

Date Distributed: January 30, 2015



**THE
NATIONAL
BOARD**
OF BOILER AND
PRESSURE VESSEL
INSPECTORS

NATIONAL BOARD SUBCOMMITTEE ON PRESSURE RELIEF DEVICES

MINUTES

Meeting of January 21, 2015
Orlando, FL

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The National Board of Boiler & Pressure Vessel Inspectors
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Columbus OH 43229
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SUBCOMMITTEE CORRESPONDENCE

1. CALL TO ORDER

The meeting was called to order at 8:00 AM on Wednesday January 22, 2015 by Chairman Sid Cammeresi.

The following members and visitors were in attendance:

Members

J. Alton Cox
Marriane Brodeur
Robert “Buddy” Dobbins
Thakor Patel
R.W. Donalson
Kevin Simmons
Brandon Nutter
Sid Cammeresi (Chair)
Adam Renaldo
Kim Beise
David McHugh
Thomas P. Beirne, P.E.

Affiliation

JAC Consulting, Inc.
International Valve & Instrument Corp.
Zurich N.A.
Farris Engineering
Pentair Valves and Controls
Pentair Valves and Controls
DuPont
Furmanite America
Praxair
Dowco Valve Co., Inc.
Allied Valve, Inc.
National Board (Subcommittee Secretary)

Members Not Present

Benjamin Anthony
Raymond McCaffrey
Denis DeMichael

State of Rhode Island
Quality Valve, Inc.
DuPont

Visitors

Dan Marek
Dave Gonzales
Josh Satterthwaite

Mainthia Technologies
Setpoint Integrated Solutions
Trisate Valves & Controls

2. ANNOUNCEMENTS

Mr. Cammeresi announced the reception for Wednesday and meals provided.

3. ADOPTION OF THE AGENDA

The agenda dated June 17, 2014 was presented. Six new action items were added to this agenda. It was moved and seconded to approve the agenda with the addition of the new action items. The motion was unanimously approved.

4. **REVIEW OF THE MINUTES**

It was moved and seconded to approve the minutes of the July 2014 meeting of the Subcommittee on Pressure Relief Devices. The motion was unanimously approved.

5. **REVIEW OF THE ROSTER**

It was noted that Mr. Cox's membership was up for renewal on 1/31/15. Mr. Cox would like to continue his membership. The membership item is included on the main committee agenda for action.

6. **PUBLIC REVIEW COMMENTS**

There were no public review comments for this meeting.

7. **INTERPRETATIONS**

There were no interpretation requests for this meeting.

8. **ACTION ITEMS**

NB11-0401 Proposed Part 4, Pressure Relief Document

Work on Part 4 continues. As a result of a detailed review of the Part 4 text within this subcommittee a number of new action items were assigned to clarify various items in the text in the existing three parts. The goal of this subcommittee is to have a final draft of Part 4 approved by this subcommittee at the July meeting. Then send the final draft out for letter ballot to the main committee and other subcommittees for review and comment. Address the comments at the January 2016 meeting then a final letter ballot to the main committee after the January 2016 meeting.

NB12-0901 Part 3, Prepare guide for repair of tank vents

Mr. Nutter reported that Mr. DeMichael received commitment from one manufacturer to join the task group and is currently in discussions with other manufacturers. Once he receives commitment from one or two other manufacturers work will commence on writing the guide.

NB13-1901 SC on PRD- Add provision to NBIC to allow partial disassembly of certain ASME Section XII valves without having to do VR.

Testing was performed on one manufacturer's valves and determined that the cleaning and disassembly for cleaning effectively did not change the set pressure once the valve was reassembled. It was determined that this manufacturer had a locking mechanism to

maintain spring compression during disassembly. More research will be done on other manufacturer's valves to see if those without locking mechanism will have the same results as those with the mechanism.

NB14-0602 Update/Improve Index in Parts 1, 2, 3

No additional progress was made on this item since the last meeting. This item will be continued to be worked in parallel with the development of the new Part 4 since many of the references will change.

NB14-0603 Part 3, 1.7.5.4i), 4.5.1b)2), 4.5.3c) Review of Records Retention Requirements

Mr. Dobbins presented a draft proposal. After receiving further direction from the subcommittee, the proposal will be revised and should have something to vote on for the next meeting.

NB15-0301 Part 3, 4.5.2 Back Pressure Testing Requirement for Owner/Users

Mr. Cox stated he is still working on a proposal with the task group members and should have something to present at the next meeting.

NB15-0302 Part 3, 5.12.3d) Review of Blowdown Requirements

A task group was formed to work on this item. Bob Donalson (PM), Thakor Patel

NB15-0303 Part 1, 4.5.1 and 5.3.1 Capacity Certification Wording for Resistance to Flow

A task group was formed to work on this item. Brandon Nutter (PM), Kevin Simmons

NB15-0304 Part 3, 5.12.3 Verification of Manufacturer's Nameplate Information

Mr. Nutter presented a draft proposal. After discussion the proposal will be revised and letter balloted before the next meeting.

NB15-0305 Part 1 Create Guidelines for Installation of Overpressure Protection by System Design

A task group was formed to work on this item. Buddy Dobbins (PM), Brandon Nutter, Adam Renaldo, Dan Marek

NB15-0306 Part 1, 2.9.2b) and 2.9.2c)2) Use of Pilot Operated Valves with Forced Flow Steam Generators

A task group was formed to work on this item. Kevin Simmons (PM), Thakor Patel

NB15-0307 Part 3 Create Guidelines for Repair of Pin Devices

A task group was formed to work on this item. David McHugh (PM), Josh Satterthwaite

NB15-0308 Part 1 Create Guidelines for Installation of Pressure Relief Devices for Organic Fluid Vaporizers

A task group was formed to work on this item. Thakor Patel (PM), Kim Beise, Buddy Dobbins

NB15-0309 Part 1, 4.5.6e), 5.3.2, 5.3.6e) Change “Should” to “May”

The subcommittee worked on a proposal to permit the use of isolation valves instead of suggest that they be used (changing “should” to “may” in some locations in the referenced paragraphs). A motion was made and seconded to accept the proposal. The motion was voted on unanimously passed. The proposal is being sent to the main committee for a vote. (See Attachment 1).

NB15-0310 Part 3, 1.7.5.4 Give Guidance as to Which Spring Chart Should be used in Repairs.

Mr. Cox made a proposal after discussion work will continue on this item.

NB15-0311 Part 1, 4.5.4b) Clarify Text for Fire Condition PRV Installation Requirements

A task group was formed to work on this item. Brandon Nutter (PM), Kim Beise, Dan Marek

NB15-0312 Part 2, 2.5.7, 2.5.8 Re-evaluate T&P Valve Inspection Requirements Based on Robert Boiko Presentation

Mr. Boiko listened in on phone conference during discussion on this item. Work will continue on this item. New task group members were added (Alton Cox, Adam Renaldo) to the current task group consisting of Buddy Dobbins (PM), Robert Boiko, Ben Anthony, and Joe Ball

NB15-0313 Part 1, 3.9.4.7 Clarify Text to Better Define Valve Outlet Area

A task group was formed to work on this item. Thakor Patel (PM), Dan Marek

NB15-0314 Part 1, 3.9.4.2 Review of Y-Base or Valveless Headers for Use in T&P Valve Installations

A task group was formed to work on this item. Buddy Dobbins (PM), David McHugh

NB15-0315 Part 1, 4.5.6, 5.3.6 Review isolation Valve Requirements

A task group was formed to work on this item. Denis DeMichael (PM), Brandon Nutter, Adam Renaldo

NB15-1004 – Parts 1, 2, and 3 Address wording of “ASME Code Symbol Stamp” vs. “Symbol” vs. “Code Symbol” vs. “Stamp” vs. “Certification

After discussion it was determined that this would be worked on in conjunction with the new Part 4.

9. NEW BUSINESS

NB15-0316 Part 3, 1.7.5.4(a) Lift assist device paragraph reference.

A proposal was made to add paragraph reference of 4.5.3 (c) to 1.7.5.4(a) to require that lift assist device qualification records be and element include in the “VR” quality manual. A motion was made and seconded to accept the proposal. The motion passed unanimously and the proposal was forwarded to the main committee for a vote. (See Attachment 2)

NB15-0317 Part 1, 5.3.1 a) Mandating capacity certification in pressure relief devices installed in piping systems.

A task group was formed to work on this item. Kim Beise (PM), Dan Marek, Dave Gonzales

NB15-0318 Part 1, 1.7.5(b) and Part 2, 2.5.2 Set pressure in multiple valve installations

A proposal was made to clarify that at least one valve must be set or below MAWP in multiple valve installations. A motion was made and seconded to accept the proposal. The motion passed unanimously and was forwarded to the main committee for a vote. (See Attachment 3)

NB15-0319 Part 2, 2.5.8 f) Add external environment as one of the items that should be considered in inspection frequency

A proposal was made to add that external environment in which the valve is installed should also be considered when determining inspection frequencies. A motion was made and seconded to accept the proposal. The motion passed unanimously and was forwarded to the main committee for a vote. (See Attachment 4).

NB15-0320 Part 2, 2.5.5.3 g) 9) Review Necessity to replace pre-torqued rupture disks after in-service inspection.

A task group was formed to work on this item. Brandon Nutter (PM)

NB15-0321 Part 2, 2.5.7 Review suggested requirements vs. mandated acceptance criteria for in-service testing

A task group was formed to work on this item. Alton Cox (PM), Adam Renaldo, Josh Satterthwaite

10. FUTURE MEETINGS

The next NBIC committee and subcommittee meetings will be held in Columbus, OH during the week of July 20, 2015. The subcommittee meeting will be on July 22, 2015.

July 20-23, 2015 Columbus, OH

11. ADJOURNMENT

The meeting adjourned at approximately 5:23 PM

Respectfully Submitted,

Thomas P. Beirne, P.E.
Secretary, NBIC Subcommittee Pressure Relief Devices

pc: D. Douin
 D. Cook
 R. Hough
 B. Besserman

Ref. Para. 4.5.6

- c) The opening in the pressure vessel wall shall be designed to provide unobstructed flow between the vessel and its pressure relief device.
- d) When two or more required pressure relief devices are placed on one connection, the inlet cross-sectional area of this connection shall be sized either to avoid restricting flow to the pressure relief devices or made at least equal to the combined inlet areas of the pressure relief devices connected to it. The flow characteristics of the upstream system shall satisfy the requirements of NBIC Part 1, 4.5.6 a).
- e) There shall be no intervening stop valves between the vessel and its pressure relief device(s), or between the pressure relief device(s) and the point of discharge, except under the following conditions:
 - 1) When these stop valves are so constructed or positively controlled that the closing of the maximum number of block valves at one time will not reduce the pressure relieving capacity below the required relieving capacity; or,
 - 2) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a pressure vessel and its pressure relief device ~~should~~ ^{may} be provided for inspection and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station.
 - 3) A full area stop valve ~~should~~ ^{may} also be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked and sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed.
 - 4) A pressure vessel in a system where the pressure originates from an outside source ~~should~~ ^{may} have a stop valve between the vessel and the pressure relief device, and this valve need not be sealed open, provided it also closes off that vessel from the source of the pressure.
 - 5) Pressure vessels designed for human occupancy (such as decompression or hyperbaric chambers) shall be provided with a quick opening stop valve between the pressure vessel and its pressure relief valve. The stop valve shall be normally sealed open with a frangible seal and be readily accessible to the pressure relief attendant.
- f) Pressure relief device discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location for disposal of fluids being relieved.
- g) Discharge lines from pressure relief devices shall be designed to facilitate drainage or be fitted with drains to prevent liquid from collecting in the discharge side of a pressure relief device. The size of discharge lines shall be such that any pressure that may exist or develop will not reduce the relieving capacity of the pressure relief device or adversely affect the operation of the pressure relief device. It shall be as short and straight as possible and arranged to avoid undue stress on the pressure relief device.
- h) Pressure relief devices shall be installed so they are readily accessible for inspection, repair, or replacement.

- 1) In certain cases piping standards permit the use of regulators, which may include integral pressure relief valves to limit the pressure in a piping system. In this case, capacity certification of the pressure relief valve is not required.
- b) Dead weight or weighted lever pressure relief devices shall not be used.
- c) Pressure relief devices shall be selected (i.e., material, pressure, etc.) and installed such that their proper functioning will not be hindered by the nature of the piping system's contents.

5.3.2 NUMBER OF DEVICES

At least one pressure relief device shall be provided for protection of a piping system. A pressure relief device installed on a pressure vessel or other component connected to the piping system ~~should~~ be used to meet this requirement. Portions of piping systems with different maximum allowable working pressures shall have a pressure relief device to protect each portion separately.

may

5.3.3 LOCATION

Pressure relief devices, except those covered by Sections 2 and 3 of this Part, may be installed at any location in the system provided the pressure in any portion of the system cannot exceed the maximum overpressure permitted by the original code of construction. Pressure drop to the pressure relief device under flowing conditions shall be considered when determining pressure relief device location. The pressure-relief device shall not be isolated from the piping system except as permitted by NBIC Part 1, 5.3.6 e).

5.3.4 CAPACITY

- a) The pressure relief device(s) shall have sufficient capacity to ensure that the piping is not exposed to pressures greater than that specified in the original code of construction.
- b) When a non-reclosing device is installed between a pressure relief valve and the pipe, the reduction in capacity due to installation of the non-reclosing device shall be determined in accordance with the code of construction by use of a National Board certified Combination Capacity Factor (CCF). For rupture disks, if a certified combination capacity factor is not available, the capacity of the pressure relief valve shall be multiplied by 0.9 and this value used as the capacity of the combination installation.
- c) The owner shall document the basis for selection of the pressure relief devices used, including capacity, and have such calculations available for review by the Jurisdiction, when required.

5.3.5 SET PRESSURE

- a) When a single pressure relief device is used, the set pressure marked on the device shall not exceed the maximum allowable working pressure, except when allowed by the original code of construction.
- b) When more than one pressure relief device is provided to obtain the required capacity, only one pressure relief device set pressure needs to be at the maximum allowable working pressure. The set pressures of the additional pressure relief devices shall be such that the pressure cannot exceed the overpressure permitted by the code of construction.

5.3.6 INLET AND DISCHARGE PIPING REQUIREMENTS

- a) The opening through all pipes and fittings between a piping system and its pressure relief device shall have at least the area of the pressure relief device inlet. The characteristics of this upstream system shall be such that the pressure drop will not reduce the relieving capacity below that required or adversely affect the operation of the pressure relief device.
- b) A non-reclosing device installed between a piping system and a pressure relief valve shall meet the requirements of NBIC Part 1, 5.3.6 a).
- c) The opening in the pipe shall be designed to provide unobstructed flow between the pipe and its pressure relief device.
- d) When two or more required pressure relief devices are placed on the connection, the inlet cross-sectional area of this connection shall be sized either to avoid restricting flow to the pressure relief devices or made at least equal to the combined inlet areas of the pressure relief devices connected to it. The flow characteristics of the upstream system shall satisfy the requirements of [NBIC Part 1, 5.3.6 a\)](#).
- e) There shall be no intervening stop valves between the piping system and its pressure relief device(s), or between the pressure relief device(s) and the point of discharge except under the following conditions:
- 1) When these stop valves are so constructed or positively controlled that the closing of the maximum number of block valves at one time will not reduce the pressure relieving capacity below the required relieving capacity;
 - 2) Upon specific acceptance of the Jurisdiction, when necessary for the continuous operation of processing equipment of such a complex nature that shutdown of any part is not feasible, a full area stop valve between a piping system and its pressure relief device ~~should~~ ^{may} be provided for inspection and repair purposes only. This stop valve shall be arranged so that it can be locked or sealed open and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station;
 - 3) A full area stop valve may be placed on the discharge side of a pressure relief device when its discharge is connected to a common header for pressure relief devices to prevent discharges from these other devices from flowing back to the first device during inspection and repair. This stop valve shall be arranged so that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there during that period of operation while the valve remains closed. The valve shall be locked or sealed in the open position before the authorized person leaves the station. This valve shall only be used when a stop valve on the inlet side of the pressure relief device is first closed; or
 - 4) A piping system where the pressure originates from an outside source ~~should~~ ^{may} have a stop valve between the system and the pressure relief device, and this valve need not be sealed open, provided it also closes off that vessel from the source of pressure.
- f) Pressure relief device discharges shall be arranged such that they are not a hazard to personnel or other equipment and, when necessary, lead to a safe location for disposal of fluids being relieved.
- g) Discharge lines from pressure relief devices shall be designed to facilitate drainage or be fitted with drains to prevent liquid from collecting in the discharge side of a pressure relief device. The size of discharge

Ref. Part 3, 1.7.5.4

The quality system shall include:

- 1) Measures to control the issuance of and revisions to the quality system manual;
- 2) Provisions for a review of the system in order to maintain the manual current with these rules and the applicable sections of the ASME Code;
- 3) The title(s) of the individual(s) responsible for control, revisions, and review of the manual;
- 4) Provision of a controlled copy of the written quality system manual to be submitted to the National Board; and
- 5) Revisions shall be submitted for acceptance by the National Board prior to being implemented.

o) Nonconformities

The system shall establish measures for the identification, documentation, evaluation, segregation, and disposition of nonconformities. A nonconformity is a condition of any material, item, product, or process in which one or more characteristics do not conform to the established requirements. These may include, but are not limited to, data discrepancies, procedural and/or documentation deficiencies, or material defects. Also, the title(s) of the individual(s) involved in this process shall be included.

p) Exhibits

Forms used in the quality system shall be included in the manual with a written description. Forms exhibited should be marked SAMPLE and completed in a manner typical of actual valve repair procedures.

q) Testing Equipment (See NBIC Part 3, Supplement 8)

The system shall include a means to control the development, addition, or modification of testing equipment to ensure the requirements of NBIC Part 3, 4.5.1(b) are met.

r) Field Repairs (See NBIC Part 3, S7.7)

and 4.5.3(c)

If field repairs are included in the scope of work, the system shall address any differences or additions to the quality system required to properly control this activity, including the following:

- 1) Provisions for annual audits of field activities shall be included;
- 2) Provisions for receipt and inspection of replacement parts, including parts received from the owner-user, shall be addressed;
- 3) If owner-user personnel will assist with repairs, provisions for the use of owner-user personnel shall be included; and
- 4) Provisions for use of owner-user measurement and test equipment, if applicable, shall be addressed.

1.8 “NR” PROGRAM REQUIREMENTS**1.8.1 SCOPE**

Minimum Liquid Temperature for Pressure Testing (deg C)	Thickness (mm) of Pressure Retaining Object ^(Note1) t
43	t > 100
Note (1) Thickest section of the pressure retaining object.	

6) Hold-time for the pressure test shall be a minimum of 10 minutes prior to examination by the Inspector. Where the test pressure exceeds the MAWP of the item, the test pressure shall be reduced to the MAWP for close examination by the Inspector. Hold-time for close examination shall be as necessary for the Inspector to conduct the examination.

b) Pneumatic Test

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

c) Nondestructive Examination

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

4.5 PRESSURE RELIEF VALVE PERFORMANCE TESTING AND TESTING EQUIPMENT

Each pressure relief valve to which the "VR" repair symbol stamp is to be applied shall be subjected to the following tests by the repair certificate holder.

4.5.1 TEST MEDIUM AND TESTING EQUIPMENT

Valves marked for steam service, or having special internal parts for steam service, shall be tested on steam. Valves marked for air, gas, or vapor service shall be tested with air or gas. Valves marked for liquid service shall be tested with water or other suitable liquid. ASME Code, Section IV hot-water valves, shall be tested on water, steam, or air.

a) Each valve shall be tested to demonstrate the following:

- 1) Set pressure (as defined by the valve manufacturer and as listed in NB-18, *Pressure Relief Device Certifications*);
- 2) Response to blowdown, when required by the original code of construction;

- 3) Seat tightness; and
 - 4) For valves designed to discharge to a closed system, the tightness of the secondary pressure zone shall be tested as required by the original code of construction.
- b) The equipment used for the performance testing prescribed above shall meet the following requirements:
- 1) The performance testing equipment shall include a pressure vessel of adequate volume and pressure source capacity to ensure compliance with NBIC Part 3, 4.5.1 a)1);
 - 2) Prior to use, all performance testing equipment shall be qualified by the certificate holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment. This qualification may be accomplished by benchmark testing, comparisons to equipment used for verification testing as specified in the quality system, or comparisons to field performance. This qualification shall be documented and provisions made to retain such documentation for a period of at least five years after the testing equipment is retired. Documentation of this qualification shall include, but not be limited to:
 - a. Schematic of the performance test equipment;
 - b. Size and pressure ranges of valves to be tested and the test fluid to be used;
 - c. Dimensions of test vessels;
 - d. Accuracy of pressure measuring equipment;
 - e. Size and design type of valves used to control flow; and
 - f. Method of qualifying.
 - 3) Prior to the implementation of any addition or modification to the testing equipment that would alter the contents of the document required in NBIC Part 3, 4.5.1(b)(2), the certificate holder shall re-qualify the performance test equipment in accordance with NBIC Part 3, 4.5.1(b)(2). If the equipment changed was used to satisfy the requirements of verification testing, the certificate holder shall notify the National Board and additional verification testing, in accordance with the quality system, may be required.

4.5.2 OWNER-USER ASME CODE SECTION VIII STEAM TESTING

When ASME Code Section VIII valves are repaired by the owner for the owner's own use, valves for steam service may be tested on air for set pressure and, if possible, blowdown adjustment, provided the valve manufacturer's corrections for differential in set pressure between steam and air are applied to the set pressure.

4.5.3 LIFT ASSIST TESTING

- a) A device may be used to apply an auxiliary lifting load on the spring of a repaired valve to establish the set pressure in lieu of the tests required in NBIC Part 3, 4.5.1a) 1) when such testing at full pressure:
- 1) may cause damage to the valve being tested; or
 - 2) is impractical when system design considerations preclude testing at full pressure.

- b) While actual valve blowdown and valve performance characteristics cannot be verified, valve set pressure may be determined to an acceptable degree of accuracy using this testing technique provided, as a minimum, that:
- 1) equipment utilized is calibrated as required in the quality system; including, but not limited to:
 - a. System pressure measurement equipment;
 - b. Lifting force measurement equipment; and
 - c. Other measuring elements required by the device manufacturer.
 - 2) the device and test procedures that have proved to give accurate results are used and followed;
 - 3) a static inlet pressure is applied with the test medium specified in NBIC Part 3, 4.5.1; and
 - 4) adjustments are made in accordance with the valve manufacturer's recommendations to ensure proper lift and blowdown.
- c) Prior to use, all lift assist devices shall be qualified by the certificate holder to ensure that the equipment and testing procedures will provide accurate results when used within the ranges established for that equipment used for verification testing as specified in the quality system or comparisons to field performance. This qualification shall be documented and provisions made to retain such documentation for a period of at least five years after the lift assist device is retired. Documentation of this qualification shall include but not be limited to:
- 1) A description of the lift assist device including model number, serial number and manufacturer
 - 2) Size and pressure ranges of valves to be tested with the lift assist device and the test fluid to be used. Note: Maximum set pressure is determined by available lift force and system pressure.
 - 3) Accuracy of pressure measuring equipment;
 - 4) Method of qualifying.
- d) After initial qualification of the device the device shall be re-qualified if:
- 1) Modifications or repairs to the device are made Which would affect test results
 - 2) The manufacturer issues a mandatory recall or modification to the device which will affect test results.

4.5.4 PRESSURE TEST OF PARTS

- a) Parts used in repaired valves shall be pressure tested and documentation provided according to the following categories:
- 1) Replacement Parts
The "VR" Certificate Holder is responsible for documentation that the appropriate pressure test has been completed as required by the original code of construction.

- 1) In certain cases piping standards permit the use of regulators, which may include integral pressure relief valves to limit the pressure in a piping system. In this case, capacity certification of the pressure relief valve is not required.
- b) Dead weight or weighted lever pressure relief devices shall not be used.
- c) Pressure relief devices shall be selected (i.e., material, pressure, etc.) and installed such that their proper functioning will not be hindered by the nature of the piping system's contents.

5.3.2 NUMBER OF DEVICES

At least one pressure relief device shall be provided for protection of a piping system. A pressure relief device installed on a pressure vessel or other component connected to the piping system should be used to meet this requirement. Portions of piping systems with different maximum allowable working pressures shall have a pressure relief device to protect each portion separately.

5.3.3 LOCATION

Pressure relief devices, except those covered by Sections 2 and 3 of this Part, may be installed at any location in the system provided the pressure in any portion of the system cannot exceed the maximum overpressure permitted by the original code of construction. Pressure drop to the pressure relief device under flowing conditions shall be considered when determining pressure relief device location. The pressure-relief device shall not be isolated from the piping system except as permitted by NBIC Part 1, 5.3.6 e).

5.3.4 CAPACITY

- a) The pressure relief device(s) shall have sufficient capacity to ensure that the piping is not exposed to pressures greater than that specified in the original code of construction.
- b) When a non-reclosing device is installed between a pressure relief valve and the pipe, the reduction in capacity due to installation of the non-reclosing device shall be determined in accordance with the code of construction by use of a National Board certified Combination Capacity Factor (CCF). For rupture disks, if a certified combination capacity factor is not available, the capacity of the pressure relief valve shall be multiplied by 0.9 and this value used as the capacity of the combination installation.
- c) The owner shall document the basis for selection of the pressure relief devices used, including capacity, and have such calculations available for review by the Jurisdiction, when required.

5.3.5 SET PRESSURE

- a) When a single pressure relief device is used, the set pressure marked on the device shall not exceed the maximum allowable working pressure, except when allowed by the original code of construction.
- b) When more than one pressure relief device is provided to obtain the required capacity, only one pressure relief device set pressure needs to be at the maximum allowable working pressure. The set pressures of the additional pressure relief devices shall be such that the pressure cannot exceed the overpressure permitted by the code of construction.

or below

overpressure of piping systems.

2.4.8.3 QUICK-DISCONNECT COUPLING

Piping connections utilizing a quick-disconnect coupling should be checked to ensure that the coupling and its holding elements are fully engaged in their intended operating position. Means should be provided that warn the operator against disengaging the coupling or prevent the opening mechanism from operating unless the piping is completely depressurized.

2.5 PRESSURE RELIEF DEVICES

2.5.1 SCOPE

- a) The most important appurtenances on any pressurized system are the pressure relief devices provided for overpressure protection of that system. These are devices such as safety valves, safety relief valves, pilot valves, and rupture disks or other non-reclosing devices that are called upon to operate and reduce an overpressure condition.
- b) These devices are not designed or intended to control the pressure in the system during normal operation. Instead, they are intended to function when normal operating controls fail or abnormal system conditions are encountered.
- c) Periodic inspection and maintenance of these important safety devices is critical to ensure their continued functioning and availability when called upon to operate. See NBIC Part 2, 2.5.8 for recommended testing frequency for PRDs.
- d) Inspection areas of concern include:
 - 1) correct set pressure;
 - 2) safety considerations;
 - 3) device data;
 - 4) condition of the device;
 - 5) condition of the installation; and
 - 6) testing and operational inspection.

When more than one pressure relief device is provided to obtain the required capacity, only one pressure relief device set pressure need be at or below the maximum allowable working pressure.

2.5.2 PRESSURE RELIEF DEVICE DATA

- a) Nameplate marking or stamping of the device should be compared to stamping on the protected pressure-retaining item. For a single device, the set pressure shall be no higher than the maximum allowable working pressure (MAWP) marked on the protected pressure-retaining item or system.
- b) ~~If multiple devices are provided, the difference between set pressures shall not exceed that permitted by the original code of construction.~~ The set pressure of additional devices may exceed the MAWP, as permit-



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ted by the original Code of Construction.

- c) Verify nameplate capacity and, if possible, compare to system capacity requirements.
- d) Check identification on seals and ensure they match nameplates or other identification (repair or reset nameplate) on the valve or device.

2.5.3 INSERVICE INSPECTION REQUIREMENTS FOR PRESSURE RELIEF DEVICE CONDITIONS

- a) Check for evidence that the valve or device is leaking or not sealing properly. Evidence of leakage through pressure-relief valves may indicate that the system is being operated at a pressure that is too close to the valve's set pressure. See NBIC Part 2, Supplement 8.
- b) Seals for adjustments should be intact and show no evidence of tampering.
- c) Connecting bolting should be tight and all bolts intact.
- d) The valve or device should be examined for deposits or material buildup.
- e) Evidence of rust or corrosion should be checked.
- f) Check for damaged or misapplied parts.
- g) If a drain hole is visible, ensure it is not clogged with debris or deposits.
- h) Check for test gages left in place after pressure testing of the unit.
- i) Bellows valves shall be checked to ensure the bonnet vent is open or piped to a safe location. The vent shall not be plugged since this will cause the valve set pressure to be high if the bellows develops a leak. Leakage noted from the vent indicates the bellows is damaged and will no longer protect the valve from the effects of back pressure.

2.5.4 INSERVICE INSPECTION REQUIREMENTS FOR PRESSURE RELIEF DEVICE INSTALLATION CONDITION

- a) Inspect inlet piping and ensure it meets the requirements of the original code of Construction. For pressure relief valves, check that the inlet pipe size is not smaller than the device inlet size.
- b) Inspect discharge piping and ensure it meets the original code of construction. Check that the discharge pipe size is not smaller than the device outlet size.
- c) Check that the valve drain piping is open.
- d) Check drainage of discharge piping.
- e) Check that inlet and discharge piping are not binding or placing excessive stress on the valve body, which can lead to distortion of the valve body and leakage or malfunction.
- f) Check the condition and adequacy of piping supports. Discharge piping should be supported independent

3) Pressure tests should be performed prior to bringing the boiler down for planned internal inspection so needed repairs or adjustments can be made while the boiler is down.

b) High-temperature hot-water boilers

Pressure test annually to verify nameplate set pressure or as determined by operating experience as verified by testing history. For safety reasons, removal and testing on a steam test bench is recommended. Such testing will avoid damaging the safety valve by discharge of a steam-water mixture, which could occur if the valve is tested in place.

c) Low-pressure steam heating boilers

Manual check quarterly; pressure test annually prior to steam heating season to verify nameplate set pressure.

d) Hot-water heating boilers

Manual check quarterly; pressure test annually prior to heating season to verify nameplate set pressure.

Note: The frequencies specified for the testing of pressure relief valves on boilers is primarily based on differences between high pressure boilers that are continuously manned, and lower pressure automatically controlled boilers that are not monitored by a boiler operator at all times. When any boiler experiences an overpressure condition such that the safety or safety relief valves actuate, the valves should be inspected for seat leakage and other damage as soon as possible and any deficiencies corrected.

e) Water heaters

Manual check every two months. Due to the relatively low cost of safety valves for this service, it is recommended that a defective valve be replaced with a new valve if a repair or resetting is indicated.

f) Pressure vessels and piping

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Frequency of test and inspection of pressure relief devices for pressure vessel and piping service is greatly dependent on the nature of the contents and operation of the system and only general recommendations can be given. Inspection frequency should be based on previous inspection history. If valves are found to be defective or damaged ~~by system contents during inspection~~, intervals should be shortened until acceptable inspection results are obtained. Where test records and/or inspection history are not available, the inspection frequencies in Table 2.5.8 are suggested.

, during inspection,

Service	Inspection Frequency
Steam	Annual
Air and clean Dry gases	Every three years
Pressure relief valves in combination with rupture disks	Every five years
Propane, refrigerant	Every five years
All others	Per inspection history

g) Establishment of inspection and test intervals

Where a recommended test frequency is not listed, the valve user and Inspector must determine and agree