Date Distributed:

THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD SUBCOMMITTEE INSTALLATION

MINUTES

Meeting of January 13th, 2021
San Antonio, TX

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The National Board of Boiler & Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, Ohio 43229-1183
Phone: (614)888-8320
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1. **Call to Order**

Chair, M. Wadkinson, called the meeting to order at 8:00 am

2. **Introduction of Members and Visitors**

Introductions took place amongst all members and visitors both by in person and Zoom. The attendance sheet was checked off by the Secretary. See Attachment 1.

Subcommittee Installation

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

M. Byrum (in for Kenneth Watson in the SG meeting and as a visitor in the SC meeting) and E. Wiggins attended in person.

M. Wadkinson, R. Austin, J. Brockman, T. Creacy, J. Downs, G. Tompkins (in for Geoffrey Halley), S. Konopacki, D. Patten, H. Michael Richards, R. Smith and M. Washington attended remotely via Zoom.

Visitors who attended remotely were as follows: C. Dinic, D. Rivera, T. Clark, P. Jennings, D. Moreno, R. Adams, R. Spiker, and B. Ahee,

3. **Check for a Quorum**

With the attached roster and the noted individuals, a quorum was established. There was a motion to approve the roster. The motion was unanimously approved.

Subcommittee Installation

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

- G. Tompkins (in for Geoffrey Halley)

4. **Awards/Special Recognition**

Luis Ponce presented Mr. Eddie Wiggins his 5 years of service award pin.

5. **Announcements**

- The National Board hosted a reception for all committee members and visitors Wednesday evening from 5:30pm – 7:30 pm at Michelino's located at 521 Riverwalk.
- The National Board hosted breakfast for all committee members and visitors on Thursday morning at 7:00 am and a lunch at 11:30 am in the Magnolia/Blue Bonnet on the 2nd floor of the Hotel.
- A coffee station with snacks was provided on the 3rd floor at 10 am.
- The 2021 NBIC will be available for purchase on July 1, 2021
- Each attendee was encouraged to stay muted and use the raise hand feature to show that thy wished to speak.
- Voice voting for each item was used. It was assumed all voted approved and then asked if anyone is voting "not approved", "abstention", or "not voting".

6. Adoption of the Agenda

Attachment proposals submitted by G. Tompkins for items 20-35 and 20-27 and by P. Jennings for items 20-34 and 18-57. These were added to the cloud for the SG and SC's review.

There was a motion to adopt the Agenda with the noted additions/changes. The motion was unanimously approved.

7. Approval of the Minutes of July 15th, 2020 Meeting

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

There was a motion to approve the Minutes of July 15th, 2020 as published. The motion was unanimously approved.

8. Review of Rosters (Attachment Page)

a. Membership Nominations

Mr. Marvin Byrum (AIA) and Mr. Gene Tompkins (Manufacturer) are interested in becoming a member of SG and SC Installation.

A vote would have been taken in the SC meeting for membership to the SG and the names would have been given to the MC for membership to the SC. However this has been postponed to take place in the July 2021 meeting so as to review the balance of interest membership and to receive official resignations from K. Watson and G. Halley.

b. Membership Reappointments

The following subgroup member terms are set to expire on 1/30/2021:

- Mr. Todd Creacy

The SC took a vote and unanimously agreed to the reappointment of Mr. Todd Creacy to the SG Installation.

c. Officer Appointments

None.

9. Open PRD Items Related to Installation

- NB15-0305 – Create Guidelines for Installation of Overpressure Protection by System Design – D. Marek (PM)
- NB15-0315 – Review isolation valve requirements in Part 1, 4.5.6 and 5.3.6 – D. DeMichael (PM)
- 17-115 – Complete rewrite of Part 4, Section 2 combining common requirements into a general requirements section for all pressure relief devices – A. Renaldo (PM)
- 17-119 – Part 4, 2.2.5 states that pressure setting may exceed 10% range. Clarify by how much – T. Patel (PM). This item is on hold pending ASME action.

As per T. Beirne of Part 4 PRD NB-15-0305 and NB15-0315, 17-119 are still in T.G. work and 17-115 is reorganizing Part 4 only. No changes to Part 1.

10. Interpretations

Item Number: 20-84	NBIC Location: Part 1, 3.7.5.1 d) 4)	Attachment Pages 2-4

General Description: Adjustable Packing on Low Pressure Boiler Stop Valves

Subgroup: SG Installation

Task Group: ~~None assigned.~~ M. Wadkinson (PM), R. Spiker, and M. Downs

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.

January 2021 Meeting Action: Progress Report – In the SG meeting extensive discussions took place and the SG spoke with Mr. Cantrell to get his input. It was decided that Melissa would take this to the Section IV meetings to be held in February 2021 and May 2021 due to the complexity of this topic. This interpretation will be pending what happens in these meetings. In the mean-time a new item was opened (20-01) to address modifying the code.

A TG was assigned being M. Wadkinson (PM), R. Spiker, and M. Downs.

11. Action Items

Item Number: NB11-1901	NBIC Location: Part 1	Attachment Pages 5-12

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

January 2021 Meeting Action: Progress Report – R. Smith gave an update received from Bernard Shelley of FRP stating: “The comments from Rex Smith were discussed at the last FRP SG meeting in October 2020. Two members agreed to review them and present a revised proposal on installation to the FRP SG at our April 2021 meeting for reballot. The FRP SG is working on revisions to 11-1901 to incorporate Mr. Smith's comments and make it in line with the revisions to Section X allowing more fluids for Class 3 vessels.

Item Number: 18-57	NBIC Location: Part 1	Attachment Pages 13-26

General Description: Address the use & definition of the word inspector.

Subgroup: SG Installation

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

January 2021 Meeting Action: Proposal – P. Jennings presented an updated proposal from the one presented in the July 2020 meeting addressing the capitalization of the word inspections along with inspector. The SG and SC held discussions and are in-agreement with the additional changes. There was a motion to approve the proposal to the MC. The motion was unanimously approved.

Item Number: 20-27	NBIC Location: Part 1, 1.6.9 & S6.3	Attachment Page 27

General Description: Carbon Monoxide Detector/Alarm NBIC 2019

Subgroup: SG Installation

Task Group: G. Tompkins (PM), R. Spiker, R. Smith, E. Wiggins, S. Konopacki, and R. Austin

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?

January 2021 Meeting Action: Close w/no Action – G. Tompkins presented a proposal summarizing that this proposal was to provide further direction. The SG and SC held extensive discussions and while it is recognized that this is a problem it is questioned "are we stepping out of the bounds of the NBIC?" With that said a motion was made to close this item with no action. The motion was unanimously approved.

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.

January 2021 Meeting Action: Progress Report – M. Downs reported that the TG will report further progress on this item in the July 2021 meeting.

Item Number: 20-34	NBIC Location: Part 1	Attachment Pages 28-40

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.

January 2021 Meeting Action: Progress Report – P. Jennings presented a proposal. The SG and SC held discussions and are in-agreement that this proposal should be letter balloted to the SG for review and then letter balloted to the SC and MC for review and comment. There was a motion to letter ballot to the SG for review and then letter ballot to the SC and MC for review and comment. The motion was unanimously approved. This item is in conjunction with item 20-35.

Item Number: 20-35	NBIC Location: Part 1	Attachment Page 41

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.

January 2021 Meeting Action: Progress Report – G. Tompkins presented a proposal. The SG and SC held discussions and made a revision (changing requirements to recommendations) and are in-agreement that the revised proposal should be letter balloted to the SG for review of wording. It was suggested that the numbering should be in the same structure as item 20-34's proposal. There was a motion to letter ballot to the SG for review of wording. The motion was unanimously approved. This item is in conjunction with item 20-34.

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.

January 2021 Meeting Action: Progress Report – It was reported that there has been no progress on this item pending the update of Section IV. Melissa will check on the status of the update of Section IV and will get back with an update and/or a proposal for the July 2021 NBIC SG meeting.

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.

January 2021 Meeting Action: Close w/no Action – R. Adams presented a summary of this item and how it is covered and relates to item 20-34. The SG and SC held discussions and are in-agreement that this is already covered under item 20-34. With that said a motion was made to close this item (20-40) with no action. The motion was unanimously approved.

Item Number: 20-41	NBIC Location: Part 1	Attachment Page 42

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.

January 2021 Meeting Action: Progress Report – PRD submitted comments on our proposal from the July 2020 meeting. Extensive discussions were held amongst the SG on PRD's comments on the proposal. This item is being worked on in conjunction with item 20-43. After extensive discussions in the SG meeting it was decided that G. Scribner will follow-up with PRD on some concerns before approving the proposal. This was communicated to T. Beirne of PRD – Part 4.

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

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.

January 2021 Meeting Action: Progress Report – PRD submitted comments on our proposal from the July 2020 meeting. Extensive discussions were held amongst the SG on PRD's comments on the proposal. This item is being worked on in conjunction with item 20-41. After extensive discussions in the SG meeting it was decided that G. Scribner will follow-up with PRD on some concerns before approving the proposal. This was communicated to T. Beirne of PRD – Part 4.

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

General Description: CW Vacuum Boilers

Subgroup: SG Installation

Task Group: ~~K. Watson~~ R. Spiker (PM), M. Washington, ~~P. Jennings~~ M. Byrum

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

January 2021 Meeting Action: Progress Report – The TG was updated to remove K. Watson & P. Jennings and add R. Spiker as (PM) and M. Byrum. A brief summary was presented by G. Scribner and discussion was held amongst the SG and SC.

12. New Items:

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

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: Progress Report – A TG was assigned being T. Clark (PM), E. Wiggins, R. Spiker, T. Creacy, P. Jennings, G. Tompkins, and D. Patten. An overview summary of the JRS system and the need for updated forms was presented by G. Scribner and discussion was held amongst the SG and SC.

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.~~ E. Wiggins (PM), D. Patten, M. Washington and S. Konopacki.

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: Progress Report – A TG was assigned being E. Wiggins (PM), D. Patten, M. Washington and S. Konopacki. An overview summary was presented by E. Wiggins of why this item came about and discussion was held amongst the SG and SC.

Item Number: 20-94	NBIC Location: Part 1	Attachment Pages 45-49

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.~~ M. Wadkinson

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

January 2021 Meeting Action: Proposal – The SG was approached by Part 2 Inspection regarding a proposal they have on item 19-88 that directly affects our item 20-94. The SG was asked to review their proposal to make sure we were in-agreement. The SG and SC are in-agreement with their proposal resulting in the creation of a proposal on our item 20-94. M. Wadkinson presented the proposal to the SC. Discussion was held amongst the SC. There was a motion to approve the proposal to the MC. The motion was unanimously approved.

Item Number: 20-51 **Attachment Page 50**

January 2021 Meeting Action: Proposal – The SG was approached by Part 3 Repairs and Alterations regarding a definition for "practicable" their item 20-51. The SG was asked to review their proposal to make sure we were in-agreement. The SG held discussions and added additional wording to their proposal. This was communicated back to J. Metzmaier of Part 2 Inspection, T. Hellman of Part 3 Repairs and Alterations, and T. Beirne of PRD – Part 4. There was a motion to approve our addition of wording to Part 3 proposal for the definition of "practicable" to the SC and then to the MC. The motion was unanimously approved. This will be presented by Part 3 in the MC meeting.

13. Future Meetings

- July 12th-15th, 2021 – Cincinnati, OH
- January 10th-13th, 2022 – TBD

14. Adjournment

A motion was made and unanimously approved to adjourn the meeting at 9:35 am

Respectfully submitted,

Jeanne Bock
NBIC Part 1 Secretary

1/13/21

January 2021

X - Absent

have 12
Nd 7

Code: R – Attended Remotely
IP – Attended In Person

Subcommittee Installation

Last Name	First Name	Interest Category	Role	
Wadkinson	Melissa	Manufacturers	Chair	R
Wiggins	Edward	Jurisdictional Authorities	Vice Chair	IP
Bock	Jeanne		Secretary	R
Austin	Randall	Users	Member	R
Brockman	Joe	Authorized Inspection Agencies	Member	R
Creacy	Todd	Authorized Inspection Agencies	Member	R
Downs	James	Manufacturers	Member	R
Halley X	Geoffrey	? (General Interest) Gene Tompkins (Man)	Member	R
Konopacki	Stanley	Users	Member	R
Patten	Don	Manufacturers ? could be (User)	Member	R
Richards	H. Michael	General Interest	Member	R
Smith	Rex	Authorized Inspection Agencies changed to Remote	Member	IP
Washington	Milton	Jurisdictional Authorities	Member	R

Visitors:

LNAME	FNAME		
Byrum	Marvin		IP
Tompkins	Gene		R
Dinic	Coslav		R
Shah	M.H.		R
Rivera	Daniel		R
Clark	Tom		R
Jennings	Patrick		R
		Daniel-Moreno ✓ Evanik	R
Hickens	Rodger	Zurich	R

Luis IP

Bryan Ahee — Bradford White Corp. R

Ron Spiker R

Tom Clark R both days ✓ Chief

Mark Clemens ✓

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	

3.7.5 STOP VALVES

3.7.5.1 STEAM HEATING, HOT-WATER HEATING, AND HOT-WATER SUPPLY BOILERS

a) For Single Steam Heating Boilers

When a stop valve is used in the supply pipe connection of a single steam boiler, there shall be one installed in the return pipe connection.

b) For Single Hot-Water Heating & Hot-Water Supply Boilers

1) Stop valves shall be located at an accessible point in the supply and return pipe connections as near the boiler as is convenient and practicable, of a single hot water boiler installation to permit draining the boiler without emptying the system.

2) When the boiler is located above the system and can be drained without draining the system stop valves required in NBIC Part 1, 3.7.5.1 b) 1) may be eliminated.

c) For Multiple Boiler Installations

A stop valve shall be used in each supply- and-return pipe connection of two or more boilers connected to a common system. See NBIC Part 1, Figures 3.7.5.1-a, 3.7.5.1-b, and 3.7.5.1-c.

d) Types of Stop Valve(s)

1) All valves or cocks shall conform with the applicable portions of an acceptable code of construction and may be ferrous or nonferrous.

2) The minimum pressure rating of all valves or cocks shall be at least equal to the pressure stamped upon the boiler, and the temperature rating of such valves or cocks, including all internal components, shall be not less than 250°F (121°C).

3) Valves or cocks shall be flanged, threaded or have ends suitable for welding or brazing.

4) All valves or cocks with stems or spindles shall have adjustable pressure-type packing glands and, in addition, all plug-type cocks shall be equipped with a guard or gland. The plug or other operating mechanism shall be distinctly marked in line with the passage to indicate whether it is opened or closed.

5) All valves or cocks shall have tight closure when under boiler hydrostatic test pressure.

HG-710.5

Austin, Randall Duane to: JBock@nationalboard.org

HG-710.5 Type of Stop Valve(s).

(a) All valves or cocks shall conform with the applicable portions of HF-203 and may be ferrous or nonferrous.

(b) The minimum pressure rating of all valves or cocks shall be at least equal to the pressure stamped upon the boiler, and the temperature rating of such valves or cocks, including all internal components, shall be not less than 250°F (120°C).

(c) Valves or cocks shall be flanged, threaded, or have ends suitable for welding or brazing.

(d) All valves or cocks with stems or spindles shall have adjustable pressure type packing glands and, in addition, all plug type cocks shall be equipped with a guard or gland. The plug or other operating mechanism shall be distinctly marked in line with the passage to indicate whether it is opened or closed.

(e) All valves or cocks shall have tight closure when under boiler hydrostatic test pressure.

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*

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The following terms are defined in NBIC Part 1 Glossary. In the text of NBIC Part 1, there are instances where the terms are used in the context of the definition but are not capitalized. In these instances, the terms should be capitalized in the text.

Inspection — A process of review to ensure engineering design, materials, assembly, examination, and testing requirements have been met and are compliant with the code.

Inspector — See National Board Commissioned Inspector and National Board Owner-User Commissioned Inspector.

National Board Commissioned Inspector — An individual who holds a valid and current National Board Commission.

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 iinspection 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 iinspector 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, iinspections, and tests required by the code of construction have been performed prior to operation.

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BACKGROUND INFORMATION – Review of Inspector, Inspect, Inspection

The following is the review of Inspector Inspect and Inspection that was performed.

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) Several 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*	Inservice inspector responsibilities under Part 1. Capital I IS endorsement

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.	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	

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S5.8.2 PRESSURE TEST 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***.	Prior to operation. Capitol I 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	Inspection – little i but by context should be I.

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.	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.

Commented [RA1]: By the definition I think this *SHOULD* be lowercase "i" as the external piping should be verified at the time of installation and inspection but not necessarily during the "Inspection".

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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 final closure.	Generic i.

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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 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,	Generic i

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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 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	Generic i.

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 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 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

Commented [RA2]: I think this should be capital "I" as an inspection *may* be performed but an Inspection is required to be performed; therefore, Inspection would override the use of inspection.

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 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.	Generic i?
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	This is not a Inspector responsibility?

Commented [RA3]: I agree that this should be a lowercase "i" as the **installer** isn't conducting an "Inspection". The **installer** is merely conducting their own inspection.

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….	
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)	

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Owner-User <u>Inspection</u> Organization (Introduction), (9.1)	

Proposed CO Wording Changes - Item Number 20-27

1.6.9 CARBON MONOXIDE (CO) DETECTOR/ALARM

The owner or user shall install a carbon monoxide (CO) detector/alarm in equipment rooms where fuel fired boilers and/or fuel fired pressure vessels are located in accordance with the authority having Jurisdiction.

a) **If a carbon monoxide detector/alarm is required, it is recommended that the NFPA 72 standards be used for installation details not otherwise covered.**

b) **The installer shall follow the combustion tuning requirements of the manufacture, including the equipment used for the combustion tuning.**

c) **It is recommended that burner combustion adjustments be performed with a combustion analyzer that measures Carbon Monoxide (CO), and that corrective actions are taken with high levels.**

Rational

CO has been a major hazard related to boilers, killing and injuring many people every year. NBIC has been dealing with ways to address this for several years, with the new section 1.6.9 recently added. Other changes requested include requiring calibrated combustion analyzers for startups and the requirement to use ambient CO monitors in all boiler rooms, neither of which were accepted by the group.

The ideal solution would be a CO sensor in the stack that would quickly identify a problem and shut the unit off, but there are no inexpensive reliable CO sensors that would be cost effective for the many small boilers existing and sold every year. There are simple inexpensive ambient CO monitors that are being used as a means of detecting CO problems.

The NFPA 72 standard (was NFPA 720) covers the application of ambient CO monitors in great deal, but is targeted towards buildings that house people, like nursing homes, apartment buildings and so on. They require CO monitors in all living areas and boiler rooms.

These changes are intended to address the two primary issues that this group asked;

1. Now that the individual states are starting to require ambient CO monitors, questions like what are the correct equipment and installation procedures. The answers are given in the NFPA 72 standard.

2. To address the proper setup of the burner (and CO levels), require that they follow the manufacturers setup procedures. Many of the CO problems are from improper installation, like using natural gas orifices for LP gas.

3. Encourage the use of combustion analyzers to check for high CO levels and take corrective actions if needed.

Gene Tompkins 1-11-2020

ITEM 20-34 Venting.

PROPOSED CHANGES

1.6.5 FUEL

All fuel systems shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards, such as ASME CSD-1, applicable ANSI Z/CSA, NFPA 85 or others as applicable.

a) Natural Gas
   1) Cleaning
      a. It is recommended that strainers be installed in the main gas line leading to the boiler control equipment.
      b. A sediment trap is required prior to the gas controls. This trap shall be located in a vertical section of pipe as close as practical upstream of the gas controls.
   2) Manual Valves
      a. A manual valve is required upstream of all controls and as close as practical to the boiler to isolate the fuel train when required. If a pilot line is upstream of the manual valve on the main fuel train, it shall also have a manual valve.
      b. These manual valves shall be accessible from the floor and designed to be opened/closed without additional tools. They shall be ball or a lubricated plug type with a non-removable handle that is perpendicular to the gas flow when closed and parallel when open and the valves shall have stops.
      c. If the non-removable handle creates a hazard, the handle can be temporarily removed provided the valve handle is always on while the valve is in the open position. At all times, the position of the valve shall be indicated. When the valve is in the closed position and the handle is not attached, the valve shall be tagged/locked out and the handle shall be tethered and accessible.
      d. If the valve is not part of a listed and labeled assembly, the valve shall comply with a nationally recognized standard.
   3) Vents
      a. All vent or bleed lines from natural gas equipment such as regulators, controls, switches, relief, vent valves, etc. shall be vented outside to a safe point of discharge per the requirements of the manufacturer or the authority having jurisdiction.
      b. Vent and bleed line shall be sized in accordance with a nationally recognized standard.
      c. Manifold of vent lines or of bleed lines shall be in accordance with a nationally recognized standard. Vent lines shall not be manifolded with bleed lines.
      d. No vent or bleed line shall discharge into a flue.
      e. Vent materials shall be selected such that they shall have suitable strength and durability for their intended purpose and shall be listed for the intended purpose by the jurisdiction having authority or a nationally recognized standard.

b) Fuel Oil - By others

Commented [RA1]: Should this read "gas" instead of "boiler" to maintain consistency with "gas controls" in the first sentence of (b.)?

Commented [JP-H2R1]: Yes. Made the change.

Commented [JP-H3]: I changed this from 6 feet to the as close as practical per Roger's suggestion.

Commented [RA4]: What if the handle is not attached and the valve is open? We wouldn't then want the valve locked open…

Commented [JP-H5R4]: Revised the words.

Commented [RA6]: We mentioned this in San Diego; however, do we want to make mention of the material for vents? Someone stated that, "venting shouldn't be copper or aluminum because it can be easily crushed, etc."

Commented [JP-H7R6]: I have added a line on vent materials based on language in NBIC part 1 and CSD.

Item 20-34 Jennings 1/12/2021 July 2020 NBIC Part 1

BACKGROUND INFORMATION

NBIC part 1 addresses fuel for all boilers in 1.6.5. Controls are part of 2.5.3.3 and 3.5.3.3. The intent here is to address fuel train related items. It does not make sense to break up the equipment between fuel supply equipment (sediment trap, shutoff valves) and the controls equipment (vents). They are fuel related equipment, so the new requirements should be located in 1.6.5.

FOLLOWING is the Review of CSD-1 and what was suggested in the January 20 meeting.

CF - 120

CSD – 1 Summary	NBIC – Yes/No and words.	Should it cover
CF-120 – Fuel Train		
a) Non-mandatory appendix provides typical fuel train examples. Fuel trains other than those pictured, but meeting the standard shall be permitted.	Following are the current wording in NBIC. 1.4.5.1.1 Guide for Completing National Board Boiler Installation Report 40) External Piping ASME CODE AND FUEL TRAIN: Indicate if external piping is ASME Code, if not, indicate what code or standard external piping is manufactured to. Indicate if the fuel train meets the requirements of CSD-1 or… 1.6.5 Fuel – All fuel systems shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards, such as ASME CSD-1, applicable ANSI Z/CSA, NFPA 85 or others as applicable. Fuel train component requirements will be based on the standard, fuel fired and the heat input. 2.5.2 Fuel See NBIC Part 1, Section 1.6.5, *Fuel*. 2.5.3.3 and 3.5.3.3 – Controls and Heat-Generating Apparatus a) Oil and gas-fired and electrically heated boilers shall be equipped with suitable primary (flame safeguard) safety controls, safety limit switches and controls, and burners or electric	YES

	elements as required by a nationally or internationally recognized standard. b) The symbol of the certifying organization that has investigated such equipment as having complied with a nationally recognized standard shall be affixed to the equipment and shall be considered as evidence that the unit was manufactured in accordance with that standard. c) These devices shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards, as applicable. 3.5.2 Fuel See NBIC Part 1, Section 1.6.5, *Fuel*.	
c) Thread sealing compound resistant to LPG	No mention of thread sealing compound, etc. in NBIC Part 1, Installation.	No.

CF-130 – Filters or Strainers

CSD – 1 Summary	NBIC – Yes/No and words.	Should it cover
CF-130 – Filters or Strainers		
Filters or strainers are recommended in the main gas supply line.	Not mentioned.	Yes.

CF-140 – Sediment Traps and Drips

CSD – 1 Summary	NBIC – Yes/No and words.	Should it cover
CF-140 – Sediment Traps and Drips		
a) A sediment trap shall be installed before the controls. On a vertical. Manufacture supplies or specifies that the sediment trap is installed as close as practicable to the controls.	Also covered in NFGC NFPA 54 No mention of sediment traps and drips in NBIC Part 1, Installation.	Yes
b) If the gas is not dry, a drip shall be provided at any point where condensate could collect.	No – How do we know if its wet or dry	No

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CF-150 Manually Operated Gas shutoff valves

CF-150 Manually operated gas shutoff valves a) Unless provided as part of an assembly, each valve shall comply with ANSI, CSA, UL or a nationally recognized standard and be suitable	Not currently – Manually operated gas shutoff valves shall be provided and comply with a national standard and a symbol……	Yes
b) Manual shutoff valves shall be ball or lubricated plug type with stops.	Gas shut off valves shall be ball or lubricated plug type	Yes
c) Manually operated valves shall be T-handle or lever-handled with handle parallel to the gas flow when open and perpendicular when closed. Valve shall be accessible and indicate open/closed. Adequate size to be operated without using tools. Maintained and exercised in accordance with manufacturer's instructions.	Handles attached so the handle is parallel when open and perpendicular when closed. Valve shall be accessible and indicate open/closed. Adequate size.	Yes
d) Except as allowed in e) below the handle shall be permanently attached.	Similar to CF-150 d) and e) Handle permanently attached unless it creates a hazard. Handle can be **temporarily** (must be reattached before operator leaves) removed and reattached, must be attached when open.	Yes Do we want to define temporarily.
e) A removable handle is permitted in certain conditions (creates a personnel hazard or obstruction). In these cases, the handle must meet all of the following: 1) Handle remains installed when valve is open 2) Handle can only be reattached so the handle is perpendicular to the flow in a closed position 3) Valve position is indicated, with or without handle 4) Upon removal, the handle must be turned and reattached180 deg to remove hazard or tethered no more than 3 ft away and usable trouble free without untethering 5) A handle tethered in 4) above shall only be permitted when the line is tagged/locked out to prevent operation	Do we want to go into this level of detail?	MAYBE
f) A manually operated valve shall be		Yes

Commented [RA8]: I think "temporarily" is defined by stating, "must be reattached before operator leaves".

Commented [RA9]: Yes…I think we should discuss the instances of when a removable handle is permitted if it we are going to allow it in the NBIC.

provided upstream from all other main gas controls to isolate the fuel train 1) Valve shall be within 6 ft of the boiler and accessible from the floor 2) When a valve is not required per h), then the valve require by f) shall be located immediately external to the boiler/burner unit		
g) When the pilot gas is obtained independently or upstream of the manual shutoff valve, a separate manual valve (per a-e) shall be located in the gas supply line to the pilot. When the pilot is downstream of f) one or more manual valves or other means to permit turndown tests and/or pressurization of the pilot without pressurizing the main fuel train.	But only on the pilot being independent or upstream of the manual shut off valve.	Yes
h) A manually operated shutoff valve in 1-e shall be provided after the downstream SSV to the main burner or group of burners if required by the boiler/burner mfgr for testing or maintenance.	How does the inspector know what the Mfgr requirements are.	No

I would suggest a paragraph in the following manner.

A manual valve is required upstream of all controls and within 6 ft of the boiler to isolate the fuel train. If a pilot line is independent from the main gas train, it shall also have a manual valve. These manual valves shall be accessible from the floor and designed to be opened/closed without additional tools. They shall be valve ball or plug type with a non-removable handle that is perpendicular to the gas flow when closed and parallel when open. The handle can be temporarily removed if…. At all times, the position of the valve shall be indicated.

Commented [RA10]: I understand what the intent is by saying "within 6 ft. of the boiler"; however, is this ambiguous in that someone could think it has to be within 6 ft. of the boiler in the gas train?

CF-160 – Gas pressure Regulators

Commented [RA11]: Just as you specified with CF-160 – CF-180, I think gas pressure regulators, control valves, and SSV's are specific to fuel train systems and should NOT be part of the NBIC.

We don't get into specific's about burners; therefore, why would we get into specifics about fuel train components?

I think we stop after the manually operated gas shutoff valve. If we include gas pressure regulators, etc. then we have to include all gas train components, in my opinion and I don't believe that's within the scope of the NBIC.

CF-160 Gas Pressure Regulators		
a) Individual Gas pressure regulators or regulators that are part of a combination valve shall be used for both the pilot and main gas per ANSI Z21.78/CSA 6.2. Regulated pressure shall be within +/- 10% set pressure at all firing rates. Pressure test port required	Do we need to specify equipment downstream of the gas shutoff valve or rely on the 1.6.5 and the reliance on an industry standard?	Committee Question
b) Regulators with integral vent limiters – meet ANSI Z21.18/CSA 6.3.		No
c) Second stage regulators for LPG gas (alone or in combo) must comply with UL		No

144 and installed per NFPA 58		

CF-161 – Overpressure Protection		
a) If the MAWP of any component is less than the entering gas pressure so a regulator failure would produce pressure above the MAWP, the downstream piping system shall have overpressure protection.	See CF 160	
b) If OP protection is require, it shall be located upstream of all controls for both the burner and the Pilot. OP devices shall be vented to safe point of discharge, if required.		
c) CG-210 is referenced. (NFPA 54 gas, NFPA 31 oil and NFPA 58 LP gas)		
d) OP, if required, may be provided by any device listed in the latest NFPA 54/ANSI Z223.1		

CF-162 – Gas Pressure Supervision		
a) Gas pressure supervision shall be provided based on heat input and firing system type (power, mech draft, pulse – or – natural draft.) to accomplish a safety shutdown and lockout in the event of either high or low gas pressure.	See CF 160	
b) Location 1) High pressure downstream of main regulator – Switch locks out before the manifold gas pressure exceeds a) The boiler/burner manufacturer's specified setting b) 150% of the boiler/burner main manifold gas pressure if not specified by manufacturer		
2) High pressure upstream of main regulator – the regulator must be a zero governor pressure regulator. The high pressure switch locks out		

when the supply pressure exceeds a) The setting of the OP protection device in CF 161 if equipped. b) The boiler/burner manufacturers specified setting c) 150% of the boiler/burner main manifold gas pressure if not specified by manufacturer A high gas pressure switch is not required when a boiler unit incorporates a listed shutoff valve with a zero governor pressure regulator that causes a safety shutdown if the zero governor pressure regulator fails due to a ruptured diaphragm		
c) Low gas pressure shall function to accomplish a safety shutdown before the main manifold gas pressure is less than 1 The boiler/burner manufacturer's specified setting 2 50% of the boiler/burner's main manifold gas pressure if the setting is not specified. The low gas pressure switch shall be located upstream of the SSVs. When the low gas-pressure switch is located upstream of the main gas-pressure regulator, the burner or boiler unit shall be labeled and listed by a nationally recognized testing agency for this arrangement.	See CF-160 No – Even if we do agree that switches should be included.	
d) Pressure test port(s) are required		
e) Gas-pressure switches shall be labeled and listed	As part of 1.6.5?	
f) Switches shall be capable of withstanding a pressure not less than 10% above the relieving pressure of the nearest upstream OP device. When no relief is provided, the switches shall be capable a pressure not less than the maximum inlet pressure of the	No. Even in we do agree that switches should be included.	

nearest gas-pressure regulator. When the high gas-pressure switch is located downstream of the SSV, the switch shall be capable of withstanding a pressure no less than 50% above it's upper set point limit.		
g) Gas-pressure switches of the automatic or manual reset type shall be electrically connected in accordance with CE-110(j)	No	

Part 1

CF-170 – Control Valves

CF – 170 – Control Valves		
a) An automatic input, complete closure, control valve may be combined with a SSV.	See CF 160	
b) A bypass valve may be installed only around a control valve, not any valve that is a shutoff		

CF-180 Safety Shutoff Valves (SSV)

CF-180 Safety Shutoff Valves (SSV)		
a) Each main and pilot shall have a SSV that is compliant with one of the ANSI/CSA or UL 429	See CF 160	
b) Single burners main burner supply line shall be equipped as follows 1) <= 500K, Two safety shutoff in series (can be single body) or one safety shutoff with a proof of closer interlock. If the two shutoff valves are in on body, they shall be in series with independently operated shafts 2) >= 500 K up to 12.5 million, Two SSVs in series that may be in a single valve body. At least one shall incorporate a proof of closure interlock. If the two shutoff valves are in on boy, they shall be in series with independently operated shafts 3) If there is a branch line to a second burner, either a or b following apply		

a. <500K b) 1) applies b. >500K up to 12.5 million – 1) Safety shutoff in b)1) applies to each branch or 2) At least one SSV on the main and one on the branch shall incorporate a proof of closure interlock		
c) For multiple burner units the main burner shall be equipped as follows 1) <= 500 k safety shut off in b)1) applies to each individual line 2) >500K up to 12.5 million, either of the following applies a. SSV requirements in b)2) applies to each line b. SSV requirements in b)1) apply to each line and the main burner supply line has at least one SSV with proof of closure interlock.		
d) The valve seal overtravel (proof of closure) interlock shall prevent boiler ignition if the switch does not prove the valve closed during the startup		
e) Pilot supply line shall be equipped with at least one SSV		
f) SSVs labeled, listed by a national…		
g) SSVs shall have a shutoff time not to exceed that specified in Tables CF1-4		
h) SSV's shall be capable of withstanding a pressure not less than 10% above closest upstream OP device. If no OP device, the valves can withstand a pressure not less than maximum inlet to regulator		
i) Provisions to independently test each SSV for seal leakage. Any special equipment made available to boiler/burner mfgr.		

CF-190 – Vent, Bleed, Gas-pressure relief, vent valve, and feedback LINES for fuel train components.

a) Vent Lines 1) Regulators, combination controls, pressure interlock switches and all components requiring atmosphere air	Yes. Maybe combine all into one paragraph. Vent or bleed lines coming from gas equipment such as regulators, controls,	

Commented [RA12]: I agree that CF-190 should be included in the NBIC and I also agree that it should be condensed similarly to what is described here.

pressure shall have the atmospheric side of the diaphragm connected to a vent line that shall be pipe outside to a safe point of discharge as determined by the AHJ unless allowed in c) or h) below. 2) Where there is more than one fuel train component requiring a vent, each component shall have a separate vent piped outside to the safe place of discharge (per AHJ) unless otherwise permitted by f) or h).	etc. shall be vented outside to a safe point of discharge. Sizing of vents, manifolding etc. should be per the applicable accepted standard. Vent to safe point of discharge per the standard or the AHJ.	
b) Bleed lines 1) Regulators, combination controls, pressure interlock switches and all components requiring atmosphere air pressure and periodically release gas shall have the atmospheric side of the diaphragm connected to a bleed line that shall be piped outside to a safe point of discharge as determined by the AHJ unless allowed in c) or h) below. 2) Where there is more than one fuel train components requiring a bleed line at a location, each component shall have a separate bleed line piped outside to the safe place of discharge (per AHJ) unless otherwise permitted by f) or h).		
c) *Components with Vent Limiters.* A listed and labeled gas-pressure regulator, etc. or other fuel train component incorporating a vent limiter shall be permitted to vent directly into ambient space		
d) Gas-pressure relief lines 1) If an OP device incorporates a gas-pressure relief device, the outlet shall be connected to a relief line piped outside to the safe place of discharge (per AHJ) 2) The relief line shall be sized in accordance with the component manufacturer's instructions and shall be at least the same size as the outlet connection of the relief valve 3) Where there is more than one gas-pressure relief valve, each relief valve shall have a separate line piped outside to the safe place of discharge (per AHJ) unless otherwise permitted		

by f).		
e) Lines from vent valves 1) A vent valve, if installed shall be piped outdoors to a safepoint of discharge as determined by the AHJ 2) Vent line shall be >= to the outlet connection 3) Where there is more than one vent valve at a location, each vent valve shall be piped outside to the safe place of discharge (per AHJ) unless otherwise permitted by f).		
f) Manifolding of Lines If approved by the AHJ, same type lines (vent, bleed) shall be permitted and vent and bleed manifolding is permitted. To minimize backpressure, the manifolded line shall have a cross- sectional area of not less than the area of the largest branch line piped+ 50% of the additional cross-sectional areas. The following manifolding is not permitted 1) Gas-pressure relief with vent line, bleed lines or vent valve lines 2) Vent valve lines with vent lines or bleed lines 3) No vent lines of any type from one boiler to another		
g) Connecting lines to Flue Passages No vent lines of any type shall connect to a boilers flue passages		
h) Points of discharge: Outdoor requirements, special exceptions, and prohibited practices 1) Unless terminated per 2) or 4) all lines shall be piped outside to the safe place of discharge (per AHJ). The point of discharge shall be protected from foreign material. 2) A combination gas control integrating an internal gas bleed line shall be permitted to discharge its bleed line back into the valve body – if designed to not leak into burner. 3) If prone to floods, the discharge shall be protected (anti-flood or raise height) 4) A bleed or vent line can be discharged into a pilot if it is not a manifolded line and the discharge		

uses a burner tip. 5) Bleed or vent line shall not discharge into a positive pressure combustion chamber		
i) *Clearance for Points of Discharge* The point of discharge from the referenced vents piped outside shall have clearance as determined by the AHJ and the point of discharge shall extend above boiler and structures to prevent gaseous discharge from being drawn into combustion air intakes, ventilating systems, mechanical air intakes, windows of the boiler room or of an adjacent building.		
j) Burner tips 1) If used per h)4) – metal with a melting point of +1,450 F and its length shall extend from location in 3) to the outer wall of the combustion chamber. 2) Installer to document compliance and provide documention accompanying the boiler 3) Burner tip location shall be located so the gas is readily ignited and the tips securely held in relation to the pilot.		
k) Feedback Lines for Fuel Train components Feedback lines – Piped per manufacturer's instructions		
l) Bleed, Vent, and Relief lines All materials for these lines must be strong and durable enough and suitable for the environmental stresses. Materials shall be listed for intended purpose by a nationally recognized standard as accepted by the AHJ. In the absence of a standard NFPA 54 shall be used.		

Reminder

FROM NBIC PART 1

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 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 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.

Oil burners

1.6.5 FUEL

All fuel systems shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards as applicable

1.6.5.1 Gas Fuel Requirements (I am assuming this is needs to be added)

1.6.5.2 Oil Fuel Requirements

The installer shall provide and install any additional components required for proper burner operation but not provided with the listed burner. These shall include but not limited to;

a) **A filter or strainer shall be installed upstream of the safety shutoff valves. The filter or strainer shall meet the manufacturer's recommendations and installed in accordance with jurisdictional and environmental requirements and/or industry standards, as applicable.**

b) **An atomizing medium shall be installed according to the manufacturer's recommendations and in accordance with jurisdictional and environmental requirements and/or industry standards, as applicable.**

c) **A pressure relief valve shall be connected to a fuel line in which the pressure greater than the system design pressure may occur. The relief valve line from the relief valve shall discharge into the return line, oil tank or pump suction line.**

In Section 9.1 Definitions

Atomizing Medium – A medium used to help atomize fuel oil, typically air or steam

Note – material in italics is not part of the existing and recommended wording, and are for general information only.

Rational

The standards (UL 296) do not require that a listed burner include the above items. Details of the atomizing medium and strainer/filter must be included by the burner manufacturer, but the manufacturer does not need to include the equipment.

The atomizing medium (usually air or steam) is required with some burners, while many other oil burners will use pressure atomization (and do not require a separate atomizing medium). The manufacturer is not required to provide this, but it is required to properly operate. CSD-1 does not specifically call this out, but is included here as a essential item for the installer to provide.

The relief valve becomes an issue when the oil is supplied by a pump, and that the pressure could become too high for the burner to handle safely.

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

3.9.2 ~~(a)~~ 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~~ by the National Board.

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

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

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.

Commented [TB1]: Correct paragraph reference is b)

Commented [TB2]: Flow resistance only applies to Section VIII non-reclosing pressure relief devices. It would not be appropriate to reference flow resistance here.

Commented [TB3]: Correct paragraph reference is 3.9.2

Commented [TB4]: Flow resistance only applies to Section VIII non-reclosing pressure relief devices. It would not be appropriate to reference flow resistance here.

Commented [TB5]: This is not the current text in 3.9.2 b). If this is new text I think it would be redundant to put it here since 3.9.1 states the same thing. If this was added by mistake I would recommend only showing the changes to made to (a).

Commented [TB6]: 4.5.1 a) applies to pressure relief devices used for pressure vessels. Flow resistance would not apply to pressure relief valves used for Section I or Section IV boilers.

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~~ by the National Board.

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

Commented [TB1]: Flow resistance only applies to Section VIII non-reclosing pressure relief devices. It would not be appropriate to reference flow resistance here.

Commented [TB2]: 4.5.1 a) applies to pressure relief devices used for pressure vessels. Flow resistance would not apply to pressure relief valves used for Section I or Section IV boilers.

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

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the heater at all times regardless of control valve position. If 3-way valves are used, balancing valves should be included.

b) Design of piping supports should be in accordance with jurisdictional requirements, manufacturer's recommendations, and/or other industry standards as applicable. Thermal insulation used on the pipes and equipment should be selected for the intended purpose and for compatibility with the fluid. Where there is the potential for fluid system leaks (flanged joints, etc.), the thermal insulation selected should be non-absorbent. Laminated foam glass or cellular glass (nonabsorbent, closed cell) insulation are examples of suitable insulation.

S5.5.6 FUEL

See NBIC Part 1, Section 1.6.5 *Fuel*

(19) ### S5.5.7 ELECTRICAL

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

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

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

d) If the equipment room door is on the building exterior, the shutdown switch should be located just inside the door. If there is more than one door to the equipment room, there should be a shutdown switch located at each door of egress. For atmospheric-gas burners, and oil burners where a fan is on a common shaft with the oil pump, the complete burner and controls should be shut off. For power burners with detached auxiliaries, only the fuel input supply to the firebox need be shut off.

e) Controls for Heat Generating Apparatus

1) Oil and gas-fired and electrically heated thermal fluid heaters shall be equipped with suitable primary (flame safeguard) safety controls, safety limit switches and controls, and burners or electric elements by a nationally or internationally recognized standard.

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

a. Expansion tank low level switch, liquid level switch (or similar device) interlocked with the circulating pump operation to confirm minimum level in the expansion tank when the system is cold. This interlock prevents pump cavitation. The function of this device shall prevent burner and pump operation if the liquid level is not adequate.

b. Thermal fluid temperature operation control. This temperature actuated control shall shut down the fuel supply when the system reaches a preset operation temperature. This requirement does not preclude the use of additional operation control devices when required.

c. High temperature limit safety switch located on the thermal fluid heater outlet. This limit shall prevent the fluid temperature from exceeding the maximum allowable temperature of the

specific fluid. The high temperature limit safety switch set point should be set no higher than the maximum temperature specified by the fluid manufacturer, heater designer, or downstream process limits, whichever is lowest. Functioning of this control shall cause a safety shutdown and lockout. The manual rest may be incorporated in the temperature limit control. Where a reset device is separate from the temperature limit control, a means shall be provided to indicate actuation of the temperature sensing element. Each limit and operating control shall have its own sensing element and operating switch.

d. Primary flame safety control for each main burner assembly. This control shall deenergize the main fuel shut off valve and shut off pilot fuel upon loss of flame at the point of supervision. The function of this control shall cause a safety shutdown and lockout.

e. Power burners and mechanical draft atmospheric burners shall provide for the preignition purging of the combustion chamber and flue passes. The purge shall provide no fewer than four air changes or greater as specified by the manufacturer.

f. Proof of flow interlock-thermal fluid heaters require a minimum flow rate to ensure proper velocities and film temperatures through the heater. A low flow condition can cause overheating, degradation of the fluid or heater coil or tube failure. Activation of this interlock shall cause a safety shutdown of the burner and pump. One or more interlocks shall be provided to prove minimum flow through the heater at all operating conditions.

3) In accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or other industry standards, as applicable, Thermal fluid heaters may also have:

g. ~~a.~~ A high stack temperature switch interlock – in the event of a high stack temperature (indication of improper combustion or cracked coil) this device shall shut off the burner and circulating pump and cause a lockout condition.

a. ~~b.~~ An inert gas smothering system (steam or CO_2) – this system is used to quench combustion in the event of a cracked heater coil or tube. The gas smothering system should be installed per local codes and requirements. A typical system may include two stack limit switches, an alarm and valve to allow inert gas to enter the combustion chamber. One stack limit is set at a value above the typical stack temperature for the equipment [e.g. 1,000. ºF (540°C)] and the second is set at 100 ºF (40°C) above the first. If the limit is tripped, the pump and burner will shut down. If the second limit is tripped, the inert gas shall enter the combustion chamber to quench the flame.

b. ~~c.~~ A high inlet pressure switch – this normally closed switch senses pressure at the heater inlet and its setpoint is determined based on the system design pressure when the system is cold. Activation of this switch indicates a restriction in flow and should shutdown the burner and pump and cause a lockout condition.

c. ~~d.~~ A low inlet pressure switch – this normally open switch senses pressure at the heater inlet and its setpoint is determined based on system pressure when the system is operating at temperature. Activation of this switch indicates a restriction in flow and should shutdown the burner and pump and cause a lockout condition.

d. ~~e.~~ A high outlet pressure switch – this normally closed switch senses pressure at the heater outlet and its setpoint is determined based on the system pressures when the system is at operating temperature. Activation of this switch indicates a restriction in flow and should shutdown the burner and pump and cause a lockout condition. Note: the setpoint of this switch should be lower than the safety relief valve setting.

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

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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) 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 shall be monitored and recorded daily while in operation.

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

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b) Industrial Applications

Thermal fluid heaters, often called boilers, are used in a variety of industrial applications such as solid wood products manufacturing, resins, turpentine~~s~~, 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.

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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. Overheating 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. 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 organization every 12 to 36 months, depending on conditions, unless otherwise

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directed by the jurisdiction. The pressure relief ~~discharge~~ installation ~~should~~ shall meet the requirements of NBIC Part 4, 2.3. Inspection and testing of the relief device shall

~~1. Both thermal and chemical reactions (personnel hazard);~~

~~2. Combustible materials (fire hazard);~~

~~Surface drains (pollution and fire hazard);~~

~~3. Loop seal or rain cap on the discharge (keep both air and water out of the system);~~

~~3. Drip leg near device (prevent liquid collection); and~~

~~3. Heat tracing for systems using high freeze point fluids (prevent blockage).~~

g. Inspection 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 manufacturer 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.

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

General Description: Add practicable and its definition to the glossary

Subgroup: Repairs and Alterations

Task Group: Kathy Moore (PM)

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

Proposed Definition:

Practicable – capable of being accomplished based on technical consideration of the nature and scope of activities, design or arrangement.