NBIC Committee
Action Block

Subject Change of Service

File Number NB 08-0321
NB 08-0701
NB 08-0703

Prop. on Pg.

Proposal Part 2: Add a new Supplement 9, Requirements for Change of Service, and add a new paragraph 1.6 that includes a reference to Supplement 9
Part 1: Add a new paragraph 1.5 that makes reference to Part 2, Supplement 9
Part 3: Add a new paragraph 3.2.7 that makes reference to Part 2, Supplement 9.

Explanation Various segments of business and industry that utilize boilers and pressure vessels face issues where the functional aspects or purpose of the equipment have changed. Sometimes due to economics existing vessels are subject to new environments, usage, or different commodities. There are several standards in place that may have specific rules for specific change conditions to vessels. And some may even prohibit the operation of vessels with certain commodities. For example, NFPA 58 prohibits the use of anhydrous ammonia in vessels that have continually operated with propane, or 49 CFR prohibits using DOT railway cars in stationary service after they have served their usefulness. These may be severe or extreme cases. But there are many other situations that could cause peril that are not so obvious. And further, there is no single document that would provide advice to users of the risks associated with changing the service environment without making a thorough review or evaluation of the effects on the equipment. So, this addition to the NBIC is intended to provide that needed guidance to boiler and pressure vessel users. This supplement includes general advice, some of the criteria to be evaluated, and a few examples of what would be considered a change of service condition.

Project Manager Robert Wielgoszinski

Task Group

TG Meeting Date

Negatives

Supplement 9

Requirements for Change of Service

S9.1 Scope:

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

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

S9.2 Classification of Service Changes

S9.2.1 Service Contents

A change in service contents is considered to be any modification to the commodity or contents that the pressure retaining item was originally intended to contain when the pressure retaining item was constructed.

For example, a change:

a) From LP gas service to ammonia service.
b) From lethal to non lethal service.

S9.2.2 Service Type or Change of Usage

A change in service type is considered to be a change of how the pressure retaining item is being used.

For example, a change:

a) From above ground service to underground service for LP gas tanks.
b) From mobile or transport use to stationary use

S9.3 Factors to Consider

Before a change of service is to be made, the owner or user shall consider and evaluate the effects of the new operating conditions or environment on the existing condition and suitability for service of the

pressure retaining item. Various factors will have an impact on the reliability of the pressure retaining item in its new service environment. Changes can be successfully adopted providing there is an understanding of the effect on the pressure retaining item. However, there are some cases where changes are detrimental to the existing pressure retaining item. The owner or user should seek technical guidance of experienced personnel in appropriate areas affected by the change of service (e.g. design, metallurgy, or operations of the pressure retaining item).

The following is a listing of criteria that should be evaluated as appropriate. The criterion is not limited to that listed herein. Other factors may be considered as necessary;

1) Design Consideration:
   a) Thickness of existing vessel material
   b) Vessel or system flow rate or pressure
   c) Weight of vessel with new contents
   d) Existing or additional loads imposed on nozzles and highly stressed areas
   e) Change in pressure or temperature cycling
   f) Compliance to product or industry standards, such as ANSI K61, API 579, or NFPA 58

2) Material Consideration:
   a) Chemical and mechanical properties of existing material or any new material to be added or replaced to assure it has the required strength and toughness to withstand the pressure and temperature effects of the new environment.
   b) Effects of erosion or corrosion
   c) Time dependent effects on service life - creep or fatigue.

3) Environment
   a) Physical condition of the pressure retaining item
   b) Overpressure protection needs
   c) Regulatory environment - Verification of compliance to new or existing jurisdictional rules or regulations.

4) Operational History
   a) A review of current and past operational logs or records should be made to assure that no conditions existed where any further use would render the pressure retaining item hazardous or otherwise unsafe.
   b) Records to be obtained and reviewed would include Data Reports, Repair and Alteration Forms, Inspection reports.

5) Repairs and Alterations Made:

a) A review of any repairs, alterations, reratings, or reconfigurations that have been performed on the pressure retaining item, so as to assure that they will not have a detrimental impact on the intended use.

6) Proposed rework
   a) Any physical work to be performed to restore the material to the existing or intended state or to meet any requirements for the new operating conditions.
   b) Repairs and alterations shall be performed in accordance with NBIC, Part 3.
   c) The effects of heat applied as a result of welding or heat treatment on the material or shaped parts.
   d) The method and extent of any physical or non destructive examination should be considered.
   e) Any physical testing or pressure testing to be performed to determine of verify leak tightness or structural integrity of the pressure retaining item.
   f) The pressure retaining item shall meet the Code requirements for the new environment at the time of change.

7) Documentation
   a) Review existing records that are required to satisfy customer, user, or legal requirements.
   b) Review the need for any marking, stamping, or labeling required for the intended service.
   c) Review the need for developing or revising an inspection plan to ensure safe operation. Refer to Part 2, Section 1.5.2.1 Inspection Plan.

S9.4 Some Examples for Change of Service

The following is a typical list of examples of what constitutes a change in service and some factors to consider. Note: This list is not all inclusive. There may other service changes not mentioned.

Also, the listing of "Factors to Consider" is also not all inclusive. There may be other elements that can influence the safe and reliable operation.

The Owner shall check with the Jurisdiction where the pressure retaining item is to operate in the new environment, and review local building Codes, laws, and regulations for additional requirements or prohibitions against a change of service.

Some examples of Change of Service conditions	
Change	**Some Factors to Consider**
LP gas to ammonia	• PWHT of vessel during construction • Wet-fluorescent magnetic particle testing (WFMT) on

Some examples of Change of Service conditions	
Change	**Some Factors to Consider**
	all internal surfaces • Internal access of vessel is necessary. May need to install manhole.
Ammonia to LP gas	• NFPA-58, paragraph 5.2.1.5 should be consulted. i.e. restriction on maximum volume • Wet-fluorescent magnetic particle testing (WFMT) on all internal surfaces • Internal access of vessel is necessary. May need to install manhole. • Also see, NBIC Part 2, 2.3.6.4
LP gas service: from above ground to underground	• Requires alterations (additional nozzles). • Corrosion protection • See NFPA 58
LP gas to air receiver	• Assurance of vessel cleanliness. i.e. removal of mercaptan. • Appropriateness and number of inspection and drain openings. • Corrosion allowance
Boiler service: Steam to Hot Water	• May require replacement of smaller steam outlet nozzle with larger nozzle to accommodate condensate carryover • Change of Pressure Relief Device
Boiler Service: High Pressure to Low Pressure	• Additional controls required by the LP boiler Code • Safety valve change • Need for larger opening for safety relief valves
Sulfur dioxide service. Sweet to sour gas service.	• Concern over hydrogen cracking
Inert to Oxidizing atmosphere	• Inspection for damage mechanisms that may be present from previous service life that is detrimental to the vessel in the new environment. • Cleanliness of hydrocarbons
Lethal service to non-lethal	• Design conditions and suitability for service

Some examples of Change of Service conditions	
Change	**Some Factors to Consider**
DOT railcars or ICC transport tanks to stationary service	• Prohibited by DOT regulations (49 CFR 180) for permanent service. • Temporary stationary service permitted as per NFPA 58 • Inspection for damage mechanisms that may be present from previous service life that is detrimental to the vessel in the new environment.

S9.5 Documentation of Change of Service

Any records, forms, or reports required documenting the change of service event that may be required by contract or the jurisdiction where the pressure retaining item operates shall be completed as specified. Such documentation should be retained by the owner or user for future reference or use as needed.

1.4.5.1.1 GUIDE FOR COMPLETING NATIONAL BOARD BOILER INSTALLATION REPORT

1. INSTALLATION: Indicate the type and date of installation — new, reinstalled, or second hand.
2. INSTALLER: Enter the Installer's name and physical address.
3. OWNER-USER: Enter the name and mailing address of the owner-user of the boiler.
4. OBJECT LOCATION: Enter the name of the company or business and physical address where the installation was made.
5. JURISDICTION NO.: Enter the Jurisdiction number if assigned at the time of installation.
6. NATIONAL BOARD NO.: Enter the assigned National Board number.
   Note: Cast-iron section boilers do not require National Board registration.
7. MANUFACTURER: Enter the boiler manufacturer's name.
8. MFG. SERIAL NO.: Enter the assigned boiler manufacturer's serial number.
9. YEAR BUILT: Enter the year the boiler was manufactured.
10. BOILER TYPE: Enter the type of boiler, i.e., watertube, firetube, cast iron, electric, etc.
11. BOILER USE: Enter the service the boiler will be used for, i.e., heating (steam or water), potable water, etc.
12. FUEL: Enter the type of fuel, i.e., natural gas, diesel, wood, etc. If more than one fuel type, enter the types the boiler is equipped for.
13. METHOD OF FIRING: Enter the method of firing, i.e., automatic, hand, stoker, etc.
14. Btu/KW INPUT: Enter the Btu/hr or kw input of the boiler.
15. Btu/KW OUTPUT: Enter the Btu/hr or kw output of the boiler.
16. OPERATING PSI: Enter the allowed operating pressure.
17. ASME CODE STAMP(S): Check the ASME Code stamp shown on the code nameplate or stamping of other certification mark (specify).
18. STAMPED MAWP: Enter the maximum allowable working pressure shown on the nameplate or stamping.
19. HEATING SURFACE SQ. FT.: Enter the boiler heating surface shown on the stamping or nameplate. **Note:** This entry is not required for electric boilers.
20. CAST IRON: Enter the total number of sections for cast-iron boilers.
21. MANHOLE: Indicate whether the boiler has a manway.
22. SPECIFIC ON-SITE LOCATION: Enter the on-site location of the boiler in sufficient detail to allow location of that boiler.

23. PRESSURE RELIEF VALVE SIZE: Enter the inlet and outlet size of all installed boiler safety or safety relief valves.

24. PRESSURE RELIEF VALVE SET PRESSURE: Enter the set pressure of all installed boiler safety or safety relief valves.

25. PRESSURE RELIEF VALVE CAPACITY: Enter the capacity in either lbs. of steam per hour or Btu/hr for each installed boiler safety or safety relief valve.

26. MANUFACTURER: Enter the manufacturer of each installed boiler safety and safety relief valve.

27. LOW-WATER FUEL CUTOFF: Enter the manufacturer's name, type, number, and maximum allowable working pressure of all installed low-water fuel cutoff devices.

28. PRESSURE/ALTITUDE GAGE: Enter the dial range of the installed pressure or altitude gage, cutout valve or cock size, a maximum allowable working pressure, and gage pipe connection size. For steam boilers, indicate gage siphon or equivalent device installed.

29. EXPANSION TANK: Indicate code of construction of installed expansion tank, tank maximum allowable working pressure, and tank capacity in gallons.

30. VENTILATION AND COMBUSTION AIR: Indicate total square inches of unobstructed opening or total cubic feet per minute of power ventilator fan(s) available for ventilation and combustion air.

31. WATER LEVEL INDICATORS: Enter the number of gage glasses and/or remote indicators and connecting pipe size.

32. FEED WATER SUPPLY: Enter the total number of feeding means, connecting pipe size, stop and check valve size, and maximum allowable working pressure.

33. STOP VALVE(S): Enter the number of stop valves installed, valve size, and maximum allowable working pressure.

34. POTABLE WATER HEATER UNIQUE REQUIREMENTS: Indicate if stop valves installed and, if so, enter size and maximum allowable working pressure. Enter drain valve size and indicate installation of thermometer at or near boiler outlet.

Add new paragraph:

1.5 Change of Service

See NBIC Part 2, Supplement 9 for requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.

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

39. BOTTOM BLOWDOWN CONNECTIONS: Indicate number of valves, valve size, and MAWP. Indicate if piping run is full size to point of discharge.

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 NFPA-85, If other indicate code or standard used.

Note: If a vessel has not been properly prepared for an internal inspection, the Inspector shall decline to make the inspection.

1.5.4 POST-INSPECTION ACTIVITIES

a) During any inspections or tests of pressure-retaining items, the actual operating and maintenance practices should be noted by the Inspector and a determination made as to their acceptability.

b) Any defects or deficiencies in the condition, operating, and maintenance practices of the pressure-retaining item shall be discussed with the owner or user at the time of inspection and recommendations made for correction. Follow-up inspections should be performed as needed to determine if deficiencies have been corrected satisfactorily.

c) Documentation of inspection shall contain pertinent data such as description of item, classification, identification numbers, inspection intervals, date inspected, type of inspection, and test performed, and any other information required by the inspection agency, jurisdiction, and/or owner-user. The Inspector shall sign, date, and note any deficiencies, comments, or recommendations on the inspection report. The Inspector should retain and distribute copies of the inspection report, as required.

d) The form and format of the inspection report shall be as required by the Jurisdiction. Where no Jurisdiction exists, forms NB-5, NB-6, or NB-7 (see NBIC Part 2, 5.3) or any other form(s) required by the inspection agency or owner-user may be used as appropriate.

Add new paragraph:
1.6 Change of Service
Supplement 9 provides requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.
Whenever there is a change of service, the local jurisdiction where the pressure retaining item is to be operated, shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

3.2.5 CALCULATIONS

For alterations, calculations shall be completed prior to the start of any physical work. All design calculations shall be completed by an organization experienced in the design portion of the standard used for construction of the item. All calculations shall be made available for review by the Inspector accepting the design.

3.2.6 REFERENCE TO OTHER CODES AND STANDARDS

Other codes, standards, and practices pertaining to the repair and alteration of pressure retaining items can provide useful guidance. Use of these codes, standards and practices is subject to review and acceptance by the Inspector, and when required, by the Jurisdiction. The user is cautioned that the referenced codes, standards and practices may address methods categorized as repairs; however, some of these methods are considered alterations by the NBIC.

In the event of a conflict with the requirements of the NBIC, the requirements of the NBIC take precedence. Some examples are as follows:

(a) National Board *Bulletin* - National Board Classic Articles Series;

(b) ASME PCC-1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly;

(c) ASME PCC-2, Repair of Pressure Equipment and Piping.

3.3 REPAIRS TO PRESSURE-RETAINING ITEMS

3.3.1 DEFECT REPAIRS

Add new paragraph:

3.2.7 Change of Service

See NBIC Part 2, Supplement 9 for requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.

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

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

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

d) Repairs falling within one or more of the following categories may be considered routine: