



*THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS*

NATIONAL BOARD INSPECTION CODE SUBCOMMITTEE INSTALLATION

AGENDA

Meeting of January 19th, 2022
San Diego, CA

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

1. Call to Order

8:00 AM Pacific Time. For those attending in person, the meeting will be held in Riviera on the third floor of the hotel.

2. Introduction of Members and Visitors

3. Check for a Quorum

4. Awards/Special Recognition

5. Announcements

- This will be Ms. Jeanne Bock's last meeting as secretary for Subgroup and Subcommittee Installation, as she has accepted a new position at the National Board. Ms. Michelle Vance will be taking over as secretary for both committees.
- The National Board will be hosting a reception on Wednesday evening from 5:30pm to 7:30pm at The Smoking Gun.
- The National Board will be hosting breakfast and lunch on Thursday. Breakfast will be served from 7:00am to 8:00am, and lunch will be served from 11:30am to 12:30pm. Both meals will be served at the hotel in Le Fontainebleau.
- A coffee station will be provided outside of the meeting rooms on each floor.

6. Adoption of the Agenda

7. Approval of the Minutes of the July 14th, 2021 Meeting

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

8. Review of Rosters (See [Attachment Page 1](#))

a. Membership Nominations

b. Membership Reappointments

- i. Mr. William Anderson and Mr. Ron Spiker have memberships to the subgroup that are set to expire before the July 2022 NBIC meetings.

c. Officer Appointments

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)
- 17-119 – 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.
- 19-83 – Address Alternate Pressure Relief Valve Mounting Permitted by ASME CC2887-1 – D. Marek (PM)
- 21-52 – Incorrect paragraph reference at end of Part 4 2.5.3 a) and Part 1 4.5.3 a)

10. Interpretations

There are no Part 1 interpretation requests to address.

11. Action Items

Item Number: NB11-1901	NBIC Location: Part 1	Attachment Pages 2-9
General Description: Add guidance for the safe installation of high pressure composite pressure vessels operating in close proximity to the public		
Subgroup: FRP		
Task Group: R. Smith (PM), M. Richards, S. Konopacki, D. Patten and E. Wiggins		
July 2021 Meeting Action: Proposal – Mr. Shelley presented a summary and stated that the revised proposal that incorporates Mr. Smith's comments and making it in line with the revisions to Section X has passed FRP. There was a motion to send the proposal to letter ballot to the SG, then to SC and to Part 4. The motion was unanimously approved.		
Update: The proposal was balloted to both Subcommittee Installation and Subcommittee PRD. The Installation ballot passed with no comments, and the PRD ballot passed with three disapproval votes. In his response to those votes, the project manager Mr. Rex Smith stated that he would review the comments to see if any adjustments needed to be made to the proposal.		

Item Number: 20-27	NBIC Location: Part 1, 1.6.9 & S6.3	Attachment Pages 10-18
General Description: Carbon Monoxide Detector/Alarm NBIC 2019		
Subgroup: SG Installation		
Task Group: E. Wiggins (PM), G. Tompkins , R. Spiker, R. Smith, 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?		
July 2021 Meeting Action: Proposal – The (PM) moved to E. Wiggins from G. Tompkins. In the January 2021 MC meeting after discussion, Ms. Wadkinson agreed to rescind the original motion of closing this item if Mr. Troutt and Mr. Newton agreed to help the task group develop a proposal. Mr. Troutt presented his proposal giving his concerns\importance of this item. The SC held extensive discussions on the proposal. There was a motion to send the proposal to letter ballot to the SG, then to SC and then to MC. The motion was unanimously approved.		
Update: The proposal was balloted to the subgroup and received several disapproval votes.		

Item Number: 20-33	NBIC Location: Part 1	No Attachment
General Description: Flow or Temp Sensing Devices forced Circulation Boilers Subgroup: SG Installation Task Group: M. Downs (PM), D. Patten, M. Wadkinson Explanation of Need: Incorporation of applicable CSD-1 requirements. July 2021 Meeting Action: Progress Report – The TG reported they were not able to hold discussions on this item prior to this meeting. A break-out session was held in the SG meeting to further discuss this item. The TG will continue to work on this item to have a proposal by the January 2022 meeting.		

Item Number: 20-34	NBIC Location: Part 1	Attachment Pages 19-33
General Description: Venting of gas train components Subgroup: SG Installation Task Group: P. Jennings (PM), M. Washington, R. Adams Explanation of Need: Incorporation of applicable CSD-1 requirements. July 2021 Meeting Action: Proposal – P. Jennings presented a proposal. The SG & SC held discussions on the proposal. There was a motion to approve this proposal to be sent to Letter Ballot to the SG, then to the SC with a Review and Comment for MC. The motion was unanimously approved. Update: The proposal was balloted to the subgroup and received several disapproval votes.		

Item Number: 20-39	NBIC Location: Part 1	No Attachment
General Description: Modular Boilers Subgroup: SG Installation Task Group: T. Clark (PM), M. Downs, M. Wadkinson, D. Patten, R. Austin Explanation of Need: Incorporation of applicable CSD-1 requirements. July 2021 Meeting Action: Progress Report – T. Clark presented an overview on this item. It was stated that the Section IV 2021 Edition has been restructured on Modular Boilers. Tom will review and have a proposal for the next meeting in January 2022.		

Item Number: 20-41	NBIC Location: Part 1	Attachment Page 34
<p>General Description: Safety and Safety Relief Valves for Steam and Hot Water Heating Boilers.</p> <p>Subgroup: SG Installation</p> <p>Task Group: E. Wiggins (PM), J. Brockman, G. Tompkins</p> <p>Explanation of Need: Incorporation of applicable CSD-1 requirements.</p> <p>July 2021 Meeting Action: Proposal – The SG and SC reviewed the proposal and agrees with PRD’s comments\changes. There was a motion to approve to Letter Ballot to the SG, then to SC and to PRD for vote. The motion was unanimously approved.</p> <p>Update: This item was approved by Subgroup Installation and Subgroup PRD. It is currently being balloted to Subcommittee Installation and Subcommittee PRD.</p>		

Item Number: 20-43	NBIC Location: Part 1	Attachment Page 35
<p>General Description: Safety Relief valve for Hot Water Supply Boilers</p> <p>Subgroup: SG Installation</p> <p>Task Group: W. Anderson (PM), E. Wiggins, J. Brockman</p> <p>Explanation of Need: Incorporation of applicable CSD-1 requirements.</p> <p>July 2021 Meeting Action: Proposal - The SG and SC reviewed the proposal and agrees with PRD’s comments\changes. There was a motion to approve to Letter Ballot to the SG, then to SC and to PRD for vote. The motion was unanimously approved.</p> <p>Update: The item was balloted to subgroups Installation and PRD and was approved by both groups. It is currently being balloted to the Installation and PRD subcommittees.</p>		

Item Number: 20-44	NBIC Location: Part 1	Attachment Page 36
<p>General Description: CW Vacuum Boilers</p> <p>Subgroup: SG Installation</p> <p>Task Group: R. Spiker (PM), M. Washington, and M. Byrum</p> <p>Explanation of Need: Incorporation of applicable CSD-1 requirements.</p> <p>July 2021 Meeting Action: Proposal – The SG and SC held discussions to revise the proposal and then agreed that this should be sent out as a Letter Ballot for review and comment to the SG, then to the SC. There was a motion to LB to the SG then to the SC. The motion was unanimously approved.</p> <p>Update: The proposal is currently being balloted to Subcommittee Installation.</p>		

Item Number: 20-62	NBIC Location: Part 1, 1.4.5.1	No Attachment
General Description: Update the National Board Boiler Installation Report		
Subgroup: SG Installation		
Task Group: T. Clark (PM), E. Wiggins, R. Spiker, T. Creacy, P. Jennings, G. Tompkins, and D. Patten.		
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.		
July 2021 Meeting Action: Progress Report – T. Clark presented a summary of follow-up survey results that has been completed on this item. He will continue to gather additional information to support the applicable updating of the report form.		

Item Number: 20-86	NBIC Location: Part 1, 2.10.1 a)	Attachment Page 37
General Description: Testing and Acceptance: Boiling-out Procedure		
Subgroup: SG Installation		
Task Group: 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.		
July 2021 Meeting Action: Progress Report – The SG & SC held discussions on this item with sharing additional attachment information. M. Wadkinson suggested doing this as a supplement and to include Part 2 and Part 3. The TG will look over the attachment with hopes of having a proposal by the next meeting in January 2022.		

12. New Items:

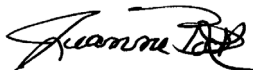
Item Number: 21-55	NBIC Location: Part 1, 3.7.5.1 b)	Attachment Page 38
General Description:		
Subgroup: SG Installation		
Task Group: None assigned.		
Explanation of Need: The inquirer manufactures a packaged pool heating system that uses a water-to-water heat exchanger to isolate the water boiler from the pool heating system loop. They do not provide stop valves between the boiler and the heat exchanger. Even though the boiler can be drained and serviced without draining or disturbing the primary system, they are told that NBIC Part 1, 3.7.5.1 mandates that isolation valves be installed on the boiler. This is a non-value-added expense to change the package design and rework existing installations. This has no impact on safety and is also consistent with the conditions and exemptions currently in 3.7.5.1 b and provides a needed clarification to the existing language.		
January 2022 Meeting Action:		

13. Future Meetings

- July 2022 – TBD
- January 2023 – TBD

14. Adjournment

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Jeanne Bock". The signature is stylized with a large, sweeping initial "J" and a distinct "B".

Jeanne Bock
NBIC Part 1 Secretary

Wadkinson	Melissa	Manufacturers	Chair	07/30/2024	Details
Wiggins	Edward	Jurisdictional Authorities	Vice Chair	07/30/2023	Details
Bock	Jeanne		Secretary	01/30/2099	Details
Vance	Michelle		Secretary	12/30/2099	Details
Austin	Randall	Users	Member	10/30/2022	Details
Brockman	Joe	Authorized Inspection Agencies	Member	07/30/2023	Details
Creacy	Todd	Authorized Inspection Agencies	Member	01/30/2024	Details
Downs	James	Manufacturers	Member	10/30/2022	Details
Jennings	Patrick	Authorized Inspection Agencies	Member	07/30/2024	Details
Konopacki	Stanley	Users	Member	01/30/2023	Details
Patten	Don	Manufacturers	Member	01/30/2023	Details
Richards	H. Michael	General Interest	Member	07/30/2024	Details
Smith	Rex	Authorized Inspection Agencies	Member	01/30/2023	Details
Spiker	Ronald	Jurisdictional Authorities	Member	07/30/2024	Details
Washington	Milton	Jurisdictional Authorities	Member	01/30/2023	Details

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 compressed natural gas fluids shall comply with NFPA 52. The location of vessels containing hydrogen or other 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 or NFPA 52, as appropriate.

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, NFPA 52, 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*

Supplement 10

Installation of Carbon Monoxide Detectors in Boiler Rooms

S10.1 Scope

This supplement provides guidelines for the installation of carbon monoxide (CO) detectors/alarms in fuel fired equipment rooms.

Carbon Monoxide (CO) is a poisonoustoxic, colorless, odorless and tasteless gas that can cause injury and even death if not detected. Statistics show about 400 deaths and 10,000 hospitalizations each year from non-fire related CO incidents. High levels of CO can be an indication of poor combustion leading to inefficient operation resulting in increased fuel usage and emissions or improperly installed or corroded flue piping.

All boiler mechanical rooms containing one or more boilers and/or pressure vessels from which carbon monoxide can be produced should be equipped with a carbon monoxide detector that can meet the criteria below.

S10.2 General Requirements for Installation of Carbon Monoxide Detector

It is recommended a carbon monoxide detector and any PRI that can produce CO should be interlocked to stop the production of CO by disabling all equipment capable of producing CO in the space the equipment is installed.

(a) (C) The CO Detector should be interlocked to disable all PRI's capable of producing CO in the space the PRI is installed when the detector trips.

(A)CO Detectors without remote monitoring in the space where CO is capable of being produced.

(1) The CO Detector should be of the manual reset type

(2) The CO Detector should set to alarm and trip at 50 PPM. [JE1]

(B) CO Detectors provided with remote monitoring in the space where CO is capable of being produced.

(1) The CO Detector should be of the manual reset type.

(2) The CO Detector should be set to alarm at 50 PPM

(3) The CO Detector should set to trip at 200 PPM. [JE2]

(c) When the CO Detector trips in (a) or (b) above, the detector should be interlocked with all PRI's installed in the space to secure the PRI's, thus stopping the production of CO.

(d) The carbon monoxide detector should be calibrated in accordance with the manufacturer's recommendations or every eighteen months after installation of the detector. A record of calibration should be identified on the CO Detector.

Initial installation and calibration should be performed in accordance with the manufacturers requirements. Subsequent inspections should be performed in accordance with recognized industry or regulatory standards.

KEY EXCERPTS FROM NFPA 720

- 5.8.5.3.3 Carbon Monoxide detectors shall be marked in accordance with their listing. Detector thresholds shall be set to respond at the levels specified by ANSI/UL2034, Standard for Single and Multiple Station Monoxide Alarms.
- 5.8.5.3.4 All carbon monoxide detectors shall be located and mounted so that accidental operation will not be caused by jarring or vibration.
- 5.8.5.3.5 The location of carbon monoxide detectors shall be based on an evaluation of potential ambient sources and flows of carbon monoxide, moisture, temperature, dust, or fumes and of electrical influences to minimize nuisance alarms [72: 17.7.1.9]
- 5.8.5.3.6 The selection and placement of [carbon monoxide] detectors shall take into account both the performance characteristics of the detector and the areas into which the detectors are to be installed to prevent nuisance and unintentional alarms or improper operation after installation [72: 17.7.1.7]

Single and Multiple Station Carbon Monoxide Alarms

UL 2034

1 Scope

1.1 These requirements cover electrically operated single and multiple station carbon monoxide (CO) alarms intended for protection in ordinary indoor locations of dwelling units, including recreational vehicles, mobile homes, and recreational boats with enclosed accommodation spaces and cockpit areas.

SECTION 915 CARBON MONOXIDE DETECTION

[F]915.1 General.

CDP

Carbon monoxide detection shall be installed in new buildings in accordance with [Sections 915.1.1](#) through [915.6](#). Carbon monoxide detection shall be installed in existing buildings in accordance with [Chapter 11](#) of the *International Fire Code*.

[F]915.1.1 Where required.

Carbon monoxide detection shall be provided in Group I-1, I-2, I-4 and R occupancies and in classrooms in Group E occupancies in the locations specified in [Section 915.2](#) where any of the conditions in [Sections 915.1.2](#) through [915.1.6](#) exist.

[F]915.1.2 Fuel-burning appliances and fuel-burning fireplaces.

Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms that contain a fuel-burning appliance or a fuel-burning fireplace.

[F]915.1.3 Fuel burning, forced-air furnaces.

Carbon monoxide detection shall be provided in dwelling units, sleeping units and classrooms served by a fuel-burning, forced-air furnace.

Exception: Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms if a carbon monoxide detector is provided in the first room or area served by each main duct leaving the furnace, and the carbon monoxide alarm signals are automatically transmitted to an approved location.

[F]915.1.4 Fuel-burning appliances outside of dwelling units, sleeping units and classrooms.

Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms located in buildings that contain fuel-burning appliances or fuel-burning fireplaces.

Exceptions:

1. Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms without communicating openings between the fuel-burning appliance or fuel-burning fireplace and the *dwelling unit*, *sleeping unit* or classroom.
2. Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms where a carbon monoxide detector is provided in one of the following locations:
 - 2.1. In an *approved* location between the fuel-burning appliance or fuel-burning fireplace and the *dwelling unit*, *sleeping unit* or classroom.
 - 2.2. On the ceiling of the room containing the fuel-burning appliance or fuel-burning fireplace.

[F]915.1.5 Private garages.

Carbon monoxide detection shall be provided in *dwelling units*, *sleeping units* and classrooms in buildings with attached *private garages*.

Exceptions:

1. Carbon monoxide detection shall not be required in dwelling units, sleeping units and classrooms without communicating openings between the *private garage* and the *dwelling unit*, *sleeping unit* or classroom.
2. Carbon monoxide detection shall not be required in *dwelling units*, *sleeping units* and classrooms located more than one *story* above or below a *private garage*.
3. Carbon monoxide detection shall not be required where the *private garage* connects to the building through an *open-ended corridor*.
4. Where a carbon monoxide detector is provided in an *approved* location between openings to a *private garage* and *dwelling units*, *sleeping units* or classrooms.

[F]915.1.6Exempt garages.

For determining compliance with [Section 915.1.5](#), an *open parking garage* complying with [Section 406.5](#) or an enclosed parking garage complying with [Section 406.6](#) shall not be considered a *private garage*.

[F]915.2Locations.

Where required by [Section 915.1.1](#), carbon monoxide detection shall be installed in the locations specified in [Sections 915.2.1](#) through [915.2.3](#).

[F]915.2.1Dwelling units.

Carbon monoxide detection shall be installed in *dwelling units* outside of each separate sleeping area in the immediate vicinity of the bedrooms. Where a fuel-burning appliance is located within a bedroom or its attached bathroom, carbon monoxide detection shall be installed within the bedroom.

[F]915.2.2Sleeping units.

CDP

Carbon monoxide detection shall be installed in *sleeping units*.

Exception: Carbon monoxide detection shall be allowed to be installed outside of each separate sleeping area in the immediate vicinity of the *sleeping unit* where the *sleeping unit* or its attached bathroom does not contain a fuel-burning appliance and is not served by a forced air furnace.

[F]915.2.3Group E occupancies.

Carbon monoxide detectors shall be installed in classrooms in Group E occupancies. Carbon monoxide alarm signals shall be automatically transmitted to an on-site location that is staffed by school personnel.

Exception: Carbon monoxide alarm signals shall not be required to be automatically transmitted to an on-site location that is staffed by school personnel in Group E occupancies with an *occupant load* of 30 or less.

[F]915.3Carbon monoxide detection.

Carbon monoxide detection required by [Sections 915.1](#) through [915.2.3](#) shall be provided by carbon monoxide alarms complying with [Section 915.4](#) or carbon monoxide detection systems complying with [Section 915.5](#).

[F]915.4Carbon monoxide alarms.

Carbon monoxide alarms shall comply with [Sections 915.4.1](#) through [915.4.4](#).

[F]915.4.1Power source.

Carbon monoxide alarms shall receive their primary power from the building wiring where such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than that required for overcurrent protection.

Exception: Where installed in buildings without commercial power, battery-powered carbon monoxide alarms shall be an acceptable alternative.

[F]915.4.2Listings.

Carbon monoxide alarms shall be listed in accordance with [UL 2034](#).

[F]915.4.3Locations.

Carbon monoxide alarms shall only be installed in *dwelling units* and in *sleeping units*. They shall not be installed in locations where the code requires carbon monoxide detectors to be used.

[F]915.4.4Combination alarms.

Combination carbon monoxide/smoke alarms shall be an acceptable alternative to carbon monoxide alarms. Combination carbon monoxide/smoke alarms shall be listed in accordance with [UL 217](#) and [UL 2034](#).

[F]915.5Carbon monoxide detection systems.

CDP

Carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide alarms and shall comply with [Sections 915.5.1](#) through [915.5.3](#).

[F]915.5.1General.

CDP

Carbon monoxide detection systems shall comply with [NFPA 720](#). Carbon monoxide detectors shall be *listed* in accordance with [UL 2075](#).

[F]915.5.2Locations.

CDP

Carbon monoxide detectors shall be installed in the locations specified in [Section 915.2](#). These locations supersede the locations specified in [NFPA 720](#).

[F]915.5.3Combination detectors.

CDP

Combination carbon monoxide/smoke detectors installed in carbon monoxide detection systems shall be an acceptable alternative to carbon monoxide detectors, provided that they are listed in accordance with [UL 268](#) and [UL 2075](#).

[F]915.6Maintenance.

Carbon monoxide alarms and carbon monoxide detection systems shall be maintained in accordance with the [International Fire Code](#).

Carbon Monoxide Poisoning

Carbon monoxide (CO) is a poisonous, colorless, odorless and tasteless gas. Although it has no detectable odor, CO is often mixed with other gases that do have an odor. So, you can inhale carbon monoxide right along with gases that you can smell and not even know that CO is present.

CO is a common industrial hazard resulting from the incomplete burning of material containing carbon such as natural gas, gasoline, kerosene, oil, propane, coal, or wood. Forges, blast furnaces and coke ovens produce CO, but one of the most common sources of exposure in the workplace is the internal combustion engine.

How does CO harm you?

Carbon monoxide is harmful when breathed because it displaces oxygen in the blood and deprives the heart, brain and other vital organs of oxygen. Large amounts of CO can overcome you in minutes without warning — causing you to lose consciousness and suffocate.

Besides tightness across the chest, initial symptoms of CO poisoning may include headache, fatigue, dizziness, drowsiness, or nausea. Sudden chest pain may occur in people with angina. During prolonged or high exposures, symptoms may worsen and include vomiting, confusion and collapse in addition to loss of consciousness and muscle weakness. Symptoms can vary widely from person to person. CO poisoning may occur sooner in those most susceptible: young children, the elderly, people with lung or heart disease, people at high altitudes, or those who already have elevated CO blood levels, such as smokers. Also, CO poisoning poses a special risk to fetuses.

CO poisoning can be reversed if caught in time. But even if you recover, acute poisoning may result in permanent damage to the parts of your body that require a lot of oxygen such as the heart and brain. Significant reproductive risk is also linked to CO.

Who is at risk?

You may be exposed to harmful levels of CO in boiler rooms, warehouses, petroleum refineries, pulp and paper production, and steel production; around docks, blast furnaces, or coke ovens; or in one of the following occupations:

- Welder
- Garage mechanic
- Firefighter
- Carbon-black maker
- Organic chemical synthesizer
- Metal oxide reducer
- Longshore worker
- Diesel engine operator
- Forklift operator
- Marine terminal worker
- Toll booth or tunnel attendant
- Customs inspector
- Police officer
- Taxi driver

What can you do if you suspect that someone has been poisoned with CO?

When you suspect CO poisoning, promptly taking the following actions can save lives:

- Move the victim immediately to fresh air in an open area.
- Call 911 or another local emergency number for medical attention or assistance.
- Administer 100 percent oxygen using a tight-fitting mask if the victim is breathing.

- Administer cardiopulmonary resuscitation if the victim has stopped breathing.

Warning: You may be exposed to fatal levels of CO poisoning in a rescue attempt. Rescuers should be skilled at performing recovery operations and using recovery equipment. Employers should make sure that rescuers are not exposed to dangerous CO levels when performing rescue operations.

How can employers help prevent CO poisoning?

To reduce the chances of CO poisoning in the workplace, employers should take the following actions:

- Install an effective ventilation system that will remove CO from work areas.
- Maintain equipment and appliances (e.g., water heaters, space heaters, cooking ranges) that can produce CO in good working order to promote their safe operation and to reduce CO formation.
- Consider switching from gasoline-powered equipment to equipment powered by electricity, batteries, or compressed air if it can be used safely.
- Prohibit the use of gasoline-powered engines or tools in poorly ventilated areas.
- Provide personal CO monitors with audible alarms if potential exposure to CO exists.
- Test air regularly in areas where CO may be present, including confined spaces. See Title 29 of the Code of Federal Regulations (CFR) 1910.146.
- Use a full-facepiece pressure-demand self-contained breathing apparatus (SCBA) certified by the National Institute for Occupational Safety and Health (NIOSH), or a combination full-facepiece pressure demand supplied-air respirator with auxiliary self-contained air supply in areas with high CO concentrations, i.e., those with immediately dangerous to life and health atmospheres. (See 29 CFR 1910.134.)
- Use respirators with appropriate canisters, in conjunction with personal CO monitoring, for short periods under certain circumstances where CO levels are not exceedingly high.
- Educate workers about the sources and conditions that may result in CO poisoning as well as the symptoms and control of CO exposure.

In addition, if your employees are working in confined spaces where the presence of CO is suspected, you must ensure that workers test for oxygen sufficiency before entering.

What can employees do to help prevent CO poisoning?

Employees should do the following to reduce the chances of CO poisoning in the workplace:

- Report any situation to your employer that might cause CO to accumulate.
- Be alert to ventilation problems — especially in enclosed areas where gases of burning fuels may be released.
- Report promptly complaints of dizziness, drowsiness, or nausea.
- Avoid overexertion if you suspect CO poisoning and leave the contaminated area.
- Tell your doctor that you may have been exposed to CO if you get sick.
- Avoid the use of gas-powered engines, such as those in powered washers as well as heaters and forklifts, while working in enclosed spaces.

What are the OSHA standards for CO exposure?

- The OSHA PEL for CO is 50 parts per million (ppm). OSHA standards prohibit worker exposure to more than 50 parts of CO gas per million parts of air averaged during an 8-hour time period.
- The 8-hour PEL for CO in maritime operations is also 50 ppm. Maritime workers, however, must be removed from exposure if the CO concentration in the atmosphere exceeds 100 ppm. The peak CO level for employees engaged in Ro-Ro operations (roll-on roll-off operations during cargo loading and unloading) is 200 ppm.

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.

- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For additional information, see OSHA's Workers page (www.osha.gov/workers).

How to Contact OSHA

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to help ensure these conditions for America's working men and women by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.



U.S. Department of Labor



DSG FS-3522 04/2012

ITEM 20-34, 20-35 (and 20-40) COMBINED

PROPOSED CHANGES – The following proposal is based on the comments recorded during the R&C ballot. Comments show where the changes were incorporated or felt they were already addressed. All comments are presented in the background information.

1.6.5 FUEL

All fuel systems shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations^[JP-H1], and/or industry standards, such as ASME CSD-1, ANSI Z/CSA, NFPA 85 or others, as applicable^[JP-H2]

a) Natural Gas1) 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

For gas components that are vented or bled, the following requirements apply:^[JP-H3]

- 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 manufacturer's requirements^[JP-H4] 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 -

A strainer or filter shall be installed upstream of the safetyshutoff valves.[JP-H5]

BACKGROUND INFORMATION

Comments to R&C ballot 4-22 to 05/21 2021

1) Don Patten

Committee Member:	Don Patten	Vote Date:	2021-04-29	Vote:	Approved	Uploads:	_____
Member Comment:	See below information. Something needs to be inserted in 3) Vents allowing for ventless gas components & trains. Exception: A regulator and vent limiting means combination listed as complying with ANSI Z21.80/CSA 6.22, Line Pressure Regulators, shall be permitted to be used without a vent to the outdoors. Also some gas valves and switches are certified as ventless (Siemens, Dungs, etc.).						
PM Reply:	Thank you for the comment. You are correct, there are many components that don't require vents. We already reference national standards in the opening, so perhaps an introductory statement such as the following would suffice: For gas components that are vented, the following requirements apply:						

2) Melissa Wadkinson

Committee Member:	Melissa Wadkinson	Vote Date:	2021-05-19	Vote:	Approved	Uploads:	_____
Member Comment:	I'll approve this but upon reading do we want to add some language "or in accordance with the manufacturer's instructions"?						
PM Reply:	Thank you for the comment and support. In the lead paragraph of 1.6.5, the existing words include manufacturer's recommendations. "All fuel systems shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards, such as....." Everything added regarding Natural Gas is a subset to the lead in, so I believe that it is already covered. This raises a good question however. There is no guidance on how to resolve a conflict between the NBIC and the manufacturer's recommendation however.						

3) Eddie Wiggins

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.

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Wiggins, Ed
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word of the s

4) H. Michael Richards

Committee Member:	H. Michael Richards	Vote Date:	2021-05-12	Vote:	Approved	Uploads:	_____
Member Comment:	As edited 5/12/2021						
PM Reply:	Mr. Richards, I am sorry, but I don't understand your comment.						

REVIEW – The following is the original review that led to the above.

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

<u>CSD – 1 Summary</u>	<u>NBIC – Yes/No and words.</u>	<u>Should it cover</u>
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.	<p>Following are the current wording in NBIC.</p> <p>1.4.5.1.1 Guide for Completing National Board Boiler Installation Report</p> <p>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...</p> <p>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.</p>	YES

	<p>Fuel train component requirements will be based on the standard, fuel fired and the heat input.</p> <p>2.5.2 Fuel</p> <p>See NBIC Part 1, Section 1.6.5, <i>Fuel</i>.</p> <p>2.5.3.3 and 3.5.3.3 – Controls and Heat-Generating Apparatus</p> <p>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 elements as required by a nationally or internationally recognized standard.</p> <p>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.</p> <p>c) These devices shall be installed in accordance with jurisdictional and environmental requirements, manufacturer's recommendations, and/or industry standards, as applicable.</p> <p>3.5.2 Fuel</p> <p>See NBIC Part 1, Section 1.6.5, <i>Fuel</i>.</p>	
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

<u>CSD – 1 Summary</u>	<u>NBIC – Yes/No and words.</u>	<u>Should it cover</u>
CF-130 – Filters or Strainers		

Filters or strainers are recommended in the main gas supply line.	Not mentioned.	Yes.
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CF-140 – Sediment Traps and Drips

<u>CSD – 1 Summary</u>	<u>NBIC – Yes/No and words.</u>	<u>Should it cover</u>
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

CF-150 Manually Operated Gas shutoff valves

CF-150 Manually operated gas shutoff valves	Not currently –	Yes
a) Unless provided as part of an assembly, each valve shall comply with ANSI, CSA, UL or a nationally recognized standard and be suitable	Manually operated gas shutoff valves shall be provided and comply with a national standard and a symbol.....	
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	Yes Do we want to define temporarily[RA6].

	reattached, must be attached when open.	
<p>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:</p> <ol style="list-style-type: none"> 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 reattached 180 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 	<p>Do we want to go into this level of detail?</p>	MAYBE[RA7]
<p>f) A manually operated valve shall be provided upstream from all other main gas controls to isolate the fuel train</p> <ol style="list-style-type: none"> 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 		Yes
<p>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.</p>	But only on the pilot being independent or upstream of the manual shut off valve.	Yes
<p>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.</p>	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 [RA8] 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.

CF-160 – Gas pressure Regulators[RA9]

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 144 and installed per NFPA 58		No

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 <ul style="list-style-type: none"> 1) High pressure downstream of main regulator – Switch locks out before the manifold gas pressure exceeds <ul style="list-style-type: none"> a) The boiler/burner manufacturer's specified setting b) 150% of the boiler/burner main manifold gas pressure if not specified by manufacturer 		
<ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 		

<p>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</p>		
<p>c) Low gas pressure shall function to accomplish a safety shutdown before the main manifold gas pressure is less than</p> <ol style="list-style-type: none"> 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. <p>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.</p>	<p>See CF-160</p> <p>No – Even if we do agree that switches should be included.</p>	
<p>d) Pressure test port(s) are required</p>		
<p>e) Gas-pressure switches shall be labeled and listed</p>	<p>As part of 1.6.5?</p>	
<p>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 nearest gas-pressure</p>	<p>No.</p> <p>Even in we do agree that switches should be included.</p>	

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 its 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 <ol style="list-style-type: none"> 1) $\leq 500K$, 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) $\geq 500 K$ up to 12.5 million, Two SSVs in series that may be in a single valve body. At least one shall 		

<p>incorporate a proof of closure interlock. If the two shutoff valves are in on boy, they shall be in series with independently operated shafts</p> <p>3) If there is a branch line to a second burner, either a or b following apply</p> <ul style="list-style-type: none"> a. <500K b) 1) applies b. >500K up to 12.5 million – <ul style="list-style-type: none"> 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 		
<p>c) For multiple burner units the main burner shall be equipped as follows</p> <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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. 		
<p>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</p>		
<p>e) Pilot supply line shall be equipped with at least one SSV</p>		
<p>f) SSVs labeled, listed by a national...</p>		
<p>g) SSVs shall have a shutoff time not to exceed that specified in Tables CF1-4</p>		
<p>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</p>		
<p>i) Provisions to independently test each SSV for seal leakage. Any special</p>		

equipment made available to boiler/burner mfgr.		
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CF-190 – Vent, Bleed, Gas-pressure relief, vent valve, and feedback LINES for fuel train components.

<p>a) <i>Vent Lines</i></p> <ol style="list-style-type: none"> 1) Regulators, combination controls, pressure interlock switches and all components requiring atmosphere air 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). 	<p>Yes. Maybe combine all into one paragraph.[RA10]</p> <p>Vent or bleed lines coming from gas equipment such as regulators, controls, etc. shall be vented outside to a safe point of discharge. Sizing of vents, manifolding etc. should be per the applicable accepted standard.</p> <p>Vent to safe point of discharge per the standard or the AHJ.</p>	
<p>b) <i>Bleed lines</i></p> <ol style="list-style-type: none"> 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). 		
<p>c) <i>Components with Vent Limiters.</i> 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</p>		

<p>d) Gas-pressure relief lines</p> <ol style="list-style-type: none"> 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). 		
<p>e) <i>Lines from vent valves</i></p> <ol style="list-style-type: none"> 1) A vent valve, if installed shall be piped outdoors to a safe point of discharge as determined by the AHJ 2) Vent line shall be \geq 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). 		
<p>f) <i>Manifolding of Lines</i></p> <p>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</p> <ol style="list-style-type: none"> 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 		
<p>g) <i>Connecting lines to Flue Passages</i></p> <p>No vent lines of any type shall connect to a boiler's flue passages</p>		

<p><i>h) Points of discharge: Outdoor requirements, special exceptions, and prohibited practices</i></p> <ol style="list-style-type: none"> 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 		
<p><i>i) Clearance for Points of Discharge</i></p> <p>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.</p>		
<p><i>j) Burner tips</i></p> <ol style="list-style-type: none"> 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 documentation 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. 		

<p>k) <i>Feedback Lines for Fuel Train components</i></p> <p>Feedback lines – Piped per manufacturer's instructions</p>		
<p>l) <i>Bleed, Vent, and Relief lines</i></p> <p>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.</p>		

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.

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

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

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

NBIC Part 4 2019 Edition

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

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

Item Number: 20-43

ASME CSD-1 2018 Edition

CW-510 Requirements for Hot-Water Supply Boilers

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

Part 1, 2019 Ed.

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

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:

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

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

References:

CSD-1 CW-700

CW 710

ASME Sec IV Mandatory Appendix 5 Vacuum Boilers

5-300 Design Parameters and 5-600 Instruments, Fittings and Controls

NBIC Item # 20-86

NBIC Location: Part 1, 2.10.1 a) Testing and Acceptance: Boil Out

Recommended Verbiage – DP 1/14/21

It is recommended that a newly installed boiler(s) be boiled out. Its internal surfaces could be fouled with oil, grease, and/or other protective coatings from the manufacturing of the boiler. Boiling out will also remove any remaining mill scale, rust, welding flux, or other foreign matter normally associated with manufacturing or shipment. All contamination needs to be removed since it lowers the heat transfer rate and could cause localized overheating.

Existing boilers that have had any tube replacement, re-rolling or other extensive repairs to the pressure parts should also be boiled out. The lubricant used for rolling tubes, plus the protective coating on the new tubes, must be removed by boiling out before the repaired boiler can be put back on the line.

There are several methods used to perform the boil out operation. The boil out chemicals that are added to the water create a highly caustic solution, which upon heating dissolves the oils and greases and takes them into solution. After the period of boil out and blowing down the boiler, the concentration is diluted enough that practically all the oils and greases and other matter have been eliminated.

For new system installed the condensate return from the system should be dumped as this piping could also contain contaminants that could result in being put back into the boiler(s). The time for this should be determined on the size of the system.

Refer to the manufacturer and/or a chemical treatment company or specialist for the recommended chemicals and procedure to follow.



January 4, 2022

Subject: NBIC Part 1, 3.7.5.1 b) – Isolation Valve Requirements

To whom it may concern:

The Lochinvar AQUAS is a factory assembled “package” that incorporates a Lochinvar boiler and a separate heat exchanger. These packages are designed to indirectly heat a swimming pool or spa.

Part HG-710 of Section IV of the ASME Boiler and Pressure Vessel code addresses the requirement for Stop Valves. Part HG-710.2 specifically addresses “Single Hot Water Heating Boilers”.

Part HG-710.2 (b) states the following: *When the boiler is located above the system and can be drained without draining the system, stop valves may be eliminated*

With an AQUAS package, the “system” is a stand-alone heat exchanger that is mounted on the skid below the level of the boiler. Therefore, Lochinvar AQUAS packages are not required to be equipped with isolation (stop) valves installed in the piping between the boiler and the heat exchanger because the boiler can be drained without draining the system (heat exchanger).

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.~~ The stop valves required in NBIC Part 1, 3.7.5.1 b) 1) may be eliminated when the boiler can be drained without draining the system. Means to allow draining the boiler without emptying the system may include installation of the boiler above the system or isolation of the boiler from the system by equipment.

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.