the original vessel was postweld heat treated, then the addition of refractory clips by welding, regardless of size, without postweld heat treatment is an alteration. However, NBIC Part 3 [2019 Edition], 3.3.3 b)1) and 2) list addition of welded attachments to pressure parts, such as: Studs for insulation or refractory lining and hex steel or expanded metal for refractory lining as "Examples of Repairs". Furthermore, NBIC Part 3 [2019 Edition], 3.3.2 e) 2) states: "The following repairs may be considered as routine repairs and shall be limited to these categories:

2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;

Item Number: 20-77	NBIC Location: Part 3, 1.3.2	Attachment Page 78

General Description: Authorization of repair/alteration activities

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need:
Many R-certificate holders also have U or S stamps and as such have a regular AI (with R endorsement) to whom they tend to have review repair and alteration packages. However, when the physical work will be conducted 'out of state' travel limitations and or jurisdictional authorization requirement prevent the local AI from making the final acceptance inspection thus another AI must do that work, para 1.3.2 a) makes clear that both Inspectors have to be employed by the same agency. Form R-2 has 2 Inspector sign off locations but does not make clear if the two Inspectors must be from the same AIA or not.

Item Number: 20-78	NBIC Location: Part 3, 3.3.3 s) & 3.4.4 d)	Attachment Page 79

General Description: Repairs and Alterations of Tube Bundles

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need:
Submission is for R Certificate Holders we provide Repair Inspection services for. NBIC Part 3, 3.3.3 s) seems to allow to be a repair, but under 3.4.4 d) where the dimensions change it might be classified as an alteration.)

Item Number: 20-81	NBIC Location: Part 3, 4.4.2 a) 1)	Attachment Page 81

General Description: Minimum Required Test Pressure for Alteration Activities

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

Explanation of Need:
To provide clarity that the minimum test pressure for alterations shall be in accordance with the original code of construction.

Item Number: 20-89	NBIC Location: Part 3, 4.4.2	Attachment Page 82

General Description: LIQUID PRESSURE TEST EXAMINATION METHODS APPLICABLE TO ALTERATIONS

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need:
For Alteration can Minimum Test Pressure Shall be Design Pressure or MAWP considering same Condition as Clause 4.4.1 of Pressure Test for Repairs.

Item Number: 20-90	NBIC Location: Part 3, 1.4.1	Attachment Page 83

General Description: 1.4.1 ACCREDITATION PROCESS / NB-415- Certification of Scope

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need:
The NBIC Certification scope Does not Restrict the Repair Organization to Perform Based on their ASME Certification of scope, as long as Manual Controls are addressed for the Design and Repair/ Fabrication Scope they can perform Repair and Alteration.

Item Number: 20-91	NBIC Location: Part 3, 1.5.1 h)	Attachment Page 84

General Description: Mechanical Repair Procedures

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

Explanation of Need:
Part 3, paragraph 1.5.1(h) requires that control of mechanical assembly/repair procedures be addressed in the R Certificate Holder's Quality Manual. Over the last year or so, there have been National Board Team Leaders requesting these procedures (during joint reviews) for work such as rolling tubes in a boiler and replacing a bolted fitting on a pressure retaining item. This has resulted in questions from certificate holders and Inspectors about why an "R" certificate holder is required to have procedures for mechanical work that doesn't even require an "R" Stamp.

iii. Action Items – Old Business

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

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

Subgroup: Graphite
Task Group: Greg Becherer (PM)

July 2020 Meeting Action: Mr. Troutt reported that there was no update for this item, as Graphite is still working on the item.

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

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

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

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

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

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

Subgroup: Graphite

Task Group: Aaron Viet (PM)

July 2020 Meeting Action: Mr. Troutt reported that there was no update for this item, as Graphite is still working on the item.

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

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

Subgroup: Graphite

Task Group: C. Cary (PM)

July 2020 Meeting Action: Mr. Troutt reported that there was no update for this item, as Graphite is still working on the item.

Item Number: 18-100	**NBIC Location: Part 3, 3.3.2**	**No Attachment**

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

Subgroup: Repairs and Alterations

Task Group: (Marty Toth – PM), B. Schaefer, N. Carter

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 19-16	NBIC Location: Part 3, 3.3.2 e)	No Attachment

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

Subgroup: Repairs and Alterations

Task Group: T. White (PM)

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 19-60	NBIC Location: Part 3, 1.5.1	Attachment Page 85

General Description: Quality System For Qualification For The National Board "R" Certificate

Subgroup: Repairs and Alterations

Task Group: R. Miletti (PM), K. Moore, B. Boseo, M. Toth

Explanation of Need: Part 3, 1.5.1 provides a good outline for a Quality Systems Manual. However, the remaining elements of a Quality System, outside of the one's currently being addressed in Item 19-47 and 19-4 need to be embellished to provide a more auditable description of each element.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 19-61	NBIC Location: Part 3, 3.3.4	No Attachment

General Description: Quality System For Qualification For The National Board "R" Certificate

Subgroup: Repairs and Alterations

Task Group: P. Shanks (PM), N. Carter, J. Walker, T. McBee

Explanation of Need: Threaded insert are being used to fix a bolt that has broken off on certain types of boilers (autoclaves) which hold the heating elements in the water side of the boiler. When this happens, the technician correcting the problem will simply drill out the broken bolt with an over sized bit and inset a metallic insert. NBIC does address this this type of alteration.

July 2020 Meeting Action: Mr. Troutt reported that work a proposal will be sent to Subgroup and Subcommittee R&A as a letter ballot.

Item Number: 19-68	NBIC Location: Part 3, 1.6	No Attachment

General Description: Quality System For Qualification For The National Board "R" Certificate

Subgroup: Repairs and Alterations

Task Group: B. Wielgoszinski

Explanation of Need: Review of 1.6 for possible requirement for ANI's and ANII's to hold the (R) Endorsement for "NR" activities.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the 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.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 19-74	NBIC Location: Part 3, S3.3	No Attachment

General Description: Routine repair requirements for partial nozzle replacement

Subgroup: Graphite
Task Group: A. Stupica (PM), M. Bost

Explanation of Need: Currently only nozzle replacement is addressed as a routine repair. The group is planning on defining the types of partial nozzle replacements and repairs that could be defined as routine.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 19-79	NBIC Location: Part 3, S3.5.4 h)	No Attachment

General Description: Re-word Part 3, S3.5.4 h) to clarify cementing procedure for plugs

Subgroup: Graphite

Task Group: A. Stupica (PM)

Explanation of Need: Existing language includes unnecessary steps and is clunky to read. Text will be reworded to clarify the full procedure.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 19-82	NBIC Location: Part 3, 1.5.1 j)	No Attachment

General Description: Review verbiage in Part 3, 5.12.5.1 8) and 5.12.5.1.11)

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Safety is not addressed in Part 3. This verbiage could be added to the 1.5.1 j) Method of Performing Work paragraph so Certificate Holders can address the safety concerns specific to their scope of activities.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 20-8	NBIC Location: Part 3, 8.1 b)	No Attachment

General Description: Interpretation revision process

Subgroup: Repairs and Alterations

Task Group: K. Moore (PM)

Explanation of Need: Adding language to specify that interpretations of previous NBIC editions are applicable to the most current edition, as long as code requirements have not changed.

July 2020 Meeting Action: Mr. Troutt reported that there will be a proposal to close this item once the 2021 Edition has been published with an updated Introduction that includes the proposed language.

Item Number: 20-15	NBIC Location: Part 3, 3.3.2 & 5.7.2	Attachment Page 91

General Description: Stamping requirements for routine repairs

Subgroup: Repairs and Alterations

Task Group: R. Troutt (PM), K. Moore

Explanation of Need: This would offer traceability to the R-Stamp holder responsible for the work.

July 2020 Meeting Action: Mr. Toutt reported that a proposal for this item would be sent to subgroup and subcommittee R&A as a letter ballot.

Item Number: 20-16	NBIC Location: Part 3, 3.4.4	Attachment Page 96

General Description: Rules to address re-cold stretching of vessels built to Appendix 44 rules

Subgroup: Repairs and Alterations

Task Group: P. Shanks (PM)

Explanation of Need: ASME Section VIII Div.1 Mandatory Appendix 44 paragraph 44-6.2(g) clearly sets out that a vessel built to those rules needs to be re-stretch having had repair welding. it is not clear if ASME are referring to in process (at the original manufactures location) repairs or post construction repairs. However as the NBIC is currently silent this potential issue should be addressed.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 20-20	NBIC Location: Part 3, 3.2.2 e)	No Attachment

General Description: Revision to Part 3, 3.2.2 e)

Subgroup: Repairs and Alterations

Task Group: P. Davis (PM)

Explanation of Need: The certificate holder should not have to explain or justify why a part was not pressure tested in the manufacturing stage. PG-106.8 of Section I allows the part to be fabricated and shipped as such therefore no explanation should be required.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

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, & 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.

July 2020 Meeting Action: Mr. Troutt reported that work continues on the proposal for this item.

Item Number: 20-47	NBIC Location: All Parts, 9.1	No Attachment

General Description: Revision of the definition of ANIA in Section 9 of all Parts

Subgroup: Repairs and Alterations

Task Group: R. Spuhl (PM).

Explanation of Need: ANIA can be revised to clarify requirements and activities of AIA's performing NR inspection activities. After discussion of ANI endorsement requirements per Item 19-68, a revision of "ANIA" is being considered as a way to provide clarity on the ANI and ANIA requirements.

July 2020 Meeting Action: Mr. Troutt reported that work continues on a proposal for this item.

Item Number: 20-48	NBIC Location: Part 3, 1.6	No Attachment

General Description: Compare 2015 NQA-1 revision to NR program (1.6) for consistency.

Subgroup: Repairs and Alterations

Task Group: B. Wielgoszinski (PM).

Explanation of Need: Latest NQA-1 revision to be compared to NR program (1.6) for consistency.

July 2020 Meeting Action: Mr. Troutt reported that work continues on a proposal for this item.

iv. New Items:

Item Number: 20-51	NBIC Location: Part 3, 9.1	Attachment Page 98

General Description: Add practicable and its definition to the glossary

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: This is not a commonly used term in everyday language.

Item Number: 20-52	NBIC Location: Part 3, 1.6.2 a) 2)	No Attachment

General Description: Rvw NR requirements for ASME Section XI Div. 2 potential applications

Subgroup: Repairs and Alterations

Task Group: T. Roberts (PM)

Explanation of Need: This was created based on discussion from Item 20-47 dealing with ANIA requirements.

Item Number: 20-53	NBIC Location: Part 3, 3.3.5.2 a) & 3.4.5.1 b)	No Attachment

General Description: Certification of Repair or Alteration Plans

Subgroup: Repairs and Alterations

Task Group: S. Chestnut (PM)

Explanation of Need: The Clarification of the Certifying Engineer requirements.

Item Number: 20-54	NBIC Location: Part 3, 3.2.2 e)	No Attachment

General Description: Review and Update Part 3, 3.4.4 d)

Subgroup: Repairs and Alterations

Task Group: B. Schaefer (PM)

Explanation of Need: A change in dimension and/or contour is currently listed as an example of an alteration in Part 3, 3.4.4 d). A change in dimension may or may not be an alteration in actuality. Current wording does not allow for a change in dimension, even if it is a minor change not affecting the pressure retaining capability of the PRI, without being an alteration. This can be a burden to the industry.

Item Number: 20-55	NBIC Location: Part 3, 3.3.3 e)	Attachment Page 99

General Description: Examples of repairs

Subgroup: Repairs and Alterations

Task Group: J. Walker (PM)

Explanation of Need: By having an and between boiler and heat exchanger the tube is required to be simultaneously installed in both a boiler and a heat exchanger. This is valid for a boiler as they are heat exchanger but in the case of a pressure vessel heat exchanger they are not boilers as boil may not be happening. Therefore, this example is not applicable to pressure vessel which I do not believe is the intent.

Item Number: 20-60	NBIC Location: Part 3, 3.3.4.8	No Attachment

General Description: Part 3 Supplement for FFS Guidelines

Subgroup: Repairs and Alterations

Task Group: J. Siefert (PM)

Explanation of Need: The NBIC provides little guidance related to FFS activities and repairs in part 3.

Item Number: 20-61	NBIC Location: Part 3, S8	No Attachment

General Description: Revise Supplement 8

Subgroup: Repairs and Alterations

Task Group: J. Siefert (PM)

Explanation of Need: Supplement 8 has one sentence regarding filler metal size that needs to be deleted and dissimilar metal welding needs to be addressed under this Supplement.

Item Number: 20-63	NBIC Location: Part 3, 4.4.2 d)	Attachment Page 100

General Description: Addition of alternative method in lieu of pressure testing

Subgroup: Repairs and Alterations

Task Group: T. McBee (PM)

Explanation of Need: Another alternative method is required when contamination of the pressure-retaining item by liquids is possible or when pressure testing is not practicable, and when NDE is not fully applicable to ensure the structural integrity of the alteration.

Item Number: 20-67	NBIC Location: Part 3, S6	No Attachment

General Description: Revisions to Part 3, Supplement 6

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

Explanation of Need: Supplement 6 was implemented into the 2007 Edition of the NBIC Part 3 to provide requirements and guidelines for repairs, alterations and modifications to DOT Transport Tanks using the National Board's "TR" Program (which was never implemented). S6 has been revised over the years to remove reference to the "TR" Program, but still contains many requirements that are not correct. This purpose of this proposal is to review the entire Supplement and make appropriate revisions that comply with NBIC Part 3 and DOT requirements.

Item Number: 20-68	NBIC Location: Part 3, 1.5.1 e) & f)	Attachment Page 101

General Description: Certifications to be addressed for electric or written signature and date

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

Explanation of Need: Certifications, either written or electronic, are not addressed in the NBIC.

Item Number: 20-69	NBIC Location: Part 3, S1.2.11.5	Attachment Page 105

General Description: Welds Across Riveted Lap Seams

Subgroup: Locomotive

Task Group: M. Ray (PM)

Explanation of Need: Clarify wording regarding weld taper and provide a cleaner figure to better illustrate the repair. Historical Boilers is considering adding the same text to their Section.

Item Number: 20-73	NBIC Location: Part 3, 4.4.2 a) 2)	Attachment Page 107

General Description: Pressure Testing of Connecting Welds (Part 3, 4.4.2(a)(2)

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

Explanation of Need: To clarify what the term "replacement part" as used in 4.4.2(a)(2) of Part 3 means.

Item Number: 20-74	NBIC Location: Part 3, 2.2.1	No Attachment

General Description: PQR conditions of validity

Subgroup: Repairs and Alterations

Task Group: P. Shanks (PM)

Explanation of Need: ASME Section IX are planning to issue a new code case under record number 19-2833 which would allow for the normal room temperature tensile test to be replaced with an elevated one due to some material not being capable of passing at room temp. As part of this the WPS may only be used within +- 50°F of the actual test temperature. If this code case is used and a boiler design temperature is changed the validity of the PQR/PWS qualification is in question. This is a similar situation to a PWHT time at temperature- reheat treating an existing PRI may take the PQR/WPS outside of its qualification.

Item Number: 20-75	NBIC Location: Part 3, 2.5.3.2 d) & h)	No Attachment

General Description: Charpy Impact Test Temperature for Welding Method 2

Subgroup: Repairs and Alterations

Task Group: S. Chestnut (PM)

Explanation of Need: Current text in 2.5.3.2 h) requires Charpy impact tests be conducted "at the temperature determined in accordance with NBIC Part 3, 2.5.3.2 d)." 2.5.3.2 d) only discusses WPS preheat and interpass temperature. It does not discuss the temperature at which to conduct CVN testing. There is no reference made to the MDMT.

Item Number: 20-76	NBIC Location: Part 3, 9.1	Attachment Page 110

General Description: Define "Remote" in the NBIC Glossary

Subgroup: Repairs and Alterations

Task Group: R. Valdez (PM)

Explanation of Need: With the use of indirect inspection equipment from borescopes to tethered drones/vehicles for confined space inspections, there is a need to clarify what is considered a "remote" inspection vs an "indirect" inspection.

Item Number: 20-80	NBIC Location: Part 3, 4.4.2 a) 1)	Attachment Page 111

General Description: Liquid Pressure Testing of Alterations

Subgroup: Repairs and Alterations

Task Group: R. Underwood (PM)

Explanation of Need: To provide clarity that the minimum test pressure for alterations shall be in accordance with the original code of construction.

Item Number: 20-83	NBIC Location: Part 3, 1.5.1 s) & 9.1	Attachment Page 112

General Description: Revision to Part 3, 3.2.2 e)

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: Action Item 19-60 is proposing revisions/additions to all of 1.5.1. This proposal is to move the definition of "Nonconformance" out of the current 1.5.1 s) paragraph and into the glossary.

Item Number: 20-87	NBIC Location: Part 3, S6.8	Attachment Page 113

General Description: Registered Inspector requirements per DOT

Subgroup: Repairs and Alterations

Task Group: None assigned.

Explanation of Need: This reference to 49 CFR statutes would clarify the difference between an "Inspector" as used throughout the NBIC and a "Registered Inspector" specific to DOT tank repair/alteration activities.

Item Number: 20-88	NBIC Location: Part 3, S6.15.1	Attachment Page 114
General Description: Remove S6.15.1 - It is redundant and is not needed **Subgroup:** Repairs and Alterations **Task Group:** None assigned. **Explanation of Need:** The certificate holder should not have to explain or justify why a part was not pressure tested in the manufacturing stage. PG-106.8 of Section I allows the part to be fabricated and shipped as such therefore no explanation should be required.		

Item Number: 20-92	NBIC Location: Part 3, 1.5.1 h)	Attachment Page 115
General Description: Changing "Mechanical assembly procedures" to "Mechanical Repair Procedures" **Subgroup:** Repairs and Alterations **Task Group:** R. Underwood (PM) **Explanation of Need:** "Mechanical assembly procedures" appears to be incorrectly referenced in the first sentence of 1.5.1(h) and should state "mechanical repair procedures."		

d. Subcommittee Pressure Relief Devices

i. Interpretations

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 **July 2020 Meeting Action:** Ms. Brodeur reported that a proposal for this item is still in development.		

Item Number: NB15-0307	NBIC Location: Part 4	No Attachment
General Description: Create Guidelines for Repair of Pin Devices. **Task Group:** D. McHugh (PM), A. Renaldo, T. Tarbay, R. McCaffrey, J. Simms, C. Beair **July 2020 Meeting Action:** Ms. Brodeur reported that a proposal for this item is still in development.		

Item Number: NB15-0315	NBIC Location: Part 4, 2.5.6 and 2.6.6 and Part 1, 4.5.6 and 5.3.6	No Attachment
General Description: Review isolation Valve Requirements, and reword to allow installation of pressure relief devices in upstream piping. **Task Group:** D. DeMichael (PM), B. Nutter, A. Renaldo, D. Marek **July 2020 Meeting Action:** Ms. Brodeur reported that a proposal for this item is still in development.		

Item Number: 17-115	NBIC Location: Part 4, Section 2	Attachment Page 117

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

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

July 2020 Meeting Action: Ms. Brodeur announced that the proposal for this item would be sent to Subcommittee PRD as a letter ballot.

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

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

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

July 2020 Meeting Action: Ms. Brodeur reported that a proposal for this item is still in development.

Item Number: 19-1	NBIC Location: Part 4, 4.8.5.4 & 4.8.6.1	Attachment Page 135

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

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

July 2020 Meeting Action: Ms. Brodeur reported that a proposal for this item is still in development.

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

General Description: Origin of Replacement Parts for Pressure Relief Devices

Task Group: A. Cox (PM), T. Patel, P. Dhobi, J. Simms

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

July 2020 Meeting Action: Ms. Brodeur reported that a proposal for this item is still in development.

Item Number: 19-71	NBIC Location: Part 4, 4.9.2 & 4.9.3	Attachment Page 138

General Description: Use of Personnel from another VR Certificate Holder to perform VR Repairs

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

Explanation of Need: NBIC SCPRD needs to address the practice of sub-contracted personnel between VR Holders. In order to maintain Quality Standards, the responsible VR Holder must verify the qualifications all personnel and maintain records per NBIC Part 4, Table 4.8.5.4 s)

July 2020 Meeting Action: Ms. Brodeur announced that the proposal for this item would be sent to Subgroup PRD as a letter ballot.

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.

July 2020 Meeting Action: Ms. Brodeur reported that a proposal for this item is still in development.

Item Number: 19-85	NBIC Location: Part 4, 2.3.6 j)	No Attachment

General Description: Thermal Fluid Heaters

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

Explanation of Need: Thermal Fluid heaters with no change of phase are not specifically addressed in 2.3.6 j).

July 2020 Meeting Action: Ms. Brodeur reported that a proposal for this item is still in development.

iii. New Items:

Item Number: 20-56	NBIC Location: Part 4, 2.3.6 j)	No Attachment

General Description: Review and clarify requirements training program for T/O holders

Subgroup: PRD

Task Group: None

Explanation of Need: Need to align the T/O language with the new approved language in Section 4.

Item Number: 20-58	NBIC Location: Part 4, 3.4 and 3.5	No Attachment

General Description: Correct Paragraph numbers in Section 3 Related to T/O Requirements

Subgroup: PRD

Task Group: None

Explanation of Need: The paragraph hierarchy is incorrect. Section 3 is for all of in-service inspection and Section 3.3 is specifically for the T/O program. Current sections 3.4 and 3.5 are specific to the T/O program and should be a subordinate paragraph in the document.

11. Liaison Activities

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

i. Mr. Paul Edwards will present a report on recent ASME activities.

b. American Welding Society (AWS)

i. Mr. Jim Sekely will present a report on recent AWS activities.

12. Future Meetings

- July 12th-15th, 2021 – Cincinnati, OH at The Hilton Netherlands Hotel
- January 10th-13th, 2022 – TBD

13. Adjournment

Respectfully submitted,

Jonathan Ellis

Jonathan Ellis
NBIC Secretary

NBIC Main Committee

Last Name	First Name	Interest Category	Role	Exp. Date	More
Wielgoszinski	Robert	Authorized Inspection Agencies	Chair	08/30/2021	Details
Galanes	George	Users	Vice Chair	01/30/2022	Details
Ellis	Jonathan		Secretary	12/30/2099	Details
Austin	Randall	Users	Member	01/30/2023	Details
Brodeur	Marianne	National Board Certificate Holders	Member	10/30/2022	Details
Edwards	Paul	National Board Certificate Holders	Member	08/30/2021	Details
Getter	Jim	Manufacturers	Member	01/30/2023	Details
Hopkins	Craig	National Board Certificate Holders	Member	07/30/2022	Details
LeSage	Donnie	Jurisdictional Authorities	Member	01/30/2022	Details
Morelock	Brian	Users	Member	01/30/2023	Details
Newton	Venus	Authorized Inspection Agencies	Member	01/30/2023	Details
Patel	Thakor	Manufacturers	Member	01/30/2023	Details
Richards	H. Michael	General Interest	Member	08/30/2022	Details
Sansone	Matthew	Jurisdictional Authorities	Member	07/30/2023	Details
Seime	Trevor	Jurisdictional Authorities	Member	07/30/2023	Details
Sekely	James	General Interest	Member	08/30/2023	Details
Sturm	Rick	Jurisdictional Authorities	Member	10/30/2022	Details
Toth	Marty	General Interest	Member	10/30/2022	Details
Troutt	Robby	Jurisdictional Authorities	Member	01/30/2021	Details
Wadkinson	Melissa	Manufacturers	Member	01/30/2023	Details
Washington	Milton	Jurisdictional Authorities	Member	01/30/2022	Details
Welch	Paul	Authorized Inspection Agencies	Member	08/30/2022	Details

Items Approved for 2023 NBIC

Title	Item Number	CaseStatus	Cycle	NBICEdition	Assigned Committee
Review and clarify requirements for documented training program for VR and T/O programs.	19-2	MC Approved	A	2023	Subcommittee Pressure Relief Devices
Prepare a guide for repair of tank vents	NB12-0901	MC Approved	A	2023	Subcommittee Pressure Relief Devices
Create Guidelines for Installation of Pressure Relief Devices for Organic Fluid Vaporizers	NB15-0308	MC Approved	A	2023	Subcommittee Pressure Relief Devices
Review testing requirements for inservice testing of pressure relief devices	NB15-0321	MC Approved	A	2023	Subcommittee Pressure Relief Devices

Subcommittee Installation

Last Name	First Name	Interest Category	Role	Exp. Date	More
Wadkinson	Melissa	Manufacturers	Chair	08/30/2021	Details
Wiggins	Edward	Jurisdictional Authorities	Vice Chair	07/30/2023	Details
Bock	Jeanne		Secretary	01/30/2099	Details
Austin	Randall	Users	Member	10/30/2022	Details
Brockman	Joe	Authorized Inspection Agencies	Member	07/30/2023	Details
Creacy	Todd	Authorized Inspection Agencies	Member	01/30/2021	Details
Downs	James	Manufacturers	Member	10/30/2022	Details
Halley	Geoffrey	General Interest	Member	08/30/2021	Details
Konopacki	Stanley	Users	Member	01/30/2023	Details
Patten	Don	Manufacturers	Member	01/30/2023	Details
Richards	H. Michael	General Interest	Member	08/30/2021	Details
Smith	Rex	Authorized Inspection Agencies	Member	01/30/2023	Details
Washington	Milton	Jurisdictional Authorities	Member	01/30/2023	Details

PROPOSED INTERPRETATION

Inquiry No.	**20-84**
Source	Chris Cantrell, State of Nebraska Christopher.Cantrell@nebraska.gov
Subject	Adjustable Packing on Low Pressure Boiler Stop Valves **Background:** Most new hot water heating boilers and hot water supply boilers are being installed with appropriately-pressure/temperature-rated butterfly valves as their outlet isolation valves. Most butterfly valves that are installed do not have adjustable pressure-type packing glands. Instead, these valves are supplied with EPDM or Viton seals inside the stem housing to prevent water escape. EPDM is rated to 275 F, and Viton is rated to 300 F. It is unclear whether or not the text of the referenced code is a requirement that is specifically intended to apply to water boilers, or if it is a requirement that has simply been in the code and has carried forward through the years. It is also unclear as to the safety basis for requiring adjustable packing for low pressure hot water boiler stop valves.
Edition	**Part 1, 3.7.5.1 d) 4)**
Question	Does the requirement in NBIC, Part 1, Section 3, paragraph 3.7.5.1(d)(4) that all valves or cocks with stems or spindles shall have adjustable pressure-type packing glands apply to stop valves used on low pressure hot water heating or hot water supply boilers?
Reply	No. This requirement applies to stop valves used on low pressure steam boilers only.
Committee's Question	
Committee's Reply	
Rationale	

NB11-1901

SUPPLEMENT X
INSTALLATION OF HIGH PRESSURE COMPOSITE PRESSURE VESSELS

SX.1 SCOPE

This supplement provides requirements for the installation of high-pressure composite pressure vessels. This supplement is applicable to pressure vessels with an MAWP not exceeding 15,000 psi, and is applicable to the following classes of vessels:

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

b) Metallic vessel with a full FRP wrap (both load sharing)

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

d) FRP vessel with a non-load sharing non-metallic liner

SX.2 SUPPORTS

Design of supports, foundations, and settings shall consider the dead loads, live loads, wind, and seismic loads. Vibration and thermal expansion shall also be considered. The design of supports, foundations, and settings shall be in accordance with ASCE/SEI 7, *Minimum Design Loads for Buildings and Other Structures*. The importance factors used in calculating the seismic and wind loads shall be the

highest value specified for any category in ASCE/SEI 7.

SX.3 CLEARANCES

The pressure vessel installation shall allow sufficient clearance for normal operation, maintenance, and inspection. Stacking of pressure vessels is permitted. The minimum clear space between pressure vessels shall be 1 ft. vertical and 2 ft. horizontal. Vessel nameplates shall be visible after installation for inspection. The location of vessels containing flammable fluids shall comply with NFPA 2. The vessel owner shall document the vessel pressure and pipe diameters used as a basis for compliance with NFPA 2 location requirements.

SX.4 PIPING LOADS

Piping loads on vessel nozzles shall be determined by a formal flexibility analysis per ASME B31.12: paragraph IP-6.1.5(b). The piping loads shall not exceed the maximum nozzle loads defined by the vessel manufacturer.

SX.5 MECHANICAL CONNECTIONS

Mechanical connections shall comply with pressure vessel manufacturer’s instructions, and with requirements of the Jurisdiction. Connections to threaded nozzles shall have primary and secondary seals. The seal design shall include a method for detecting a leak in the primary seal. Seal functionality shall be demonstrated at the initial pressurization of the vessel.

SX.6 PRESSURE INDICATING DEVICES

Each pressure vessel shall be equipped with a pressure gage mounted on the vessel. The dial range shall be from 0 psi to not less than 1.25 times the vessel MAWP. The pressure gage shall have an opening not to exceed 0.0550in (1.4mm) (No. 54 drill size) at the inlet connection. In addition, vessel pressure shall be monitored by a suitable remote pressure indicating device with alarm having an indicating range of 0 psi to not less than 1.25 times the vessel MAWP.

SX.7 PRESSURE RELIEF DEVICES

Each pressure vessel shall be protected by pressure relief devices per the following requirements:

a) Pressure relief devices shall be suitable for the intended service.

b) Pressure relief devices shall be manufactured in accordance with a national or international standard and certified for capacity (or resistance to flow for rupture disk devices) by the National Board.

c) Dead weight or weighted lever pressure relief valves are prohibited.

d) Pressure relief valves shall not be fitted with lifting devices.

e) The pressure relief device shall be installed directly on the pressure vessel with no isolation valves between the vessel and the pressure relief device except:

1) When these isolation valves are so constructed or positively controlled below the minimum required capacity, that closing the maximum number of valves at one time will not reduce the pressure relieving capacity, or

2) Upon specific acceptance of the Jurisdiction, an isolation valve between vessel and its pressure relief device may be provided for vessel inspection and repair only. The isolation valve shall be arranged so it can be locked or sealed open.

f) The discharge from pressure relief device(s) shall be directed upward to prevent any impingement of escaping fluid upon the vessel, adjacent vessels, adjacent structures, or personnel. The discharge must be to outdoors, not under any structure or roof that might permit formation of a “cloud”. The pressure relief device(s) discharge piping shall be designed so that it cannot become plugged by animals, insects, rainwater, or other materials.

g) When a single pressure relieving device is used, it shall be set to operate at a pressure not exceeding the MAWP of the vessel. When the required capacity is provided in more than one pressure relieving device, only one device need be set at or below the MAWP, and the additional device(s) may be set to open at higher pressures but in no case at a pressure higher than 105% of the MAWP. The requirements of RR-130 of ASME Section X shall also apply.

h) The pressure relief device(s) shall have sufficient capacity to ensure the pressure vessel does not exceed the MAWP of that specified in the original code of construction.

i) The owner shall document the basis for selection of the pressure relief device(s) used, including capacity.

j) The owner shall have such analysis available for review by the Jurisdiction.

k) Pressure relief devices and discharge piping shall be supported so that reaction forces are not transmitted to the vessel.

l) Heat detection system: a heat activated system shall be provided so that vessel contents will be vented per f) (above), if any part of the vessel is exposed to a temperature greater than 220°F.

m) Positive methods shall be incorporated to prevent overfilling of the vessel.

SX.8 ASSESSMENT OF INSTALLATION

a) Isolation valve(s) shall be installed directly on each vessel, but not between the vessel and the pressure relief device except as noted in 3.7, e), above.

b) Vessels shall not be buried.

c) Vessels may be installed in a vault subject to a hazard analysis, verified by the manufacturer, owner, user, qualified engineer, or the Jurisdiction, to include as a minimum the following:

1) Ventilation

2) Inlet and outlet openings

3) Access to vessels

4) Clearances

5) Intrusion of ground water

6) Designed for cover loads

7) Explosion control

8) Ignition sources

9) Noncombustible construction

10) Remote monitoring for leaks, smoke, and fire

11) Remote controlled isolation valves

d) Fire and heat detection/suppression provisions shall comply with the requirements of the Jurisdiction and, as a minimum, include relief scenarios in the event of a fire or impending overpressure from heat sources.

e) Installation locations shall provide the following:

1) Guard posts shall be provided to protect the vessels from vehicular damage per NFPA 2. Protection from wind, seismic events shall be provided.

2) Supports and barriers shall be constructed of non-combustible materials.

3) Vessels shall be protected from degradation due to direct sunlight.

4) Access to vessels shall be limited to authorized personnel.

5) Any fence surrounding the vessels shall be provided with a minimum of two gates. The gates shall open outward, and shall be capable of being opened from the inside without a key.

6) Access for initial and periodic visual inspection and NDE of vessels, supports, piping, pressure gages or devices, relief devices and related piping, and other associated equipment.

7) Completed installations shall be validated as required by the Jurisdiction as addressing all of the above, and any requirements of the Jurisdiction, prior to first use. This verification shall be posted in a conspicuous location near the vessel and, when required, on file with the

Jurisdiction. Certificates shall be updated as required by mandated subsequent inspections.

8) Piping installation shall comply with ASME B31.12 or NFPA 2.

9) The vessels shall be electrically bonded and grounded per NFPA 55.

SX.9 LADDERS AND RUNWAYS

See NBIC Part 1, Section 1.6.4 *Ladders and Runways*

ITEM 18-57

Proposed Changes – Where highlighted, the term capitalization is proposed to be changed.

1.4.1 RESPONSIBILITY

a) The owner is responsible for satisfying jurisdictional requirements for certification and documentation. When required by jurisdictional rules applicable to the location of installation, the boilers, pressure vessels, piping, and other pressure-retaining items shall not be operated until the required documentation has been provided by the installer to the owner and the Jurisdiction.

b) The National Board Commissioned Inspector providing inservice ~~i~~inspection for the facility in which the pressure-retaining item is installed has the following responsibilities: 1) Verify the Boiler Installation Report (I-1 Report) has been completed and signed by the installer, when required by the Jurisdiction; 2) Verify pressure-retaining items comply with the laws and regulations of the Jurisdiction governing the specific type of boiler or pressure vessel; 3) Verify any repairs or alterations to pressure-retaining items, which are conducted prior to, or during, the initial installation, are in accordance with the NBIC; 4) Request or assign jurisdictional identification number, when required by the Jurisdiction; and 5) Complete and submit the first inservice inspection/certificate report to the Jurisdiction when required by the Jurisdiction.

c) Unless otherwise specifically required by the Jurisdiction, the duties of the inservice ~~i~~inspector do not include the installation's compliance with manufacturer's recommendations or applicability of, or compliance with, other standards and requirements (e.g., environmental, construction, electrical, undefined industry standards, etc.) for which other regulatory agencies have authority and responsibility to oversee.

5.4 EXAMINATION, INSPECTION, AND TESTING {piping}

The owner shall ensure that all examinations, ~~i~~inspections, and tests required by the code of construction have been performed prior to operation.

BACKGROUND INFORMATION – Review of Inspector, Inspect, Inspection

1) The proposal does not address locations where the addition of the endorsement could be considered. This includes the following:

- 4.6 – Testing and Acceptance – “the Inspector shall witness the pressure test of the completed installation…”
- Definitions – Dutchman – references “acceptable to the Inspector”

2) Two instances where the terms appear generic.

Location and Usage – Inspector – inspector	Comments
1.1 Scope Middle of main paragraph. “Otherwise the requirements specified in NBIC part 1 provide guidance for installers, contractor, owners*, inspectors*, and jurisdictions to ensure safe and satisfactory installation of specified pressure-retaining items.	The first part of the paragraph states that the owner-user is responsible for ensuring that the installation meet all the requirements of the Jurisdiction at the point of installation including licensing, registration, or certification of those performing installations. Inspector is little i. Could mean jurisdictional or other.
1.4.1 Responsibility b) The National Board Commissioned *Inspector* providing inservice inspection for the facility in which the pressure-retaining item is installed have the following responsibilities: 1) Verify the Boiler Installation Report (I-1 Report) has been completed and signed by the installer, when required by the jurisdiction, 2) Verify pressure-retaining items comply with the laws and regulations of the Jurisdiction governing the specific type of boiler or pressure vessel 3) Verify any repairs or alteration to pressure-retaining item, which are conducted prior to or during, the initial installation, are in accordance with the NBIC; 4) Request or assign jurisdictional identification number, when required by the Jurisdiction; and 5) Complete and service the first inservice inspection/certificate report to the Jurisdiction when required by the Jurisdiction c) Unless otherwise specifically required by the Jurisdiction, the duties of the inservice *inspector* do not include the installation’s compliance to other standards and requirements (e.g., environmental, construction, electrical, undefined industry standards, etc.) for which other regulatory agencies have authority and responsibility to oversee.	Inservice inspector responsibilities under Part 1. Capital I IS endorsement Little I, but references a commission. This should be capitalized

2.10.2 Pressure Test Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in accordance with the original code of construction. Any pressure piping and fittings such as water columns, blowoff valves, feedwater regulators, superheaters, economizers, stop valves, etc., which are shipped connected to the boiler as a unit, shall be hydrostatically tested with the boiler and witnessed by an *Inspector.*	Capital Inspector so a Commissioned inspector Inservice or shop? (IS vs. R) Do we want to differentiate?
4.6 testing and acceptance (pressure vessels) b. The completed pressure vessel shall be pressure tested in the shop or in the field in accordance to the original code of construction. When required by the Jurisdiction, owner or user, the *Inspector* shall witness the pressure test of the completed installation, including piping….	Is this the AI? It is a commissioned Inspector so Capital I is appropriate, but which one?
Supplement 1 Installation of Yankee Dryers **S1.2 ASSESSMENT OF INSTALLATION** a. The *Inspector* verifies that the owner or user is properly controlling the operating conditions of the dryer. The *Inspector* does this by reviewing the owners comprehensive assessments of the complete installation. f. To maintain produce quality, the dryer surface is periodically refurbished by grinding…. The manufacturer, or another qualified source acceptable to the *Inspector*, instead provided a series of curves that graphically defines these maximum allowable operating parameters…. h. If nonstandard load events (incidents) have occurred during installation, then the *Inspector* should ensure that an appropriate assessment of the structural integrity….	Inservice Inspector Capital I and context fits.
Supplement 2 - Pressure relief valves on the low-pressure side of steam pressure reducing valves **S2.2 PRESSURE RELIEF VALVE CAPACITY** b. By using the formula in NBIC Part 1, S2.3, *Inspectors* may calculate the required relieving capacities of the pressure relief valve(s) installed on the low-pressure side of the reducing valve.	Assume meant for inservice Capital I and context.
Supplement 5 Installation of thermal fluid heaters **S5.8.2 PRESSURE TEST**	Prior to operation. Capitol I

Prior to initial operation, the completed thermal fluid heater system, including pressure piping, pumps, stop valves, etc. shall be pressure tested in accordance with the manufacturer's recommendations. Hydrostatic testing of the system is not recommended due to possible contamination of the system. All pressure testing should be witnessed by an *Inspector*.	Is this an in-service or shop as it is the system test. AIA typically doesn't test completed systems but in-service don't inspect prior to operation.
Definitions Confined space - … the *Inspector* is a cautioned of the need to comply with…	Any commissioned Inspector.
Dutchman - Generally limited to tube or pipe cross-section replacement. … meeting the service requirements and installation procedures acceptable to the *Inspector*….	Dutchman are repair – shop/repair Not in-service.
National Board Commissioned *Inspector* - An individual who holds a valid and current National Board Owner-user Commission.	Definition – No distinction between in-service and AIA
Owner-user *Inspector* - An individual who holds a valid and current National Board Commission.	Same definition as an NBIC commissioned inspector. This was originally copied from NBIC part 1 incorrectly. This is correct as shown and the definition is acceptable.
Interpretations Multiple references to *Inspector.*	Most appear to reference repairs. Some are older references and difficult to ascertain from the Subject.
Location and Usage **Inspection - inspection**	
1.4 CERTIFICATION, INSPECTION, AND JURISDICTIONAL REQUIREMENTS b) The National Board Commissioned Inspector providing inservice inspection for the facility in which the pressure-retaining item is installed has the following responsibilities: 1) Verify the Boiler Installation Report (I-1 Report) has been completed and signed by the installer,	Inspection – little i but by context should be I.

when required by the Jurisdiction; 2) Verify pressure-retaining items comply with the laws and regulations of the Jurisdiction governing the specific type of boiler or pressure vessel; 3) Verify any repairs or alterations to pressure-retaining items, which are conducted prior to, or during, the initial installation, are in accordance with the NBIC; 4) Request or assign jurisdictional identification number, when required by the Jurisdiction; and 5) Complete and submit the first inservice inspection/certificate report to the Jurisdiction when required by the Jurisdiction.	Also should be I, not i.
1.4.2 EQUIPMENT CERTIFICATION b) Package boilers having external piping disassembled and shipped with the boiler shall have a method for traceability of the disassembled piping that can be verified at the time of installation and inspection. The manufacturer of the package boiler is responsible for determining a method of traceability.	Little i, but unclear.
1.4.4 INSPECTION All boilers, pressure vessels, piping, and other pressure-retaining items shall be inspected and tested after installation and prior to commencing operation. 1.4.5 BOILER INSTALLATION REPORT a) Upon completion, inspection, testing, and acceptance of the installation, the installer shall complete and certify the Boiler Installation Report (I-1) for all power boilers, hot-water heating boilers, steam-heating boilers, hot-water supply boilers, and potable water heaters.	Little i, the installation report is by the installer. Not an Inspector reference.
1.6.4 LADDERS AND RUNWAYS	Little i. Reference to generic inspection activities that may include big I Inspection.

a) All walkways, runways, and platforms shall be: 1) of metal construction or equivalent material; 2) provided between or over the top of boilers, heaters, or vessels that are more than 8 ft. (2.4 m) above the operating floor to afford accessibility for normal operation, maintenance, and inspection;	("Generic i" in the following cases)
2.3.3 CLEARANCES a) Boiler installations shall allow for normal operation, maintenance, and inspections. There shall be at least 36 in. (915 mm) of clearance on each side of the boiler to enable access for maintenance and/or inspection activities. Boilers operated in battery shall not be installed closer than 48 in. (1220 mm) from each other. The front or rear of any boiler shall not be located nearer than 36 in. (915 mm) from any wall or structure. e) Boilers with a bottom opening used for inspection or maintenance shall have at least 12 in. (305 mm) of unobstructed clearance.	Generic i.
2.7.5 BLOWOFF q) Where necessary to install a blowoff tank underground, it shall be enclosed in a concrete or brick pit with a removable cover so that inspection of the entire shell and heads of the tank can be made.	Generic i.
2.10 TESTING AND ACCEPTANCE 2.10.1 GENERAL a) Care shall be exercised during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the boiler. Where possible, an inspection of the interior of the boiler and its appurtenances shall be made for the presence of foreign debris prior to making the	Generic i.

final closure.	
2.10.6 BOILER INSTALLATION REPORT a) Upon completion, inspection, and acceptance of the installation, the installer shall complete and certify the Boiler Installation Report I-1. See NBIC Part 1, 1.4.5.1.	Not an Inspector. Little i. ?
3.3.4 CLEARANCES c) Heating boilers shall be located so that adequate space is provided for proper operation, maintenance, and inspection of equipment and appurtenances, which shall include the removal of tubes if applicable.	Generic i.
3.7.4 FEEDWATER, MAKEUP WATER, AND WATER SUPPLY a) Steam Boilers Feedwater or water treatment shall be introduced into a boiler through the return piping system. Alternatively, feedwater or water treatment shall be introduced through an independent connection. The water flow from the independent connection shall not discharge directly against parts of the boiler exposed to direct radiant heat from the fire. Feedwater or water treatment shall not be introduced through openings or connections provided for inspection or cleaning, safety valve, water column, water-gage glass, or pressure gage. The feedwater pipe shall be provided with a check valve, or a backflow preventer containing a check valve, near the boiler and a stop valve or cock between the check valve and the boiler, or between the check valve and the return pipe system. b) Hot-Water Boilers Makeup water may be introduced into a boiler through the piping system or through an independent connection. The water flow from the independent connection shall not discharge directly against parts	Generic i

of the boiler exposed to direct radiant heat from the fire. Makeup water shall not be introduced through openings or connections provided exclusively for inspection or cleaning, safety relief valve, pressure gage, or temperature gage. The makeup water pipe shall be provided with a check valve, or a backflow preventer containing a check valve, near the boiler and a stop valve or cock between the check valve and the boiler, or between the check valve and the piping system.	
3.10.3 BOILER INSTALLATION REPORT a) Upon completion, inspection, and acceptance of the installation, the installer shall complete and certify the Boiler Installation Report I-1. See NBIC Part 1, 1.4.5.1. 4.3.2 CLEARANCES a) All pressure vessel installations must allow sufficient clearance for normal operation, maintenance, and inspection (internal and external).	Not the in-service inspector prior to first "inspection"
4.5.6 INSTALLATION AND DISCHARGE PIPING REQUIREMENTS e) There shall be no intervening stop valves…except under the following conditions: 2) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a pressure vessel and its pressure relief device may be provided for inspection and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the	Generic i.

open position before the authorized person leaves the station. 3) A full area stop valve may also be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked and sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed. h) Pressure relief devices shall be installed so they are readily accessible for inspection, repair, or replacement.	
4.7.2 CLEARANCE AND ACCEPTABILITY a) The required nameplate (marking or stamping) should be exposed and accessible. b) The openings when required should be accessible to allow for entry for inspection and maintenance.	Generic i.
5.3.6 INLET AND DISCHARGE PIPING REQUIREMENTS e) There shall be no intervening stop valves … except under the following conditions: 2) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a piping system and its pressure relief device may be provided for inspection	Generic i.

and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station; 3) A full area stop valve may be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed; or i) Pressure relief devices shall be installed so they are accessible for inspection, repair, or replacement. These stop valves shall be so constructed or positively controlled that the closing of the maximum number of block valves at one time will not reduce the pressure relieving capacity below the required relieving capacity.	
5.4 EXAMINATION, INSPECTION, AND TESTING The owner shall ensure that all examinations, inspections, and tests required by the code of construction have been performed prior to operation.	As it is required by the code of construction, should this be a capitol I? Why both examinations and inspections.
S3.2.1 GENERAL REQUIREMENTS (ENCLOSED AND UNENCLOSED AREAS)	

a) LCDSVs shall not be located within 10 feet (3,050 mm) of elevators, unprotected platform ledges, or other areas where falling would result in dropping distances exceeding half the container height. b) LCDSVs shall be installed with sufficient clearance for filling, operation, maintenance, inspection, and replacement.	Generic i
S5.3.4 CLEARANCES a) Thermal fluid heater installations shall allow for normal operation, maintenance, and inspections. There shall be at least 18 in. (460 mm) of clearance on each side of the thermal fluid heater to enable access for maintenance and/or inspection activities. Thermal fluid heaters operated in battery shall not be installed closer than 18 in. (460 mm) from each other. The front or rear of any thermal fluid heater shall not be located nearer than 36 in. (915 mm) from any wall or structure. c) Heaters with a bottom opening used for inspection or maintenance shall have at least 18 in. (460 mm) of unobstructed clearance.	Generic i
S5.8.1 GENERAL a) Care shall be exercised during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the thermal fluid system. Where possible, an inspection of the interior of the thermal fluid heater and its appurtenances shall be made for the presence of foreign debris prior to making the final closure.	Generic i
S5.8.6 INSTALLATION REPORT	Generic i?

a) Upon completion, inspection, and acceptance of the installation, the installer should complete and certify the Boiler Installation Report I-1. See 1.4.5.1.	
S7.3.1 RECEIVING AND INITIAL INSPECTION OF GRAPHITE PRESSURE EQUIPMENT Graphite equipment should be thoroughly inspected and tested as it is received in order to identify any in transit damage. Whenever possible, this inspection should be made before the exchanger is removed from the carrier. To verify the unit has arrived in an undamaged condition, a pressure test may be performed. The bolt torques and spring heights should be verified prior to a pressure test. This pressure test shall not exceed the MAWP of the vessel….	This is not a Inspector responsibility?
PART 1, SECTION 8 INSTALLATION — PREPARATION OF TECHNICAL INQUIRIES TO THE NATIONAL BOARD INSPECTION CODE COMMITTEE SKIPPED INSPECTION IN THIS SECTION	
Authorized Inspection Agency (AIA) **Inservice**: An Authorized Inspection Agency is either: a) a jurisdictional authority as defined in the National Board Constitution; or b) an entity that is accredited by the National Board meeting NB-369, Accreditation of Authorized Inspection Agencies Performing Inservice Inspection Activities; NB-371, Accreditation of Owner-User Inspection Organizations (OUIO); or NB-390, Qualifications and duties for Federal Inspection Agencies (FIAs) Performing Inservice Inspection Activities. **New Construction**: An Authorized Inspection Agency is one that is accredited by the National Board meeting the qualification and duties of NB-360, Criteria for Acceptance of Authorized Inspection Agencies for New Construction. **Authorized Nuclear Inspection Agency** — An Authorized Inspection Agency intending to perform nuclear	

inspection activities and employing nuclear Inspectors / Supervisors	
Inspection — A process of review to ensure engineering design, materials, assembly, examination, and testing requirements have been met and are compliant with the code.	Capitol I Inspection.
Jurisdiction — The National Board member Jurisdiction where the organization is located. Alternatively, where the Jurisdiction elects not to perform the review or where there is no Jurisdiction or where the Jurisdiction is the organization's Authorized Inspection Agency, The National Board of Boiler and Pressure Vessel Inspectors will represent the Jurisdiction. At the Jurisdiction's discretion, the Jurisdiction may choose to be a member of the review team if the Jurisdiction chooses not to be the team leader.	
NBIC — The National Board Inspection Code published by The National Board of Boiler and Pressure Vessel Inspectors.	
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.	
Some in Interpretations	
Index	

Inservice Inspection (Introduction), (1.4.1), (8.1), (9.1) **Inspection** (Foreword), (Introduction), (1.4), (1.4.1), (1.4.2), (1.4.4), (1.4.5), (1.6.4), (2.3.3), (2.7.5), (2.10.1), (2.10.6), (3.3.4), (3.7.4), (3.10.3), (4.3.2), (4.5.6), (4.7.2), (5.3.6), (5.4), (S1.2), (S3.2.1), (S5.3.4), (S5.8.1), (S5.8.6), (7.1), (8.4), (9.1) **Owner-User Inspection Organization** (Introduction), (9.1)	

Item Number: 20-41

ASME CSD-1 2018 Edition

CW-510 Requirements for Steam and Hot-Water Heating Boilers

The safety and safety relief valves of all steam and hot-water heating boilers shall conform to the ASME Boiler and Pressure Vessel Code, Section I or Section IV, as applicable.

NBIC Part I 2019 Edition

2.9.1 (~~c~~b[TB1]) Pressure relief valve shall be manufactured in accordance with a national or international standard and be certified for capacity ~~or flow resistance~~ [TB2]by the National Board.

3.9.2 ~~(a)~~ [TB3]Pressure Relief Valve requirements for steam heating boilers

(a) Pressure relief valve shall be manufactured in accordance with a national or international standard and be certified for capacity ~~or flow resistance~~ [TB4]by the National Board.

(b) The following general requirements pertain to installing, mounting and connecting pressure relief valves on heating boilers.[TB5]

(Note: certified for capacity or flow resistance by the NB is referenced in 4.5.1(a))[TB6]

NBIC Part 4 2019 Edition

2.2.1b) Pressure relief valves shall be manufactured in accordance with a national or international standard and be certified for capacity by the National Board.

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

Item Number: 20-43

ASME CSD-1 2018 Edition

CW-510 Requirements for Hot-Water Supply Boilers

The safety and safety relief valves of all hot-water supply boilers shall conform to the ASME Boiler and Pressure Vessel Code, Section I or Section IV, as applicable.

Part 1, 2019 Ed.

3.9.3 (a) Pressure relief valve shall be manufactured in accordance with a national or international standard and be certified for capacity ~~or flow resistance~~ [TB1] by the National Board.

(Note: certified for capacity or flow resistance by the NB is referenced in Part 1, 4.5.1(a)) [TB2]

Part 4, 2019 Ed.

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

It is intended that the number be **3.8.1.7** and that the item currently **3.8.1.7** becomes **3.8.1.8**

3.8.1.7 Vacuum Boilers

Vacuum Boilers shall be provided with instruments, fittings and controls in accordance with Section 3.8 but are exempt from the following requirements if pressure and temperature controls are installed as described in 3.8.1.7 below:

3.8.1.2 Water-Gage Glasses
3.8.1.3 Water Column and Water Level Control Piping
3.8.1.4 Pressure Control
3.8.1.5 Auto Low Water Cut-Off and /or Water feeding device
3.7.7 Blow Off and Drain Valves

The exemptions are allowed only when the following controls are installed:

a) Pressure Control – Each boiler shall have a pressure control that interrupts the burner operation in response to boiler pressure. This pressure control shall be set from 2.5 psig (17 kpa) to 14.7 psig (101 kpa).
b) Temperature Control- Each boiler shall have two temperature controls responsive to boiler temperature that interrupt burner operation. One shall operate at a temperature below 210’F (99'C). The other shall at a temperature not exceeding 210'F (99'C) and shall cause a safety shutdown and lockout.
c) Safety Relief Valves - Each boiler shall have a properly sized safety valve and shall conform to the following.
    1. Have no test lever
    2. Be set to a maximum pressure of 7.1 psig (49 kpa).
    3. ASME Boiler and Pressure Vessel Code Section IV

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

S14.1 Scope

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

S14.2 General

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

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

S 14.3 Life Extension Procedure

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

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

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

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

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

S14.4 Life Extension Test Program

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

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

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

S14.5 Life Extension Test Program Steps

S14.5.1 Step 1

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

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

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

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

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

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

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

f) The burst pressures of all three vessels shall be greater than the minimum design burst pressure.

g) If the burst pressure of any one of the three vessels is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension and there is no need to proceed with Step 2 below.

Note: It is possible that one or more of the vessels selected had damage not obvious to visual inspection. If during this burst testing phase the MAE test identifies a vessel as damaged, the substitution of three other randomly selected vessels is allowed.

S14.5.2 Step 2

If the vessels pass Step 1, fatigue testing shall be carried out on a minimum of three vessels of the same type being considered for life extension.

a) Prior to testing, the vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs.

b) Prior to fatigue testing, MAE testing as specified in Step 1 shall be done in conjunction with the fatigue testing, hereinafter called the MAE test or MAE testing, in order to determine the suitability of the vessels for fatigue testing, i.e., that they pass the MAE test.

c) Next, the vessels shall be subjected to fatigue cycles. Pressure shall be 100 psi +0, -50% to at least 1.05 x working pressure. Vessels shall survive one and one-half (1.5) additional lifetimes. If they survive then they shall be tested by an MAE test as was done prior to fatigue cycling.

d) Provided they pass the MAE test, they shall be burst tested. At least two sensors shall remain on each vessel all the way to burst in order to establish that the BEO (background energy oscillation) pressure for the fatigued vessels is consistent, i.e., is the same percentage of ultimate, with that of the vessels tested in Step 1.

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

f) The burst pressures at the end of the fatigue testing shall be greater than or equal to the minimum design burst. If the burst pressure of any one of the three vessels is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension.

S14.5.3 Step 3

If the vessels pass Step 2, impact testing shall be carried out on a minimum of three vessels of the same type being considered for life extension.

a) Prior to testing, the vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs. Prior to impact testing, MAE testing shall be done in order to determine the suitability of the vessels for impact testing, i.e., that they pass the MAE test.

b) Two vessels shall be subjected to an ISO 11119.2 drop test and then subjected to the MAE test.

If they pass the MAE test, then one vessel shall be burst tested. At least two sensors shall remain on the vessel all the way to burst in order to establish that the BEO (background energy oscillation) pressure for the fatigued vessels is consistent, i.e., is the same percentage of ultimate, with that of the vessels tested in Step 1.

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

d) If the burst pressure is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension.

e) If the first vessel passes the burst test, the other dropped vessel shall be fatigue cycled and subsequently subjected to the MAE test and, if it passes, shall be burst tested under the same conditions as before. If the vessel fails during fatigue cycling, i.e., bursts or leaks, then these vessels shall not be eligible for life extension.

f) If the modulus changes by more than 10%, then these vessels shall not be eligible for life extension. The strain gages should be mounted in a location that is away from the impact zone.

g) The burst pressure at the end of the fatigue testing of the dropped vessel shall be greater than or equal to the minimum design burst. The vessels shall have MAE testing applied during burst testing as before and the BEO shall be consistent with the previously established percent of burst ±10%.

S14.5.4 Step 4

If the vessels pass Step 3, cut testing shall be carried out on a minimum of two vessels of the same type being considered for life extension.

a) Prior to testing, the vessels shall be inspected for visible damage, i.e., cuts, scrapes, discolored areas, and the vessel appearance shall be documented with photographs. Prior to cut testing, MAE testing shall be done in order to determine the suitability of the vessels for cut testing, i.e., that they pass the MAE test.

b) Two vessels shall be subjected to an ISO 11119.2 cut test and then subjected to the MAE test. If they pass, then one shall be burst tested under all the conditions and procedures delineated in Step 2. If the burst pressure is not greater than the minimum design burst pressure, then these vessels shall not be eligible for life extension.

c) If the cut vessel passes, then the other cut vessel shall be fatigue cycled as described in Step 2 and subsequently subjected to the MAE test and then burst tested with at least two MAE sensors remaining on and monitoring the vessel as before. If it does not survive fatigue cycling, then these vessels shall not be eligible for life extension.

d) The burst pressure at the end of the fatigue testing of the cut vessel shall be greater than or equal to the minimum burst pressure specified by ISO 11119.2.

If the vessel type passes Steps 1 to 4, then that type is eligible for life extension. An out of life vessel of the type subjected to the program above may have its life extended for one additional lifetime if it passes the MAE test. The vessel shall pass the MAE test at subsequent five-year intervals or at one-third of the lifetime, whichever is less, in order to continue in service. The vessel shall be labeled as having passed the NBIC life extension test.

U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety Administration**

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

DOT-SP 16320

EXPIRATION DATE: March 31, 2019

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: Digital Wave Corporation
Centennial, CO

2. PURPOSE AND LIMITATION:

a. This special permit authorizes the extension of the service life of certain DOT-CFFC cylinders, which are subjected to the requalification and operational controls that are defined in this special permit. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.

b. The safety analyses performed in the development of this special permit only considered the hazards and risks associated with the transportation in commerce.

c. No party status will be granted to this special permit.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 180.205(g) in that alternative testing is authorized as provided herein.

5. BASIS: This special permit is based on the application of Digital Wave Corporation dated November 5, 2014 submitted in accordance with § 107.105, the public proceeding thereon, and additional information dated December 23, 2015 and October 11, 2016.

6. HAZARDOUS MATERIALS (49 CFR 172.101):

Hazardous Materials Description			
Proper Shipping Name	**Hazard Class/ Division**	**Identi-fication Number**	**Packing Group**
Air, compressed (breathing air containing up to 39% by volume oxygen)	2.2	UN1002	N/A

7. SAFETY CONTROL MEASURES:

a. Packaging -

(1) Packagings prescribed are limited to certain non-DOT specification composite cylinders made under the DOT-CFFC standard and manufactured under special permits, used exclusively in Self Contained Breathing Apparatus (SCBA) service and maintained under the standard operating procedure as described in the Digital Wave Corporation (DWC) special permit application on file with the Office of Hazardous Materials Safety Approvals and Permits Division (OHMSAPD).

(2) Cylinders may be considered for an extended service life not exceeding 30 years after the original manufacturing date of the cylinder.

(3) Each cylinder considered for extended service life must be requalified by Modal Acoustic Emission (MAE) in accordance with the procedures specified in the DWC application for special permit on file with the OHMSAPD and as prescribed in this special permit.

(4) Cylinders passing the MAE requalification may be marked "DOT-SP 16320" and authorized for an additional 5 years. Cylinders with the DOT-SP 16320 marking must be successfully requalified once every 5 years using MAE in order to remain in service for a maximum service life of 30 years from the date of manufacture.

b. MAE Equipment and Performance - The MAE testing system must include 1) broadband piezoelectric sensors, 2) preamplifiers, 3) high-pass and low-pass filters, 4) amplifiers, 5) A/D (analog-to-digital) converters, 6) a computer program for the collection of data, 7) computer and monitor for the display of data and 8) a computer program for analysis of data. The MAE technician must be capable of examining the waveforms (event by event) and the waveforms for each event must correspond precisely with the pressure and time data during the test. The MAE testing system must include a computer program capable of detecting the first arrival channel. The MAE testing system must include sensors and recording equipment with a current calibration sticker (yearly) or a current certificate of calibration. Sensors shall have a flat frequency response (+/- 6 dB amplitude response over the frequency range specified) from 50 kHz to 400 kHz. Deviation from flat response (signal coloration) must be corrected by using a sensitivity curve obtained with a Michelson Interferometer calibration system similar to the apparatus used by the National Institute for Standards and Technology. MAE sensors must have a diameter no greater than 0.5 inch for the active part of the sensor face. The aperture effect must be taken into account. Sensor sensitivity must be at least 0.1 V/nm. Preamplifiers and amplifiers will have a flat frequency response (+/- 1 dB) over the frequency range of interest. The MAE system must include a high-pass filter of 20 kHz. Additionally, a low-pass filter must be applied to prevent digital aliasing that occurs if frequencies higher than the Nyquist frequency (half the Sampling Rate) are in the signal. The MAE system must include the memory depth (wave window length) and sampling rate of the high speed analog-to-digital (A/D) converter and must be set for the MAE test requirements.

c. Standard References and Calibration -

(1) The MAE system must be calibrated to detect and measure the wave energy of the test object (e.g., fiber breakage from a composite cylinder) by using a Rolling Ball Impactor and Inclined Plate. The rolling ball impactor must be used to create an acoustical impulse in the aluminum-inclined-plate. The impact setup includes a steel ball 1/2 inch in diameter. The ball

impactor is made of chrome steel alloy hardened to R/C 63, ground and lapped to a surface finish of 1.5 micro-inch, within 0.0001 of actual size and roundness within 0.000025 inch. The calibration Inclined Plate is made of aluminum alloy 7075-T6, and must have lateral dimensions of at least 4′ x 4′ in size, and 0.125 inch (0.003 meters) in thickness and be supported by steel blocks. The inclined plate includes a machined square groove 3/8″ wide which supports and guides the impact ball to the impact point. The length of groove and inclined angle must be 16″ and 6°, respectively. The grooved inclined plate must be positioned next to the edge of the aluminum plate such that the center (equator) of the ball impacts the center (mid-line) of the edge of the aluminum plate, as shown in Figure 1 below.

(2) Each Sensor has a flat frequency response (+/- 6 dB amplitude response over the frequency range specified) and has a range of 50 kHz to 400 kHz and diameter less than or equal to 0.5 inch. Each sensor must be mounted on the inclined aluminum plate and tested separately via the rolling ball impact. The vertical position of the ball impact point must be adjusted gradually in order to "peak up" the acoustical signal, much as is done in ultrasonic testing where the angle is varied slightly to peak up the response. The center frequency of the first cycle of the extensional mode plate wave (E wave) must be confirmed as 125 kHz ± 10 kHz. The energy value in joules of the first half cycle of the E wave, is defined as U^{AE}_{RBI}, the wave energy detected by the MAE system, and must be used to scale the fiber break energy, U_{FB}. This must be an "end-to-end" calibration meaning that the energy measured using the complete AE instrumentation (sensor, cables, preamplifiers, amplifiers, filters and digitizer) that is to be used in the actual testing situation. The energy linearity of the complete AE instrumentation (sensor, cables, preamplifiers, amplifiers, filters and digitizer) must be measured by using different roll lengths of 8, 12 and 16 inches. A mechanism (manual or automated) must be used to release the ball down the inclined plane. The start of the E wave must be from the first cycle of the waveform recognizable as the front end of the E wave to the end of the E wave which taken as 10 μs later (the time was calculated from the dispersion curves for the specified aluminum plate). The wave energy must be computed and

recorded from the digital waveform as described in DWC application on file with the OHMSAPD.

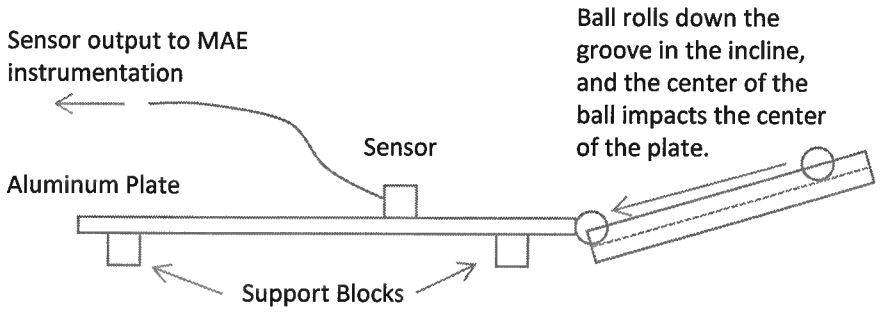


Figure 1. Inclined grooved Plate, impact balls, aluminum plate and sensor configuration

(3) Analog-to-Digital Converter Calibration - The sampling rate of the A/D must be such that aliasing does not occur. The recording system (consisting of all amplifiers, filters and digitizers beyond the sensor) must be calibrated by using a 20 cycle long tone burst with amplitude of 0.1 V at 100, 200, 300, and 400 kHz. The system must display an energy value of

$$U = (V^2 \times N \times T)/(2Z) \text{ joules}$$

at each frequency, where V = 0.1 volts, N = 20, Z is the preamplifier input impedance and T is the period of the cycle. If the measured values agree to within 15% of the theoretical values, the correct sampling rate has been set. These measurements must be performed at a system gain of 0 dB.

(4) Amplifier Gain Correction - All energies must be corrected for gain (e.g., 20 dB (x10) gain increases apparent energy 100 times and 40 dB (x100) gain increases apparent energy 10,000 times).

d. Visual Inspection - Prior to MAE testing, external and internal surfaces of each cylinder must be inspected in accordance with CGA Pamphlet C-6.2. Cylinders that do not meet the visual inspection criteria must be condemned.

e. MAE Test Procedure - After completion of MAE system calibration, the following test procedure must be completed:

(1) Sensor Mounting - A minimum of two (2) sensors must be mounted on each cylinder, one sensor installed at each end of a cylinder. The sensors are located within two inches from the dome-to-sidewall transition area and will be in-line along the axial direction of the vessel.

(2) System sensitivity - The sampling rate and memory depth settings for the MAE system are:

(i) Threshold: 52 dBAE (The sensitivity must be adjusted to account for the response of the sensors as measured from the rolling ball calibration);

(ii) Sampling Rate: 5 MHz; and

(iii) Memory Depth: 2048 Samples.

(3) Sensor Performance Checks - DWC must conduct sensor performance checks prior to each test to verify proper operation and good coupling to the vessel. For the coupling check, the E and F waveforms must be observed by breaking pencil lead at approximately 2 inches (5 cm) from each sensor along the axial direction of the vessel. The energy of the lead break waveforms must be 5×10^{-15} to 20×10^{-15} Joules. If this energy level is not met, the sensor coupling must be checked, or the sensor replaced. All calibration data must be recorded. Amplitude response performance checks must be carried out by pencil lead breaks (Pentel 2H, 0.3 mm) at a location centered along a line between the two sensors. Both sensors must have a maximum amplitude response within 3 dB of each other. The gain settings for the calibration must be such that the signal does not saturate either the amplifiers or the A/D. If so, repeat the lead breaks at a system gain that does not saturate the system. Prior to pressurization, reset the gain to the test gain.

(4) Pressurization Procedure - Each cylinder must be subjected to a two-step hydraulic pressurization process from 0 psig to the cylinder's design test pressure (5/3 marked service pressure). During the first pressurization, the cylinder must be held at test pressure for at least five (5) minutes and up to 15 minutes. If no MAE activity is recorded after a five

(5) minute interval during the hold, the cylinder is stable and the pressure may be reduced to zero (0) psig. The pressure must be held at zero (0) psi for 100 seconds, then the step 1 pressurization must be repeated and held for a period of 100 seconds and depressurized as described above. The MAE event waveforms must be monitored and recorded during the two-step pressurizations process. Pressurization must be stopped, if the Background Energy Oscillation (BEO) exceeds two (2) times the quiescent background energy of that channel. The fill rate must be less than the rate at which flow noise first appears. If at any time during fill, the fill rate is too high in that it causes flow noise, the fill rate must be decreased until the flow noise disappears. A post-test system sensitivity check (lead breaks as described above) must be conducted and the data must be saved. The test temperature shall be between 50 °F (10 °C) and 120 °F (49 °C).

Warning: Appropriate measures shall be taken to ensure safe operation and to contain any energy that may be released as a result of a cylinder rupture during pressurization, regardless of hydraulic or pneumatic pressurization.

f. Accept/Reject Criteria - Each cylinder must be evaluated during MAE testing for the following four (4) Criteria:

(1) Stability - For each channel, the cumulative events versus time plot or event decay rate (B) must be measured.

Rejection - a cylinder must be rejected if the value of B does not meet the following:

$-0.1 \leq B \leq -0.0001$, $R^2 \geq 0.80$

R^2 = coefficient of determination used in regression calculation.

(2) Fiber Breakage - To determine if fiber bundle breakage has occurred during the second pressurization, the frequency spectra of the direct E and F waves in the digital signal must be examined as follows:

(i) Energy Measurement - The energies, U, for the following frequency ranges must be measured and recorded:

U0: 50 - 400 kHz

U1: 100 - 200 kHz

U2: 250 - 400 kHz

(ii) Energy Conditions - The criteria for determining if high frequency spectrum events have occurred, the following conditions must be calculated:

A- $U0 \geq U^{AE}_{FBB}$ Joules; and

B- $U2 / (U1 + U2) \geq 30\%$; and

C- $U2 / U0 \geq 30\%$

(iii) The values of U^{AE}_{FBB} for DOT-CFFC (Carbon Fiber) cylinders are:

U^{AE}_{FBB} for DOT CFFC = 2.7×10^{-16} Joules

Note: These values are sensor and system specific, and must be determined for each monitoring system configuration.

Rejection - A cylinder must be rejected if all three criteria (A, B and C) have occurred.

(3) Friction between Fracture Surfaces - The energy from friction between fracture surfaces is measured from the recorded MAE events.

Rejection - A cylinder must be rejected if a measured MAE event (energy) is greater than 2.7×10^{-14} Joules for carbon fiber cylinders.

(4) Background Energy Oscillation (BEO) - the background energy oscillation of each MAE channel must be measured and recorded during pressurization.

Rejection - A cylinder must be rejected if the BEO exceeds two (2) times the quiescent background energy of that channel at any time during pressurization.

Warning - If BEO with a difference in amplitude is greater than two (2) between minima and maxima, the pressure of the cylinder must be reduced immediately.

g. Action for Rejected Cylinders - When a cylinder is rejected, the retester must securely affix to the cylinder a label with the word "CONDEMNED" overcoated with epoxy near, but not obscuring, the original cylinder manufacturer's label. Alternatively, at the direction of the owner, the requalifier may render the cylinder incapable of holding pressure.

h. Marking - Each cylinder that has passed the requalification described in this special permit for extended service life must be marked "DOT-SP 16320". The new "DOT-SP 16320" marking must cover the current special permit marking by using epoxy, and then epoxy coated to ensure it is permanently attached to the cylinder. All markings, including requalification date (month/year), must be permanently placed on the cylinder as specified in § 180.213. The marking of the RIN symbol on the cylinder certifies compliance with all of the terms and conditions of this special permit.

i. Report - A report must be generated for each cylinder that was tested. The MAE reports must include the following:

(1) RIN;
(2) MAE equipment, model and serial number;
(3) Cylinder manufacture date, serial number, special permit number and marked service pressure;
(4) MAE technicians' name and certification level;
(5) Test date;
(6) Event energies exceeding the fiber bundle failure criteria, if any;
(7) Event energies exceeding the fretting emission energy allowable criteria, if any;
(8) Background energy oscillation pressure;

(9) Visual inspection results (Pass/Fail); and
(10) Acceptance/rejection results. If the cylinder is rejected, include each cause of rejection criteria as described in 7.f.

The MAE reports must be on file at the test site, and must be made available to a DOT representative when requested.

j. Personnel Qualification - Each person who performs retesting or who evaluates or certifies retest results must meet the following requirements:

(1) Project Manager - The senior manager of DWC responsible for compliance with DOT regulations including this special permit. Additionally, the project manager must ensure that each operator and senior review technologist maintains the required certifications described herein.

(2) MAE Tester - The personnel responsible for performing cylinder retesting under this special permit must be qualified to an appropriate Level (Level I, II or III) in MAE testing in accordance with the American Society for Nondestructive Testing (ASNT) Recommended Practice SNT-TC-1A-1996 depending upon the assigned responsibility as described below:

(i) As a minimum, a Level II Operator must perform system startup, calibrate the system and review and certify the test results when written acceptance and rejection criteria for cylinders have been provided by a Senior Review Technologist. Based on written criteria, the Level II Operator may authorize cylinders that pass the retest to be marked in accordance with paragraph 7.h. of this special permit. However, a person with Level I certification may perform a system startup, check calibration and perform MAE under the direct guidance and supervision of a Senior Review Technologist or a Level II Operator, either of whom must be physically present at the test site so as to be able to observe examinations conducted under this special permit.

(ii) Senior Review Technologist (SRT) - A person who provides the written MAE procedure, supervisory training and examinations (Level I and II), technical guidance to operators and reviews and verifies the test results. The SRT must prepare and submit the reports required in paragraph 7.i. and annually verify that the MAE program is being operated in accordance with the requirements of this special permit. An SRT must have a thorough understanding of the DOT Regulations (49 CFR) pertaining to the requalification and reuse of DOT cylinders authorized under this special permit and ASNT Recommended Practice SNT-TC-1A and possess:

(A) A Level III certificate from ASNT in Acoustic Emission with a documented minimum of 2 years of experience in Non-Destructive Evaluation (NDE) of pressure vessels or pipelines using the Modal Acoustic Emission test method;

(B) A Professional Engineer (PE) License with a documented minimum of 2 years of experience in Non-Destructive Evaluation (NDE) of pressure vessels or pipelines using the Modal Acoustic Emission test method; or

(C) A PhD degree in Engineering/Physics with documented evidence of experience in Non-Destructive Evaluation (NDE) of pressure vessels or pipelines, using the Modal Acoustic Emission test method or research/thesis work and authoring/co-authoring of technical papers published, in recognized technical journals, in the field of Modal Acoustic Emission testing methods.

The most recent copies of certification (e.g., ASNT Level III or PE license) must be available for inspection at each requalification facility.

k. OPERATIONAL CONTROLS -

(1) The cylinders that are requalified for service life extension under this special permit are limited to DOT-CFFC cylinders that are exclusively used in SCBA service.

(2) Each cylinder covered by the terms of this special permit must have a prominent warning label on the external surface of the cylinder that indicates "The Cylinder must be externally inspected per CGA C6.2 prior to every fill".

(3) A cylinder that has been dropped in a fire may not be returned to service.

(4) Each cylinder that is requalified for service life extension under this special permit must be identified by special permit designation, serial number, the cylinder's owner (e.g., Fire station), and MAE requalification results (fail/pass);

(5) The original special permit marking of each cylinder that is requalified for service life extension under this special permit must be covered and replaced with "DOT-SP 16320" as described in paragraph 7.d. of this special permit.

(6) Record Keeping - Prior to marking a cylinder with "DOT-SP 16320" (designation for extended service life), the identification of each cylinder as described in paragraph 8.c. of this special permit must be submitted to the OHMSAPD.

(7) Revalidation Plan - All cylinders marked with "DOT-SP 16320" are subject to the in-service life extension (Revalidation Plan). The Revalidation Plan is described in paragraph 8.a. of this special permit.

(8) Maximum Service Life - Cylinders requalified under this special permit are authorized for an additional 5 year service life extension. The maximum service life of any cylinder that was qualified under this special permit is 30 years from the date of manufacture.

8. SPECIAL PROVISIONS:

a. Revalidation Plan - DWC must formulate a plan for all the cylinders that are marked "DOT-SP 16320" for the additional service life extension. The plan must be submitted to the OHMSAPD within 12 months of the issuance of this special permit and must include:

(1) A detailed procedure for obtaining the DOT-CFFC cylinders from the field and design qualification testing of each design type;

(2) A procedure for the random selection of a minimum of 5 cylinders which have been in service for 18, 21, 24 and 27 years;

(3) All randomly selected cylinders from the field must be tested in accordance with Sections 8.5.4, 8.5.5, 8.5.7 and 8.5.8 of ISO 11119-2:2002. Acceptance criteria must be as defined in ISO 11119-2; and

(4) The complete MAE test report, including the original test data, must be submitted to the Associate Administrator for Hazardous Materials Safety for assessment within 30 days of completion of the test. Failure to meet the acceptance criteria specified in this special permit may result in the design being restricted to a maximum life of 15 years.

b. The designated SRT must review the MAE program annually. The designated SRT must submit a letter to the OHMSAPD, on January 7th each year that this special permit is effective, verifying that the MAE program is meeting the terms and requirements of this special permit.

c. The total number of cylinders tested under this special permit must be reported by special permit number, type (e.g., CFFC), serial number and age. These results must be summarized and reported to DOT on an annual basis. A summary of the test results at each facility must be reported (electronic or paper) to the Associate Administrator for Hazardous Materials Safety annually to assess the effectiveness of the test program. The summary must include the total number of cylinders tested under this special permit grouped by type or special permit number, size and age. The summary must include the number of cylinders accepted, rejected or condemned. For any rejected or condemned cylinder, the defect causing the rejection/condemnation must be fully characterized and profiled (i.e., cuts, abrasions, impacts, fiber failures, chemical damage, heat damage, etc.) and the specific size of the defect should be determined (i.e., length, depth, width, etc.). The cylinders that were condemned at visual inspection (prior to MAE) must also be included in the report.

d. A statement of qualifications and supporting documentation, for each "qualified MAE tester" used under this special permit and information in support thereof, must be maintained by DWC. The location of this statement, for each "qualified MAE tester", must be identified to the OHMSAPD.

e. A person who is not a holder of this special permit who receives a package covered by this special permit may reoffer it for transportation provided no modification or change is made to the package and it is reoffered for transportation in conformance with this special permit and the HMR.

f. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

g. A current copy of the DOT special permit for the cylinders listed in paragraph 7.a. of this special permit must be maintained at each facility where retesting is performed.

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, cargo vessel, passenger-carrying aircraft, cargo aircraft and rail freight.

10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each cargo vessel, aircraft, or motor vehicle used to transport packages covered by this special permit. The shipper must furnish a copy of this special permit to the air carrier before or at the time the shipment is tendered.

11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

- All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
- Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.

- Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

No person may use or apply this special permit, including display of its number, when this special permit has expired or is otherwise no longer in effect.

Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)— "The Hazardous Materials Safety and Security Reauthorization Act of 2005" (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term "exemption" to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 Immediate notice of certain hazardous materials incidents, and 171.16 Detailed hazardous materials incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:

April 21, 2017

William Schoonover
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Material Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm. Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: MT

1.6 CHANGE OF SERVICE

Supplement 9 of this part provides requirements and guidelines to be followed when a change of service or service type is made to a pressure-retaining item.

Whenever there is a change of service, the Jurisdiction where the pressure-retaining item is to be operated, shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

1.7 SCRAPPING PRESSURE RETAINING ITEMS

The owner or user shall deface the code nameplate(s) of any pressure retaining item that is scrapped. The removal or defacement of the Code nameplate(s) should be verified by the Inspector, and the National Board form NB-XXX shall be completed and submitted to the National Board and Jurisdiction, if required.

ADD DEFINITION:

SCRAPPED – Permanent removal from service by owner's or user's procedures.

Scrapping of Pressure Retaining Items

In accordance with provisions of the National Board Inspection Code

1.Submitted to:

Name of Jurisdiction

Address

Phone Number

2. Submitted by:

(Name of Owner/User)

Address

Phone Number

3. Manufactured by:
(name and address)

4. Location of Installation:
(address)

5. Manufacturer's Data Report: ☐ YES ☐ NO

6. Item Registered with National Board: ☐ YES ☐ NO NB Number:

7. Item Identification:

Year Built: Mfr. Serial No.:

Type: Jurisdiction no.:

Dimensions: MAWP:

8. Date of removal or defacement of the Code nameplate(s)

9. I certify that to the best of my knowledge and belief the statements in this report are correct, and with provisions of the National Board Inspection Code.

Name of Owner or User:

Signature: Date:

Instructions for Completing the Form NB-XXX, *Scrapping of Pressure Retaining Items Form*

Items 1-9 shall be completed by the owner, user, or "R" Stamp Holder making the request.

1) The name, address, and phone number of the Jurisdiction, Authorized Inspection Agency (when there is no Jurisdiction) the form is being submitted to for approval.
2) Enter the name and address of your company or organization.
3) Enter the name and address of the manufacturer shown on the name plate.
4) Enter the name and address of the location where the pressure-retaining item is installed. If this is the same as number 2, check the box "same as # 4."
5) Manufacturer's Data Report Attached-check the appropriate box.
6) Is the pressure-retaining item registered with the National Board? Check the appropriate box. If yes, provide the National Board Registration Number.
7) Provide as much information as known to help identify the pressure-retaining item.
8) Enter date the removal or defacement of the Code nameplate.
9) Enter the name and signature of the owner, user, or "R" Stamp Holder (and "R" Stamp number if applicable).

Note: Once completed the requester shall file a copy with the Jurisdiction where the pressure retaining item is installed, the National Board (if registered with the National Board), and the owner or user of the vessel if the request was made by an "R" Stamp Holder, and upon request to the Authorized Inspection Agency who witnessed the removal or defacement of the nameplate.

Proposed NBIC Part II Section 2.3.6.11. Task 18-63

2.3.6.11 Inspection of Vessels for pressures at and above 10,000 PSI

a) This section provides guidelines for the inspection of pressure vessels designed for pressures at or above 10,000 PSI.

b) Inspector shall verify the vessel is constructed to a standard acceptable to the jurisdiction.

c) The inspector shall verify the following these requirements as part of the inspection:

1. Records are being kept of cycles
2. Complete documentation of installation of safety interlocks required by the manufacturer and the jurisdiction for the vessel with listed set points, readily available to the operator and inspector. All devices must be listed.
3. Documentation safety device alarms and interlock checks are being completed on each protective device and controls are calibrated in accordance with manufacturers specifications
4. Operators and maintenance personal are trained for the inspection, maintenance and operation of the vessel and systems
5. Documentation of pressure relief device inspection and testing

d) Vessels constructed for a set number of cycles, as defined by the code of construction, which have reached the end of those cycles, must be removed from service or requalified for continued use. Any requalification for continued service must be completed in accordance with the requirements of the jurisdiction. The inspector shall verify that documentation of any requalification is retained.

e) Requalification of any vessel shall either be completed by the original manufacturer or a manufacturer familiar with the construction of pressure vessels at and above 10,000 PSI. Guidance for completing requalification can be found in ASME PCC-3, Inspection Planning and Using Risk-Based Methods.

Action Item Request Form

CODE REVISIONS OR ADDITIONS

Request for Code revisions or additions shall provide the following:

a) Proposed Revisions or Additions

Current text is incomplete with respect to inspecting riveted joints for failure. This proposal suggests adding more text, found in historic inspection documents, to further assist and direct the field inspector for assessing the condition of a riveted joint.

Existing Text:

S2.10.7 LIMITATIONS

a) The maximum allowable working pressure shall be the lesser of that calculated in accordance with NBIC Part 2, S2.10, or the MAWP established by the original manufacturer.

b) The shell or drum of a boiler in which a "lap seam crack" extending parallel to the longitudinal joint and located either between or adjacent to rivet holes, when discovered along a longitudinal riveted joint for either butt or lap joint, shall be permanently discontinued for use under steam pressure, unless it is repaired with jurisdictional approval.

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

The text covers cracks parallel to a longitudinal joint, but there is no text covering inspection of plate material around a rivet.

c) Background Information

Review of the NBIC shows that failure indicators of riveted seams have not been identified or itemized. This proposal addresses this oversite.

Referenced standards, related discussion follow proposed wording.

Proposed wording

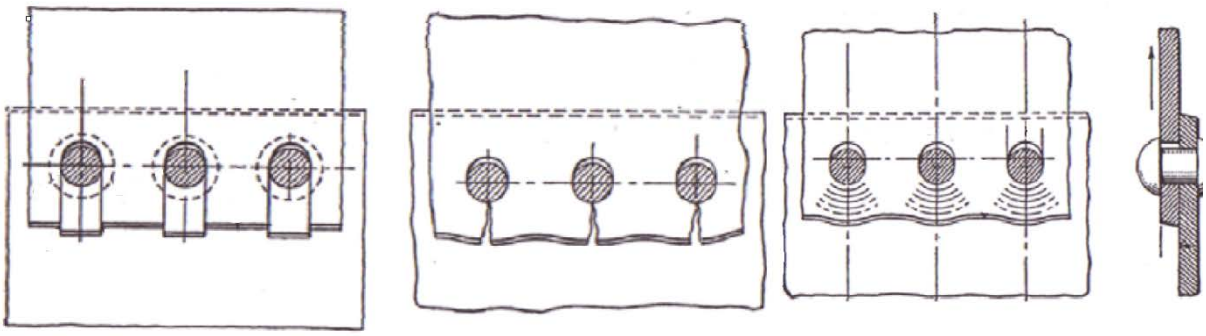
S2.10.2.3 INSPECTION OF RIVETED SEAMS

A riveted joint in a vessel subjected to pressure may fail in a number of different ways, depending on the type and relative proportions of the joint. Methods of failure may be classified as follows:

a.) Rivets may shear off.
b.) The plate may tear along the centerline of the row of rivets.
c.) The plate may shear in front of the rivets.
d.) The plate may tear from the outer edge of the rivet hole to the caulking edge.
e.) The plate may crush in front of the rivets.

Figure S2.10.2.3 illustrates visual indicators of (c), (d), (e). Inspection shall visually inspect for cracked or stressed plate material along a riveted joint. Indications of failure shall be monitored or repaired, at the discretion of the jurisdiction.

FIGURE S2.10.2.3



Note: Good engineering practice requires that the lap of plate outside rivet holes, measured from the outer edge of the rivet holes to the edge of the plate must be at least equal to the diameter of the rivet hole.

Referenced text:

Steam Boiler Design, Part 2, Great Britain, 1922:

20. Methods of Failure of Riveted Joint.—A riveted joint in a vessel subjected to pressure may fail in a number of different ways, depending on the type and relative proportions of the joint; but the simplest methods of failure may be illustrated by taking a single-riveted lap joint as an example. With such a joint, the methods of failure may be classified as follows:

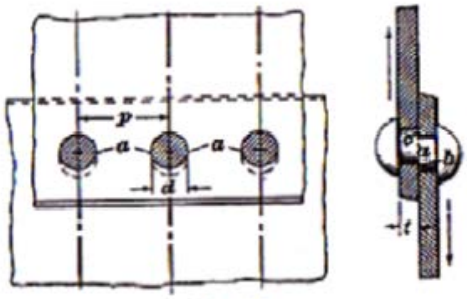


FIG. 19

1. The rivets may shear off, as shown in Fig. 19.

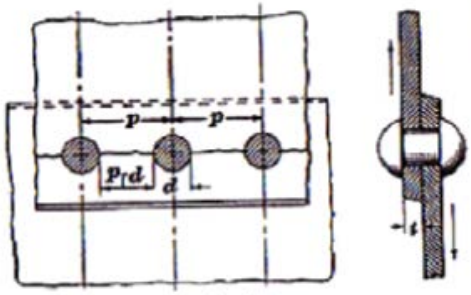


FIG. 20

2. The plate may tear along the center line of the row of rivets, as shown in Fig. 20.

3. The plate may crush in front of the rivets, as shown in Fig. 21.

4. The plate may shear in front of the rivets, as shown in Fig. 22 (*a*).

5. The plate may tear from the outer edge of the rivet hole to the calking edge, as shown in Fig. 22 (*b*).

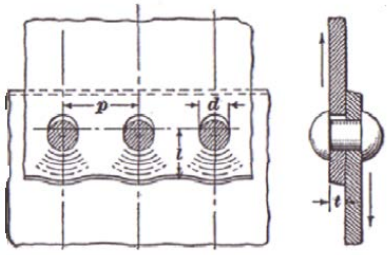


FIG. 21

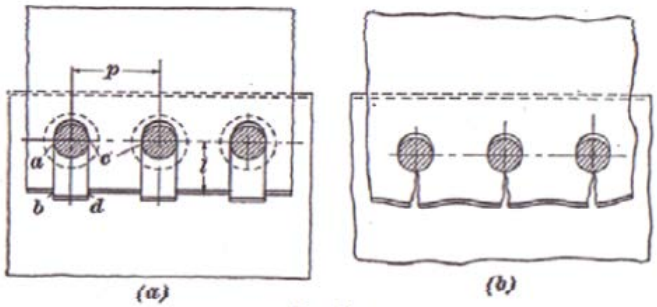


FIG. 22

The provided Note is also important, because a design that does not adhere to this rule may need a different joint efficiency value than what is provided in TABLE S2.10.6. This rule has existed but is not necessarily followed in pre-code boilers.

ASME, 1914:

183 On longitudinal joints, the distance from the centers of rivet holes to the edges of the plates, except rivet holes in the ends of butt straps, shall be not less than one and one-half times the diameter of the rivet holes.

Canadian Interprovincial Standard, 1931:

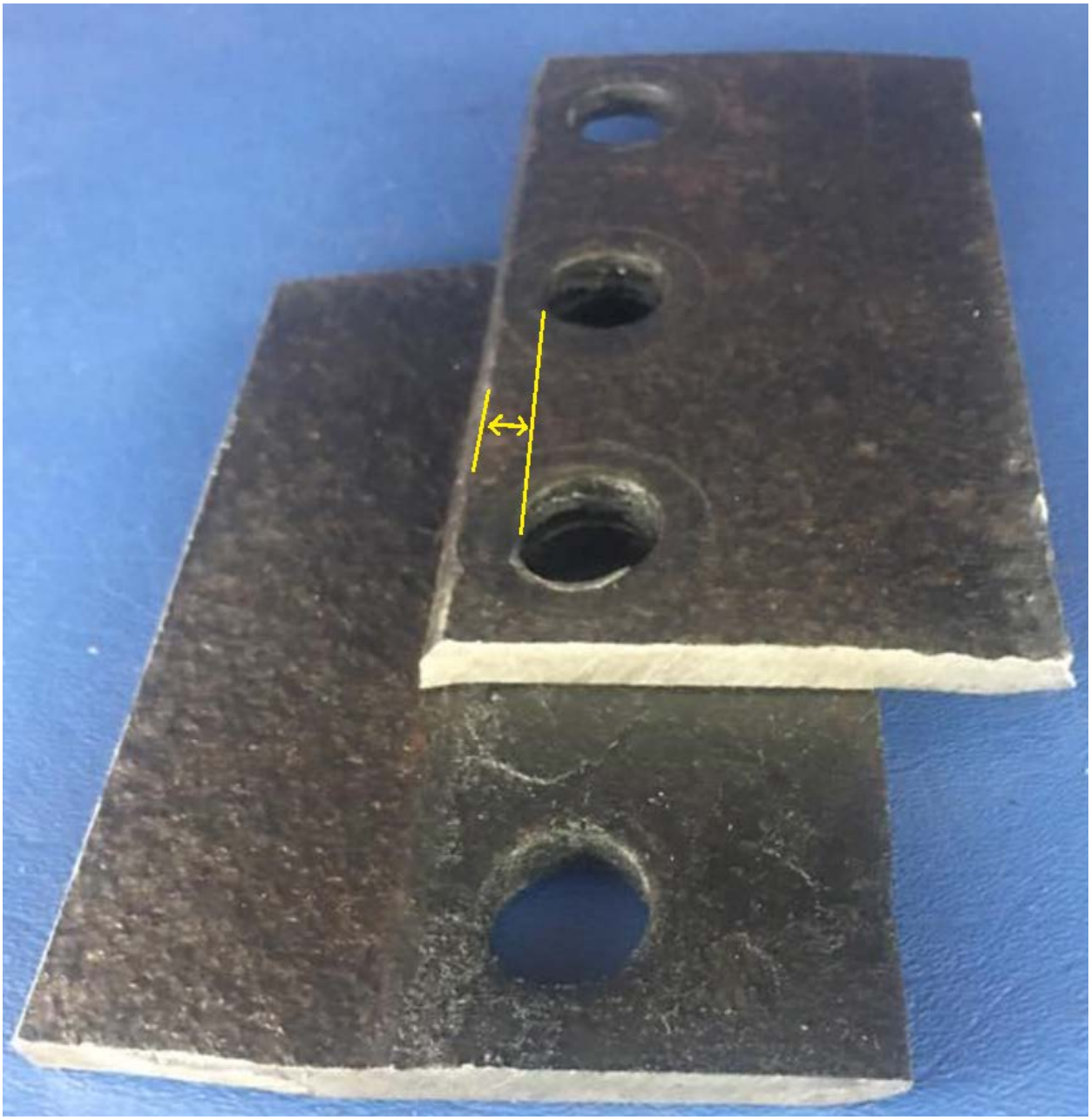
Lap Outside Rivet Holes

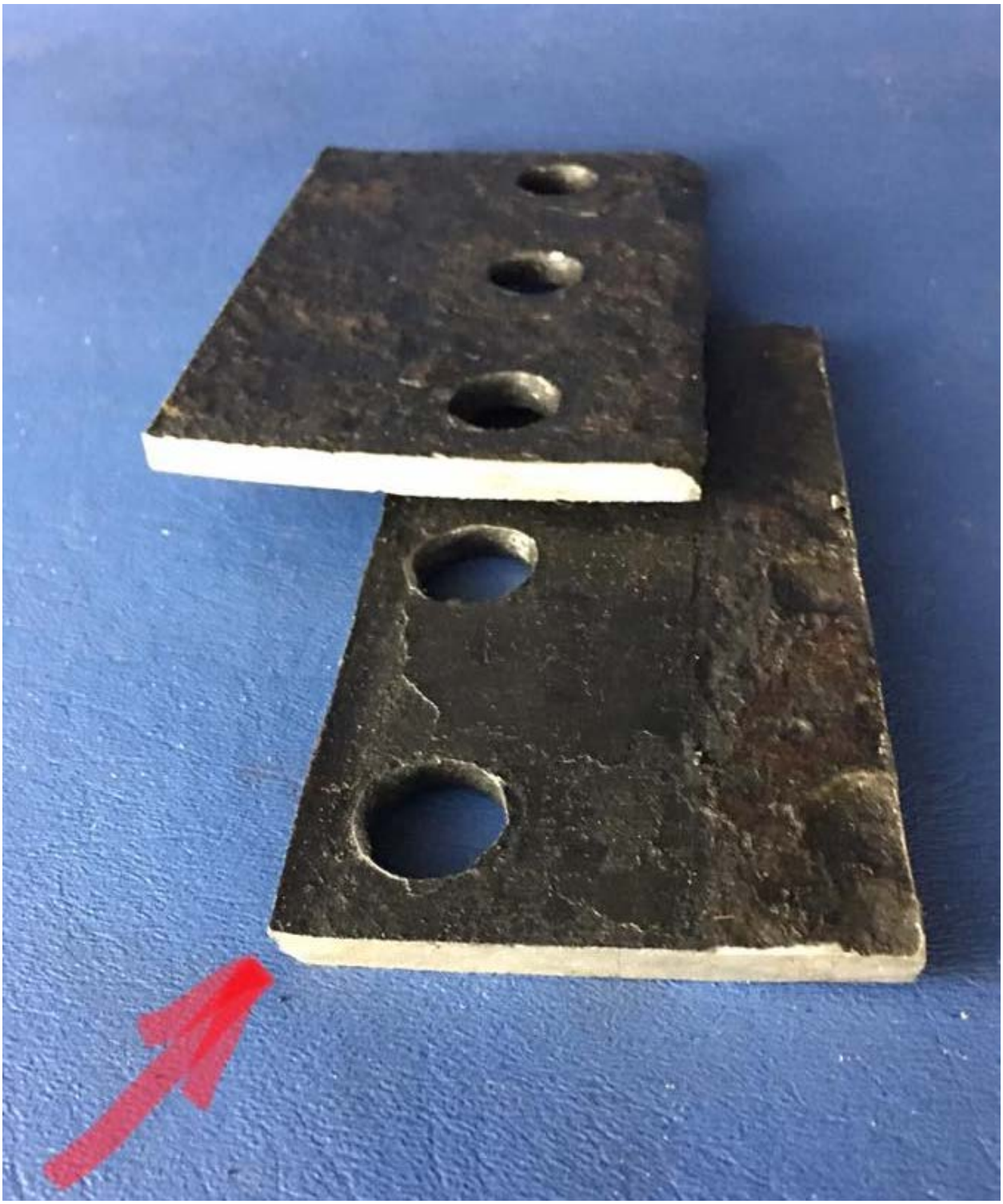
199. The lap of plate outside rivet holes measured from the outer edge of the rivet holes to edge of plate must be at least equal to diameter of rivet hole, and must not be more than 1/8 inch in excess of the diameter of the rivet hole.

Thurston, 1888:

tion. The joint is so proportioned that the fracture will occur by shearing the rivets rather than by breaking out the edge of the sheet or tearing away the lap bodily. The lap usually extends beyond the rivet-hole about 1.5 times the diameter of the rivet.

Single-row lap seam from an 1881 6hp Russell traction engine:





2.2.12.7 THERMAL FLUID HEATERS

a) Design and Operating Features

1) Many thermal fluid heaters are pressure vessels in which a synthetic or organic fluid is heated or vaporized. Some thermal fluid heaters operate at atmospheric pressure. The fluids are typically flammable, are heated above the liquid flash point, and may be heated above the liquid boiling point. The heaters are commonly direct-fired by combustion of a fuel or by electric resistance elements. Heater design may be similar to an electric resistance heated boiler, to a firetube boiler or, more commonly, to a watertube boiler. Depending on process heating requirements, the fluid may be vaporized with a natural circulation, but more often, the fluid is heated and circulated by pumping the liquid. Use of thermal fluid heating permits heating at a high temperature with a low system pressure (600°F to 700°F [316°C to 371°C] at pressures just above atmospheric). To heat water to those temperatures would require pressures of at least 1,530 psig (10.6 MPa).

2) Nearly all thermal heating fluids are flammable. Leaks within a fired heater can result in destruction of the heater. Leaks in external piping can result in fire and may result in an explosion. Water accumulation in a thermal heating system may cause upsets and possible fluid release from the system if the water contacts heated fluid (remember, flashing water expands approximately 1,600 times). It is essential for safe system operation to have installed and to maintain appropriate fluid level, temperature and flow controls for liquid systems, and level, temperature, and pressure controls for vapor systems. Expansion tanks used in thermal heater systems, including vented systems, should be designed and constructed to a recognized standard such as ASME Section VIII, Div. 1, to withstand pressure surges that may occur during process upsets. This is due to the rapid expansion of water exceeding the venting capability.

3) ~~3)~~ Because heat transfer fluids contract and become more viscous when cooled, proper controls and expansion tank venting are required to prevent low fluid level and collapse of the tank. Some commonly used fluids will solidify at temperatures as high as 54°F (12°C). Others do not become solid until -40°F (-40°C) or even lower. The fluids that become viscous will also become difficult to pump when cooled. Increased viscosity could cause low flow rates through the heater. The heater manufacturer recommendations and the fluid manufacturer's Material Safety Data Sheets (MSDS) should be reviewed for heat tracing requirements.

4) Verify the thermal fluid heaters have stack gas temperature indicators, alarms and safety shut down devices. Stack gas temperatures must be monitored daily while in operation.

((Need to present to NBIC Part 1 that the installion of high stack temperature indicator with a safety shut down be mandatory. See Supplament 5.5.7 3 a change "may" to "must"))

b) Industrial Applications

Thermal fluid heaters, often called boilers, are used in a variety of industrial applications such as solid wood products manufacturing, resins, ~~turpentines~~turpentine, and various types of chemicals, drugs,

plastics, corrugating plants, and wherever high temperatures are required. They are also frequently found in asphalt plants for heating of oils, tars, asphalt pitches, and other viscous materials. Many chemical plants use this type of heater in jacketed reactors or other types of heat exchangers.

c) ~~Inspection~~

~~1) Inspection of thermal fluid heaters typically is done in either the operating mode or the shutdown mode. Internal inspections, however, are rarely possible due to the characteristics of the fluids and the need to drain and store the fluid. Reliable and safe operation of a heater requires frequent analysis of the fluid to determine that its condition is satisfactory for continued operation. If the fluid begins to break down, carbon will form and collect on heat transfer surfaces within the heater. Over- heating and pressure boundary failure may result. Review of fluid test results and control and safety device maintenance records are essential in determining satisfactory conditions for continued safe heater operation.~~

~~2)~~1) Due to the unique design and material considerations of thermal fluid heaters and vaporizers, common areas of inspection are:

a. Design — Specific requirements outlined in construction codes must be met. Some jurisdictions may require ASME Section I or Section VIII construction. Code requirements for the particular Jurisdiction should be reviewed for specific design criteria;

b. Materials — For some thermal fluids, the use of aluminum or zinc anywhere in the system is not advisable. Aluminum acts as a catalyst that will hasten decomposition of the fluid. In addition, some fluids when hot will cause aluminum to corrode rapidly or will dissolve zinc. The zinc will then form a precipitate that can cause localized corrosion or plug instrumentation, valves, or even piping in extreme cases. These fluids should not be used in systems containing aluminum or galvanized pipe. The fluid specifications will list such restrictions;

Note: Some manufacturers of these fluids recommend not using aluminum paint on valves or fittings in the heat transfer system.

c. Corrosion — When used in applications and installations recommended by fluid manufacturer, heat transfer fluids are typically noncorrosive. However, some fluids, if used at temperatures above 150°F (65°C) in systems containing aluminum or zinc, can cause rapid corrosion;

d. Leakage — Any sign of leakage could signify problems since the fluid or its vapors can be hazardous as well as flammable. Areas for potential leaks include cracks at weld attachment points and tube thinning in areas where tubes are near soot blowers. The thermal fluid manufacturer specifications will list the potential hazards;

e. Solidification of the fluid — Determine that no conditions exist that would allow solidification of the thermal fluid. When heat tracing or insulation on piping is recommended by the heater manufacturer, the heat tracing and insulation should be checked for proper operation and installation;

~~f.~~ f. Pressure relief devices — Pressure relief valves shall be a closed bonnet design with no manual lift lever. Pressure relief valves must be tested by a qualified repair concern every 12 to 36 months, depending on conditions, unless otherwise directed by the jurisdiction. The pressure relief installation ~~discharge~~ shall ~~ould~~ meet the requirements of NBIC Part IV, Section 2.3. Inspection and testing of the relief device shall meet the requirements of NBIC Part IV, Section 3. ~~be connected to a closed, vented storage tank or blowdown tank with solid piping (no drip pan elbow or other air gap). When outdoor discharge is used, the following should be considered for discharge piping at the point of discharge:~~

~~1. Both thermal and chemical reactions (personnel hazard);~~
~~2. Combustible materials (fire hazard);~~
~~3. Surface drains (pollution and fire hazard);~~
~~4. Loop seal or rain cap on the discharge (keep both air and water out of the system);~~
~~5. Drip leg near device (prevent liquid collection); and~~
f. ~~6. Heat tracing for systems using~~

~~g. Inspections~~

g. Inspections of thermal fluid heaters shall include verifying that fluid testing is conducted annually and that results are compared to the fluid manufacturer's standard. The inspector shall annually verify the documentation of testing of controls and safety devices.

((Need to consult manufactuer on internals))

h. Vapor phase systems must have a documented vessel and piping risk based inspection assessment program in accordance with NBIC Part 2, 4.5.

PROPOSED ACTION ITEM

Item Number:	**20-59**
Submitted by:	Doug Biggar doug@ditechtesting.com
Subject:	Temporary nameplate removal for external inspection. **Explanation of Need:** What is being added to NBIC part 2 (item 19-30) for NBIC 2021 edition: [(e) removal and re-attachment of the original manufacturer's nameplate shall only be done in accordance with NBIC Part 3, 5.11]. To have an inspector present onsite each time we need to have a nameplate temporarily removed has a cost that a commercial refurbisher such as ourselves would need to pass onto the customer as well as dramatically affect the efficiency of our assembly line. **Background Information:** Ditech Testing is the largest commercial refurbisher of LPG pressure vessels in North America. Approximately 15-25% of bulk ASME LPG Pressure vessels can have a raised nameplate which needs complete removal for external inspection and re-coating under it.
NBIC Location:	2019 NBIC Part 2, 5.2.1 a)

Current Text:	**Proposed Text:**
5.2.1 AUTHORIZATION a) Permission from the jurisdiction is not required for the reattachment of nameplates that are partially attached. When traceability cannot be established, the jurisdiction shall be contacted.	**5.2.1 AUTHORIZATION** a) Permission from the jurisdiction is not required for the reattachment of nameplates that are partially attached or wholly removed temporarily for external inspection purposes by a commercial refurbisher. When traceability cannot be established, the jurisdiction shall be contacted.

Item #20-70 **Proposal V1**

Task Group Locomotive Boilers

Summary

Many steam locomotive operators do not inspect the sliding firebox supports on their locomotives (when they are equipped). Inspections have found them to be rusted in-place causing breakage of connection bolts and other damage to the locomotive firebox and mudring.

Furnace slide supports which are locked in-place by corrosion will adversely impact the thermal expansion of the boiler and lead to staybolt breakage.

Proposal

S1.4.2.29 BOILER ATTACHMENT BRACKETS

The boiler attachment brackets and associated components and fasteners used to secure the boiler to the frame shall be inspected for:

a) Correct installation;
b) Damaged or missing components;
c) Looseness;
d) Leakage;
e) Loose, bent, broken, or damaged rivets, nuts, bolts and studs;
f) Defective rivets;
g) Provision for expansion; and
h) Corrosion which may preclude free movement of sliding supports

Item #20-71 **Proposal V1**

Task Group Locomotive Boilers

Summary

Locomotive safety valves may have nameplate data that is missing or illegible. Owners have to rely on capacity charts produced by the manufacturers. These charts were dependent upon the lift of the valve. The valve lift prior to around 1920 was fixed at 0.1 inch. However, after 1920 or so, manufacturers began to increase the lift of their valves. This lead to increased relieving capability. Thus, it is imperative to understand the lift of the valve on the locomotive in order to assign the correct relieving capability.

This is to ensure safety valves provide the adequate relieving capacity for steam locomotive boilers..

Proposal

a) The minimum safety valve capacity in pounds per hour (kilograms per hour) shall be calculated by multiplying the boiler heating surface area by the factor from the appropriate chart in NBIC Part 2, Table S1.6 (1 pound steam/hr/sq. ft = 4.88 kg steam/hr/sq meter).

b) If the original nameplate data for the locomotive’s safety valves is missing or illegible, the relieving capacity of the installed safety valve(s) shall be obtained from the manufacturer's capacity charts corresponding to the valve model, diameter, pressure setting, and valve lift.

PROPOSED ACTION ITEM

Item Number:	**20-79**
Submitted by:	Jonathan Ellis via PR20-0201 jellis@nationalboard.org
Subject:	Add nomenclature to formula in Part 2, S10.10.4 c) **Explanation of Need:** The current formula has no nomenclature to define the variables. **Background Information:** The change request came about from Public Review Comment PR20-0201, which relates to the approved item NB16-1401. The Main Committee voted in October of 2020 to open a new action item to add nomenclature for this formula. Mike Gorman, Project Manager for item NB16-1401, provided the following definitios for the variables in the equation: "U is the measured signal energy in joules. The signal is the captured waveform from, say, a fiber break source. V is the signal amplitude in volts point by point in the signal. Voltage must be corrected for gain (G). Z is in ohms. The (differential) time is dt in seconds."
NBIC Location:	2021 NBIC Part 2, S10.10.4 c)

Current Text:	**Proposed Text:**
S10.10.4 EQUIPMENT c) Scaling Fiber Break Energy The wave energy shall be computed by the formula: $u = \int v^2 \, dt/z$	**S10.10.4 EQUIPMENT** d) Scaling Fiber Break Energy The wave energy shall be computed by the formula: $u = \int v^2 \, dt/z$ Where: u = signal energy (joules) v = signal amplitude (volts) t = time (seconds) z = resistance (ohms)

NBIC Part 2 Inquiry

Robert Underwood
Hartford Steam Boiler
12/15/20

Item No.	**20-82 –** Reporting of Form NB-136
Purpose	To permit the original PRI manufacturer to prepare and submit Form NB-136
Statement of Need:	Revise NB-136 Reporting requirements and Form NB-136 to permit the original manufacturer of the pressure retaining item to prepare and submit the form.
Background Information:	This proposal is the result of a field inquiry. Currently, only the owner, user, or R Stamp holder are permitted to prepare and submit Form NB-136 (Replacement of Stamped Data). After discussing with NB staff, we saw no reason to prohibit the original PRI manufacturer from replacing stamped data or nameplates and preparing/submitting the NB-136 Form. This proposal will revise 5.2.2(a), Form NB-136, and the instructions on how to complete Form NB-136 (paragraph 5.3.3) to permit the original PRI manufacturer to prepare and submit the NB-136 Form.
Existing Text:	**See Attachment**
Proposed Text:	**See Attachment**

5.2.2 REPORTING

a) The completed Form NB-136 with a facsimile of the replacement stamping or nameplate applied and appropriate signatures shall be filed with the Jurisdiction, if applicable and the National Board by the owner, user, original manufacturer, or "R" Stamp Holder.

5.3.3 INSTRUCTIONS FOR COMPLETING THE FORM NB-136, REPLACEMENT OF STAMPED DATA FORM

Items 1-12 shall be completed by the owner, user, original manufacturer, or "R" Stamp holder making the request.

1) Enter purchase order, job, or other identifying number used by your company if applicable.

2) The name, address and phone number of the Jurisdiction, Authorized Inspection Agency (when there is no Jurisdiction) the form is being submitted to for approval.

3) Enter the name and address of your company or organization.

4) Enter the name, email, and phone number of the person who can be contacted if there are any questions concerning this request within your company or organization.

5) Enter the name and address of the location where the pressure-retaining item is installed. If this is the same as number 3, check the box "same as # 3". If the pressure-retaining item is being refurbished and the final installation location is unknown, check the box "Stock item-unknown".

6) Enter the date the pressure-retaining item was installed. If unknown check the box "Unknown".

7) Enter the name of the manufacturer of the pressure retaining item the request is being submitted for.

8) Manufacturer's Data Report Attached, check the appropriate box.

9) Is the pressure-retaining item registered with the National Board? Check the appropriate block. If yes provide the National Board Registration Number.

10) Provide as much information as known to help identify the pressure-retaining item.

11) Provide a true facsimile of the legible part of the nameplate or stamping.

12) Attach any other documentation that helps provide traceability of the vessels to the original stamping, such as purchase orders, blueprints, inspection reports, etc.

13) Provide the name of owner, ~~or~~ user, or original manufacturer of the pressure-retaining item or "R" Stamp holder making the request. If an "R" Stamp holder, provide the "R" Stamp number. Signature of the requester and date requested.

14) To be completed by the Jurisdiction or Authorized Inspection Agency's authorized representative.

    If the original manufacturer is currently in business, concurrence shall be obtained by the owner/user.

    The requester shall submit the form along with any attachments to the Jurisdiction where the pressure-retaining item is installed for approval. If there is no Jurisdiction or the pressure-retaining item is a stock item, the requester shall submit the form to a National Board Commissioned Inspector for approval.

After authorization, the form will be returned to the owner, user, original manufacturer, or “R” Stamp holder who made the request. The requester is required to contact the Jurisdiction or an Authorized Inspection Agency to pro- vide a National Board Commissioned Inspector to witness the re-stamping or installation of the new nameplate. If the nameplate is being welded to the pressure-retaining boundary of the vessel, the weld- ing shall be done by a “R” Stamp holder. The requester will provide the new nameplate or have the tools on-hand to do the re-stamping in accordance with the original Code of Construction.

15) Once the re-stamping is completed, or the new nameplate is attached, the requester shall provide a true facsimile of the replacement stamping.

16) The owner, user, original manufacturer, or “R” Stamp Holder shall fill in their name (and number if an “R” Stamp holder), sign and date.

17) To be completed by the National Board Commissioned Inspector who witnessed the re-stamping or installation of the new nameplate.

Note: Once completed the requester shall file a copy with the Jurisdiction where the pressure-retaining item is installed, the National Board, and the owner or user of the vessel if the request was made by the original manufacturer or ~~and~~ “R” Stamp holder, and upon request to the Authorized Inspection Agency who witnessed the re-stamping or attachment of the new nameplate.

REPLACEMENT OF STAMPED DATA FORM, NB-136
in accordance with provisions of the *National Board Inspection Code*

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

2. SUBMITTED TO: _____
(Name of Jurisdiction)

_____
(Address)

_____
(Telephone no.)

3. SUBMITTED BY: _____
(Name of Owner, User, **Original Manufacturer,** or **"R"** Certificate Holder)

_____
(Address)

4. _____ _____ _____
(Name of contact) (Email) Telephone no.)

5. LOCATION OF INSTALLATION: ☐ SAME AS #3 ☐ STOCK ITEM-UNKNOWN

_____
(Name)

_____
(Address)

6. DATE INSTALLED: _____ ☐ UNKNOWN

7. MANUFACTURER: _____
(Name)

8. MANUFACTURER'S DATA REPORT ATTACHED: ☐ NO ☐ YES

9. ITEM REGISTERED WITH NATIONAL BOARD: ☐ NO ☐ YES, NB NUMBER _____

10. ITEM IDENTIFICATION: _____ _____ _____ _____
(Type) (Mfg. serial no.) (Jurisdiction no.) (Year built)

_____ _____ SAFETY RELIEF VALVE SET AT: _____
(Dimensions) (MAWP psi) (psi)

13. I REQUEST AUTHORIZATION TO REPLACE THE STAMPED DATA OR NAMEPLATE ON THE ABOVE DESCRIBED PRESSURE-RETAINING ITEM IN ACCORDANCE WITH THE RULES OF THE *NATIONAL BOARD INSPECTION CODE* (NBIC).

NAME: _____ NUMBER: _____
(Name of Owner/user, Original Manufacturer, or "R" Certificate Holder) ("R" Certificate Holder only)

SIGNATURE: _____ DATE: _____
(Authorized Representative)

14. BASED ON THE TRACEABILITY PROVIDED, AUTHORIZATION IS GRANTED TO REPLACE THE STAMPED DATA OR TO REPLACE THE NAMEPLATE OF THE ABOVE DESCRIBED PRESSURE-RETAINING ITEM.

SIGNATURE: _____ DATE: _____
(Authorized Jurisdictional Representative or Inspector)

NATIONAL BOARD COMMISSION NO.: _____ JURISDICTIONAL NUMBER: _____
(If available)

15. THE FOLLOWING IS A TRUE FACSIMILE OF THE ITEM'S REPLACEMENT STAMPING OR NAMEPLATE.
(Must clearly state "replacement")

16. I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, THE STATEMENTS IN THIS REPORT ARE CORRECT, AND THAT THE REPLACEMENT INFORMATION, DATA, AND IDENTIFICATION NUMBERS ARE CORRECT AND IN ACCORDANCE WITH PROVISIONS OF THE *NATIONAL BOARD INSPECTION CODE* (NBIC).

NAME: _____ NUMBER: _____
(Name of Owner/user, Original Manufacturer, or "R" Certificate Holder) ("R" Certificate Holder only)

SIGNATURE: _____ DATE: _____
(Authorized Representative)

17. WITNESSED BY: _____ EMPLOYER: _____
(Name of Inspector)

Subcommittee Repairs/Alterations

Last Name	First Name	Interest Category	Role	Exp. Date	More
Troutt	Robby	Jurisdictional Authorities	Chair	08/30/2021	Details
Moore	Kathy	National Board Certificate Holders	Vice Chair	01/30/2022	Details
Hellman	Terrence		Secretary	12/30/2099	Details
Becker	Patricia	National Board Certificate Holders	Member	10/30/2022	Details
Boseo	Brian	National Board Certificate Holders	Member	08/30/2021	Details
Edwards	Paul	National Board Certificate Holders	Member	08/30/2021	Details
Hopkins	Craig	National Board Certificate Holders	Member	01/30/2022	Details
McBee	Timothy	Authorized Inspection Agencies	Member	10/30/2022	Details
Miletti	Ray	Manufacturers	Member	07/30/2022	Details
Moedinger	Linn	Users	Member	01/30/2022	Details
Morelock	Brian	Users	Member	01/30/2023	Details
Quisenberry	Michael	National Board Certificate Holders	Member	10/30/2022	Details
Schaefer	Benjamin	National Board Certificate Holders	Member	01/30/2022	Details
Seime	Trevor	Jurisdictional Authorities	Member	07/30/2023	Details
Sekely	James	General Interest	Member	08/30/2021	Details
Shanks	Paul	Authorized Inspection Agencies	Member	10/30/2022	Details
Siefert	John	General Interest	Member	10/30/2022	Details
Sturm	Rick	Jurisdictional Authorities	Member	07/30/2023	Details
Toth	Marty	General Interest	Member	01/30/2022	Details
Underwood	Robert	Authorized Inspection Agencies	Member	07/30/2023	Details

PROPOSED INTERPRETATION

Inquiry No.	**20-3**
Source	Nathan Carter, HSB nathan_carter@hsb.org
Subject	Inspector involvement in Fitness-for-Service Assessments **Background:** The below questions are intended to gain clarity as to first which Inspector (i.e. "IS" Commissioned or "R" Endorsement) signs the FFSA Form NB-403 when an "R" Certificate Holder is involved with a repair in that region as well as determine what level of review of the Fitness-for-Service the Inspector is expected to complete. If it is an Inspector holding a "R" Endorsement with an AI Commission (not tested on NBIC Part 2), shouldn't the relevant pages in NBIC Part 2 concerning Fitness for Service be included in their tested body of knowledge, so they are aware of the detailed rules? The Body-Of-Knowledge for National Board Inspectors holding either an "IS" Commission or "R" Endorsement does not reference ASME FFS-1/API 579 Fitness-For-Service Standard or have any expectation that the Inspector be capable of determining if the correct Fitness for Service methodology was used or that the assumptions taken by the Engineer in the analysis were the most appropriate or accurate. Clarification is also requested due to the Form NB-403 signature block stating "Verified by" for the Inspector without any other disclaimers as typically found on other Forms signed by Inspectors such as ASME MDRs and NBIC Form R-1/R-2. An example is a R-Certificate holder was hired to repair a weld seam. It was discovered during a repair that multiple base metal laminations existed adjacent to the repair location. A Fitness for Services Evaluation was subsequently performed. The first question is whether or not it is the responsibility of the Repair Inspector to sign the FFSA form once everything has been properly vetted, since the defect being left in place is not necessarily within the scope of the initial repair being performed by the "R" Certificate Holder, or should this be signed off by a Commissioned Inservice Inspector, since they are examined on the rules of NBIC Part 2? Also, Form NB-403 is vague in the signature block region for the scope of what the Inspector is signed for. It could be alluded that without a statement, such as those found on the R-1 and R-2 forms, the Inspector is signing off on the appropriateness and adequacy of the Fitness-For-Service methodology performed by the Engineer.
Edition	2019; Part: Repairs and Alterations; Section: 3; Paragraph: 3.3.4.8 2019; Part: Inspection; Section: 4; Paragraph: 4.4
Question	Question 1: In accordance with NBIC Part 3, 3.3.4.8, a fitness-for-service condition assessment as described in NBIC Part 2, 4.4 shall be completed and adequately documented on the FFSA Form NB-403. Once Form NB-403 is completed, is it required that the Inspector signing this Form hold a National Board "R" Endorsement as described in RCI-1/NB-263? Question 2: NBIC Part 2 4.4.1 d) states that the Inspector shall indicate acceptance of the Report of FFSA by signing. Paragraph 4.4.3 b) states that the Inspector shall review the condition assessment methodology and ensure that the inspection data and documentation are in accordance with Part 2. Is the Inspector's signature on Form NB-403 an indication that the condition assessment and recommendations completed by the Engineer have been fully reviewed for appropriateness and accuracy by the Inspector?

	Question 3: If the answer to Question 2 is No, is the Inspector's signature on Form NB-403 an indication of acceptance solely on the basis of review of the Form for completeness and verification that the requirements outlined in 4.4 were addressed?
Reply	Proposed Reply 1: Yes Proposed Reply 2: No Proposed Reply 3: Yes
Committee's Question	
Committee's Reply	
Rationale	

PROPOSED INTERPRETATION

Inquiry No.	**20-11**
Source	Hugh-Jean Nel, Sasol Hugh-Jean.Nel@sasol.com
Subject	Scope of Repairs **Background:** Historically NBIC has not defined limitations on the scope of repair provided the entire item is being rebuilt, see Question & Reply 2 & 3 in Interpretation 98-28. NBIC Part 3 lists several examples of repair but nowhere limits the scope or amount of these examples that can be utilized when performing repairs. This creates some uncertainty when performing some types of repairs, such as replacing the tubesheets of a fixed tubesheet type heat exchanger as listed in 3.3.3 e). According to ASME BPV Code Section VIII Division 1 Part UHX, Section 13, the length of the tubes is a design parameter and therefore replacing the tubesheet in accordance with its original design might require the replacement of the tubes as well to maintain the original design length.
Edition	2019; Part: Repairs and Alterations; Section: 3; Paragraph: 3.3.3 Examples of Repairs
Question	Question: Is it permissible for repair activities performed on pressure retaining item to have more than one activity listed in 3.3.3 with the scope of repair?
Reply	Proposed Reply: Yes, ~~provided that the scope of repairs has been approved by the Inspector, and when required, by the Jurisdiction.~~
Committee's Question 1	~~Can~~ May multiple repair activities referenced in 3.3.3 of Part 3 be listed on a single Form R-1 Report when performing a repair on a pressure retaining item?
Committee's Reply	Yes
Rationale	There is nothing in the NBIC that restrict the repair work performed on one vessel at the same time.
Committee's Question 2	Other than tube plugging, ~~I~~is it considered an alteration when the heat transfer surface(s)~~tube length~~ of a heat exchanger is ~~changed~~ changed from its original design~~while replacing tube sheets~~ on a ~~ASME~~ ~~Section VIII, Div 1~~ pressure vessel?
Committee's Reply	Yes~~.~~ Reference NBIC Part 3,. 3.4.4 d)
Rationale:	~~The tube length is a dimension as mentioned in 3.4.4. d~~

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3.4.4 EXAMPLES OF ALTERATIONS

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

3.3.3 EXAMPLES OF REPAIRS

e) Replacement of heat exchanger tubesheets in accordance with the original design;

INTERPRETATION 98-28

Subject: RC-1050(c) Replacement Parts Fabricated by an "R" Certificate Holder
Appendix 6 Pressure Retaining Replacement Items
RC-1050 Definition of New Replacement Parts

1998 Edition

Question 1: Does RC-1050(c) of the NBIC permit the holder of an "R" Certificate to fabricate by welding new and exact pressure retaining replacement parts for an ASME stamped item that the "R" stamp holder is repairing?

Reply 1: No. ASME replacement parts fabricated by welding that require shop inspection by an Authorized Inspector shall be fabricated by an organization having an appropriate ASME Certificate of Authorization.
Question 2: An ASME stamped item is determined to be corroded beyond repair and the only salvageable part is the ASME Code stamping or nameplate. Is it the intent of the NBIC to permit a holder of an "R" Certificate only to build a complete new and exact pressure retaining replacement item using the original ASME construction Code, Section, Edition and Addenda and same materials, transfer and document the transfer of the ASME stamping or nameplate on an R-1 Form to the new pressure-retaining item and stamp the repair with the "R" stamp?
Reply 2: No.
Question 3: Does the NBIC define the point at which a repair becomes new construction?
Reply 3: No.

PROPOSED INTERPRETATION

Item Number:	**20-66**
Submitted by:	Alexander Garbolevsky Alex_garbolevsky@hsb.com
Subject:	Possible contradictory interpretations of Part 3, 3.3.2 e) 2) **Explanation of Need:** Two previously issued interpretations, 95-14 and 95-21, seem to be contradictory with the NBIC itself. **Background Information:** The reason for the interpretation request is that two previously published NBIC Interpretations and the NBIC itself seem to be contradictory. Interpretations 95-14 and 95-21 lead the reader to conclude that if the original vessel was postweld heat treated, then the addition of refractory clips by welding, regardless of size, without postweld heat treatment is an alteration. However, NBIC Part 3 [2019 Edition], 3.3.3 b)1) and 2) list addition of welded attachments to pressure parts, such as: Studs for insulation or refractory lining and hex steel or expanded metal for refractory lining as "Examples of Repairs". Furthermore, NBIC Part 3 [2019 Edition], 3.3.2 e) 2) states: "The following repairs may be considered as routine repairs and shall be limited to these categories: · 2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;
NBIC Location:	2019 NBIC Part 3, 3.3.2 e) 2)
Question:	An ASME BPV Code Section VIII, Div. 1 pressure vessel (P-No. 1, 2-1/4 in thick), fabricated in 1971, was completely postweld heat treated (PWHT) in an oven. The vessel nameplate is marked "HT". No special service applies. In 2020, refractory clips are added by welding. The attachment welds are of such size that they are exempted from PWHT per ASME BPV Section VIII, Div. 1, 2019 Edition, Table UCS-56-1 General Note (b)(3)(c). May the welding of the refractory clips be considered as a "routine repair" under NBIC (2019) Part 3, 3.3.2 e) 2)?
Proposed Reply:	Yes.
Committee's Question:	
Committee's Reply:	
Rationale:	

PROPOSED INTERPRETATION

Item Number:	**20-77**
Submitted by:	Paul Shanks paul.shanks@onecis.com
Subject:	Authorization of repair/alteration activities **Explanation of Need:** Many R-certificate holders also have U or S stamps and as such have a regular AI (with R endorsement) to whom they tend to have review repair and alteration packages. However when the physical work will be conducted 'out of state' travel limitations and or jurisdictional authorization requirement prevent the local AI from making the final acceptance inspection thus another AI must do that work, para 1.3.2 a) makes clear that both Inspectors have to be employed by the same agency. Form R-2 has 2 Inspector sign off locations but does not make clear if the two Inspectors must be from the same AIA or not. **Background Information:** Paragraph 1.3.2 a) situates that the inspectors that authorizes the repair/alteration and the inspector that performs the acceptance inspection be employed by the same AIA. However, the activity of authorizing the repair/alteration is not defined and it is not clear what constitutes authorization. Given that form R-2 has sign off locations for design and constructions, if two different Inspectors sign, should they be employed by the same agency?
NBIC Location:	2019 NBIC Part 3, 1.3.2
Question:	Q1: Given the restriction of employment in paragraph 1.3.2 a) if two inspectors are signing an R-2 may they be employed by different AIA's? Q2: if the answer to the above is yes, does this mean the Inspector making the final acceptance inspection is the only Inspector that is suitable to authorize the inspection?
Proposed Reply:	R1: No. R2: Yes.
Committee's Question:	
Committee's Reply:	
Rationale:	

PROPOSED INTERPRETATION

Item Number:	**20-78**
Submitted by:	Micah Davidian mdavidian@dir.ca.gov
Subject:	Repairs and Alterations of Tube Bundles **Explanation of Need:** Submission is for R Certificate Holders we provide Repair Inspection services for. **Background Information:** For the above questions 1-4, NBIC Part 3, 3.3.3 s) seems to allow to be a repair, but under 3.4.4 d) where the dimensions change it might be classified as an alteration.)
NBIC Location:	2019 NBIC Part 3, 3.3.3 s) & 3.4.4 d)
Question:	Question 1: When a tube bundle is replaced where the new tubesheet material is the same as the original bundle but has a thicker tubesheet due to adding corrosion allowance where the original design did not include corrosion allowance, is this considered a repair or alteration? Question 2: When a tube bundle is replaced where the new tubesheet material is the same as the original bundle but has a thicker tubesheet due to adding additional corrosion allowance to the original design, is this considered a repair or alteration? Question 3: When a tube bundle is replaced where the new tubesheet material is the same as the original bundle but has a thicker tubesheet due to adding thickness for future machining allowance, is this considered a repair or alteration? Question 4: For a tube bundle, does NBIC Part 3, 3.4.4 d) mean that any physical changes e.g. tubesheet thickness, tube wall thickness or length of tubes from the original design will be an alteration? Question 5: If a tube bundle is replaced where the new tubesheet material is the same as the original bundle but has a thicker tubesheet due to ASME Sec VIII, Div. 1, Part UHX tubesheet formulas, is this considered a repair or alteration.
Proposed Reply:	Question 1: Alteration (calculations required) Question 2: Alteration (calculations required) Question 3: Repair Question 4: Some may be repairs others alterations. Question 5: Alteration (calculations required)
Committee's Question:	
Committee's Reply:	

Rationale:	

PROPOSED INTERPRETATION

Item Number:	**20-81**
Submitted by:	Micah Davidian robert_underwood@hsb.com
Subject:	Minimum Required Test Pressure for Alteration Activities **Explanation of Need:** To provide clarity that the minimum test pressure for alterations shall be in accordance with the original code of construction. **Background Information:** I have recently had discussions with some repair firms and Repair Inspectors who believe there are no minimum test pressure requirements when performing liquid pressure tests of alterations since it is not specifically stated in paragraph 4.4.2(a)(1). This interpretation, combined with a new proposal to revise 4.4.2(a)(1) will make it clear that minimum test pressures for alteration activities shall comply with the original code of construction, which I believe is the intent.
NBIC Location:	2019 NBIC Part 3, 4.4.2 a) 1)
Question:	When conducting a liquid pressure test of an alteration activity as described in 4.4.2(a)(1), shall the minimum required test pressure be as specified in the original code of construction?
Proposed Reply:	Yes.
Committee's Question:	
Committee's Reply:	
Rationale:	

PROPOSED INTERPRETATION

Item Number:	**20-89**
Submitted by:	Jagadheesan Vellingiri Muthukumaraswamy jaga4021@hotmail.com
Subject:	LIQUID PRESSURE TEST EXAMINATION METHODS APPLICABLE TO ALTERATIONS **Explanation of Need:** For Alteration can Minimum Test Pressure Shall be Design Pressure or MAWP considering same Condition as Clause 4.4.1 of Pressure Test for Repairs. **Background Information:** For an ASME SEC VIII Div 2, Class 1 or Class 2 / ASME SEC I / ASME B 31.1 Equipment is Subjected to Alteration due to Increase in MAWP.
NBIC Location:	2019 NBIC Part 3, 4.4.2
Question:	1. Is it the Intent of the Code that the Minimum Pressure for Liquid Pressure Test for Alteration Shall be as per Original Code of Construction? 2.Can Pressure Test Be Conducted at Design Pressure or MAWP for Alteration Considering Remaining Thickness or Corrosion Condition considering Integrity of the Equipment?
Proposed Reply:	1. No 2. Yes
Committee's Question:	
Committee's Reply:	
Rationale:	

PROPOSED INTERPRETATION

Item Number:	**20-90**
Submitted by:	Jagadheesan Vellingiri Muthukumaraswamy jaga4021@hotmail.com
Subject:	1.4.1 ACCREDITATION PROCESS / NB-415- Certification of Scope **Explanation of Need:** The NBIC Certification scope Does not Restrict the Repair Organization to Peform Based on their ASME Certification of scope, as long as Manual Controls are addressed for the Design and Repair/ Fabrication Scope they can perform Repair and Alteration. **Background Information:** A Repair Organization is Holding an valid R certification under NBIC, and Holds Valid ASME- U Authorization. The Certifcation Scope Under NBIC is issued for Metallic Repair and Alteration, Can the Repair Organization Perform Repair and Alteration on ASME Sec VIII Div 2 / 3 and Section 1 Components.
NBIC Location:	2019 NBIC Part 3, 1.4.1
Question:	1. Is it the Intent of Code that based on the Initial Certification under 1.4.1 / NB-415 Process, and Quality manual Restriction that if the Repair Organization is Authorized for Repair and Alteration on Sec VIII Div 1 Vessels only they are entitled to Perform Repair and alteration of Sec VIII Div 1 Vesels? 2. If the Answer to above Question is No then can the Repair Organization Perform Repair and Alteration on Sec VIII Div 2/Div 3 and Section 1 Components if the controls are addressed in Manual?
Proposed Reply:	1. No 2. Yes
Committee's Question:	
Committee's Reply:	
Rationale:	

PROPOSED INTERPRETATION

Item Number:	**20-91**
Submitted by:	Robert Underwood Robert_Underwood@hsb.com
Subject:	Mechanical Repair Procedures **Explanation of Need:** To provide clarity on whether procedures are required for mechanical repairs that do not require an R Form. **Background Information:** Part 3, paragraph 1.5.1(h) requires that control of mechanical assembly/repair procedures be addressed in the R Certificate Holder's Quality Manual. Over the last year or so, there have been National Board Team Leaders requesting these procedures (during joint reviews) for work such as rolling tubes in a boiler and replacing a bolted fitting on a pressure retaining item. This has resulted in questions from certificate holders and Inspectors about why an "R" certificate holder is required to have procedures for mechanical work that doesn't even require an "R" Stamp.
NBIC Location:	2019 NBIC Part 3, 1.5.1 h)
Question:	Are mechanical repair/assembly procedures that are referenced in Part 3, paragraph 1.5.1(h), required for work where an R Form is not required?
Proposed Reply:	No.
Committee's Question:	
Committee's Reply:	
Rationale:	

1.5 QUALITY SYSTEM

A holder of a National Board *Certificate of Authorization* shall have and maintain a written Quality System. The Quality System shall identify the processes necessary to satisfactorily meet the requirements of the NBIC and shall be available for review. The Quality System may be in the form of a manual or consist of several documents~~brief or voluminous~~, depending on the projected scope of work. It shall be treated confidentially by the National Board.

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

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

a) Title Page

The title page shall contain the organization's legal name, accepted abbreviation, physical address, and scope of activities.

b) Content Page

The content page shall list the activities described in the Quality System so that each subject or document, number (if applicable), and revision level is clearly identified.

c) Scope of Work

The scope of work shall clearly indicate the type of repairs or alterations the organization is capable of and intends to carry out. The scope of work indicated shall include the following, as applicable.

- Repairs Only at either Shop or Field or Both
- Alterations Only at either Shop or Field or Both
- Repairs and Alterations at either Shop or Field or Both
- Metallic Repairs
- Non-Metallic Repairs
- Design Only

d) Statement of Authority and Responsibility

A dated ~~dated~~ *Statement of Authority and Responsibility*, ~~signed by a senior management official of the organization,~~ shall clearly identify that the ~~be included in the~~ Quality System has the full support of management and endorsed by signature of a senior management official. Further, the *Statement* shall include:

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

2) The title of the individual who has the authority and responsibility charged with the development and ~~ensuring the Quality System is~~ implementation~~ed~~ of the Quality System and ~~as described, and confirming~~ the freedom to identify quality problems~~,~~ ~~and to initiate, recommend and~~ provide solutions and when required stop or prohibit work from continuing.

3) A statement that ~~if there are~~ conflicts or~~is a~~ disagreements with ~~in~~ the implementation of the Quality System, will be brought to the attention of the organization's senior

management official~~the matter is to be referred~~ for a resolution ~~to a higher authority and shall be resolved~~ ~~in a manner~~ that will not conflict with code, jurisdiction/regulatory authority or Quality System requirements~~; and~~.

e) ~~Manual~~ Quality System Control

The Quality System~~manual~~ shall define how~~include the necessary provisions for~~ revisi~~o~~n~~sg~~ of individual subjects, exhibits or documents will be identified, and how distribution and retrieval~~issuing documents~~ will be achieved to ensure~~keep the manual current~~ only the latest accepted revisions are available for use. In addition, the following shall be documented:

1) The title of the individual responsible for the preparation and~~authorized to~~ approva~~l~~e of the Quality System including review of code editions, standards, and jurisdictional requirements.

2) ~~revisions shall be included in the manual.~~ Acceptance from the ~~Revisions must be accepted by the~~ Authorized Inspection Agency prior to issuance and implementation of the Quality System~~manual and its implementation~~.

f) Organization

An organizational chart shall be included in the Quality System~~manual. I~~ and it shall reflect actual levels of authority~~-~~ and lines of communication associated with the functional job titles. In addition, roles and responsibilities associated with the functional job titles identified within the organizational chart, ~~include the title of the heads of all departments or divisions that perform functions~~ that can affect the quality of the repair or alteration, shall be clearly defined and documented.~~ and it shall show the relationship between each department or division. The manual shall identify the title of those individuals responsible for preparation, implementation, or verification of the Quality System. The responsibilities shall be clearly defined and the individuals shall have the organizational freedom and authority to fulfill those responsibilities. The following activities shall be documented :~~

~~Responsibilities associated with the Authorized Inspection Agency (AIA) of record.~~
~~Protocol describing when the AIA of record cannot provide coverage.~~
~~Personnel performing supervisory activities for procedure and performance qualifications shall:~~

~~(a) be designated by the organization with responsibility for certifying qualification documents.~~

~~(b) have a satisfactory level of competence in accordance with the organization's quality program.~~

~~(c) have a record, maintained by the organization, containing objective evidence of the qualifications, training, or experience.~~

g) Drawings, Design and Specifications

The ~~manual~~Quality System shall contain controls to ensure that all applicable design information, ~~applicable~~ drawings, ~~design~~ calculations, specifications, and instructions are prepared or obtained, controlled, and interpreted in accordance with the scope of work and the original code of construction, including:~~.~~

- Initiation of job numbers and control of associated work.

- ~~Define~~Description of the ~~-~~scope of work.
- Performance and approval of design including title of approver.
- Drawings and other pertinent information (i.e., Code Edition, pressure, temperature, minimum design metal temperature, nondestructive examination (~~-NDE~~NDE), heat treatment, weld details, etc.)
- Review of design calculations, drawings, material specifications and process control sheets with Inspector to obtain acceptance.
- Revision and distribution control of design documents

h) Repair and Alteration Methods

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

i) Materials

The ~~manual~~Quality System shall describe the method used to ensure that only acceptable materials (including welding material) are used for repairs and alterations. The Quality System~~manual~~ shall include a description of how existing material is identified and new material is ordered, verified, and identified. The Quality System~~manual~~ shall identify the title of the individual(s) responsible for each function and a brief description of how the function is to be performed.

j) Method of Performing Work

The Quality System~~manual~~ shall describe the methods for performing and documenting repairs and alterations in sufficient detail to permit the Inspector to determine at what stages specific inspections are to be performed. ~~The method of repair or alteration must have prior acceptance of the Inspector. It is also essential that the Quality System include provisions to ensure safe working conditions during welding, testing, and all activities related to repairs and alterations.~~

k) Welding, NDE and Heat Treatment

The ~~manual~~ Quality System shall describe controls for welding, ~~nondestructive examination~~NDE, and heat treatment.

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

2) ~~Nondestructive examination~~NDE – The title of the individual(s) responsible to determine the type and extent of NDE required for the repair or alteration shall be identified. It is also essential that ~~this manual~~the Quality System indicate~~s~~ the individual(s) responsible for the review of subcontracted NDE procedures and personnel. When NDE is performed in-house, the individual responsible for the written practice and the standard used for the basis of training, qualification, and records shall be documented.

3) Heat treatment – The ~~manual~~Quality System shall indicate the individual(s) responsible to ensure that a proper heat treatment has been applied to the repair or alteration. It is also essential that the use of alternative welding methods per the NBIC, Part 3, 2.5.3 be described.

l) Examinations and Tests

The Quality System~~Reference~~ shall describe the process used to ensure that all required examinations and tests have been successfully performed and made available to the Inspector for acceptance ~~be made in the manual for examinations and tests upon completion~~ of the repair or alteration, prior to signing the Form "R" Report.

m) Calibration

The Quality System~~manual~~ shall describe a system for the calibration of examination, measuring, and test equipment used in the performance of repairs and alterations. At a minimum, it shall include:

1) Examination, measuring, and test equipment, subject to calibration, shall have a unique identification number and a calibrate~~d~~ion date as well as a specified next calibration due date.

2) The methodology of how the various equipment will be calibrated.

3) The person(s) responsible for the calibration of the equipment.

4) A statement that all calibrations will be ~~tracible~~traceable to the National Institute of Standards and Technology (NIST) or another nationally recognized Standards Organization~~, as much as practical~~. When no nationally recognized standard exists, the basis for calibration shall be documented.

n) ~~Approval, Inspection,~~Authorization and Acceptance ~~and Inspection~~ of Repair or Alteration

The Quality System~~manual~~ shall specifically ~~indicate~~ state that before the work is started, ~~acceptance~~ authorization of the repair/alteration plan and acceptance of the method(s) used shall be obtained from ~~an~~ the Inspector who will make the required inspections.

~~and confirm NBIC compliance by signing and dating the applicable NBIC Form "R" Report Form upon completion of the work. In addition,~~

~~T~~the Quality System~~manual shall specifically address allowance for acceptance of the inspector for application of the "R" symbol stamp to a pressure retaining item~~ and ~~.~~

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

o) Inspections and ~~Inspections~~Document Review

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

p) Control of Stamp

The Quality System shall provide adequate control of the "R" Symbol Stamp. In addition, the Quality System shall make provisions for Inspector acceptance for the application of the "R" symbol stamp to the pressure retaining item.

~~p~~q) Report of Repair or Alteration Form

The Quality System~~manual~~ shall indicate the title of the individuals responsible for preparing, signing, and presenting the NBIC Report Forms to the Inspector. The Inspector shall confirm NBIC compliance by signing and dating the applicable NBIC Form "R" Report upon completion of the work. The distribution of the NBIC Form "R" Report shall be described in the Quality System.

~~The distribution of the NBIC Form "R" Report Forms shall be described in the manual.~~

~~q~~r) Exhibits

~~Any forms~~Forms referenced in the Quality System~~manual~~ shall be included and~~. The form~~ may be a part of the referencing document or included as an exhibit or appendix. For clarity, the forms may be completed and identified as examples. ~~When forms are identified as examples, a statement shall clearly define the acceptable modifications to the examples without requiring Inspector acceptance.~~Different forms may be utilized as long as they contain the same information as the exhibited forms without the need for acceptance by the Inspector.~~The name and accepted abbreviations of the "R" Certificate Holder shall be included in the manual.~~

~~r~~s) Construction Code

The Quality System~~manual~~ shall include provisions for addressing the requirements that pertain to the specific ~~construction code~~code of construction for the equipment being repaired or altered.

~~s~~t) Nonconformances
~~ing Items~~

A~~There shall be a~~ system shall be established to identify and control a product or service in which any characteristics do not conform to the applicable rules of the NBIC, code of construction~~ code~~, or jurisdictional requirements, to prevent their use. ~~acceptable to the Inspector for the correction of nonconformities. A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system.~~ In addition, the responsibility and authority for the disposition of nonconforming items shall be defined including provisions for Inspector involvement~~Nonconformance must be corrected or~~

~~eliminated before the repaired or altered component can be considered in compliance with the NBIC~~. It is also essential that systemic or programmatic nonconformances be identified and corrected ~~and when necessary, corrected~~ within the Quality System.

~~t~~u) Records Retention

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

1) Records may represent any information ~~used to further substantiate the statements~~ used to provide documented evidence ~~to describe the scope~~ of the quality of items and quality control activities of the work completed to a pressure-retaining item (PRI), and documented on a Form "R" report as applicable.~~.~~

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

3) The record retention schedule described in the Quality System ~~Manual~~ is to follow the instructions identified in NBIC Part 3, Table 1.5.1.

3.3.2 ROUTINE REPAIRS

a) Routine repairs are repairs for which the requirements for in-process involvement by the Inspector ~~and stamping by the "R" Certificate Holder~~ may be waived as determined appropriate by the Jurisdiction and the Inspector. All other applicable requirements of this code shall be met. Prior to performing routine repairs, the "R" Certificate Holder should determine that routine repairs are acceptable to their Repair Inspector and the Jurisdiction, ~~,~~ where the pressure-retaining item is installed;

b) The Inspector, with the knowledge and understanding of jurisdictional requirements, shall be responsible for meeting jurisdictional requirements and the requirements of this code;

c) The "R" Certificate Holder's Quality System Program shall describe the process for identifying, controlling, and implementing routine repairs, the requirements for stamping by the "R" Certificate Holder shall be met. Routine repairs shall be documented on Form R-1 with this statement in the Remarks section: "Routine Repair". ~~;~~ ~~and the requirements for stamping by the "R" Certificate Holder shall be met~~

5.7.2 STAMPING REQUIREMENTS FOR REPAIRS

a) Pressure-retaining items repaired in accordance with the NBIC shall be stamped as required by this section.

b) ~~Subject to the acceptance of the Jurisdiction and the concurrence of the Inspector, nameplates and stamping may not be required for routine repairs (see NBIC Part 3, 3.3.2). In all cases, the type and extent of repairs necessary shall be considered prior to waiving the requirement.~~

c) Stamping or ~~nameplate~~ repair name-plate shall be applied adjacent to the original manufacturer's stamping or ~~repair name-name~~plate. A single ~~repair~~repair name ~~name~~plate or stamping may be used for more than one ~~repair to~~repair to a pressure-retaining item, provided each is carried out by the same certificate holder. The date of each repair, corresponding with the date on associated Form R-1, shall be stamped on the repair name ~~name~~plate.

5.7.3 STAMPING REQUIREMENTS FOR ALTERATIONS

Pressure-retaining items altered in accordance with this code shall have a ~~name~~~~repair~~alteration name~~-~~plate or stamping applied adjacent to the original manufacturer's stamping or ~~name~~~~repair~~ name~~-~~plate in accordance with this section. For an alteration where physical changes are made to the pressure-retaining item, the "R" Certificate Holder responsible for the construction portion of the alteration shall apply the stamping or ~~name~~~~repair~~alteration name~~-~~plate. For an alteration where no physical changes are made to the pressure-retaining item (e.g., a re-rating) the "R" Certificate Holder, assuming responsibility for the design, shall apply the stamping or ~~name~~~~repair~~alteration name~~-~~plate.

5.7.4 STAMPING REQUIREMENTS FOR PARTS

Stamping or ~~name~~~~repair~~ part name~~-~~plate shall be applied in a conspicuous location on the part.

5.7.5 SPECIFIC REQUIREMENTS FOR STAMPING AND ~~NAME~~REPAIR NAME PLATES

a) Required data shall be in characters of at least 5/32 in. (4 mm) high, except that characters for pressure relief valve ~~repair name~~repair/alteration name~~-~~plates may be smaller. Markings may be produced by casting, etching, embossing, debossing, stamping, or engraving. The selected method shall not result in any harmful contamination, or sharp discontinuities to, the pressure-retaining item. See NBIC Part 3, Figures 5.7.5-a through 5.7.5-e.

b) The National Board Code Symbols ("R", "VR", and "NR") are to be stamped; do not emboss.

c) Stamping directly on items, when used, shall be done with blunt-nose continuous or blunt-nose interrupted dot die stamps. If direct stamping would be detrimental to the item, required markings may appear on a ~~name~~repair/alteration name~~-~~plate affixed to the item.

d) The certificate holder shall use its full ~~name~~ name as shown on the *Certificate of Authorization* or an abbreviation acceptable to the National Board.

e) The letters "RP" shall be stamped below the "R" Symbol Stamp to indicate organizations accredited for performing repairs or alterations to fiber-reinforced plastic items.

f) The letter "G" shall be stamped below the "R" Symbol Stamp to indicate organizations accredited for performing repairs or alterations to graphite pressure equipment.

g) The subject ~~name~~repair/alteration name-plate shall be securely attached using a method compatible with the structure or stand-off bracket supporting the ~~name~~repair/alteration name-plate, in a manner that will impede easy removal. The method of attaching this ~~name~~repair/alteration name ~~name~~ plate, as permitted by the original code of construction, may include, but is not limited to:

1) Welding
2) Adhesive, bonding or cementing

~~2)~~

Page 235 – Liquid Petro gas
S7.7 CERTIFICATION/DOCUMENTATION AND STAMPING
a) Section 5 of this part is applicable for all post construction activities pertaining to certification/documentation
and stamping.

b) The "R" Certificate Holder shall assure all repairs or alterations involving a change to the following are recorded on the proper NBIC form and marked on the NBIC nameplate or stamping without changing the required format of the NBIC markings.

1) Service for which the container is designed (for example, underground, aboveground, or both).
2) Dip tube length.
3) Maximum filling limit with liquid temperature reference. Tamper-resistant

Page 229 - DOT
S6.15 GENERAL STAMPING REQUIREMENTS
The stamping of or attaching of a nameplate to a pressure-retaining item shall indicate that the work was performed

1) in accordance with the requirements of this code and any requirements of the Competent Authority. mechanical fasteners of suitable metal construction

Such stamping or attaching of a nameplate shall be done only with the knowledge and authorization of the Inspector and Competent Authority. The "R" Certificate Holder responsible for the repair or the construction portion of the modification/alteration shall

apply the stamping. For a re-rating where no physical changes are made to the pressure-retaining item, the "R" Certificate Holder responsible for the design shall apply the stamping. Requirements for stamping and nameplate information are shown in NBIC Part 3, Section 5.

S6.15.1 SPECIFIC "R" STAMPING AND NAMEPLATE REQUIREMENTS

The holder of a "R" *Certificate of Authorization* is required to affix a stamping or nameplate on the Transport Tank that indicates, the repair, alteration, or modification has been performed in accordance with the requirements of NBIC Part 3, Supplement 6 and the additional requirements of the code of construction. All repairs, alterations, and modifications, after acceptance by the Registered Inspector, shall have the "R" Symbol affixed to the stamping or the nameplate. The stamping or nameplate information shall satisfy the requirements of a) thru g) below:

a) The required data shall be in characters at least 4 mm (5/32 in.) high;

b) The markings may be produced by casting, etching, embossing, debossing, stamping, or engraving;

c) The selected method shall not result in any harmful contamination or sharp discontinuities to the pressure- retaining boundary of the Transport Tank;

d) Stamping directly on the Transport Tank, when used, shall be done with blunt-nose continuous or bluntnose interrupted dot die stamps. If direct stamping would be detrimental to the item, required markings and the embossed Code Symbol stamping may appear on a nameplate affixed to the Transport Tank;

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

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

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

Pg 221 – Yankee Dryers

S5.5 PROCEDURES THAT DO NOT REQUIRE STAMPING OR NAMEPLATE ATTACHMENT

All repair procedures, shall be acceptable to the Inspector, and when verified by the owner-user to not affect pressure-retaining capability of the Yankee dryer, do not require stamping or nameplate attachment.

Pg 207 – FRP

S4.14.1 STAMPING

Stamping requirements for FRP vessels are identified in NBIC Part 3, Section 5.

Pg 184 - Graphite

S3.4 ALTERATIONS

a) The requirements provided in this section shall apply, insofar as they are applicable to the materials discussed herein. Completed alterations shall be subjected to a pressure test not less than that required by the code of construction. The test pressure shall be maintained for a minimum of 30 minutes. The pressure shall be reduced to MAWP and maintained for inspection.

b) The nameplate shall be applied in accordance with Section 5 of this part. The letter "G" shall be applied to the nameplate under the "R" stamp when graphite alterations are made. The alternate procedure defined in 5.10 may be used in lieu of the stamping and nameplate attachment requirements of NBIC Part 3, Section 5.

~~1)~~

Item 20-16
Part 3, 3.4.4
Submitted by: Paul Shanks

Explanation of Need: ASME Section VIII Div.1 Mandatory Appendix 44 paragraph 44-6.2(g) clearly sets out that a vessel built to those rules needs to be re-stretched, having had repair welding. It is not clear if ASME is referring to in process (at the original manufactures location) repairs or post construction repairs. However, the NBIC is currently silent on this and this potential issue should be addressed.

Background Information: ASME Section VIII Div.1 Mandatory Appendix 44 establishes rules that allow a vessel to be designed and built for use at low temperatures using allowable stresses which are higher than would normally be allowed at 'room temperature'. The condition for doing so is that said vessels are subject to a pre-stressing operation that actually stretches the base material. The use of these higher stresses is contingent on certain design and manufacturing criteria.

Proposed Change:
3.4.4 EXAMPLES OF ALTERATIONS

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

b) A decrease in the minimum temperature;

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

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

e) In a boiler, Heat Recovery Steam Generator (HRSG), or Pressure Retaining Item (PRI), an increase in the steaming capacity by means of increasing heating surface, total heat input, firing rate, adjustment, or other modification to the primary or auxiliary heat source, resulting in the steaming capacity exceeding the original Manufacturer's Minimum Required Relieving Capacity (MRRC) as described on the nameplate and or Manufacturer's Data Report (MDR);

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

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

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

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

j) For plate heat exchangers, in addition to the applicable examples of alterations above, the following changes from what is listed on the MDR or described on the Original Equipment Manufacturer's (OEM)-drawing:

1) For heat transfer plates:
   a. A change in material grade or nominal thickness;
   b. A reduction in number beyond any minimum, or when no minimum is specified;
   c. An increase in number beyond any maximum, or when no maximum is specified;
   d. A change in model type;

2) Any change in material whether described at 3.3.3 s) or as described at 3.4.4 g):
   a. A change in connection bolt or frame compression bolt diameter or material grade;

k) Performing postweld heat treatment where none was originally performed on the pressure retaining item; ~~and~~

l) The installation of a welded leak box~~.~~; and

m) Welding on a vessel, marked with the cold stretching 'CS' mark, without subsequent renewed cold stretching operations witnessed by the Inspector.

PROPOSED ACTION ITEM

Item Number:	**20-51**
Submitted by:	Kathy Moore kathymoore@joemoorecompany.com
Subject:	Add practicable to the glossary and it's definition **Explanation of Need:** The current formula has no nomenclature to define the variables. This is not a commonly used term in everyday language. **Background Information:**
NBIC Location:	2021 NBIC All Parts, 9.1

Current Text:	**Proposed Text:**
	Practicable: capable of being put into practice or being done or accomplished

PROPOSED ACTION ITEM

Item Number:	**20-55**
Submitted by:	Paul Shanks paul.shanks@onecis.com
Subject:	Examples of repairs **Explanation of Need:** By having an and between boiler and heat exchanger the tube is required to be simultaneously installed in both a boiler and a heat exchanger. This is valid for a boiler as they are heat exchanger but in the case of a pressure vessel heat exchanger they are not boilers as boil may not be happening. Therefore this example is not applicable to pressure vessel which I do not believe is the intent. **Background Information:** Per the Oxford English dictionary: and is a word used to connect words, clause or terms; or is a word used to link alternatives
NBIC Location:	NBIC Part 3, 3.3.3 f)

Current Text:	**Proposed Text:**
f) Replacement or plugging of boiler and heat exchanger tubes where welding is involved	**f) Replacement or plugging of boiler or heat exchanger tubes where welding is involved**

July 30, 2020

Kobe Steel, Ltd.

PROPOSED REVISION OF NBIC PART 3, SECTION 4

4.4.2 TEST OR EXAMINATION METHODS APPLICABLE TO ALTERATIONS

Based on the nature and scope of the alterations activity, one or a combination of the following examination and test methods shall be applied to alterations (unless waived in accordance with 3.4.1 d) of this Part) and replacement parts used in alterations.

a) Liquid Pressure Test

Pressure testing of alterations shall meet ….

b) Pneumatic Test

A pneumatic test may be conducted when contamination of the pressure-retaining item by liquids is possible or when liquid pressure testing is not practicable. Concurrence of the owner shall be obtained in addition to the Inspector and Jurisdiction where required. Pneumatic test requirements and precautions shall be in accordance with the original code of construction.

c) Nondestructive Examination

NDE may be conducted when contamination of the pressure-retaining item by liquids is possible or when pressure testing is not practicable. Concurrence of the owner shall be obtained in addition to the Inspector, and where required, the Jurisdiction. Exclusive use of Visual Examination (VT) shall not be permitted. In all cases NDE methods or combination of methods used shall be suitable for providing meaningful results to verify the integrity of the alteration.

d) Finite-Element Analysis (FEA)

FEA may be conducted when contamination of the pressure-retaining item by liquids is possible or when pressure testing is not practicable, and when NDE is not effective to ensure the structural integrity of the alteration. Concurrence of the owner shall be obtained in addition to the Inspector, and where required, the Jurisdiction. Requirements for FEA shall be in accordance with the original code of construction.

ITEM 20-68
NBIC Part 3, 1.5.1 Revision

Trevor Sieme
tsseime@nd.gov

Purpose	Revise 1.5.1 e) and f) of NBIC Part 3 to reference Certifications, either written or electronic.
Scope:	Adding verbiage to 1.5.1 e) Manual Control and adding new paragraph f) Certification
Background:	ASME has had this requirement to address Certifications, but the NBIC does not specifically address this. See proposed change attached.
Proposed Revision:	See below for the proposed revisions in red

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

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

a) Title Page

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

b) Contents Page

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

c) Scope of Work

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

d) Statement of Authority and Responsibility

A dated *Statement of Authority and Responsibility*, signed by a senior management official of the organization, shall be included in the manual. Further, the *Statement* shall include:

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

2) The title of individual who has the authority and responsibility charged with ensuring the Quality System is implemented as described, and confirming the freedom to identify quality problems and to initiate, recommend and provide solutions;

3) A statement that if there is a disagreement in the implementation of the Quality System, the matter is to be referred for resolution to a higher authority and shall be resolved in a manner that will not conflict with code, jurisdiction/regulatory authority or Quality System requirements; and a statement of the full support of management for the Quality System.

e) Manual Control

The manual shall include the necessary provisions for revising and issuing documents to keep the manual current. The title of the individual authorized to approve revisions shall be included in the manual. The manual and any ~~R~~revisions must be accepted by ~~the~~ an Inspector holding a valid commission with the appropriate endorsement(s) issued by the National Board for the scope of activities addressed in the manual ~~Authorized Inspection Agency~~ prior to ~~issuance of the manual and~~ its implementation.

f) Certification

The manual shall include provisions for certifications, authorizations and approvals that require signature and date. If certification methods other than written are used, the manual shall include provisions describing the controls and safe guards that are employed to ensure the integrity of the certification, authorization or approval.

~~f)~~g) Organization

An organizational chart shall be included in the manual. It shall include the title of the heads of all departments or divisions that perform functions that can affect the quality of the repair or alteration, and it shall show the relationship between each department or division. The manual shall identify the title of those individuals responsible for preparation, implementation, or verification of the Quality System. The responsibilities shall be clearly defined and the individuals shall have the organizational freedom and authority to fulfill those responsibilities.

~~g)~~h) Drawings, Design and Specifications

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

~~h)~~i) Repair and Alteration Methods

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

~~i)~~j) Materials

The manual shall describe the method used to ensure that only acceptable materials (including welding material) are used for repairs and alterations. The manual shall include a description of how existing material is identified and new material is ordered, verified, and identified. The manual shall identify the title of the individual(s) responsible for each function and a brief description of how the function is to be performed.

~~j)~~k) Method of Performing Work

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

~~k)~~l) Welding, NDE and Heat Treatment

The manual shall describe controls for welding, nondestructive examination (NDE), and heat treatment. The manual is to indicate the title of the individual(s) responsible for the welding procedure specification (WPS) and its qualification, and the qualification of welders and welding operators. It is essential that only welding procedure specifications and welders or welding operators qualified, as required by the NBIC, be used in the repair or alteration of pressure-retaining

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

l)m) Examinations and Tests

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

m)n) Calibration

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

n)o) Acceptance and Inspection of Repair or Alteration

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

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

3) The manual shall provide for adequate control of the “R” Symbol Stamp.

o)p) Inspections

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

p)q) Report of Repair or Alteration Form

The manual shall indicate the title of the individuals responsible for preparing, signing, and presenting the NBIC Report Forms to the Inspector. The distribution of the NBIC Report Forms shall be described in the manual.

q)r) Exhibits

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

r)s) Construction Code

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

s)t) Nonconforming Items

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

t)u) Records Retention

The quality manual shall describe a system for filing, maintaining, and easily retrieving records supporting or substantiating the administration of the Quality System within the scope of the “R” *Certificate of Authorization*.

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

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

3) The record retention schedule described in the Quality System Manual is to follow the instructions identified in NBIC Part 3, Table 1.5.1.

Task Group Locomotive Boilers

Summary

Add a sentence in S1.2.11.5 i); Replace drawing in Figure S1.2.11.5-c1 with new drawing below.

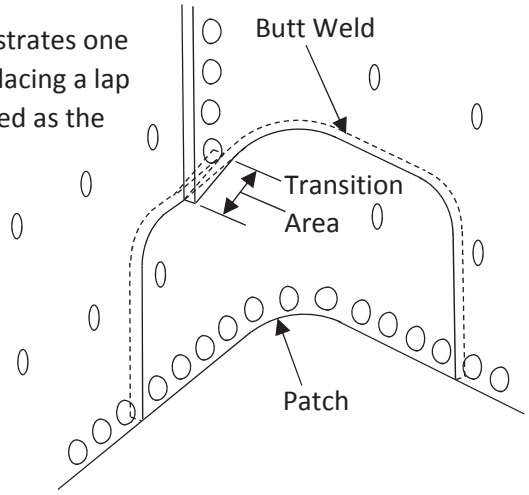
Proposal

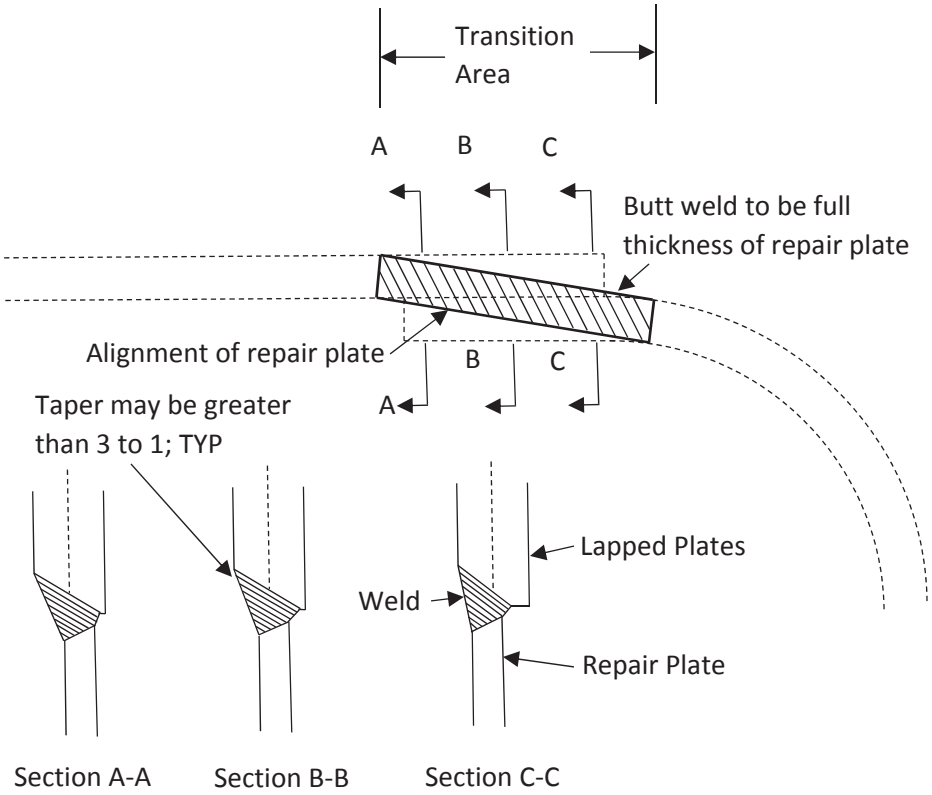
S1.2.11.5 REPAIR OF FIREBOX, WRAPPER, AND TUBESHEET KNUCKLES

i) For one-piece flange knuckle joint patches in portions of a riveted lap joint or in mud ring corners with a lap joint in the firebox, the knuckle patch shall be supported on at least one of the two planes adjacent to the flange, by means other than the weld. See Figure S1.2.11.5-c1. The weld shall be at least the full thickness of the new plate being installed. Taper of weld in transition area may be greater than 3 to 1. Volumetric examination is not required. This type of repair shall be considered a repair.

FIGURE S1.2.11.5-c1
NEW PATCH ALIGNMENT WITH ORIGINAL MATERIAL

This isometric view illustrates one instance of a patch replacing a lap seam and is not intended as the only location where this geometry may be used.





NBIC Part 3 Inquiry

Robert Underwood
Hartford Steam Boiler
10/30/2020

Item No.	**20-73 –** Pressure testing of connecting welds
Purpose	Revise 4.4.2(a)(1) and (2) to clarify the term replacement part
Statement of Need:	To clarify that "replacement part" as specified in 4.4.2(a)(1) and (2) is referring to those parts fabricated by welding as described in 3.3.2(c) and (d).
Background Information:	We have had some inquiries from repair firms and Repair Inspectors who are confused by the term "replacement part" as it is used in paragraphs 4.4.2(a)(1) and (2). I believe that "replacement part" in 4.4.2(a)(1) and (2) refers to those parts fabricated by welding as described in 3.3.2(c) and (d), and not those as described in 3.3.2(a) and (b). This proposal would clarify that alternative pressure testing of connecting welds of "replacement parts" is referring to replacement parts fabricated by welding such as economizers, superheaters, etc... and not material such as nozzles and piping.
Existing Text:	**4.4.2(a)(1 and 2) From 2021 Edition** a) Liquid Pressure Test Pressure testing of alterations shall meet the following requirements: 1) A pressure test as required by the original code of construction shall be conducted. The test pressure shall not exceed the maximum hydrostatic test pressure of the original code of construction. When the original test pressure included consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance. The pressure test for replacement parts may be performed at the point of manufacture or point of installation. 2) As an alternative to pressure testing connecting welds in accordance with the original code of construction, connecting welds may be tested or examined in accordance with the rules for repairs (see NBIC Part 3, 4.4.1). Connecting welds are defined as welds attaching the replacement part to the pressure-retaining item;

Proposed Text:	**4.4.2(a)(1) and (2) (From 2021 Edition)** a) Liquid Pressure Test Pressure testing of alterations shall meet the following requirements: 1) A pressure test as required by the original code of construction shall be conducted. The test pressure shall not exceed the maximum hydrostatic test pressure of the original code of construction. When the original test pressure included consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance. The pressure test for replacement parts fabricated by welding may be performed at the point of manufacture or point of installation. 2) As an alternative to pressure testing connecting welds in accordance with ~~the original code of construction,~~ 4.4.2(a)(1) above, connecting welds may be tested or examined in accordance with the rules for repairs (see NBIC Part 3, 4.4.1). Connecting welds are defined as welds attaching ~~the~~ a replacement part fabricated by welding to the pressure-retaining item;

3.2.2 REPLACEMENT PARTS

Replacement parts to be used in repairs or alterations shall meet the following applicable requirements:

a) Replacement parts that will be subject to internal or external pressure that consist of new materials which should be formed to the required shape by casting, spinning, forging, die forming, and on which no fabrication welding is performed, shall be supplied as material. Such parts shall be marked with the material and part identification and the name or trademark of the parts manufacturer. In lieu of full identification marking on the material or part, the part manufacturer may use a coded marking system traceable to the original marking. Such markings shall be considered as the parts manufacturer's certification that the part complies with the original code of construction. Examples include seamless or welded tubes or pipe, forged nozzles, heads or tubesheets, or subassemblies attached together mechanically;

b) Replacement parts that will be subject to internal or external pressure that are preassembled by attachment welds shall have the welding performed in accordance with the original code of construction. The supplier or manufacturer shall certify that the material and fabrication are in accordance with the original code of construction. This certification shall be supplied in the form of bills of material and drawings with statement of certification. Examples include boiler furnace wall or floor panel assemblies, prefabricated openings in boiler furnace walls, such as burner openings, air ports, inspection openings, or sootblower openings;

c) When ASME Code is the original code of construction, replacement parts subject to internal or external pressure fabricated by welding, which require inspection by an Authorized Inspector shall be fabricated by an organization having an appropriate ASME *Certificate of Authorization*. The item shall be inspected and stamped as required by the applicable section of the ASME Code. A completed ASME *Manufacturer's Partial Data Report* shall be supplied by the manufacturer.

1) ASME stamping and completion of an ASME Manufacturer's Partial Data Report is not required for parts fabricated by the "R" Certificate Holder that will be used on pressure retaining items being repaired or altered by the same "R" Certificate Holder. The controls for this activity shall be described in the quality control system.

2) The "R" Certificate Holder, using replacement parts fabricated and certified to an ASME Code edition and addenda different from that used for the original construction, shall consider and seek technical advice, where appropriate, for change or conflicts in design, materials, welding, heat treatment, examinations and tests to ensure a safe repair/alteration is performed. Note that work once classified as a repair could now be considered an alteration.

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

Action Item 20-76: Request for the addition to NBIC Part 3, Glossary

Rick Valdez
ARB, INC.
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661 331 6024

Background:	With the use of indirect inspection equipment from borescopes to tethered drones/vehicles for confined space inspections, there is a need to clarify what is considered a "remote" inspection vs an "indirect" inspection.
Explanation of need:	Remote Inspections need to be better clarified.
Date opened	9/15/2020
Proposed:	Remote Visual Examination: a visual examination technique used with visual aids for conditions where the area to be examined is inaccessible for direct visual examination.

NBIC Part 3 Inquiry

Robert Underwood
Hartford Steam Boiler
12/15/20

Purpose	Revise 4.4.2(a)(2) to clarify the term replacement part
Statement of Need:	To clarify that the minimum test pressure for alterations shall be in accordance with the original code of construction.
Background Information:	I have recently had discussions with some repair firms and Repair Inspectors who believe there are no minimum test pressure requirements when performing a liquid pressure tests of alterations since it is not specifically stated in paragraph 4.4.2(a)(1). This proposal would revise the second sentence of 4.4.2(a)(1) to specifically address minimum test pressure requirements for alterations.
Existing Text:	**4.4.2(a)(1) (From 2021 Edition)** a) Liquid Pressure Test Pressure testing of alterations shall meet the following requirements: 1) A pressure test as required by the original code of construction shall be conducted. The test pressure shall not exceed the maximum liquid test pressure of the original code of construction. When the original test pressure consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance. The pressure test for replacement parts may be performed at the point of manufacture or point of installation.
Proposed Text:	**4.4.2(a)(1) (From 2021 Edition)** a) Liquid Pressure Test Pressure testing of alterations shall meet the following requirements: 1) A pressure test as required by the original code of construction shall be conducted. The test pressure shall not be less than the minimum or exceed the maximum liquid test pressure of the original code of construction. When the original test pressure consideration of corrosion allowance, the test pressure may be further adjusted based on the remaining corrosion allowance. The pressure test for replacement parts may be performed at the point of manufacture or point of installation.

PROPOSED ACTION ITEM

Item Number:	**20-83**
Submitted by:	Terry Hellman thellman@nationalboard.org
Subject:	Definition of Nonconformance **Explanation of Need:** Action Item 19-60 is proposing revisions/additions to all of 1.5.1. This proposal is to move the definition of "Nonconformance" out of the current 1.5.1 s) paragraph and into the glossary. **Background Information:** Current text in 1.5.1 s) that is being revised via Action Item 19-60: s) Nonconforming Items There shall be a system acceptable to the Inspector for the correction of nonconformities. A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system. Nonconformance must be corrected or eliminated before the repaired or altered component can be considered in compliance with the NBIC.
NBIC Location:	NBIC Part 3, 1.5.1 s) and 9.1

Current Text:	**Proposed Text:**
s) Nonconforming Items There shall be a system acceptable to the Inspector for the correction of nonconformities. A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system. Nonconformance must be corrected or eliminated before the repaired or altered component can be considered in compliance with the NBIC.	s) Nonconforming Items There shall be a system acceptable to the Inspector for the correction of nonconformities. ~~A nonconformance is any condition that does not comply with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system.~~ Nonconformance must be corrected or eliminated before the repaired or altered component can be considered in compliance with the NBIC. **9.1 Glossary** Nonconformance – A condition of product or service in which any characteristics do not conform with the applicable rules of the NBIC, construction code, jurisdictional requirements, or the quality system.

PROPOSED ACTION ITEM

Item Number:	**20-87**
Submitted by:	Terry Hellman thellman@nationalboard.org
Subject:	Definition of Nonconformance **Explanation of Need:** This reference to 49 CFR statutes would clarify the difference between an "Inspector" as used throughout the NBIC and a "Registered Inspector" specific to DOT tank repair/alteration activities. **Background Information:** Registered Inspector requirements per DOT: REGISTERED INSPECTOR EXPERIENCE Having a working knowledge of DOT specification cargo tanks is only one aspect of a Registered Inspector. When a person tests and inspects DOT specification cargo tank motor vehicles, he or she has to be trained in the HM regulations (49 CFR Parts 107-180). According to 49 CFR §180.409 any person performing or witnessing the inspections and tests must be registered, familiar with DOT-specification cargo tanks and trained and experienced in the use of equipment needed for tests and inspections, and meet the knowledge and ability requirement of the "Registered Inspector."
NBIC Location:	NBIC Part 3, S6.8

Current Text:	**Proposed Text:**
S6.8 INSPECTION Inspection and certification shall be made by an Inspector holding an appropriate National Board Commission as required by NBIC Part 3, 1.3 and shall be a Registered Inspector meeting the requirements of the Competent Authority.	S6.8 INSPECTION Inspection and certification shall be made by an Inspector holding an appropriate National Board Commission as required by NBIC Part 3, 1.3 and shall be a Registered Inspector meeting the requirements of the Competent Authority and 49 CFR §180.409.

Such stamping or attaching of a nameplate shall be done only with the knowledge and authorization of the Inspector and Competent Authority. The "R" Certificate Holder responsible for the repair or the construction portion of the modification/alteration shall apply the stamping. For a re-rating where no physical changes are made to the pressure-retaining item, the "R" Certificate Holder responsible for the design shall apply the stamping. Requirements for stamping and nameplate information are shown in NBIC Part 3, Section 5.

~~**S6.15.1 SPECIFIC "R" STAMPING AND NAMEPLATE REQUIREMENTS**~~

~~The holder of a "R" *Certiicate of Authorization* is required to affix a stamping or nameplate on the Transport Tank that indicates, the repair, alteration, or modification has been performed in accordance with the requirements of NBIC Part 3, Supplement 6 and the additional requirements of the code of construction. All repairs, alterations, and modifications, after acceptance by the Registered Inspector, shall have the "R" Symbol affixed to the stamping or the nameplate. The stamping or nameplate information shall satisfy the requirements of a) thru g) below:~~

~~a) The required data shall be in characters at least 4 mm (5/32 in.) high;~~

~~b) The markings may be produced by casting, etching, embossing, debossing, stamping, or engraving;~~

~~c) The selected method shall not result in any harmful contamination or sharp discontinuities to the pressure- retaining boundary of the Transport Tank;~~

~~d) Stamping directly on the Transport Tank, when used, shall be done with blunt nose continuous or blunt nose interrupted dot die stamps. If direct stamping would be detrimental to the item, required markings and the embossed Code Symbol stamping may appear on a nameplate affixed to the Transport Tank;~~

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

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

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

S6.15.~~2~~1 REMOVAL OF ORIGINAL STAMPING OR NAMEPLATE

If it becomes necessary to remove the original stamping, the Inspector shall, subject to the approval of the Competent Authority, witness the making of a facsimile of the stamping, the obliteration of the old stamping, and the transfer of the stamping. When the stamping is on a nameplate, the Inspector shall witness the transfer of the nameplate to the new location. Any relocation shall be described on the applicable NBIC "R" Form. The restamping or replacement of a code symbol stamp shall be performed only as permitted by the governing code of construction.

S6.16 "R" FORMS

S6.16.1 DOCUMENTATION

Repairs, alterations, or modifications that have been performed in accordance with the NBIC shall be documented on Form R-1, *Report of Repair* or Form R-2, *Report of Alteration* as shown in NBIC Part 3, Section 5. Form R-4, *Report Supplementary Sheet*, shall be used to record additional data when space is insufficient on Form R-1 or R-2.

NBIC Part 3 Inquiry

Robert Underwood
Hartford Steam Boiler
10/30/2020

Inquiry No.	**20-92 –** Mechanical Repair Procedures
Statement of Need:	"Mechanical assembly procedures" appears to be incorrectly referenced in the first sentence of Part 3, paragraph 1.5.1(h) and should state "mechanical repair procedures."
Background Information:	Mechanical assembly appears to only apply to non-metallic repairs per the Supplement 9 Glossary and the way it is used in the last sentence in 1.5.1(h). I believe the more appropriate term to use in the first sentence of 1.5.1(h) is "mechanical repair procedures" which appears to apply to metallic repairs.
Existing Text:	**Part 3, 1.5.1(h)** h) Repair and Alteration Methods The manual shall include controls for repairs and alterations, including mechanical assembly procedures, materials, nondestructive examination methods, pre-heat, and postweld heat treatment, as applicable. Special requirements such as nonmetallic repairs and alterations to graphite and fiber reinforced thermosetting plastic pressure-retaining items including bonding or mechanical assembly procedures shall be addressed, if applicable.
Proposed Text:	**Part 3, 1.5.1(h)** h) Repair and Alteration Methods The manual shall include controls for repairs and alterations, including mechanical ~~assembly~~ repair procedures, materials, nondestructive examination methods, pre-heat, and postweld heat treatment, as applicable. Special requirements such as nonmetallic repairs and alterations to graphite and fiber reinforced thermosetting plastic pressure-retaining items including bonding or mechanical assembly procedures shall be addressed, if applicable.

Part 3, Supplement 9 – Glossary

Mechanical Assembly — The work necessary to establish or restore a pressure retaining boundary, under supplementary materials, whereby pressure-retaining capability is established through a mechanical, chemical, or physical interface, as defined under the rules of the NBIC.

Mechanical Repair Method — A method of repair, which restores a pressure retaining boundary to a safe and satisfactory operating condition, where the pressure retaining boundary is established by a method other than welding or brazing, as defined under the rules of the NBIC.

PART 4, SECTION 2
PRESSURE RELIEF DEVICES — INSTALLATION OF PRESSURE RELIEF DEVICES

2.1 SCOPE

NBIC Part 4 Section 2 provides requirements for the installation of pressure relief devices on power boilers,
steam heating boilers, hot-water heating boilers, hot-water supply boilers, potable water heaters, pressure vessels and piping.
The correct selection of appropriate pressure relief devices (PRDs) and the proper installation of those devices
are critical to the safe operation of pressure retaining items. Following are requirements for the installation of
pressure relief devices for protection of different types of pressurized equipment. See NBIC Part 1 for general
installation requirements.

2.1.1 GENERAL REQUIREMENTS FOR INSTALLATION OF PRESSURE RELIEF DEVICES

2.1.1.1 RELIEF DEVICE DESIGN & NUMBER OF DEVICES

a) Pressure retaining items shall be equipped with one or more pressure relief devices unless the option for overpressure protection by system design is utilized (when permitted by the Jurisdiction and the original code of construction). Multiple isolatable chambers, or system portions with different maximum allowable working pressures, shall have their own pressure relief device(s) to protect the chambers under the most severe coincident conditions.
b) A pressure relief device and its associated piping shall be safely supported. Design of supports, foundations, and settings shall consider vibration (including seismic where necessary), movement (including thermal movement), and loadings (including reaction forces) in accordance with jurisdictional requirements, manufacturer's recommendations, and/or other industry standards, as applicable. Piping shall be supported in a manner that avoids placing undue stress on the body of the pressure relief device.
c) Pressure relief devices shall be manufactured in accordance with a national or international standard.
d) Pressure relief devices shall have their capacity certified by the National Board unless otherwise permitted by the original code of construction
e) Pressure relief devices shall be selected (i.e., material, pressure, etc.) and installed such that their proper functioning will not be hindered by the nature of the system's contents.
f) When a pressure relief valve is exposed to outdoor elements that may affect operation of the valve, the valve may be shielded with a cover. The cover shall be properly vented and arranged to permit access for servicing
and normal operation of the valve.
g) A non-reclosing device (rupture disk) may be installed on the inlet and/or outlet of a pressure relief valve when permitted by the original code of construction. The reduction in capacity due to installation of the non-reclosing device shall be determined by use of a National Board certified Combination Capacity Factor (CCF).
For rupture disks, if a certified combination capacity factor is not available, the capacity of the pressure relief valve shall be multiplied by 0.9 and this value used as the capacity of the combination installation.

h) The effect of inlet pressure drop and discharge back pressure on relief device capacity shall be considered in the system design and relief device selection.
i) Twin pressure relief valves made by placing individual valves on Y-bases or duplex valves having two valves in the same body shall be of equal size.
j) The owner shall document the basis for selection of the pressure relief devices used, including capacity, and have such calculations available for review by the Jurisdiction.
k) Pressure relief devices shall be in accordance with the code of construction and
designed for liquid, vapor, or combination service as required for the specific installation, service fluids, and overpressure conditions.

2.1.1.2 DESIGN OF RELIEF DEVICE INLET LINES

a) Pressure relief devices shall be installed directly on, or as close as possible to, the pressure retaining item, and be installed so they are accessible for inspection, repair, or replacement. The opening in the pressure retaining item shall provide unobstructed flow to the pressure relief device. If multiple relief valves are installed on the same connection to the pressure retaining item, the opening shall have a cross-sectional area not less than the combined areas of inlet connections of all the pressure relief valves with which it connects.

b) Inlet lines shall be as short and straight as possible. Inlet lines shall be properly supported in accordance with 2.1.1.1 b).

c) The opening through all pipes and fittings between a pressure retaining item and its pressure relief device shall have at least the area of the pressure relief device inlet. The characteristics of this upstream system shall be such that the pressure drop will not reduce the relieving capacity below that required or adversely affect the operation of the pressure relief device.

d) When a pressure retaining item is fitted with one or more pressure relief devices on one connection, the inlet cross-sectional area of this connection shall be sized either to avoid restricting flow to the pressure relief devices or to have a cross sectional area not less than the combined areas of inlet connections of all the pressure relief devices with which it connects.

e) When a Y-base is used, the inlet area shall be not less than the combined outlet areas.

f) Inlets to pressure relief devices intended for use in compressible fluid or steam service shall be connected to the vessel in the vapor space above any contained liquid or in the piping system connected to the vapor space.

g) Pressure relief devices intended for use in liquid service shall be connected below the normal liquid line. The liquid level during upset conditions shall be considered.

h) Unless permitted by the code of construction, the Jurisdiction, and the requirements specific to the type of pressure retaining item found in Section 2, there shall be no intervening stop valve or changeover valve between the pressure retaining item and its pressure relief device(s),

i) Where an intervening stop valve is permitted and used, it shall comply with 2.1.1.4.

j) Where a changeover valve is permitted and used, it shall comply with 2.1.1.5.

2.1.1.3 DESIGN OF RELIEF DEVICE DISCHARGE LINES

a) Discharge lines shall be as short and straight as possible. Discharge lines shall be properly supported in accordance with 2.1.1.1 b).

b) The opening through all discharge pipes and fittings shall have at least the area of the pressure relief device outlet. The characteristics of this downstream system shall be such that the pressure drop (back pressure) will not reduce the relieving capacity below that required or adversely affect the operation of the pressure relief device.

c) Pressure relief device discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location, such as a catchment tank, for the disposal of fluids being relieved.

d) Discharge lines from pressure relief devices shall be designed to facilitate drainage and steam venting, or be fitted with drains (including valve body drains if necessary), to prevent liquid from collecting in the discharge side of a pressure relief device. Drain piping shall discharge to a safe location for the disposal of the fluids being relieved. There are additional requirements specific to boilers and heaters.

e) Where an intervening stop valve is permitted and used, it shall comply with 2.1.1.4.

f) Where a changeover valve is permitted and used, it shall comply with 2.1.1.5.

j) If a muffler is used on a pressure relief valve, it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid a possibility of restriction of the passages due to deposits. Mufflers shall not be used on high temperature water boiler pressure relief valves.

2.1.1.4 REQUIREMENTS FOR PRESSURE RELIEF STOP VALVES (WHERE PERMITTED)

a~~1~~) ~~These s~~Stop valves shall be so constructed or positively controlled that the closing of the maximum number of block valves at one time will not reduce the pressure relieving capacity below the required relieving capacity;

~~2~~b) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing
equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a piping system and its pressure relief device may be provided for inspection and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station;

~~3~~c) A full area stop valve may be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed; or

~~4~~d) A piping system where the pressure originates from an outside source may have a stop valve between the system and the pressure relief device, and this valve need not be sealed open, provided it also closes off that vessel from the source of pressure.

2.1.1.5 REQUIREMENTS FOR PRESSURE RELIEF CHANGEOVER VALVES (WHERE PERMITTED)

a) A changeover valve, which allows two redundant pressure relief valves to be installed for the purpose of changing from one pressure relief valve to the other while the pressure retaining item is operating, may be used provided the changeover valve is in accordance with the original code of construction. It is recommended that the Jurisdiction be contacted to determine the acceptability of the changeover valves on boiler applications.

b) The changeover valve shall be designed such that there is no intermediate position where both pressure relief valves are isolated from the pressure retaining item.

c) The additional flow restriction caused by a changeover valve shall be considered in the system design.

2.2 PRESSURE RELIEF VALVES FOR POWER BOILERS

See NBIC Part 1, 2.2 for the boilers covered under Part 4, 2.2

2.2.1 GENERAL REQUIREMENTS

a) Only direct spring loaded pressure relief valves or pilot operated pressure relief valves designed to relieve steam shall be used for steam service.

b) Pressure relief valves are valves designed to relieve either steam or water, depending on the application.

~~c) Pressure relief valves shall be manufactured in accordance with a national or international standard.~~[AR1]

~~d~~c) Deadweight or weighted-lever pressure relief valves shall not be used.

~~e~~d) For high temperature water boilers, pressure relief valves shall have a closed bonnet, and valve bodies
shall not be constructed of cast iron.

~~f~~e) Pressure relief valves with an inlet connection greater than NPS 3 (DN 80) and used for pressure greater than 15 psig (100 kPa), shall have a flanged or a welded inlet connection. The dimensions of flanges subjected to boiler pressure shall conform to the applicable standards.

~~g) When a pressure relief valve is exposed to outdoor elements that may affect operation of the valve, the valve may be shielded with a cover. The cover shall be properly vented and arranged to permit servicing and normal operation of the valve.~~[AR2]

2.2.2 NUMBER

At least one National Board capacity certified pressure relief valve shall be installed on the boiler in accordance with 2.1.1.1 a. If the boiler has more than 500 ft_2 (46 m_2) of heating surface, or if an electric boiler has a power input of more than 3.76 million BTU/hr (1100 kW), two or more National Board capacity certified pressure relief valves shall be installed.

2.2.3 LOCATION

~~a) Pressure relief valves shall be placed on, or as close as physically possible, to the boiler proper.~~

~~b~~a)[AR3] Pressure relief valves shall not be placed on the feedline.

c) Pressure relief valves shall be connected to the boiler independent of any other connection without any unnecessary intervening pipe or fittings. Such intervening pipe or fittings shall not be longer than the face-to-face dimension of the corresponding tee fitting of the same diameter and pressure rating as listed in the applicable standards.

2.2.4 CAPACITY

a) The pressure relief valve capacity for each boiler shall be such that the valve or valves will discharge all the steam that can be generated by the boiler without allowing the pressure to rise more than 6% above the highest pressure at which any valve is set and in no case to more than 6% above the maximum allowable working pressure of the boiler.

b) The minimum relieving capacity for other than electric boilers and forced-flow steam generators with no fixed steam line and waterline shall be estimated for the boiler and waterwall heating surfaces as given in Table 2.2.4.1, but in no case shall the minimum relieving capacity be less than the maximum designed steaming capacity as determined by the manufacturer.

c) The required relieving capacity in lbs/hr of the pressure relief valves on a high temperature water boiler shall be determined by dividing the maximum output in Btu at the boiler nozzle obtained by the firing of any fuel for which the unit is designed by one thousand.

d) The minimum pressure relief valve relieving capacity for electric boilers shall not be less than 3.5 lbs/hr/kW (1.6 kg/hr/kW) input.

e) If the pressure relief valve capacity cannot be computed, or if it is desirable to prove the computations, it should be checked by any one of the following methods; and if found insufficient, additional relieving capacity shall be provided:

1) By performing an accumulation test, that is, by shutting off all other steam discharge outlets from the boiler and forcing the fires to the maximum. This method should not be used on a boiler with a superheater or reheater or on a high-temperature water boiler.

2) By measuring the maximum amount of fuel that can be burned and computing the corresponding evaporative capacity upon the basis of the heating value of the fuel.

3) By determining the maximum evaporative capacity by measuring the feedwater. The sum of the pressure relief valve capacities marked on the valves shall be equal to or greater than the maximum evaporative capacity of the boiler. This method should not be used on high-temperature water boilers.

TABLE 2.2.4.1

MINIMUM POUNDS OF STEAM PER HOUR PER SQUARE FOOT OF HEATING SURFACE
LB STEAM/HR FT_2 (KG STEAM/HR M_2)

Firetube Boiler	Watertube Boiler
Boiler Heating Surface	
Hand-fired 5 (24)	6 (29)
Stoker-fired 7 (34)	8 (39)
Oil, gas, or pulverized fuel-fired 8 (39)	10 (49)

Waterwall Heating Surface
Hand-fired 8 (39) 8 (39)
Stoker-fired 10 (49) 12 (59)
Oil, gas, or pulverized coal 14 (68) 16 (78)
Copper-finned Watertubes
Hand-fired 4 (20)
Stoker-fired 5 (24)
Oil, gas, or pulverized fuel-fired 6 (29)

Notes:

• When a boiler is fired only by a gas having a heat value not in excess of 200 Btu/ft$_3$(7.5MJ/m$_3$), the minimum relieving capacity should be based on the values given for hand-fired boilers above.

• The heating surface shall be computed for that side of the boiler surface exposed to the products of combustion, exclusive of the superheating surface. In computing the heating surface for this purpose only the tubes, fireboxes,shells, tubesheets, and the projected area of headers need to be considered, except that for vertical firetube steam boilers, only that portion of the tube surface up to the middle gage cock is to be computed.

• For firetube boiler units exceeding 8000 Btu/ft$_2$ (9085 J/cm$_2$) (total fuel Btu (J) Input divided by total heating surface), the factor from the table will be increased by 1 (4.88) for every 1000 Btu/ft.$_2$ (1136 J/cm$_2$) above 8000 Btu/ft.$_2$ (9085 J/cm$_2$) For units less than 7000 Btu/ft$_2$ (7950 J/cm$_2$), the factor from the table will be decreased by 1 (4.88).

• For watertube boiler units exceeding 16000 Btu/ft$_2$ (18170 J/cm$_2$)(total fuel Btu input divided by the total heating surface) the factor from the table will be increased by 1 (4.88) for every 1000 Btu/ft.$_2$ (1136 J/cm$_2$) above 16000 Btu/ft.$_2$ (18170 J/cm$_2$). For units with less than 15000 Btu/ft.$_2$ (17034 J/cm$_2$), the factor in the table will be decreased by 1 (4.88) for every 1000 Btu/ft.2 (1136 J/cm$_2$) below 15000 Btu/ft.$_2$ (17034 J/cm$_2$).

2.2.5 SET PRESSURE

One or more pressure relief valves on the boiler proper shall be set at or below the maximum allowable working pressure. If additional valves are used, the highest pressure setting shall not exceed the maximum
allowable working pressure by more than 3%. The complete range of pressure settings of all the pressure relief valves on a boiler shall not exceed 10% of the highest pressure to which any valve is set. Pressure setting of pressure relief valves on high temperature water boilers may exceed this 10% range.

2.2.6 FORCED-FLOW STEAM GENERATORS

For a forced-flow steam generator with no fixed steamline and waterline, equipped with automatic controls
and protective interlocks responsive to steam pressure, pressure relief valves may be provided in accordance
with the above paragraphs identified in 2.2.5 or the following protection against overpressure shall be provided:

a) One or more power-actuated pressure relief valves shall be provided in direct communication with the boiler when the boiler is under pressure and shall receive a control impulse to open when the maximum allowable working pressure at the superheater outlet is exceeded. The total combined relieving capacity of the power actuated pressure relief valves shall be not less than 10% of the maximum design steaming capacity of the boiler under any operating condition as determined by the manufacturer. The valves shall be located in the pressure part system where they will relieve the overpressure. An isolating stop valve of the outside-screw-and-yoke type should be installed between the power actuated pressure relief valve and the boiler to permit repairs provided an alternate power-actuated pressure relief valve of the same capacity is so installed as to be in direct communication with the boiler.

b) Pressure relief valves shall be provided having a total combined relieving capacity, including that of the power-actuated pressure relief valve, of not less than 100% of the maximum designed steaming capacity of the boiler, as determined by the manufacturer. In this total, credit in excess of 30% of the total relieving capacity shall not be allowed for the power-actuated pressure relief valves actually installed. Any or all of the pressure relief valves may be set above the maximum allowable working pressure of the parts to which they are connected, but the set pressures shall be such that when all

these valves (together with the power-actuated pressure relief valves) are in operation the pressure will not rise more than 20% above the maximum allowable working pressure of any part of the boiler, except for the steam piping between the boiler and the prime mover.
c) When stop valves are installed in the water steam flow path between any two sections of a forced-flow steam generator with no fixed steamline and waterline:
1) The power-actuated pressure relief valve shall also receive a control impulse to open when the maximum allowable working pressure of the component, having the lowest pressure level upstream to the stop valve, is exceeded.
2) The pressure relief valve shall be located to provide overpressure protection for the component having the lowest working pressure.
3) A reliable pressure-recording device shall always be in service and records kept to provide evidence of conformity to the above requirements.

2.2.7 SUPERHEATERS

a) ~~Every attached superheater shall have one or more pressure relief valves.~~[AR4] ~~The location shall be suitable for the service intended~~ [AR5]~~and shall provide the overpressure protection required.~~[AR6] ~~The pressure drop upstream of each pressure relief valve shall be considered in determining the set pressure and relieving capacity of that valve.~~[AR7] If the superheater outlet header has a full, free steam passage from end to end and is so constructed that steam is supplied to it at practically equal intervals throughout its length so that there is a uniform flow of steam through the superheater tubes and the header, the pressure relief valve or valves may be located anywhere in the length of header.
b) The pressure-relieving capacity of the pressure relief valve or valves on an attached superheater shall be included in determining the number and size of the pressure relief valves for the boiler provided there are no intervening valves between the superheater pressure relief valve and the boiler and the discharge capacity of the pressure relief valve or valves, on the boiler, as distinct from the superheater, is at least 75% of the aggregate capacity required.
c) Every independently fired superheater that may be shut off from the boiler and permit the superheater to become a fired pressure vessel shall have one or more pressure relief valves having a discharge capacity equal to 6 lbs steam/hr/ft_2 (29 kg steam/hr/m_2) of superheater surface measured on the side exposed to the hot gases.
d) Every pressure relief valve used on a superheater discharging superheated steam at a temperature over 450°F (230°C) shall have a casing, including the base, body, bonnet, and spindle constructed of steel, steel alloy, or equivalent heat-resistant material. The valve shall have a flanged inlet connection or a welding-end inlet connection. The seat and disk shall be constructed of suitable heat-erosive and corrosive-resistant material, and the spring fully exposed outside of the valve casing so that it is protected from contact with the escaping steam.

2.2.8 ECONOMIZERS

An economizer that may not be isolated from a boiler does not require a pressure relief valve. Economizers that may be isolated from a boiler or other heat transfer device, allowing the economizer to become a fired pressure vessel, shall have a minimum of one pressure relief valve. Discharge capacity, rated in lbs/hr (kg/hr), of the pressure relief valve or valves shall be calculated from the maximum expected heat absorption rate in Btu/hr (kJ/hr) of the economizer, and will be determined from manufacturer data, divided by 1,000 Btu/lb (2,326 kJ/kg). The pressure relief valve shall be located as close as possible to the economizer outlet.

2.2.9 PRESSURE REDUCING VALVES

a) Where pressure reducing valves are used, one or more pressure relief valves shall be installed on the low pressure side of the reducing valve in those installations where the piping or equipment on the low pressure side does not meet the requirements for the steam supply piping.
b) The pressure relief valves shall be located as close as possible to the pressure reducing valve.
c) Capacity of the pressure relief valves shall not be less than the total amount of steam that can pass from the high pressure side to the low pressure side and be such that the pressure rating of the lower pressure piping or equipment shall not be exceeded.

d) The use of hand-controlled bypasses around reducing valves is permissible. The bypass around a reducing valve may not be greater in capacity than the reducing valve unless the piping or equipment is adequately protected by pressure relief valves or meets the requirements of the high pressure system.
e) See Supplement 1 for additional information on the calculation of the required capacity of pressure relief
valves installed after pressure-reducing valves.

2.2.10 INSTALLATION AND DISCHARGE REQUIREMENTS

a) Every boiler shall have outlet connections for the pressure relief valve, or valves, independent of any other outside steam connection, the area of opening shall be at least equal to the aggregate areas of inlet connections of all of the attached pressure relief valves. An internal collecting pipe, splash plate, or pan should be used, provided the total area for inlet of steam is not less than twice the aggregate areas of the inlet connections of the attached pressure relief valves. The holes in such collecting pipes shall be at least 1/4 in. (6 mm) in diameter, and the least dimension in any other form of opening for inlet of steam shall be 1/4 in. (6 mm). If pressure relief valves are attached to a separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than 10 times the total area of the pressure relief valve inlet.
b) Every pressure relief valve shall be connected so as to stand in an upright position with spindle vertical.
c) ~~The opening or connection between the boiler and the pressure relief valve shall have at least the area of the valve inlet and t~~T[AR8]he inlet pipe to the pressure relief valve shall be ~~be as short and straight as possible,~~[AR9]
no longer than twice the center-to-end (face) dimension of a corresponding tee fitting of the same diameter,
pressure class, and connection type. ~~When a discharge pipe is used, the cross-sectional area shall not be less than the full area of the valve outlet or of the total of the areas of the valve outlets. It shall be as short and straight as possible and arranged to avoid undue stresses on the valve or valves.~~[AR10]
d) No valves of any type except a changeover valve in accordance with 2.1.1.5 ~~as defined below~~ shall be placed between the pressure
relief valves and the boiler, nor on the discharge pipe between the pressure relief valves and the atmosphere.
~~A changeover valve, which allows two redundant pressure relief valves to be installed for the purpose of changing from one pressure relief valve to the other while the boiler is operating, may be used provided the changeover valve is in accordance with the original code of construction. It is recommended that the Jurisdiction be contacted to determine the acceptability of the changeover valves on boiler applications. The changeover valve shall be designed such that there is no intermediate position where both pressure relief valves are isolated from the boiler.~~[AR11]
e) When two or more pressure relief valves are used on a boiler, they should be mounted either separately
or as twin valves made by placing individual valves on Y-bases, or duplex valves having two valves in the same body casing. ~~Twin valves made by placing individual valves on Y-bases or duplex valves having two valves in the same body shall be of equal size.~~[AR12]
f) When two valves of different sizes are installed singly, the relieving capacity of the smaller valve shall not be less than 50% of that of the larger valve.
~~g) When a boiler is fitted with two or more pressure relief valves on one connection, this connection to the boiler shall have a cross-sectional area not less than the combined areas of inlet connections of all the pressure relief valves with which it connects.~~[AR13]
h) All pressure relief valves shall be piped to a safe point of discharge so located or piped as to be carried clear from running boards or platforms. Provision for an ample gravity drain shall be made in the discharge
pipe at or near each pressure relief valve, and where water or condensation may collect. Each valve shall have an open gravity drain through the casing below the level of the valve seat. For ironand steel- bodied valves exceeding NPS 2 (DN 50), the drain hole shall be tapped not less than NPS 3/8 (DN 10).
~~i) Discharge piping from pressure relief valves on high temperature water boilers shall have adequate provisions for water drainage as well as steam venting.~~[AR14]

j) If a muffler is used on a pressure relief valve, it shall have sufficient outlet area to prevent back pressure
from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid a possibility of restriction of the steam passages due to deposits. [AR15]Mufflers shall not be used on high temperature water boiler pressure relief valves.

2.2.11 SUPPORTS, FOUNDATIONS, AND SETTINGS

Each boiler pressure relief valve and its associated piping must be safely supported. Design of supports, foundations, and settings shall consider vibration (including seismic where necessary), movement (including
thermal movement), and loadings (including reaction forces) in accordance with jurisdictional requirements,
manufacturer's recommendations, and/or other industry standards, as applicable.[AR16]

2.3 OVERPRESSURE PROTECTION FOR THERMAL FLUID HEATERS

2.3.1 GENERAL REQUIREMENTS

Thermal fluid heaters shall be provided with overpressure protection in accordance with the code of construction.

2.3.2 PRESSURE RELIEF DEVICES

Thermal fluid heaters shall be equipped with one or more pressure relief devices unless the option for overpressure
protection by system design is utilized (when permitted by the original code of construction). [AR17]When pressure relief devices are used, the following shall apply:

a) Pressure relief valve(s) shall be of a totally enclosed type and shall not have a lifting lever. A body drain
is not required.

b) Rupture disks may be installed upstream or downstream of the pressure relief valve(s) in accordance with the original code of construction.

c) Pressure relief valves and rupture disks shall be in accordance with the code of construction and designed for liquid, vapor, or combination service as required for the specific installation, service fluids, and overpressure conditions.[AR18]

cd) The inlet connection to the valve shall be not less than NPS ½ (DN 15).

2.3.3 LOCATION

Pressure relief devices shall be connected to the heater in accordance with the original code of construction.

2.3.4 CAPACITY

The pressure relief device(s) shall have sufficient capacity to prevent the pressure vessel from exceeding the
maximum pressure specified in the vessel code of construction.

2.3.5 SET PRESSURE

a) When a single relief device is used, the set pressure marked on the device shall not exceed the maximum
allowable working pressure.

b) When more than one pressure relief device is provided to obtain the required capacity, only one pressure
relief device set pressure needs to be set at or below the maximum allowable working pressure. The set pressure of the additional relief devices shall be such that the pressure cannot exceed the maximum
pressure permitted by the code of construction.

2.3.6 INSTALLATION

a) When a discharge pipe is used, the cross-sectional area shall not be less than the full area of the valve outlet. The size of the discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity or adversely affect the operation of the attached pressure vessel relief devices. Discharge piping shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief device.[AR19]

b) The cross sectional area of the piping between the heater and the relief device shall be sized either to avoid restricting the flow to the pressure relief devices or made at least equal to the inlet area of the

~~pressure relief devices connected to it.~~[AR20]
~~c) When two or more required pressure relief devices are placed on one connection, the inlet cross-sectional~~
~~area of this connection shall be sized either to avoid restricting the flow to the pressure relief devices or made at least equal to the combined inlet areas of the pressure relief devices connected to it.~~[AR21]
~~d) Unless permitted by the code of construction, there shall be no intervening stop valve between the vessel and its pressure relief device(s), or between the pressure relief device and the point of discharge.~~[AR22]
~~e) Pressure relief device discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location, such as a catchment tank, for the disposal of fluids being relieved.~~[AR23]
~~f) Discharge lines from pressure relief devices shall be designed to facilitate drainage or be fitted with low point or valve body drains to prevent liquid from collecting in the discharge side of a pressure relief device. Drain piping shall discharge to a safe location for the disposal of the fluids being relieved.~~[AR24]
g) The pressure relief discharge should be connected to a closed, vented storage tank or blowdown tank with solid piping (no drip pan elbow, or other air gap). When outdoor discharge is used, the following should be considered for discharge piping at the point of discharge:
1) Both thermal and chemical reactions (personnel hazard);
2) Combustible materials (fire hazard);
3) Surface drains (pollution and fire hazard);
4) Loop seal or rain cap on the discharge (keep both air and water out of the system);
5) Drip leg near device (prevent liquid collection); and
6) Heat tracing for systems using high freeze point fluids (prevent blockage).
h) A suitable condenser that will condense all the vapors discharged from the pressure relief valve may be
used in lieu of piping the vapors to the atmosphere.
i) In order to minimize the loss by leakage of material through the pressure relief valve, a rupture disk may be installed between the pressure relief valve and the vaporizer, provided the following requirements are met:
1) The cross-sectional area of the connection to a vaporizer shall be not less than the required relief area of the rupture disk.
2) The maximum pressure of the range for which the disk is designed to rupture shall not exceed the opening pressure for which the pressure relief valve is set or the maximum allowable working pressure of the vessel.
3) The opening provided through the rupture disk, after breakage, shall be sufficient to permit a flow equal to the capacity of the attached valve, and there is no chance of interference with the proper functioning of the valve, but in no case shall this area be less than the inlet area of the valve.
4) The space between a rupture disk and the valve shall be provided with a pressure gage, try cock, free vent, or a suitable telltale indicator. This arrangement permits the detection of disk rupture or leakage.

j) Pressure relief valve discharge capacity shall be determined from the following equation:
$W = CKAP \sqrt{(M/T)}$
Where:
A = discharge area of pressure relief valve
C = constant for vapor that is a function of the ratio of specific heats $k = c_p/c_v$.
Note: Where k is not known, k = 1.001.
K = coefficient of discharge for the valve design
M = molecular weight
P = (set pressure × 1.03) + Atmosphere Pressure
T = absolute temperature at inlet, °F + 460 (°C + 273)
W = flow of vapor
The required minimum pressure relief valve relieving capacity shall be determined from the following equation:
W = C x H x 0.75/h

Where:
C = maximum total weight or volume of fuel burned per hour, lb (kg) or ft^3 (m^3)
H = heat of combustion of fuel, Btu/lb (J/kg) or Btu/ft^3 (J/m^3)
h = latent heat of heat transfer fluid at relieving pressure, Btu/lb (J/kg)
W = weight of organic fluid vapor generated per hour
The sum of the pressure relief valve capacities marked on the valves shall be equal to or greater than W.

2.4 PRESSURE RELIEF VALVES FOR STEAM HEATING, HOT WATER HEATING, AND HOT WATER SUPPLY BOILERS

See NBIC Part 1, 3.2 for the scope of pressure retaining items covered by Part 4, 2.4.

2.4.1 GENERAL REQUIREMENTS

The following general requirements pertain to the installation of pressure relief valves on heating boilers.

2.4.1.1 INSTALLATION OF PRESSURE RELIEF VALVES FOR HEATING BOILERS

2.4.1.1.1 PERMISSIBLE INSTALLATION

Pressure relief valves shall be located at the top side of the boiler. The top side of the boiler shall mean the highest practicable part of the boiler proper but in no case shall the pressure relief valves be located below the normal operating level and in no case shall the pressure relief valve be located below the lowest permissible water level. They shall be connected directly to a tapped or flanged opening in the boiler, to a fitting connected to the boiler by a short nipple, to a Y-base, or to a valveless header connecting steam or water outlets on the same boiler. Coil or header type boilers shall have the pressure relief valve located on the steam or hot water outlet end. Pressure relief valves shall be installed with their spindles vertical. The opening or connection between the boiler and any pressure relief valve shall have at least the area of the valve inlet.

2.4.1.1.2 REQUIREMENTS FOR COMMON CONNECTIONS FOR TWO OR MORE VALVES

~~a) When a boiler is fitted with two or more pressure relief valves on one connection, this connection shall have a cross-sectional area not less than the combined areas of inlet connections of all the pressure relief valves with which it connects.~~ [AR25]

~~b~~a) When a Y-base is used, the inlet area shall be not less than the combined outlet areas. When the size of the boiler requires a pressure relief valve larger than NPS 4 (DN 100), two or more valves having the required combined capacity shall be used. When two or more valves are used on a boiler, they may be single, directly attached, or installed on a Y-base.

2.4.1.2 THREADED CONNECTIONS

A threaded connection may be used for attaching a valve.

2.4.1.3 PROHIBITED INSTALLATIONS

Pressure relief valves shall not be connected to an internal pipe in the boiler.

2.4.1.4 USE OF SHUTOFF VALVES PROHIBITED

No shutoff valve of any description shall be placed between the pressure relief valve and the boiler or on discharge pipes between such valves and the atmosphere.

2.4.1.5 PRESSURE RELIEF VALVE DISCHARGE PIPING

a) A discharge pipe shall be used. Its internal cross-sectional area shall be not less than the full area of the valve outlet or of the total of the valve outlets that discharge into the pipe, and shall be as short and straight as possible and arranged as to avoid undue stress on the valve or valves. A union may be installed in the discharge piping close to the valve outlet. When an elbow is placed on a pressure relief valve discharge pipe, it shall be located close to the valve outlet downstream of the union to minimize reaction moment stress.

b) The discharge from pressure relief valves shall be so arranged that there will be no danger of scalding attendants. The pressure relief valve discharge shall be piped away from the boiler to a safe point of discharge, and there shall be provisions made for properly draining the piping. The size and arrangement of discharge piping shall be such that any pressure that may exist or develop will not reduce the relieving capacity of the relieving devices below that required to protect the boiler.

2.4.1.6 TEMPERATURE AND PRESSURE RELIEF VALVES

Hot-water heating or supply boilers limited to a water temperature of 210°F (99°C) may have one or more National Board capacity certified temperature and pressure relief valve(s) installed. The requirements of 2.4.1.1 through 2.4.1.5 shall be met, except as follows:
a) A Y-type fitting shall not be used.
b) If additional valves are used, they shall be temperature and pressure relief valves.
c) When the temperature and pressure relief valve is installed directly on the boiler with no more than 4 in.
(100 mm) maximum interconnecting piping, the valve may be installed in the horizontal position with the outlet pointed down.

2.4.2 PRESSURE RELIEF VALVE REQUIREMENTS FOR STEAM HEATING BOILERS

a) Pressure relief valves shall be manufactured in accordance with a national or international standard.
b) Each steam boiler shall have one or more National Board capacity certified pressure relief valves of the spring pop type adjusted and sealed to discharge at a pressure not to exceed 15 psig (100 kPa).

c) No pressure relief valve for a steam boiler shall be smaller than NPS 1/2 (DN 15). No pressure relief valve shall be larger than NPS 4 (DN 100). The inlet opening shall have an inside diameter equal to, or greater than, the seat diameter.
d) The minimum valve capacity in lbs/hr (kg/hr) shall be the greater of that determined by dividing the maximum Btu/hr (W) output at the boiler nozzle obtained by the firing of any fuel for which the unit is installed by 1,000 Btu/hr/lb (645 W/kg), or shall be determined on the basis of the lbs steam/hr/ft_2 (kg steam/hr/m_2) of boiler heating surface as given in Table 2.2.4.1. For cast-iron boilers, the minimum valve capacity shall be determined by the maximum output method. In many cases a greater relieving capacity of valves will have to be provided than the minimum specified by these rules. In every case, the requirement of 2.4.2 e) shall be met.
e) The pressure relief valve capacity for each steam boiler shall be such that with the fuel burning equipment
installed, and operated at maximum capacity, the pressure cannot rise more than 5 psig (34 kPa) above the maximum allowable working pressure.
f) When operating conditions are changed, or additional boiler heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and be in accordance with 2.4.2 e).The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.

2.4.3 PRESSURE RELIEF VALVE REQUIREMENTS FOR HOT WATER HEATING OR HOT WATER SUPPLY BOILERS

a) Pressure relief valves shall be manufactured in accordance with a national or international standard.
b) Each hot-water heating or hot-water supply boiler shall have at least one National Board capacity certified pressure relief valve, of the automatic reseating type set to relieve at or below the maximum allowable working pressure of the boiler.
c) Hot-water heating or hot-water supply boilers limited to a water temperature not in excess of 210°F (99°C) may have, in lieu of the valve(s) specified in (b) above, one or more National Board capacity certified
temperature and pressure relief valves of the automatic reseating type set to relieve at or below the maximum allowable working pressure of the boiler.
d) When more than one pressure relief valve is used on either hot-water heating or hot water supply boilers,
the additional valves shall be National Board capacity certified and may have a set pressure within a range not to exceed 6 psig (40 kPa) above the maximum allowable working pressure of the boiler up to and including 60 psig (414 kPa), and 5% for those having a maximum allowable working pressure exceeding 60 psig (414 kPa).
e) No pressure relief valve shall be smaller than NPS 3/4 (DN 20) nor larger than NPS 4 (DN 100), except that boilers having a heat input not greater than 15,000 Btu/hr (4.4 kW) should be equipped with a rated pressure relief valve of NPS 1/2 (DN 15).
f) The required relieving capacity, in lbs/hr (kg/hr), of the pressure relief valve(s) on a boiler shall be the greater of that determined by dividing the maximum output in Btu/hr (W) at the boiler nozzle obtained by the firing of any fuel for which the unit is installed by 1,000 Btu//hr/lb (645 W/kg), or shall be determined on the basis of lbs steam/hr/ft_2 (kg steam/hr/m_2) as given in Table 2.2.4.1. For cast-iron boilers, the

minimum valve capacity shall be determined by the maximum output method. In many cases a greater relieving capacity of valves will have to be provided than the minimum specified by these rules. In every case, the requirements of 2.4.3 h) shall be met.
g) When operating conditions are changed, or additional boiler heating surface is installed, the valve capacity shall be increased, if necessary, to meet the new conditions and be in accordance with 2.4.3 h). The additional valves required, on account of changed conditions, may be installed on the outlet piping provided there is no intervening valve.
h) Pressure relief valve capacity for each boiler with a single pressure relief valve shall be such that, with the fuel burning equipment installed and operated at maximum capacity, the pressure cannot rise more than 10% above the maximum allowable working pressure. When more than one pressure relief valve is used, the over pressure shall be limited to 10% above the set pressure of the highest set valve allowed by 2.4.3 b).

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. 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 valves, pumps, expansion or storage tanks, or piping) have a lesser 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 relief valve is used, the additional valve(s) may be set within a range not to exceed 10% above the set pressure of the first valve.
c) The required relieving capacity in Btu/hr (W) of the temperature and pressure relief valve shall not be less than the maximum allowable input unless the water heater is marked 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. 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 10% above 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 additional valves required, on account of changed conditions, may be installed on the outlet piping providing there is no intervening valve.

2.4.4.1 INSTALLATION

Temperature and pressure relief valves shall be installed by either the installer or the manufacturer before a
water heater is placed in operation.

2.4.4.2 PERMISSIBLE INSTALLATIONS

Temperature and pressure relief valves shall be connected directly to a tapped or flanged opening in the top
of the water heater, to a fitting connected to the water heater by a short nipple, to a Y-base, or to a valveless

header connecting water outlets on the same heater. Temperature and pressure relief valves shall be installed
with their spindles upright and vertical with no horizontal connecting pipe, except that, when the temperature

and pressure relief valve is installed directly on the water heater vessel with no more than 4 in. (100 mm) maximum interconnecting piping, the valve may be installed in the horizontal position with the outlet pointed
down. The center line of the temperature and pressure relief valve connection shall be no lower than 4 in. (100 mm) from the top of the shell. No piping or fitting used to install the temperature and pressure relief valve
shall be of nominal pipe size less than that of the valve inlet.

2.4.4.3 REQUIREMENTS FOR COMMON CONNECTION FOR TWO OR MORE VALVES

a) When a potable water heater is fitted with two or more temperature and pressure relief valves on one connection, this connection shall have a cross sectional area not less than the combined areas of inlet connections of all the temperature and pressure relief valves with which it connects.
b) When a Y-base is used, the inlet area shall be not less than the combined outlet areas.
c) When the size of the water heater requires a temperature and pressure relief valve larger than NPS 4 (DN 100) two or more valves having the required combined capacity shall be used. When two or more valves are used on a water heater, they may be single, directly attached, or installed on a Y-base.

2.4.4.4 THREADED CONNECTIONS

A threaded connection may be used for attaching a temperature and pressure relief valve.

2.4.4.5 PROHIBITED INSTALLATIONS

Temperature and pressure relief valves shall not be connected to an internal pipe in the water heater or a cold
water feed line connected to the water heater.

2.4.4.6 USE OF SHUTOFF VALVES PROHIBITED

No shutoff valve of any description shall be placed between the temperature and pressure relief valve and the
water heater or on discharge pipes between such valves and the atmosphere.

2.4.4.7 TEMPERATURE AND PRESSURE RELIEF VALVE DISCHARGE PIPING

a) The discharge from temperature and pressure relief valves shall be so arranged that there will be no danger of scalding attendants. When the temperature and pressure relief valve discharge is piped away from the water heater to the point of discharge, there shall be provisions for properly draining the piping and valve body. The size and arrangement of discharge piping shall be such that any pressure that may exist or develop will not reduce the relieving capacity of the relieving devices below that required to protect
the water heater.
b) When a discharge pipe is used, it shall be not less than the nominal size of the valve outlet and shall be as short and straight as possible and so arranged as to avoid undue stress on the valve. When an elbow is placed on a temperature and pressure relief discharge pipe, it shall be located close to the valve outlet.
c) Where multiple valves relieve into a common discharge pipe, the cross-sectional flow area of the common discharge pipe shall be equal to or greater than the sum of the individual temperature and pressure valve discharge pipe areas.

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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.

2.5 PRESSURE VESSEL PRESSURE RELIEF DEVICES

See NBIC Part 1, 4.1 for the scope of pressure vessels covered by the requirements of Part 4, 2.5. Pressure relief devices protecting pressure vessels shall meet the following requirements:

2.5.1 DEVICE REQUIREMENTS

a) Pressure relief devices shall be manufactured in accordance with a national or international standard and be certified for capacity or flow resistance by the National Board.
b) Dead weight or weighted lever pressure relief valves shall not be used.
c) An unfired steam boiler shall be equipped with pressure relief valves as required in NBIC Part 4, 2.2.
~~d) Pressure relief devices shall be selected (i.e., material, pressure, etc.) and installed such that their proper functioning will not be hindered by the nature of the vessel's contents.~~[AR26]

~~2.5.2 NUMBER OF DEVICES~~

~~At least one device shall be provided for protection of a pressure vessel. Pressure vessels with multiple chambers
with different maximum allowable working pressures shall have a pressure relief device to protect each chamber under the most severe coincident conditions.~~[AR27]

~~2.5.3 LOCATION~~

~~a) The pressure relief device shall be installed directly on the pressure vessel, unless the source of pressure
is external to the vessel and is under such positive control that the pressure cannot exceed the maximum overpressure permitted by the original code of construction and the pressure relief device cannot be isolated from the vessel, except as permitted by 2.5.6 c) 2).~~[AR28]
~~b) Pressure relief devices intended for use in compressible fluid service shall be connected to the vessel in the vapor space above any contained liquid or in the piping system connected to the vapor space.~~[AR29]
~~c) Pressure relief devices intended for use in liquid service shall be connected below the normal liquid line.
The liquid level during upset conditions shall be considered.~~[AR30]

2.5.4 CAPACITY

a) The pressure relief device(s) shall have sufficient capacity to ensure that the pressure vessel is not exposed to pressure greater than that specified in the original code of construction.
b) Pressure vessels that can be exposed to fire or other sources of unexpected external heat may require supplemental pressure relief devices to provide additional relieving capacity.
1) The combined capacity of all installed pressure relief devices shall be adequate to prevent the pressure
from rising more than 21% above maximum allowable working pressure.
2) The set point of any supplemental pressure relief device(s) shall not exceed 110% of the maximum allowable working pressure. If a single pressure relief device is utilized to protect the vessel during

both operational and fire or other unexpected external heating conditions, the set point shall not exceed maximum allowable working pressure.
c) Vessels connected together by a system of piping not containing valves that can isolate any pressure vessel may be considered as one unit when determining capacity requirements.
d) Heat exchangers and similar vessels shall be protected with a pressure relief device of sufficient capacity
to avoid overpressure in case of internal failure.

2.5.5 SET PRESSURE

a) When a single pressure relief device is used, the set pressure marked on the device shall not exceed the maximum allowable working pressure.
b) When more than one pressure relief device is provided to obtain the required capacity, only one pressure relief device set pressure needs to be at the maximum allowable working pressure. The set pressures of the additional pressure relief devices shall be such that the pressure cannot exceed the overpressure permitted by the code of construction.

2.5.6 INSTALLATION AND DISCHARGE PIPING REQUIREMENTS

~~a) The opening through all pipe and fittings between a pressure vessel and its pressure relief device shall have at least the area of the pressure relief device inlet. The characteristics of this upstream system shall be such that the pressure drop will not reduce the relieving capacity below that required or adversely affect the proper operation of the pressure relief device.~~[AR31] ~~When a discharge pipe is used, the size shall be such that any pressure that may exist or develop will not reduce the relieving capacity below that required or adversely affect the proper operation of the pressure relief device. It shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief device.~~[AR32]
~~b) A non-reclosing device installed between a pressure vessel and a pressure relief valve shall meet the requirements of 2.5.6 a).~~[AR33]
~~c) The opening in the pressure vessel wall shall be designed to provide unobstructed flow between the vessel and its pressure relief device.~~[AR34]
d) When two or more required pressure relief devices are placed on one connection, the inlet cross-sectional
area of this connection shall be sized either to avoid restricting flow to the pressure relief devices or made at least equal to the combined inlet areas of the pressure relief devices connected to it. The flow characteristics of the upstream system shall satisfy the requirements of 2.5.6 a).
e) There shall be no intervening stop valves between the vessel and its pressure relief device(s), or between the pressure relief device(s) and the point of discharge, except under the following conditions:
1) When these stop valves are so constructed or positively controlled that the closing of the maximum number of block valves at one time will not reduce the pressure relieving capacity below the required relieving capacity.
2) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing
equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a pressure vessel and its pressure relief device may be provided for inspection and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station.
3) A full area stop valve may also be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked and sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed.
4) A pressure vessel in a system where the pressure originates from an outside source may have a stop valve between the vessel and the pressure relief device, and this valve need not be sealed open, provided it also closes off that vessel from the source of the pressure.
5) Pressure vessels designed for human occupancy (such as decompression or hyperbaric chambers)

shall be provided with a quick opening stop valve between the pressure vessel and its pressure relief valve. The stop valve shall be normally sealed open with a frangible seal and be readily accessible to the pressure relief attendant.
f) Pressure relief device discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location for disposal of fluids being relieved.

g) Discharge lines from pressure relief devices shall be designed to facilitate drainage or be fitted with drains to prevent liquid from collecting in the discharge side of a pressure relief device. The size of discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity of the pressure relief device or adversely affect the operation of the pressure relief device. It shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief device.
h) Pressure relief devices shall be installed so they are readily accessible for inspection, repair, or replacement.
i) Pressure vessel pressure relief devices and discharge piping shall be safely supported. The reaction forces due to discharge of pressure relief devices shall be considered in the design of the inlet and discharge
piping. Design of supports, foundations, and settings shall consider vibration (including seismic where necessary), movement (including thermal movement), and loadings (including reaction forces during device operation in accordance with jurisdictional requirements, manufacturer's recommendations, and/or other industry standards, as applicable.

2.5.7 TEMPERATURE AND PRESSURE RELIEF DEVICES FOR HOT WATER STORAGE TANKS

a) Each hot water storage tank shall be equipped with an ASME/NB certified temperature and pressure relief device set at a pressure not to exceed the maximum allowable working pressure and 210°F. (99°C).
b) The temperature and pressure relief device shall meet the requirements of 2.5.1 through 2.5.6 above.

2.6 PIPING SYSTEM PRESSURE RELIEF DEVICES

See NBIC Part 1, Section 5 for the piping systems associated with Part 4, 2.6.
When required by the original code of construction, piping shall be protected by pressure relief devices in accordance with the following requirements.

2.6.1 DEVICE REQUIREMENTS

a) Pressure relief devices shall be manufactured in accordance with a national or international standard and be certified for capacity or flow resistance by the National Board.
1) In certain cases piping codes of construction permit the use of regulators, which may include integral pressure relief valves to limit the pressure in a piping system. In this case, capacity certification of the pressure relief valve is not required.
2) Some piping codes of construction permit the use of pressure relief devices without capacity certification.
In this case, capacity certification of the pressure relief device by the National Board is not required.
b) Dead weight or weighted lever pressure relief devices shall not be used.
~~c) Pressure relief devices shall be selected (i.e., material, pressure, etc.) and installed such that their proper functioning will not be hindered by the nature of the piping system's contents.~~[AR35]

~~2.6.2 NUMBER OF DEVICES~~

~~At least one pressure relief device shall be provided for protection of a piping system. A pressure relief device installed on a pressure vessel or other component connected to the piping system may be used to meet this requirement. Portions of piping systems with different maximum allowable working pressures shall have a pressure relief device to protect each portion separately.~~[AR36]

2.6.3 LOCATION

Pressure relief devices, except those covered by NBIC Part 4, 2.1 through 2.2, may be installed at any location in the system provided the pressure in any portion of the system cannot exceed the maximum overpressure

permitted by the original code of construction. Pressure drop to the pressure relief device under flowing conditions shall be considered when determining pressure relief device location. The pressure-relief[AR37]
device shall not be isolated from the piping system except as permitted by 2.6.6 e).[AR38]

2.6.4 CAPACITY

a) The pressure relief device(s) shall have sufficient capacity to ensure that the piping is not exposed to pressures greater than that specified in the original code of construction.
b) When a non-reclosing device is installed between a pressure relief valve and the pipe, the reduction in capacity due to installation of the non-reclosing device shall be determined in accordance with the code of construction by use of a National Board certified Combination Capacity Factor (CCF). For rupture disks, if a certified combination capacity factor is not available, the capacity of the pressure relief valve shall be multiplied by 0.9 and this value used as the capacity of the combination installation.[AR39]
c) The owner shall document the basis for selection of the pressure relief devices used, including capacity,
and have such calculations available for review by the Jurisdiction, when required.[AR40]

2.6.5 SET PRESSURE

a) When a single pressure relief device is used, the set pressure marked on the device shall not exceed the maximum allowable working pressure, except when allowed by the original code of construction.
b) When more than one pressure relief device is provided to obtain the required capacity, only one pressure
relief device set pressure need be at or below the maximum allowable working pressure. The set pressures of the additional pressure relief devices shall be such that the pressure cannot exceed the overpressure permitted by the code of construction.

2.6.6 INLET AND DISCHARGE PIPING REQUIREMENTS

a) The opening through all pipes and fittings between a piping system and its pressure relief device shall have at least the area of the pressure relief device inlet. The characteristics of this upstream system shall be such that the pressure drop will not reduce the relieving capacity below that required or adversely affect the operation of the pressure relief device.[AR41]
b) A non-reclosing device installed between a piping system and a pressure relief valve shall meet the requirements of 2.6.6 a).[AR42]
c) The opening in the pipe shall be designed to provide unobstructed flow between the pipe and its pressure
relief device.[AR43]
d) When two or more required pressure relief devices are placed on the connection, the inlet cross-sectional
area of this connection shall be sized either to avoid restricting flow to the pressure relief devices or made at least equal to the combined inlet areas of the pressure relief devices connected to it. The flow characteristics of the upstream system shall satisfy the requirements of 2.6.6 a).[AR44]
e) There shall be no intervening stop valves between the piping system and its pressure relief device(s), or
between the pressure relief device(s) and the point of discharge except under the following conditions:[AR45]

1) These stop valves shall be so constructed or positively controlled that the closing of the maximum number of block valves at one time will not reduce the pressure relieving capacity below the required relieving capacity;
2) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing
equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a piping system and its pressure relief device may be provided for inspection and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station;
3) A full area stop valve may be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from

these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed; or

4) A piping system where the pressure originates from an outside source may have a stop valve between the system and the pressure relief device, and this valve need not be sealed open, provided it also closes off that vessel from the source of pressure.[AR46]

f) Pressure relief device discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location for disposal of fluids being relieved.[AR47]

g) Discharge lines from pressure relief devices shall be designed to facilitate drainage or be fitted with drains to prevent liquid from collecting in the discharge side of a pressure relief device. The size of discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity of the pressure relief device or adversely affect the operation of the pressure relief device. It shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief device.[AR48]

h) The reaction forces due to discharge of pressure relief devices shall be considered in the design of the inlet and discharge piping.[AR49]

i) Pressure relief devices shall be installed so they are accessible for inspection, repair, or replacement.[AR50]

Item 19-1. Develop specific content and scope of annual field audits.

4.8.6.1 AUDIT REQUIREMENTS

Initial Language

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.

Re-Circulation Ballot Proposal June 2020:

Table 4.8.5.4s addition

Records of audits of the Field Repair program.	The repair organization shall conduct audits of their Field Repair program on an annual basis. The quality manual shall define the audit criteria, scope, frequency and methods to ensure that the requirements of their quality system are met in the field. The exclusions as well as audit results shall be documented.	5 Years

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The repair organization shall conduct audits of their Field Repair program on an annual basis. The quality manual shall define the audit criteria, scope, frequency and methods to ensure that the requirements of their quality system are met in the field. The audit scope shall include, but not be limited to:

a) Performance testing in accordance with 4.6.1 of valve (s) that were repaired in the field to include each applicable ASME Code Section and Test Media defined on the certificate of authorization.

b) Lift assist testing in accordance with 4.6.3 of valve (s) that were repaired in the field.

c) Pressure test of parts in accordance with 4.6.4 of valves (s) that were repaired in the field.

d) Quality system requirements specific to field repair to include, but not limited to:

    a. 4.3.1: Replacement of critical parts including parts received from the owner-user

    b. 4.8.5.4 (i: Spring identification

    c. 4.8.6.2: Use of owner-user personnel

    d. 4.8.5.4 (r: Owner-user measurement and test equipment

e) VR special processes.

Mandatory items included in a), b), c), d), and e) may be excluded if outside the repair organization's scope. The exclusions as well as audit results shall be documented.

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 on an annual basis. The intent of these audits is to ensure work in the field is completed in accordance with the ~~to ensure that the requirements of the~~ Certificate Holder's quality system. ~~are met.~~ The scope and frequency of these audits shall be established in the quality system. 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.~~

a) Performance testing in accordance with 4.6 of valve (s) that were repaired in the field

b) Quality system requirements specific to field repair

c) Certificate Holder's applicable ASME Code sections, VR special process (if applicable in the field), and test medias from the Certificate of Authorization.

d) The audits shall be documented

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) Technicians qualified by ~~Qualified technicians in the employ of~~ the Certificate Holder in accordance with 4.9.2 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.

4.9 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.

4.9.2 QUALIFICATION OF PERSONNEL

Each repair organization shall establish minimum qualification requirements for those positions within the organization as they directly relate to pressure relief valve repair. Each repair organization shall document the evaluation and acceptance of an individual's qualification for the applicable position.

4.9.3 ANNUAL REVIEW OF QUALIFICATION

The repair organization shall annually review the qualifications of repair personnel to verify proficiency as well as compliance with the Certificate Holder's quality system. This review shall include training records, documented evidence of work performed, and when necessary, monitoring job performance. The review shall be documented.

4.10 Use of Personnel not in the Certificate Holder's employ

The repair organization may use the services of personnel not in their employ to assist the Certificate Holder's technicians in the performance of repairs provided:

a) The use of such personnel is addressed in the "VR" Certificate Holder's quality system
b) The personnel are qualified in accordance with 4.9.2. Records of this qualification are to be retained in accordance with 4.8.5.4 (s)
c) The personnel work under direct supervision and control of the 'VR" Certificate Holder
d) The "VR" Certificate Holder shall have the authority to assign and remove personnel at its own discretion
e) The names of the personnel utilized are recorded on the documents as required by the quality system

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e) The names of the personnel utilized are recorded on the documents as required by the quality system

4.9 COMPETENCY, TRAINING AND QUALIFICATION OF PERSONNEL

4.9.1 COMPETENCY OF PERSONNEL

The repair organization shall establish the skills, knowledge, competencies, and method to evaluate competencies required for each position within the organization having direct effect on the quality of pressure relief repair performed in accordance with the Certificate of Authorization.

4.9.2 CONTENTS OF TRAINING PROGRAM

The repair organization shall establish a documented training program to ensure the defined skills, knowledge and competencies are achieved. As a minimum, training objectives for each position shall include:

a) Applicable ASME Code requirements;
b) Applicable NBIC requirements;
c) Individual responsibilities of each function described within the organization's quality system;
d) Technical aspects for the applicable position held;
e) Mechanical skills for the applicable position held;
f) Special processes as applicable listed on the Certificate of Authorization.

4.9.3 INITIAL EVALUATION AND ACCEPTANCE OF PERSONNEL

The repair organization shall complete an initial evaluation and acceptance of each individual's skills and competency prior to the individual being assigned to work without direct supervision. This evaluation and acceptance shall be documented.

4.9.4 ANNUAL EVALUATION AND ACCEPTANCE OF PERSONNEL

The repair organization shall complete an annual evaluation and acceptance of each individual's skills and competency to verify proficiency as well as compliance with the certificate Holder's quality system. This evaluation shall include training records, documented evidence of work performed and on-the-job observations to demonstrate competency. The evaluation shall be documented.