



THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE SUBGROUP INSTALLATION

MINUTES

Meeting of July 16, 2024
Louisville, KY

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The National Board of Boiler & Pressure Vessel Inspectors
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1. Call to Order

Subgroup Chair Mr. Brockman called the meeting to order at 8:03 A.M. Eastern Time.

2. Introduction of Members and Visitors

Mr. Brockman gave an introduction of members and visitors. Each member and visitor (in person and remote) introduced themselves with their name and company. All attendees are listed on **Attachment Page 1**.

3. Check for a Quorum

With all members present, in person and remote, a quorum was reached.

4. Awards/Special Recognition

There were no awards or special recognitions given at this meeting.

5. Announcements

Ms. Vance gave the announcements. See **Attachment Page 2**.

6. Adoption of the Agenda

A motion was made to adopt the agenda as presented. The motion was seconded and unanimously approved.

7. Approval of the Minutes of January 9, 2024, Meeting

A motion was made to approve the minutes of the January 9, 2024, meeting. The motion was seconded and unanimously approved.

8. Review of Rosters

a. Membership Nominations

Mr. Jon Choitz (Authorized Inspection Agencies) spoke about his experience in the industry and his interest in joining the subgroup. Then he left the room so the committee could discuss. A motion was made to recommend Mr. Choitz as a member of the subgroup. The motion was seconded and unanimously approved.

b. Membership Reappointments

The following SG Installation memberships are set to expire prior to the January 2025 meeting: Mr. Eddie Wiggins, Mr. Marvin Byrum, Mr. Tom Clark, Mr. Don Patten, Mr. Mike Richards, and Ms. Melissa Wadkinson.

Mr. Wiggins stated that he is not renewing his membership.

Mr. Marvin Byrum, Mr. Tom Clark, Mr. Don Patten, Mr. Mike Richards, and Ms. Melissa Wadkinson all stated their interest in continuing their membership with the subgroup.

c. Officer Appointments

Mr. Wiggins' term as Vice Chair is scheduled to end on July 31, 2024. The subgroup will need to nominate a member for this position.

Mr. Tom Clark and Mr. Marvin Byrum were both nominated for Vice Chair of Subgroup Installation. Both gentlemen spoke about why they would like to be Vice Chair of the subgroup, their experience in the industry, and their history with the NBIC. The two nominees left the room so the subgroup could vote. Through a secret ballot, Mr. Clark was chosen by a majority vote of the subgroup to become the new Vice Chair of the subgroup.

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)
- 19-83 – Address Alternate Pressure Relief Valve Mounting Permitted by ASME CC2887-1 – D. Marek (PM)
- 22-08 – Review and improve guidance for T&P valve installation relating to probe.

The committee reviewed the proposal. A motion was made to accept the proposal as presented. The motion was seconded and unanimously approved.

- I24-38 – T&P relief device installation on modular HWH supply header

After reviewing the proposal and some discussion, the committee concluded that the NBIC cannot address ASME verbiage in NBIC interpretations. Furthermore, since Part 1 does not address modular hot-water heaters, we cannot provide an interpretation. Prior to the meeting, a new item to address modular hot-water heaters (A24-26; R. Spiker as PM) was opened.

- 24-64 – PRV set pressure requirements for HW heating and supply boilers

After reviewing the proposal and some discussion, the committee decided that once the correct Part 1 paragraph references were added, they would accept the proposal. A motion was made to accept the proposal if revised with the correct Part 1 references. The motion was seconded and unanimously approved.

- 24-66 – Align Part 4, 2.5.1.5 with changes made in Part 1 Item 22-30

Ms. Vance reviewed the background of this proposal. When Item 22-30 initially opened, it was addressing only 3.6.3, so that is probably why Part 4 was not included. The only part of this item that parallels Part 4 is in Part 1, 3.9.15. Item 22-30 passed Main Committee in July 2023. Changes to Part 1, 3.9.1.5 should have also been proposed for Part 4, 2.5.1.5. Editorial changes were also proposed for the parallel paragraphs. After reviewing the proposed editorial changes, the committee decided it would be better to research this more, checking parallel paragraphs for similar verbiage that would need to change.

10. Interpretations

Item Number: 24-14	NBIC Location: Part 1, 2.3.3	Attachment Page 3
<p>General Description: 2015 NBIC Clearances for tube replacement</p> <p>Subgroup: SG Installation</p> <p>Task Group: T. Clark (PM), D. Patten, M. Richards, M. Downs, S. Konopacki</p> <p>Explanation of Need: The 2015 NBIC Part 1, 2.3.3 a) states boiler installations must allow for maintenance. 2.3.3 b) specifically states installations must allow for removal and installation of tubes. Units are being installed with ducts, structural braces, etc., obstructing the area needed to replace economizer tubes.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>Mr. Clark reviewed the background of this item and the proposal. After some discussion, the committee revised the proposed question. A motion to accept the proposal as revised was made. The motion was seconded and unanimously approved.</p>		

11. Action Items

Item Number: 20-86	NBIC Location: Part 1, 2.10.1 a)	No Attachment
General Description: Testing and Acceptance: Boil-out Procedure		
Subgroup: SG Installation		
Task Group: D. Patten (PM), S. Konopacki, and R. Spiker		
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.		
July 2024 Meeting Action: Progress Report		
Mr. Patten summarized the discussion from the January 2024 meeting about this being added as a supplement. After some discussion and revisions to the proposal, the committee decided to send this as a Review and Comment ballot to the subgroup. It was also decided that Mr. Patten would replace Mr. Wiggins as the project manager for this item as Mr. Wiggins is not continuing his membership with the NBIC.		

Item Number: 22-28	NBIC Location: Part 1	No Attachment
General Description: Pool Heater requirements and definition		
Subgroup: SG Installation		
Task Group: J. Kleiss (PM), R. Spiker, T. Creacy, and M. Byrum		
Explanation of Need: The NBIC Installation and Inspection Codes do not have a definition for pool heaters. There is potential for confusion regarding which NBIC requirements, if any, should apply to pool heaters.		
July 2024 Meeting Action: Progress Report		
This will be letter balloted to subgroup.		

Item Number: 22-32	NBIC Location: Part 1, 3.8.1.4 b)	Attachment Pages 4-5
General Description: High pressure limit control requirements for fired jacketed steam kettles		
Subgroup: SG Installation		
Task Group: R. Adams (PM), D. Patten, T. Clark, and T. Creacy		
Explanation of Need: As a safeguard to over pressurizing the fired jacketed steam kettle, the pressure range of the actuated high pressure limit control should not exceed the MAWP of the vessel.		
July 2024 Meeting Action: Proposal		
This was sent out for Review and Comment to Parts 1 and 4. Mr. Adams reviewed some of the negative comments from the ballot. After a breakout session, Mr. Adams reviewed the revised proposal incorporating the necessary changes that PRD suggested. The committee also discussed potential responses to some of the comments from PRD. Mr. Adams will follow up with those PRD members again with the committee's further responses. A motion was made to accept the proposal as revised. The motion was seconded and unanimously approved.		

Item Number: 23-52	NBIC Location: Part 1, 2.5.3.2 and 3.5.3	No Attachment
General Description: Harmonize electrical requirements for all types of boilers/water heaters		
Subgroup: SG Installation		
Task Group: T. Clark (PM), S. Konopacki, J. Kleiss, R. Spiker, and Jon Choitz		
Explanation of Need: Electrical requirements for power boilers, heating boilers, and water heaters are inconsistent, particularly regarding remote emergency shutdown switches. In some cases, the requirements are the same but worded or ordered differently. In order to promote better understanding of code requirements and consistency in their application, I propose making sections 2.5.3 and 3.5.5 as uniform as possible.		
July 2024 Meeting Action: Progress Report		
Mr. Clark reviewed his proposal and explained the new formatting to show what is being deleted, moved, added, etc. This will be letter balloted to the subgroup.		

Item Number: 24-05	NBIC Location: Part 1, New Supplement	No Attachment
General Description: Add Heat Pump Water Heater & Heat Pump Hydronic Heater Supplement		
Subgroup: SG Installation		
Task Group: J. Kleiss (PM), Bryan Ahee		
Explanation of Need: Heat pump water heating and hydronic heating are growing in prevalence. Guidance for installation and inspection of these products is needed.		
July 2024 Meeting Action: Progress Report		
Mr. Brockman reviewed the discussion from the Executive Committee meeting. Mr. Rob Troutt will present this to the Chiefs for discussion and input at their October meeting.		

12. Chiefs' Feedback:

Mr. Clark reviewed the responses from the Chiefs regarding the committee's clarifying questions. In response to the feedback on Question 2, Mr. Clark will open an item (Item 24-73) to incorporate verbiage referencing S6.5 in 1.6.6. Mr. Clark will follow up with the Chiefs in October to clarify their responses to Question 3.

13. New Items:

Item Number: 24-26	NBIC Location: Part 1, 3.7.8	No Attachment
<p>General Description: NBIC Requirements for ASME Modular Water Heaters</p> <p>Subgroup: SG Installation</p> <p>Task Group: R. Spiker (PM), M. Byrum, J. Kleiss</p> <p>Explanation of Need: ASME Section IV added requirements in the 2023 Edition for modular water heaters. The NBIC currently includes requirements for modular steam-heating and hot-water heating boilers, but not for modular water heaters.</p>		
<p>July 2024 Meeting Action: Progress Report</p> <p>Mr. Clark briefly reviewed the explanation of need and the submitter's concerns. A task group was created.</p>		

Item Number: 24-30	NBIC Location: Part 1, Figure 3.7.5.1-c	Attachment Pages 6-8
<p>General Description: Revise Note 1 in Part 1, Figure 3.7.5.1-c for clarity</p> <p>Subgroup: SG Installation</p> <p>Task Group: R. Adams (PM)</p> <p>Explanation of Need: This is being submitted on Gary Scribner's behalf: Please review and revise to clarify what Note 1 is trying to communicate. Consider rewriting the third sentence to be more specific.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>Mr. Scribner asked the committee to clarify what was meant by "or service." Ms. Wadkinson read from ASME Section IV, HG-614. Instead of ASME Section IV, NBIC Part 1, 3.8.2.4 d) should be referenced. After a breakout session, Mr. Adams shared the proposal with the correct reference. A motion was made to accept the proposal as revised. The motion was seconded and unanimously approved.</p>		

Item Number: 24-31	NBIC Location: Part 1, S5.6.2	Attachment Page 9
<p>General Description: Clarify requirements for opening drain valve</p> <p>Subgroup: SG Installation</p> <p>Task Group: M. Wadkinson (PM), R. Black, D. Patten</p> <p>Explanation of Need: "when there is temperature on the system" is rather unclear. Please specify/clarify requirements.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>Ms. Wadkinson explained the initial intent of the language “when there is temperature on the system.” After some discussion, the committee decided this language was unnecessary. A motion was made to accept the proposal as revised. The motion was seconded and unanimously approved.</p>		

Item Number: 24-32	NBIC Location: Part 1, S8.3	Attachment Page 10
<p>General Description: PVHO Characteristics- review intent of list and potentially add requirement</p> <p>Subgroup: SG Installation</p> <p>Task Group: R. Smith (PM), M. Byrum</p> <p>Explanation of Need: These changes started for editorial purposes/reviewing the use of “and/or.” S8.3 e) 8) seemed incomplete and out of place, so the changes shown are to correct that. Someone with PVHO experience should review the changes and review for any other changes that may be necessary.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>After a breakout session, Mr. Smith reviewed his comparisons between the proposal and text from PVHO-1 and PVHO-2 and deemed the proposed language acceptable. A motion was made to accept the proposal as presented. The motion was seconded and approved.</p>		

Item Number: 24-56	NBIC Location: Part 1, S3.6.1	Attachment Pages 11-13
<p>General Description: LCDSV Systems: Add Table and Figure</p> <p>Subgroup: SG Installation</p> <p>Task Group: M. Byrum (PM), R. Black</p> <p>Explanation of Need: In accordance with the NBIC Policy For Metrication, metric units need to be shown alongside US customary units. Table S3.6.1 and Figure S3.6.1-b both show only US customary units. I recommend adding a Table S3.6.1M and Figure S3.6.1-bM to show metric units. I've also included some additional editorial recommendations.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>A task group was created. After a breakout session, the committee reviewed the metric units that were added to the proposal and made a few further changes. A motion was made to accept the proposal as revised. The motion was seconded and unanimously approved.</p>		

Item Number: 24-57	NBIC Location: Part 1, S5.5.1	Attachment Page 14
<p>General Description: Revise language to be more formal (Part 1, S5.5.1)</p> <p>Subgroup: SG Installation</p> <p>Task Group: M. Wadkinson (PM)</p> <p>Explanation of Need: The current language is rather informal. It should be revised.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>After the committee discussed and made some changes, a motion was made to accept the proposal as revised. The motion was seconded and unanimously approved.</p>		

Item Number: 24-68	NBIC Location: Part 1, S3.3 c)	Attachment Page 15
<p>General Description: CO₂ is heavier than air; Part 1, S3.3 c) should say "above" not "below"</p> <p>Subgroup: SG Installation</p> <p>Task Group: M. Byrum (PM)</p> <p>Explanation of Need: CO₂ is like the foam in a beer mug flowing over—it is heavier than air. If it is below an air intake, it will go down and will not typically enter an intake above it. But if it is above an air intake, it will drop into the intake.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>Ms. Vance briefly reviewed the intent of this proposal. A motion was made to accept the proposal as presented. The motion was seconded and unanimously approved.</p>		

It was proposed to add a new item (24-73) to the agenda. A motion was made to adopt the agenda as revised. The motion was seconded and unanimously approved.

Item Number: 24-73	NBIC Location: Part 1, 1.6.6	Attachment Page 16
<p>General Description: Requirements for Sealed Combustion Systems</p> <p>Subgroup: SG Installation</p> <p>Task Group: T. Clark (PM)</p> <p>Explanation of Need: Jurisdictional Chiefs provided feedback to the Installation Subgroup that guidance for sealed combustion systems should be provided.</p>		
<p>July 2024 Meeting Action: Proposal</p> <p>Mr. Clark reviewed his proposal with the subgroup. After the committee discussed and made some minor changes, a motion was made to accept the proposal as revised. The motion was seconded and unanimously approved.</p>		

- The Executive Committee asked for a volunteer from each subgroup to be part of the task group to review the NBIC's Policy on Metrication (Section 7). The task group will work on comparing the NBIC's policy with other standards' policies, etc. Mr. Byrum volunteered to serve on the task group, representing Part 1.

15. Review of Item Processes in SG/SC

Mr. Patten reminded the committee that the Project Manager of any item needs to continue to move items along. This includes uploading any updated proposals or information to the cloud prior to meetings. Then as items evolve, proposals should be placed in the subcommittee cloud folders. Project managers also need to ensure that items are being worked on outside of meetings (when possible).

16. Discussion on Letter Ballots

Ms. Wadkinson reviewed the discussion from the Executive Committee on the procedure for letter balloting. This included the following reminders:

- Project managers should be addressing negative comments (with more than “thank you for your comment”).
- Votes with editorial comments are acceptable. However, any votes with comments suggesting technical changes should be voted as “disapproved.”
- If the project manager responds to a comment affirming the suggested changes will be made, they need to ensure those changes are incorporated in the revised proposal. In most cases they should also follow up with the committee (or commenters) showing those changes.

17. Microsoft SharePoint

Mr. Luis Ponce briefly shared that in January 2025, the National Board will be transitioning from the NBIC file share site (NBfileshare.org) to Microsoft SharePoint due to SharePoint’s increased security. Training on SharePoint will most likely be offered.

18. Future Meetings

Mr. Brockman reviewed the future meetings:

- January 13-16, 2025 – Charleston, SC
- July 2025 – TBD

19. Adjournment

A motion was made to adjourn the meeting at 3:40 P.M. Eastern Time. The motion was seconded and unanimously approved.

Respectfully submitted,



Michelle Vance
Subgroup Installation Secretary

Subgroup Installation Attendance: July 16, 2024

MEMBERS:	Interest Category	In Person	Remote	Not In Attendance
Joe Brockman	Authorized Inspection Agencies	X		
Eddie Wiggins	Jurisdictional Authorities	X		
Rodger Adams	Authorized Inspection Agencies	X		
Robert Black	Manufacturers	X		
Jim Byrum	Authorized Inspection Agencies	X		
Tom Clark	Jurisdictional Authorities	X		
Todd Creacy	Authorized Inspection Agencies	X		
J. Matt Downs	Manufacturers	X		
Jeff Kleiss	Manufacturers	X		
Stan Konopacki	Users	X		
Don Patten	NB Certificate Holders		X	
H. Michael Richards	General Interest		X	
Robert Smith	General Interest	X		
Ron Spiker	Jurisdictional Authorities	X		
Melissa Wadkinson	Manufacturers	X		
Michelle Vance	Secretary	X		

VISITORS:	Company / Interest	In Person	Remote
Rich Anderson	International Code Council, Inc.	X	
Howard Berny	State of Minnesota	X	
John Burpee	State of Maine	X	
Jon Choitz	HSB	X	
Julius Dacanay	State of Hawaii		X
Christopher Hartford	Cincinnati Insurance		X
Ken Misiewicz	Pleune Service Company	X	
Luis Ponce	NBBI Staff	X	
Gary Scribner	NBBI Staff	X	
Rob Troutt	State of Texas	X	
Ed Verderose	Miura America	X	
Bryan Ahee	Bradford White Corporation		X
Joel Amato	NBBI Staff	X	
Rob Stimson	State of Kansas		X

- **Microsoft Teams Notes:**
 - Please stay muted during the meeting. If you would like to speak, please use the “raise hand” feature, and then you can unmute as you are called on. Teams will note the order in which your hands were raised, and we will call on you in that order.
 - Any messages sent through chat **will be displayed for anyone in the meeting to see**. If you need to send me a private message, please send me an email (mvance@nbbi.org).
 - This meeting marks the end of Cycle D for the 2025 NBIC edition. This meeting marks the end of the 2025 NBIC development cycle and is the last opportunity for code revisions to be approved for the 2025 NBIC. Anything going to letter ballot will not make it into the 2025 edition.
 - The National Board will be hosting a reception on Wednesday evening from 5:30 p.m. to 7:30 p.m. at the Rooftop Garden on the 16th floor of the hotel.
 - The National Board will be hosting breakfast and lunch on Thursday in Citation A/B for those attending the Main Committee meeting. Breakfast will be served from 7:00 a.m. to 8:00 a.m. and lunch will be served from 11:30 a.m. to 12:30 p.m.
 - Meeting schedules, meeting room layouts, and other helpful information can be found on the National Board website under the **NBIC** tab → NBIC Meeting Information.
 - Remember to add any attachments that you’d like to show during the meeting (proposals, reference documents, powerpoints, etc.) to the NBIC file share site (nbfileshare.org) **prior to the meeting**.
 - Note that access to the NBIC file share site is limited to committee members only.
 - ALL powerpoint attachments/presentations must be sent to the NBIC Secretary for approval prior to the meeting.
 - Contact Jonathan Ellis (nbicsecretary@nbbi.org) for any questions regarding NBIC file share access.
 - All proposals should be submitted in word with “strike through/underline” tracking.
 - Please contact me (mvance@nbbi.org) if you need any help with this.
 - Project Managers: please ensure any proposals containing text from the 2021 NBIC are updated to contain text from the 2023 NBIC.
 - If you’d like to open a new Interpretation or Action Item, do so through the National Board Business Center.
 - Anyone, member or not, can open a new item.
 - There is a tutorial for submitting NBIC requests on the NBIC tab of the Business Center. The link is under the NBIC Requests section. If there are any other tutorials you think would be helpful, please let us know and we can do our best to add more.
 - As a reminder, anyone who would like to become a member of a subgroup or committee:
 - Should attend at least two meetings prior to being put on the agenda for membership consideration. The nominee will be on the agenda for voting during their third meeting, and they would become a voting member during their fourth meeting.
 - The nominee must submit the formal request along with their resume to the NBIC Secretary (nbicsecretary@nbbi.org) **PRIOR TO** the meeting.
 - If needed, we can also create a ballot for voting on a new member between meetings.
 - Thank you to everyone who registered online for this meeting. The online registration is helpful for ensuring we have the most up-to-date contact information and for planning our reception, meals, room setup, etc. Please continue to use the online registration for each meeting, whether you are attending in person or remotely.
- If you did not register and you are here in person, please do this now so we have an accurate count for the reception on Wednesday and breakfast and lunch on Thursday.**
- The hotel has highly recommended that you make reservations for meals, especially for the hotel’s restaurants. They recommend using the OpenTable app for this.

Interpretation No. 24-14

Subject/Title: 2015 NBIC Clearances for tube replacement

Statement of Need

The 2015 NBIC Part 1, 2.3.3 a) states boiler installations must allow for maintenance. 2.3.3 b) specifically states installations must allow for removal and installation of tubes. Units are being installed with ducts, structural braces, etc. obstructing the area needed to replace economizer tubes.

Background Information

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. Note: Alternative clearances in accordance with the manufacturer's recommendations are subject to acceptance by the Jurisdiction. b) Boilers shall be installed to allow for removal and installation of tubes. c) Boilers with a top-opening manhole shall have at least 84 in. (2135 mm) of unobstructed clearance above the manhole to the ceiling of the equipment room. d) Boilers without top-opening manholes shall have at least 36 in. (915 mm) of clearance from the top of the boiler or as recommended by the manufacturer. e) Boilers with a bottom opening used for inspection or maintenance shall have at least 12 in. (305 mm) of unobstructed clearance.

Proposed Question

Does the 2015 NBIC, Part 1, 2.3.3 a) and b) require boiler installations to keep the space unobstructed where firetubes and economizer tubes will be pulled? (i.e. no ducts or structural braces in the way that will require removal to pull the tubes.)

Proposed Reply

Yes.

Committee's Question 1

Does the 2015 NBIC, Part 1, 2.3.3 a) and b) require boiler installations to keep the space unobstructed (e.g., no ducts or structural braces in the way that will require removal to pull the tubes where ~~firetubes and economizer tubes they~~ will be ~~removed or installed~~ pulled)?

Committee's Reply 1

Yes.

Rationale

2.3.3 CLEARANCES a) Boiler installations shall allow for normal operation, maintenance, and inspections. b) Boilers shall be installed to allow for removal and installation of tubes. (Permanent or unmovable obstructions would not comply with these requirements for normal operation, maintenance, or inspections.)

SUPPLEMENT XX
INSTALLATION OF ELECTRICALLY HEATED OR GAS-FIRED JACKETED STEAM KETTLES

SXX.1 SCOPE

This supplement provides requirements and guidelines for the installation of electrically heated or gas-fired jacketed steam kettles. Jacketed steam kettles are pressure vessels with inner and outer walls subject to steam pressure.

SXX.2 GENERAL REQUIREMENTS

Electrically heated or gas-fired jacketed steam kettles shall meet all the requirements of NBIC Part 1, Section 1, Section 4, and this supplement.

SXX.3 SERVICE LIMITATIONS

No steam or water shall be withdrawn from the jacket for use external to the vessel and the operating pressure of the jacket shall not exceed 50 psi (350 kPa).

SXX.4 APPURTENANCES AND CONTROLS

The jacket shall be furnished with the following minimum appurtenances and controls

- a) a pressure gage;
- b) a water gage glass; or alternatively, for electrically heated jacketed steam kettles with immersion type heating elements, a low level warning light;
- c) a separate connection, fitted with a stop valve, for venting air or adding water to the jacket (the water may be added while the vessel is not under pressure);
- d) an electric heater control or automatic gas valve controlled by pressure or temperature to maintain the steam pressure in the jacket below the ~~safety valve~~ pressure relief device setting;
- e) a low water cutoff that will cut off the fuel to the burner or power to the electric heating element if the water in the jacket drops below the lowest permissible water level established by the manufacturer;
- f) a safety pilot control that will cut off the fuel to both the main burner and the pilot burner in case of pilot flame failure.
- g) a safety limit control that will cut off the fuel supply to prevent steam pressure from exceeding the setpoint of the pressure relief device installed on the kettle. Each control shall be constructed or limited to prevent a pressure setting above the MAWP of the kettle.

SXX.5 PRESSURE RELIEF DEVICES

The capacity of the pressure relief device in pounds of steam per hour shall be at least equal to the BTU per hour rating of the burner divided by 1,000 (646 W * hr/kg) or the kilowatt rating of the electric heating element multiplied by 3.5 (1.6 kg/hr/kW).

of both liquids and gases and be temperature compensated.

(4) The gage shall have an operating temperature range of 32°F to 250°F (0°C to 120°C) unless otherwise required by the application.

(d) Piping or tubing for pressure- or altitude-gage connections shall be of nonferrous metal when smaller than NPS 1 (DN 25).

HG-612 Thermometers/Temperature Sensors

Each hot water heating or hot water supply boiler shall have a thermometer or temperature sensor with display so located and connected that it shall be easily readable. The thermometer or sensor shall be so located that it shall at all times indicate the temperature of the water in the boiler at or near the outlet.

HG-614 Low-Water Fuel Cutoff

(a) Each automatically fired hot water heating or hot water supply boiler with heat input greater than 400,000 Btu/hr (117 kW) shall have an automatic low-water fuel cutoff that has been designed for hot water service conforming to UL 353, Standard for Limit Controls, and accepted by a nationally recognized testing agency. This device shall be so located as to automatically cut off the fuel supply when the surface of the water falls to the level established in (b) below (see [Figure HG-703.2](#)).

(b) As there is no normal waterline to be maintained in a hot water boiler, any location of the low-water fuel cutoff above the lowest safe permissible water level established by the boiler manufacturer is satisfactory.

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(c) A coil-type boiler or a watertube boiler with heat input greater than 400,000 Btu/hr (117 kW) requiring forced circulation to prevent overheating of the coils or tubes shall have a flow-sensing device installed in lieu of the low-water fuel cutoff required in (a) above to automatically cut off the fuel supply when the circulating flow is interrupted.

(d) A means shall be provided for testing the operation of the external low-water fuel cutoff without resorting to draining the entire system. Such means shall not render the device inoperable except as described as follows. If the means temporarily isolates the device from the boiler during this testing, it shall automatically return to its normal position. The connection may be so arranged that the device cannot be shut off from the boiler except by a cock placed at the device and provided with a tee or lever-handle arranged to be parallel to the pipe in which it is located when the cock is open.

(1) This system shall consist of the line, neutral, and equipment ground conductors. The control panel frame and associated control circuitry metallic enclosures shall be electrically continuous and be bonded to the equipment ground conductor.

(2) The equipment ground conductor and the neutral conductor shall be bonded together at their origin in the electrical system as required by the NEC.¹³

(3) The line side of the control circuit shall be provided with a time delay fuse sized as small as practicable.

(b) *Two-Wire Nominal 120 V System Obtained By Using an Isolation Transformer*

(1) The two-wire control circuit shall be obtained from the secondary side of an isolation transformer. One wire from the secondary of this transformer shall be electrically continuous and shall be bonded to a convenient cold water pipe. All metallic enclosures of control components shall be securely bonded to this ground

3.8.2.4 LOW-WATER FUEL CUTOFF

- a) Each automatically fired hot-water boiler shall have an automatic low-water fuel cutoff with manual reset. The low-water fuel cutoff shall be designed for hot-water service, and it shall be so located as to automatically cut off the fuel supply when the surface of the water falls to the level established in b) below.
- b) As there is no normal waterline to be maintained in a hot-water boiler, any location of the low-water fuel cutoff above the lowest safe permissible water level established by the boiler manufacturer is satisfactory.
- c) In lieu of the requirements for low-water fuel cutoffs in paragraph a), boilers requiring forced circulation to prevent overheating of the tubes, coils, or vessel, shall have an accepted flow, and/or temperature-sensing device to prevent burner operation at a flow rate inadequate to protect the boiler unit against overheating at all allowable firing rates. This safety control(s) shall shut down the burner and prevent restarting until an adequate flow is restored and shall be independent of all other controls.
- d) A means shall be provided for testing the operation of the external low-water fuel cutoff without resorting to draining the entire system. Such means shall not render the device inoperable except as follows. If the means temporarily isolates the device from the boiler during this testing, it shall automatically return to its normal position. The connection may be so arranged that the device cannot be shut off from the boiler except by a cock placed at the device and provided with a tee or lever-handle arranged to be parallel to the pipe in which it is located when the cock is open.

Title/Subject: Clarify requirements for opening drain valve

Explanation of Need: "when there is temperature on the system" is rather unclear. Please specify/clarify requirements.

Part 1, S5.6.2

S5.6.2 DRAINS

A suitable low-point drain fitted with a stop valve shall be provided in the heater or connecting piping to allow the heat transfer media to be drained out of the pressure vessel and piping when necessary. The valve may be locked in the closed position, or a blank flange may be installed downstream of the valve. ~~The valve should never be opened when there is temperature on the system.~~

Title/subject: PVHO Characteristics- review intent of list and potentially add requirement

Explanation of Need: S8.3 e) 8) seemed incomplete and out of place, so the changes shown are to correct that [now listed as e) 6) a.] Someone with PVHO experience should review the changes and review for any other changes that may be necessary.

Background Information: These changes started for editorial purposes/reviewing the use of “and/or.” The Editorial Advisory members of Part 1 reviewed editorial changes and suggested a substantive change to 8) [now 6) a.]

Part 1, S8.3 e)

- e) The following are Unique PVHO Characteristics:
- 1) Fire hazard due to oxygen-enriched environment;
 - 2) Fire hazard due to in-service hydrocarbon contamination;
 - 3) Rapid decompression hazard;
 - 4) Pressure boundary valves at PVHO penetrators
 - 5) Cleanliness of gases inside the PVHO system
 - 6) In-service life expectancy of flat disc acrylic windows in protected environments, including cylindrical windows, can be up to ~~twenty~~ 20 years with periodic inspections. Care shall be used to keep Heat, UV ultraviolet light, and solvents away as they are harmful to acrylic windows.
 - 7) Manual and/or pneumatic control systems
 - 8) ~~Heat, UV light, and solvents are harmful to acrylic windows~~

Part 1

S3.6.1 SYSTEM DESCRIPTION

The ~~Liquid-liquid Carbon-carbon Dioxide-dioxide Beverage-beverage~~ systems include the ~~Liquid-Carbon-Dioxide Storage Vessel~~ LCDSV or LCDSV (tank) and associated sub-system circuits: ~~a Liquid-liquid carbon dioxide CO₂ (CO₂) fill circuit, and associated sub-system circuits, and a pressure relief / vent line circuit.~~ The LCDSVs are vacuum-insulated pressure vessels, constructed of stainless steel, with ~~Super-Insulation~~ superinsulation wrapping between the inner pressure vessel and the outer vacuum jacket. (See Figure S3.6.1-a.) These pressure vessels are typically designed for a maximum allowable working pressure (MAWP) of either 300 psig (2,068 kPa) or 283 psig (1,951 kPa). The LCDSV comes equipped with an ASME/NB certified "UV" ~~Primary primary Relief relief Valve (PRV)~~ set at or below the MAWP of the vessel. Additionally, as recommended by the Compressed Gas Association pamphlet CGA S-1.3, ~~(Pressure Relief Device Standards Part 3 - Stationary Storage Containers For Compressed Gases),~~ a secondary ~~pressure~~ relief valve may be installed. This secondary ~~pressure~~ relief valve is beyond the scope of ASME Section VIII, Division 1 and is not required to be ASME/NB stamped and certified. This additional ~~PRV pressure relief valve~~ is typically rated no higher than 1.5 times the vessel MAWP.

Operating conditions of the system, components, and inner pressure vessel can vary causing temperatures and pressures to range from 90 psig (-56°F) to 300 psig (+2°F) {620 kPa (-49°C) to 2,068 kPa (-16°C)}. Below about 60 psig (413 kPa) in the tank, liquid CO₂ begins ~~changing to~~ transitioning into a solid phase (dry ice). If the tank becomes completely depressurized to 0 psig, temperatures inside the tank could reach -109°F (-78°C), ~~and thus create~~ (solid dry ice). When liquid CO₂ turns to solid dry ice in a completely depressurized tank, all CO₂ gas flow in the system ceases and the tank becomes nonfunctional.

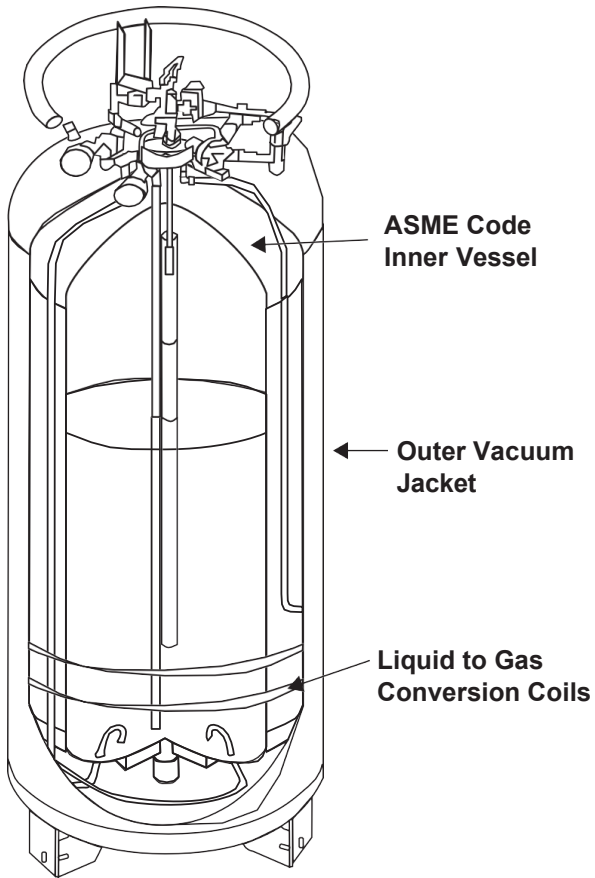
See ~~the attached Figure S3.6.1-b for a CO₂ phase diagram CO₂ Phase Diagram NBIC Part 1; Figure S3.6.1-b,~~ showing the typical operating range of these systems. Components external to the LCDSV inner tank pressure vessel may encounter pressures and temperatures between 90 psig, and -56°F, to 300 psig and +2°F, respectively {between 620 kPa, and -49°C, to 2,068 kPa and -16°C, respectively}. Typical operating pressures and temperatures vary in each of the associated sub-system circuits. (See NBIC Part 1, Table S3.6.1.)

TABLE S3.6.1
TYPICAL OPERATING PRESSURES & ~~AND~~ TEMPERATURES OF LCDSV SYSTEMS

System Component	Operating Pressure	Operating Temperature
Storage Vessel (tank internal conditions)	90 – 300 psig/ 620 – 2,068 kPa	-56°F to +2°F/ -49°C to -16°C
Liquid CO₂-CO₂ Fill Line	150 – 300 psig/ 1,034 – 2,068 kPa	-34°F to +2°F/ -36°C to -16°C
Pressure Relief Gas Vent Line	0 – 120 psig/ 0 – 827 kPa	Ambient to -50°F/ Ambient to -45°C

SUPPL. 3

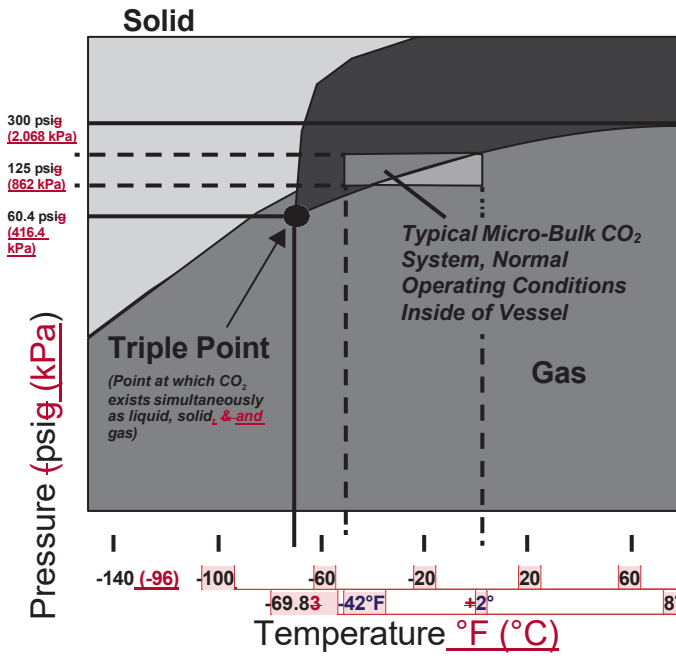
FIGURE S3.6.1-a



SUPPL. 3

FIGURE S3.6.1-b
CO₂ PHASE DIAGRAM

Commented [MV1]: Note: the comments below are the equivalent Celsius temperatures to add next to or below the Fahrenheit temps



SUPPL. 3

- Commented [MV2]:** Add -(73) to this
- Commented [MV3]:** -51
- Commented [MV4]:** -29
- Commented [MV5]:** -7
- Commented [MV6]:** 16
- Commented [MV7]:** 56.6
- Commented [MV8]:** -41
- Commented [MV9]:** 7
- Commented [MV10]:** 30

Part 1

S5.5.1 THERMAL LIQUIDS (HEAT TRANSFER FLUIDS)

~~It is extremely important that the p~~Proper heat transfer fluid shall be selected by competent personnel knowledgeable of the system. Heat transfer fluids should meet, at a minimum, the following ~~basic~~ requirements:

- a) Resist deterioration at the temperatures involved to ensure long, useful life and a clean system.
- b) Possess ~~good~~ appropriate heat transfer characteristics.
- c) Have low vapor pressures at operating temperatures to permit operation at moderate pressures. Note: processes requiring thermal fluid temperatures higher than 650°F (340°C) will require the use of specialty fluids with high vapor pressures ~~{[e.g., 150 psi (1,030 kPa)]}~~. These fluids also tend to have ~~special-specific~~ environmental, safety, and health considerations.
- d) Have low viscosities to decrease pumping losses (due to pipe friction) and the power required for circulation.
- e) Be suitable for outside temperatures involved to prevent freeze-~~u~~p unless a means of heat trace has been implemented.
- f) Meet environmental regulations.

The heat transfer fluid ~~must~~ shall be kept clean and in proper condition. The fluid manufacturer's approved laboratory shall conduct testing Tests of the fluid ~~shall be conducted perin accordance with~~ the fluid manufacturer's recommendations ~~by approved laboratories~~. Any heat transfer fluid that is added ~~must~~ shall be clean and of the proper specification.

Submitted by Gary Scribner/Michelle Vance/Jodi Metzmaier/Terrence Hellman
7/3/2024

Subject: CO₂ is heavier than air; Part 1, S3.3 c) should say "above" not "below"

Explanation of Need: CO₂ is like the foam in a beer mug flowing over—it is heavier than air. If it is below an air intake, it will go down and will not typically enter an intake above it. But if it is above an air intake, it will drop into the intake.

Background Information: Gary Scribner was the project manager on this item/supplement originally.

Item 24-68

Part 1

S3.3 FILLBOX LOCATION / SAFETY RELIEF / VENT VALVE CIRCUIT TERMINATION

Fill boxes and vent valve terminations shall be installed above grade, outdoors in an unenclosed, free airflow area. The fill connection shall be located so not to impede means of egress or the operation of sidewalk cellar entrance doors, including during the delivery process, and shall:

- a) be at least 3 ft (0.9 m) from any door or operable windows;
- b) be at least 3 ft (0.9 m) above grade;
- c) not be located within 10 ft (3 m) above, or from side to side at the same level ~~or below,~~ from of any air intakes; and
- d) not be located within 10 ft (3 m) of stairwells that go below grade.

Note: Part 2 has a parallel paragraph in S12.4 with the same proposed changes (Item 24-69).

1.6.6 VENTILATION AND COMBUSTION AIR

- a) The equipment room shall have adequate air supply to permit clean, safe combustion, minimize soot formation, and maintain a minimum of 19.5% oxygen in the air of the equipment room and sufficient to maintain ambient temperatures as recommended by the boiler, heater, or vessel manufacturer. The combustion and ventilation air should be supplied by either an unobstructed air opening or by power ventilation or fans.
- b) When combustion air is supplied to the boiler, heater, or vessel by an independent duct, with or without the employment of power ventilators or fans, the duct shall be sized and installed in accordance with the manufacturer's recommendations. However, ventilation for the equipment room must still be considered.
- c) Unobstructed air openings shall be sized on the basis of the manufacturer's recommendations, or as specified by the NFPA standards for oil and gas burning installations for the particular job conditions, or 1 in.² (650 mm²) free area per 2000 Btu/hr (586 W) maximum fuel input of the combined burners located in the equipment room. The equipment room supply openings shall be kept clear at all times.
- d) Power ventilators or fans shall be sized on the basis of 0.2 cfm (0.0057 m³/min) for each 1000 Btu/hr (293 W) of maximum fuel input for the combined burners of all boilers and heaters located in the equipment room. Additional capacity may be required for other fuel burning equipment in the equipment room.
- e) When power ventilators or fans are used to supply combustion air, they shall be installed with interlock devices so that burners will not operate without an adequate number of ventilators/fans in operation.
- f) The size of openings specified in c) above may be reduced when special engineered air supply systems approved by the Jurisdiction are used.
- g) Care should be taken to ensure that steam, water and fluid lines are not routed across combustion air openings, where freezing may occur.

h) Air intakes for sealed combustion systems shall be installed in accordance with the manufacturer's recommendations. For additional requirements regarding condensing boilers, see S6.5.