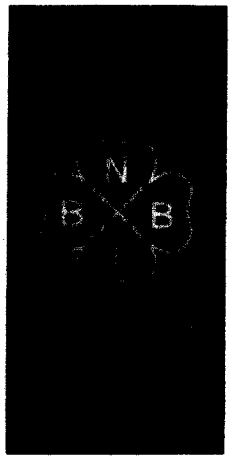


Date Distributed: December 15, 2009

THE
NATIONAL
BOARD
OF BOILER AND
PRESSURE VESSEL
INSPECTORS

SUBCOMMITTEE ON INSPECTION

AGENDA

Meeting of January 20, 2010
Austin, Texas

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 a.m.**

2. **Announcements**

3. **Adoption of the Agenda**

4. **Approval of Minutes of July 2009**

5. **Review of the Roster (Attachment 1)**

   Dr. Marshall Clark would like to join the Subgroup on Inspection Specific. Please view the attached resume. A vote will be taken.

6. **Inquiries**

   There were no inquiries assigned to this subcommittee.

7. **Public Review Comments for 2010 Edition**

   There were no public review comments received for this subcommittee.

8. **Action Items (Attachment 2)**

   NB07-0905 ***Part 2 4.3.1-4.3.3 SC Inspection*** Review these sections for completeness and consistency in pressure testing. Mr. Cook suggested forming a TG from all three parts. A task group of D. Parrish and J. Yagen has been assigned. Included in the attachment is an email from Mr. Galanes requesting that his concern be addressed in this action item. (See Attachment 2)

   July 2007
   A progress report was given.

   January 2008
   A progress report was given.

   July 2008
   A progress report was given.

   January 2009
   A progress report was given.

   July 2009
   A progress report was given and the task group was altered. The new task group members are G. Galanes (Lead),M. Horbaczewski, D. Parrish, J. Yagen and M. Clark.

   January 2010
   Mr. Parrish is expected to report.

   NB07-0910 ***Part 2 S6 SG Inspection Specific*** Review DOT supplement. A task group of S. Staniszewski (Chair), G. McRae and J. Riley has been assigned. This specific supplement should be reviewed by TG for completeness and accuracy. (No Attachment)

   July 2007
   A progress report was given. Changes to the DOT glossary were approved previously due to approved

public review comments.

January 2008

A progress report was given. The task group has met twice to discuss the public review comments received from the 2007 edition and in the process 11 more issues were identified.

July 2008

A progress report was given.

January 2009

Mr. Staniszewski gave a progress report. An advanced notice of proposed rulemaking by the D.O.T. under Docket # PHMSA 2005-21351 is scheduled to be released by June 30, 2009.

July 2009

A progress report was given. Mr. Staniszewski reported that the docket did not make its release date.

January 2010

Mr. Staniszewski is expected to report.

NB07-0912 ***Part 2 SG Inspection Specific Inspection Guides Section 5*** Review the National Board Inspection guides for Cast Iron Boilers, Pressure Relief Devices, Water Level Controls & Devices and Operating Controls. (No Attachment)

July 2007

A progress report was given.

January 2008

Task groups were assigned to address the four inspection guides.

July 2008

- Guide for Cast Iron Boilers – Task Group R. Dobbins, and D. Canonico. A motion made to accept the review and updates of the task group. The motion was unanimously approved.
- Guide for PRD – Task Group J. Richardson and R. Wacker. A progress report was given by Mr. Wacker.
- Guide for Water Level Controls & Devices – Task Group S. Bacon and V. Newton. A motion made to accept the review and updates of the task group. The motion was unanimously approved.
- Guide for Operating Controls – Task Group S. Bacon and V. Newton. A progress report w as given by Mr. Bacon.

January 2009

A report was given for the Guide for Operating controls. It was unanimously approved. A progress report was given for the Guide for PRD.

July 2009
The task group for the guide for PRD developed a report and gave it to the SC on PRD for their review.

January 2010
Mr. Richardson is expected to report.

NB08-0321 ***Part 2 1.5 SG on Insp. Spec.*** In paragraph 1.5 Inspection Activities, add verbiage to address change of service for a pressure vessel. These requirements should caution inspectors, owners, and jurisdictional authorities of the inherent dangers involved when changing service. A new supplement or new Subject under 2.3.6, Description and Concerns of Specific Types of Pressure Vessels, should be added to address the specific requirements for inspection of pressure vessels that have been converted from one service to another. A Task Group of all three parts of the NBIC has been formed under the leadership of Bob Wielgoszinski. Task group members from Inspection are G. McRae (Chair), R. Reetz, R. Wacker, D. Cook, and J. Getter. It was noted that some wording exists in Part 2 1.5.2 (a, 2.3.5.4 b)5 and 2.3.2 b) that deals with service conditions. (Attachment 2, pg. 21)

July 2008
A task group was assigned.

January 2009
A progress report was given.

July 2009
A progress report was given.

January 2010
Mr. McRae is expected to report.

NB08-0701 ***Part 2 S7 SG on Insp. Spec.*** Add a requirement for change of service from above ground to below ground installations of LPG tanks. We also need requirements for how to inspect these tanks. A task group of G. McRae (Chair), G. Galanes, J. Getter, M. Huffman, V. Mullins, J. Reed, D. Cook, J. Richardson and V. Newton has been assigned. (No Attachment)

January 2008
A progress report was given and a task group was assigned.

July 2008
A progress report was given.

January 2009
A progress report was given.

July 2009
A progress report was given.

January 2010
Mr. McRae is expected to report.

NB08-0702 ***Part 2 S7 SG on Insp. Spec.*** The maximum corrosion allowance for a LPG tank should be 10% of the minimum thickness required. A task group of G. McRae (Lead), G. Galanes, J. Getter, M. Huffman, V. Mullins, J. Reed, D. Cook, J. Richardson and V. Newton has been assigned. (No Attachment)

January 2008
A progress report was given and a task group was assigned.

July 2008
A progress report was given.

January 2009
A progress report was given.

July 2009
A progress report was given.

NB08-0703 ***Part 2 S7 SG on Insp. Spec.*** Investigate the feasibility of marking or stamping a re-rated name plate on a LPG tank that is being altered from an above ground tank to a below ground tank. A task group of G. McRae (Chair), G. Galanes, J. Getter, M. Huffman, V. Mullins, J. Reed, D. Cook, J. Richardson and V. Newton has been assigned. (No Attachment)

July 2008
A progress report was given and a task group was assigned.

January 2009
A progress report was given.

July 2009
A progress report was given.

January 2010
Mr. McRae is expected to report.

9. New Business

10. Future Meetings

July 2010, Columbus, Ohio
January 2011, Austin, Texas

11. Adjournment

Respectfully Submitted,

Bill Smith
Secretary
:rh
H:\ROBIN-Active Documents\NBIC Secretarial Documents\Committees\SC on Inspection\SC on Inspection\Agendas\Agenda Inspection 0110.doc

Attachment 1

SC on Inspection

Member	Title	ExpirDate	Interest Category
Bacon, Steven E.		8/27/2012	Users
Barker, Timothy		2/24/2012	Auth Inpection Agencies
Canonico, Dr. Domenic A.		8/27/2012	General Interest
Cook, Don	Chair	8/27/2012	Jurisdictional Authorities
Getter, Jim		8/27/2012	Manufacturer
Horbaczewski, Mark		8/27/2012	Users
McRae, Greg		8/27/2012	Manufacturer
Mooney, Mark		8/27/2012	Auth Inpection Agencies
Newton, Venus		7/19/2010	Auth Inpection Agencies
Parrish, Dave		8/27/2012	Auth Inpection Agencies
Reetz, Robert		7/19/2010	Jurisdictional Authorities
Richardson, John		8/27/2012	Manufacturer
Riley, Jim		8/27/2012	Users
Schwartzwalder, Mike		8/27/2012	NB Certificate Holders
Smith, Bill	Secretary		
Staniszewski, Jr., Stanley	Vice Chair	8/27/2012	Regulatory Authorities
Wacker, Randy A.		8/27/2012	Manufacturer

Total Members: 16

Structural Integrity Associates, Inc.

175 Admiral Cochrane Drive, Ste 401
Annapolis, MD 21401

Phone: 410-571-0861
Fax: 410-571-0313
www.structint.com
email@structint.com

June 23, 2009

Mr. Don Cook
Chair, NBIC Subcommittee Inspection
1055 Crupper Avenue
Columbus, OH 43229

Subject: Structural Integrity Associates, Inc.Support for NBIC Committee Activities

Dear Mr. Cook

As a major consulting firm providing engineering, NDE and condition assessment services to the utility and energy related industries we recognize the value and benefit afforded by the National Board and the National Board Inspection Code. For more than 25 years Structural Integrity Associates, Inc (SI) clients have come to expect and rely on our expertise, responsiveness, quality, and innovation in each of our projects.

Dr. Marshal Clark, from our Salt Lake City office, has requested SI's support for continued participation in NBIC activities. SI encourages our staff to participate in this type of activity and we will support Dr. Clark's participation with the NBIC. SI and Dr. Clark recognize that his initial involvement will likely remain as a guest but as his involvement continues he has expressed an interest in becoming a member of the NBIC Subcommittee on Inspection and we would support and encourage this level of participation. SI recognizes there are two week long meetings each year and their will be some time commitment between meetings for review and comment of committee documents.

SI's staff finds itself in nearly 200 operating units each year providing our clients with boiler, turbine and high energy piping condition assessments and engineering evaluations. Several of our staff are active members of ASME BPV and B31 code activities and we trust Dr. Clark's participation in NBIC committee activities will provide a beneficial perspective to your activities.

I have attached Dr. Clark's CV for your consideration and if please fell free to contact me if you have any questions.

Very truly yours,

Laney Bisbee
President and CEO

Attachment (1)
cc: MDC

10813 South River Front Pkwy
Suite 135
South Jordan, UT 84095

Structural Integrity Associates, Inc.

Phone: (801) 676-0216
Fax: (801) 676-0227
structint.com

MARSHAL D. CLARK, Ph.D., P.E.

Associate

Dr. Clark has over 29 years of technical experience in welding, metallurgy, materials selection and testing, corrosion, failure analysis, and selection of protective coatings for the oil field, process, and electric power generation industries. He is able to develop and lead major inspection and condition assessment programs of electric power generation and process industries equipment and components including boilers, turbines, steam lines, fuel storage tanks, oil and gas production and refinery equipment. Dr. Clark has extensive experience in the design of weldments and selection of welding processes. Dr. Clark is able to perform in-depth failure analysis of metallic components using light optical and scanning electron microscopy, mechanical and chemical testing, and fractography and fracture mechanics. Dr. Clark has provided services as an expert witness on metallurgical failures associated with power generation, oil and gas production, and the aviation industry.

Dr. Clark is an Adjunct Associate Professor of Metallurgical Engineering for the University of Utah where he teaches a graduate course in Metallurgical Failure Analysis. He is also a collaborator on a DOE sponsored research program, through the University of Utah, on Novel Nanocrystalline Intermetallic Coatings for Metal Alloys in Coal-Fired Environments.

EDUCATION/PROFESSIONAL ASSOCIATIONS/REGISTRATIONS

Ph.D. - Metallurgical & Materials Engineering	Colorado School of Mines, 2001
B.S. - Metallurgical Engineering	Colorado School of Mines, 1979

Other Technical Education:

University of Alaska, "Cold Regions Engineering," 1989
American Society of Mechanical Engineers, "ASME Boiler and Pressure Vessel Code: Section III," 1988
University of Kansas, "Fracture and Fatigue Control in Structures," 1988
American Society of Mechanical Engineers, "Remaining Life Evaluation," 1987
National Association of Corrosion Engineers, "Basic Corrosion Course," 1983
University of Tennessee, "Welding, Metallurgy, Quality, Inspection, Codes and Processes," 1983
American Society for Metals, "Fractography," 1979

Registrations:

Registered Professional Engineer in Colorado (23217), Utah (6659883-2202) and Wyoming (11320)

Member:

American Society of Mechanical Engineers (ASME)
ASM International (American Society for Metals)
NACE International (National Association of Corrosion Engineers)
American Welding Society (AWS)

PROFESSIONAL EXPERIENCE

2006 to Present	Associate, Structural Integrity Associates, Inc.
2003 to 2006	Principal Engineer, PacifiCorp Energy
2002 to 2003	Senior Consultant, Engineering Systems, Inc.
1994 to 2001	President, Investigative Engineering Corporation
1981 to 1994	Materials Engineering Group Coordinator, Stone & Webster Engineering Corporation
1979 to 1981	Manager of Metallurgical Engineering, Otis Engineering Corporation

PRESENTATIONS

Fan, P., Riddle, E., Fang, Z.Z., Sohn, H.Y. and Clark, M.D., "Iron Aluminide Coating Produced by Plasma Transferred Arc Process," presented at 8th International Conference on Trends in Welding Research, June 2008, Pine Mt., GA.

Clark, M. and Porter, A., "The Use of Linear Phased Array Ultrasonics for the Inspection of Boiler Tube Welds In Lieu of Radiography," EPRI Boiler Reliability Work Group Meeting, Dallas, TX, November 2006.

Clark, M., "The Use of Linear Phased Array Ultrasonics for the Inspection of Boiler Tube Welds In Lieu of Radiography," presented at Electric Power Materials Committee Meeting, June 2006, Sawgrass, FL.

Clark, M.D. and Edwards, G.R., "Microstructural Characterization of Low Alloy Steel Weldments Containing Yttrium," presented at the 82nd Annual AWS Convention, Cleveland, OH 6-10, 2001.

Clark, M.D. and Edwards, G.R., "Microstructural and Fractographic Characterization of SMAW Filler Metal for HSLA 100 Steel," presented at the 79th Annual AWS Convention, Detroit, MI, 26-29 April 1998.

PUBLICATIONS

Co-author of "Fossil Plant High Energy Piping Damage: Theory and Practice," Electric Power Research Institute, Volume 1(Product ID 1012201): June 2007, Volume 2 (Product ID 1015505): November 2007, Volume 3 (Product ID 1016212): March 2008

Clark, M., Huntsman, L., Healy, Q., Arnold, J., "PacifiCorp Energy's Experience with Circumferential Weld Repairs in High Energy Piping Systems," presented at EPRI International Conference on Advances in Condition and Remaining Life Assessment for Fossil Power Plants, October 2006, Louisville, KY.

Clark, M., Metzler, C., Arnold, J., Elkins, C., "The Use of Linear Phased Array Ultrasonics for the Inspection of Boiler Tube Welds In Lieu of Radiography," presented at EPRI International Conference on Advances in Condition and Remaining Life Assessment for Fossil Power Plants, October 2006, Louisville, KY.

Clark, M., Huntsman, L., Healy, Q., Arnold, J., "PacifiCorp Energy's Experience with Circumferential Weld Repairs in High Energy Piping Systems," presented at EPRI Welding and Repair Technology for Power Plants, June 2006, Sawgrass, FL.

Clark, M., Healy, Q., and Bisbee, L., "Evaluation of Creep Damage in Girth Welds in a Hot Reheat Piping System," presented at Materials and Corrosion Experience for Fossil Power Plants, Isle of the Palms, SC, November 18-21, 2003, EPRI.

Clark, M.D. and Edwards, G.R., "Inclusion Growth in Yttrium Containing Low Alloy Steel Welds through Liquid Phase Sintering," presented at Trends in Welding Research 6th International Conference, Pine Mountain, GA, April 15-19, 2002, AWS/ASM.

Clark, M.D. and Edwards, G.R., "Characterization of Weld Metal Oxides in Low Alloy Steel Welds Containing Yttrium," presented at the Materials solutions Conference and Exposition, St. Louis, MO, October 9-12, 2000.

Clark, M.D., "Inspecting Welds with Time-of-Flight Diffraction," The Fabricator, June 1999, Vol. 29, No. 6, pp. 38-41.

Bisbee, L., Clark, M., Nottingham, L., and Queen, H., "Ultrasonic Detection and Characterization of Incipient Creep Damage in High Energy Piping Seam Welds," EPRI Fossil Plant Inspection Workshop, San Antonio, Texas, 25 June 1999.

Clark, M.D. and Olson, D.L., "The Role of Welding Parameters in Hydrogen Management," presented at CANMET's Hydrogen Workshop, Ottawa, Ontario, 5-9 October 1998.

Clark, M.D., Edwards, G.R., and Landau, A., "Metallographic Techniques for Microstructural Characterization of SMAW Filler Metal for HSLA 100 Steel," presented at Trends in Welding Research 1998, Pine Mountain, GA, 1-5 June 1998.

Clark, M.D., Sehkar, N., Shattuck, D., and Wedig, C., "Corrosion Problems Associated with Pollution Control," National Association of Corrosion Engineers' South Central Region Conference, 1992.

Clark, M.D. and Galpin, D.S., "Critical Piping Inspection," Association of Rural Electric Generating Cooperatives Annual Meeting, 15-17 June 1987.

Clark, M.D., Hall, F.S., Keys, R.L., and Stasis, R.P., "Critical Piping Inspection Program at Utah Power & Light Company," EPRI Fossil Plant Inspection Workshop, 9-11 September 1986.

Clark, M., Potter, D. and Spence, N., "Critical Piping Assessment," Rocky Mountain Electric League, Spring Conference, May 1986.

Cavallo, J.R. and Clark, M.D., "New Advances in Corrosion Mitigation in the Geysers KGRA," National Association of Corrosion Engineers/Corrosion 84, April 1984.

Attachment 2

NBIC Main Committee Task Group Action Block

Subject Pressure Testing Terminology in the NBIC

File Number 07-0905 **Prop. on Pg.**

Proposal Review current use of pressure testing terminology and revise as necessary to provide consistency of terminology across Parts 1-3 of the NBIC. Also, evaluate need for cautionary statement regarding low toughness materials subjected to pressure testing.

Explanation

Project Manager M. Horbaczewski

Task Group Galanes (CHAIR), Parrish, Yagen, andHorbaczewski.

Task Group Negatives **TG Meeting Date**

Background

This task group (TG) has been re-assigned to report back to the NBIC main committee Chair. The purpose of this TG is to review pressure testing terminology as currently stated in the NBIC, and to recommend necessary revisions to provide consistency of pressure testing terminology for Parts 1-3 of the NBIC.

NBIC Main Committee Task Group Action Block

NB07-0905

NBIC Glossary Revisions

Current Definition for Pressure Testing

> **Pressure Test** — Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in a test performed in accordance with the original code of construction prior to initial operation of an installed unit that is witnessed by an Inspector.

Delete above.

Insert New Definitions below into the Glossary

Hydrostatic Test – a liquid pressure test that is performed in accordance with the requirements of the original code of construction.

Liquid Pressure Test - a test method using water or other liquid medium (which is incompressible) to verify the leak tightness integrity of a repair or to verify the leak tightness of a pressure retaining item. The liquid test pressure shall be the minimum required to verify the integrity of the repair or leak tightness of the pressure retaining item, as agreed upon between the Inspector and the owner-user.

Pneumatic Pressure test – a test method using an inert gas which shall not exceed the maximum pneumatic test pressure in the original code of construction (if applicable) or as agreed upon between the owner/user and Certificate holder.

Rationale;
The proposed change to the existing definition of pressure testing to liquid pressure testing captures the essence of using a liquid only. We now have identified the use of pneumatic pressure testing, where an inert gas is used versus a liquid.

NBIC Main Committee Task Group Action Block

So, by having three forms of pressure testing identified in the Glossary, we can now go back and substitute in Part 1-3, terms where we can use Hydrotesting with reference to original code of construction followed by Liquid pressure testing to check for leaks or to verify leak integrity and finally we have pneumatic pressure testing as an alternative to Liquid Pressure testing.

I believe using the above definitions provides improved consistency and uniformity across all 3 parts of the NBIC. I deliberately chose not to address the definition of "Leak Test" because this can fall under a Liquid Pressure test OR pneumatic pressure test.

NBIC Main Committee Task Group Action Block

Subject Pressure Testing Terminology in the NBIC

File Number 07-0905 **Prop. on Pg.**

Proposal Review current use of pressure testing terminology and revise as necessary to provide consistency of terminology across Parts 1-3 of the NBIC. Also, evaluate need for cautionary statement regarding low toughness materials subjected to pressure testing.

Explanation

Project Manager TBD

Task Group Galanes, Parrish,
Yagen, Horbaczewski,
and ?

Task Group Negatives **TG Meeting Date**

Background

This task group (TG) has been re-assigned to report back to the NBIC main committee Chair. The purpose of this TG is to review pressure testing terminology as currently stated in the NBIC, and to recommend necessary revisions to provide consistency of pressure testing terminology for Parts 1-3 of the NBIC.

1/20

EXISTING TEXT	PROPOSED TEXT
RION CODE • PART 2 — INSPECTION procedures. Alternatively, lines may be blanked or sections of pipe removed. Blowoff lines, where practicable, shall be disconnected between pressure parts and valves. All drains and vent lines shall be open. 2) The Inspector shall review all personnel safety requirements as outlined in 1.4 prior to entry. Note: If a boiler has not been properly prepared for an internal inspection, the inspector shall decline to make the inspection. 2.2.7 EVIDENCE OF LEAKAGE a) It is not normally necessary to remove insulating material, masonry, or fixed parts of a boiler for inspection, unless defects or deterioration are suspected or are commonly found in the particular type of boiler being inspected. Where there is evidence of leakage showing on the covering, the Inspector shall have the covering removed in order that a thorough inspection of the area may be made. Such inspection may require removal of insulating material, masonry, or fixed parts of the boiler. b) For additional information regarding a leak in a boiler or determining the extent of a possible defect, a leak test may be performed per 4.3.3. A07	**pressure** [replace "leak" with "pressure"]

2.3.3 EXTERNAL INSPECTION

The purpose of an external inspection is to provide information regarding the general condition of the pressure vessel. The following should be reviewed:

a) Insulation or Other Coverings
If it is found that external coverings such as insulation and corrosion-resistant linings are in good condition and there is no reason to suspect any unsafe condition behind them, it is not necessary to remove them for inspection of the vessel. However, it may be advisable to remove small portions of the coverings in order to investigate attachments, nozzles, and material conditions.

Note: Precautions should be taken when removing insulation while vessel is under pressure.

b) Evidence of Leakage
Any leakage of gas, vapor, or liquid should be investigated. Leakage coming from behind insulation coverings, supports or settings, or evidence of past leakage should be thoroughly investigated by removing any covering necessary until the source of leakage is established.

For additional information regarding a leak in a pressure vessel or determining the extent of a possible defect a pressure test may be performed per Section 4.3.1.

[add new text following 2.3.3, b]

...N CODE • PART 2 — INSPECTION 2.4.6 EVIDENCE OF LEAKAGE a) A leak should be thoroughly investigated and corrective action initiated. Leaks beneath piping insulation should be approached with caution, especially when removing insulation from a pressurized piping system for inspection. b) A pressure test may be required to obtain additional information regarding the extent of a defect or detrimental condition. c) To determine tightness, the test pressure need be no greater than the normal operating pressure. The metal temperature should be not less than 70°F (21°C) and the maximum metal temperature during inspection should not exceed 120°F (49°C). The potential corrosive effect of the test fluid on the piping material should be considered.	[Replace 2.4.6 with following and delete part "c."] **b) For additional information regarding a leak in piping or determining the extent of a possible defect a pressure test may be performed per Section 4.3.1.** ~~c) To determine tightness, the test pressure need be no greater than the normal operating pressure. The metal temperature should be not less than 70°F (21°C) and the maximum metal temperature during inspection should not exceed 120°F (49°C). The potential corrosive effect of the test fluid on the piping material should be considered.~~

4/20

3.4.9 CRACKS a) Cracks may result from flaws existing in material or excessive cyclic stresses. Cracking can be caused by fatigue of the metal due to continual flexing and may be accelerated A07 by corrosion. Fire cracks are caused by the thermal differential when the cooling effect of the water is not adequate to transfer the heat from the metal surfaces exposed to the fire. Some cracks result from a combination of all these causes mentioned. b) Cracks noted in shell plates and fire cracks that run from the edge of the plate into the rivet holes of girth seams should be repaired. Thermal fatigue cracks determined by engineering evaluation to be self arresting may be left in place. c) Areas where cracks are most likely to appear should be examined. This includes the ligaments between tube holes, from and between rivet holes, any flange where there may be repeated flexing of the plate during operation and around welded connections. d) Lap joints are subject to cracking where the plates lap in the longitudinal seam. If there is any evidence of leakage or other distress at this point, the Inspector shall thoroughly examine the area and, if necessary, have the plate notched or slotted in order to determine whether cracks exist in the seam. Repairs of lap joint cracks on longitudinal seams are prohibited. e) Where cracks are suspected, it may be necessary to subject the pressure-retaining item to a hydrostatic test or nondestructive examination to determine their presence and location. A07 f) Cracks shall either be repaired, or formally evaluated by Crack Propagation Analysis to quantify their existing mechanical integrity.	[Replace "hydrostatic" with "pressure" and add "a" preceding "nondestructive."] e) Where cracks are suspected, it may be necessary to subject the pressure-retaining item to a **pressure** test or **a** nondestructive examination to determine their presence and location.
65	

5/20

4.3.1 PRESSURE TESTING a) During an inspection of a pressure-retaining item, there may be certain instances where inservice conditions have adversely affected the tightness of the component or the inspection discloses unusual, hard to evaluate forms of deterioration that may affect the safety of the vessel. In these specific instances, a pressure test using air, water, or other suitable test medium may be required at the discretion of the Inspector to assess leak tightness of the pressure-retaining item. b) The Inspector is cautioned that a pressure test will not provide any indication of the amount of remaining service life or the future reliability of a pressure-retaining item. The pressure test in this instance only serves to determine if the pressure-retaining item contains defects that will not allow the item to retain pressure. In certain instances, pressure tests of inservice components may reduce the remaining service life of the component due to causing permanent deformation of the item.	**4.3.1. PRESSURE TESTING** During an inspection of a pressure-retaining item, there may be certain instances where in-service conditions have adversely affected the tightness of the component or the inspection discloses unusual, hard to evaluate forms of deterioration that may affect the pressure retaining capability of the vessel. In these specific instances, a pressure test using air, water, or other suitable test medium may be required at the discretion of the Inspector to assess pressure boundary integrity of the pressure-retaining item. The Inspector is cautioned that a pressure test will not provide any indication of the amount of remaining service life or the future reliability of a pressure-retaining item. The pressure test only serves to determine if the pressure-retaining item contains defects that will not allow the item to retain pressure. In certain instances, pressure tests of in-service components may reduce the remaining service life of the component due to causing permanent deformation of the item.

c) If an inservice pressure test is required, the following precautions shall be met:

1) The test pressure should not exceed 90% of the set pressure of the lowest setting pressure relief device on the component to avoid damage to pressure relief devices.

2) Test pressure should be selected or adjusted in agreement between the Inspector and the owner-user. When the original test pressure includes consideration of corrosion allowance, the test pressure may be further adjusted based upon the remaining corrosion allowance.

3) The metal temperature during a pressure test should not be less than 60°F (16°C) unless the owner-user provides information on the toughness characteristics of the vessel material to indicate the acceptability of a lower test temperature.

4) The metal temperature shall not be more than 120°F (49°C) unless the owner-user specifies the requirement for a higher test temperature. If the owner-user specifies a test temperature higher than 120°F (49°C), then precautions shall be taken to afford the Inspector close examination without risk of injury.

5) When contamination of the vessel contents by any medium is prohibited or when a pressure test is not practical, other testing methods described below may be used provided the precautionary requirements of the applicable Section of the original construction code or other standards are followed. In such cases, there shall be agreement as to the testing procedure between the owner-user and the Inspector.

Use of pressure test procedures shall be in agreement between the owner-user and the Inspector. Use of written procedures and experienced personnel is required when performing pressure tests. The Inspector shall review the written procedure to become familiar with limitations, adequacy, methods, and acceptance standards identified.

All instrumentation, including pressure and temperature gages, used to monitor a pressure test shall be properly calibrated.

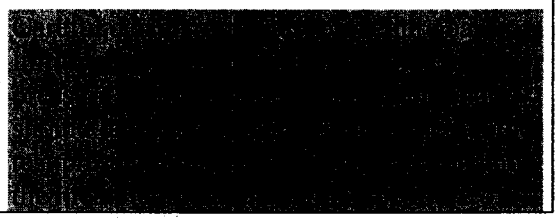
When contamination of the vessel contents by water is prohibited or when a hydrostatic test is not practical due to weight or other considerations, other test mediums may be used provided the precautionary requirements of the applicable section of the original construction code or other standards are followed. In such cases, there shall be agreement as to the testing procedure between the owner-user and the Inspector.

Pressure testing shall not be conducted using flammable or toxic fluids.

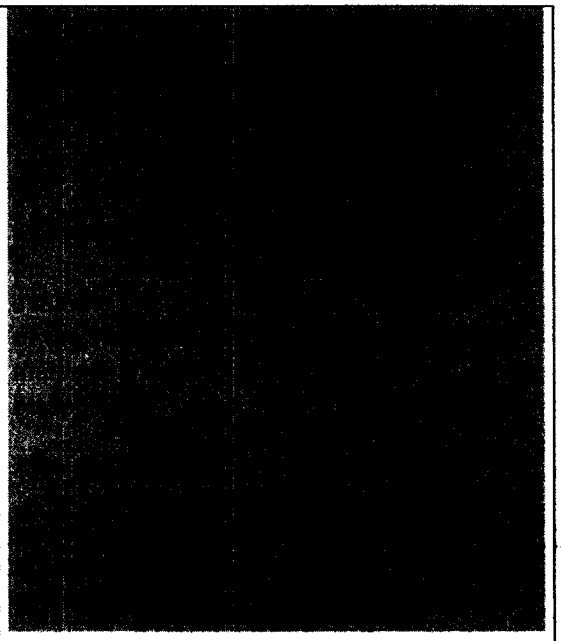
NOTE: The requirements of NBIC Part 3 shall be followed when performing a pressure test following repair or alteration of a pressure retaining item.

The following precautions shall be considered when conducting a pressure test of an inservice pressure retaining item:

ALL PRESSURE TESTING:



7/20

	 **HYDROSTATIC TEST:** A hydrostatic test is the preferred method for conducting a pressure test. Test pressure should be selected or adjusted in agreement between the Inspector and the owner-user. The test pressure should not exceed 90% of the set pressure of the lowest setting pressure relief device on the component to avoid damage to pressure relief devices. The hydrostatic test pressure must not exceed 150% of the MAWP. During a hydrostatic test where the test pressure will exceed 90% of the set pressure of a pressure relief device, the device shall be removed whenever possible. If not possible or practical, a spindle restraint such as a gag may be used provided that the valve manufacturer's instructions and recommendations are followed. Extreme caution should be

	employed to ensure only enough force is applied to contain pressure. Excessive mechanical force applied to the spindle restraint may result in damage to the seat and/or spindle and may interfere with the proper operation of the valve. The spindle restraint shall be removed following the test. The organization who performs the hydrostatic test and applies a spindle restraint shall attach a metal tag that identifies the organization and date the work was performed to the pressure-relieving device. If the seal was broken, the organization shall reseal the adjustment housing with a seal that identifies the responsible organization. The process shall be acceptable to the jurisdiction where the pressure-retaining items are installed.  The metal temperature shall not be more than 120°F (49°C) unless the owner-user specifies the requirement for a higher test temperature. If the owner-user specifies a test temperature higher than 120°F (49°C), then precautions shall be taken to afford the Inspector close examination without risk of injury. Hold-time for the hydrostatic test shall be for a minimum of 10 minutes prior to the examination by the Inspector. Test pressure shall be maintained for the time necessary for the Inspector to conduct the inspection. **PNEUMATIC TEST**

9/20

	A pressure test using a compressible gas should not be performed unless a pressure test using a non-compressible fluid will damage the pressure retaining item or cause contamination of the internal surfaces of the pressure retaining item. Due to the volumetric expansion potential of a pressurized compressible fluid, adequate safety precautions must be taken to ensure personnel safety. Properly calibrated instrumentation shall be used to detect leakage of the testing medium. The instrumentation selected shall be appropriate for the test medium. Instrumentation may detect changes in pressure or chemical concentrations and shall be sensitive enough to detect leakage. A pneumatic test using air as a test medium may be conducted without using instrumentation provided that the inspection is performed using a bubble test. Test pressure for a pneumatic bubble test is not to exceed the lesser of 10% of the pressure retaining item operating pressure or 5 psig.

ION CODE • PART 2 — INSPECTION	
he 4.3.2 LEAK TESTING ed est he es- or he en n- he ed on	Leak testing for the purpose of detecting any leakage may be performed when a pressure test cannot be performed. Some methods or techniques for leak testing may include bubble test (direct pressure or vacuum), helium mass spectrometer, pressure change, or flow measurement. Use of leak test procedures shall be in agreement between the owner-user and the Inspector. Use of written procedures and experienced personnel is required when performing leak tests. The Inspector shall review the written procedure to become familiar with limitations, adequacy, methods, and acceptance standards identified.
es- °F es er- ite n-	4.3.3 EVIDENCE OF LEAKAGE IN A BOILER For additional understanding regarding a leak in a boiler, see 2.2.7 for the extent of a possible defect. A pressure test may be performed as follows:
be he nt he ire u- sc- of el ed al, w n- le on d. nt he	a) To determine tightness, the test pressure shall be no greater than the maximum allowable working pressure stamped on the pressure-retaining item. b) During a pressure test where the test pressure will exceed 90% of the set pressure of a pressure relief device, the device shall be removed whenever possible. If not possible or practical, a spindle restraint such as a gag may be used provided that the valve manufacturer's instructions and recommendations are followed. Extreme caution should be employed to ensure only enough force is applied to contain pressure. Excessive mechanical force applied to the spindle restraint may result in damage to the seat and/or spindle and may interfere with the proper operation of the valve. The spindle restraint shall be removed following the test.

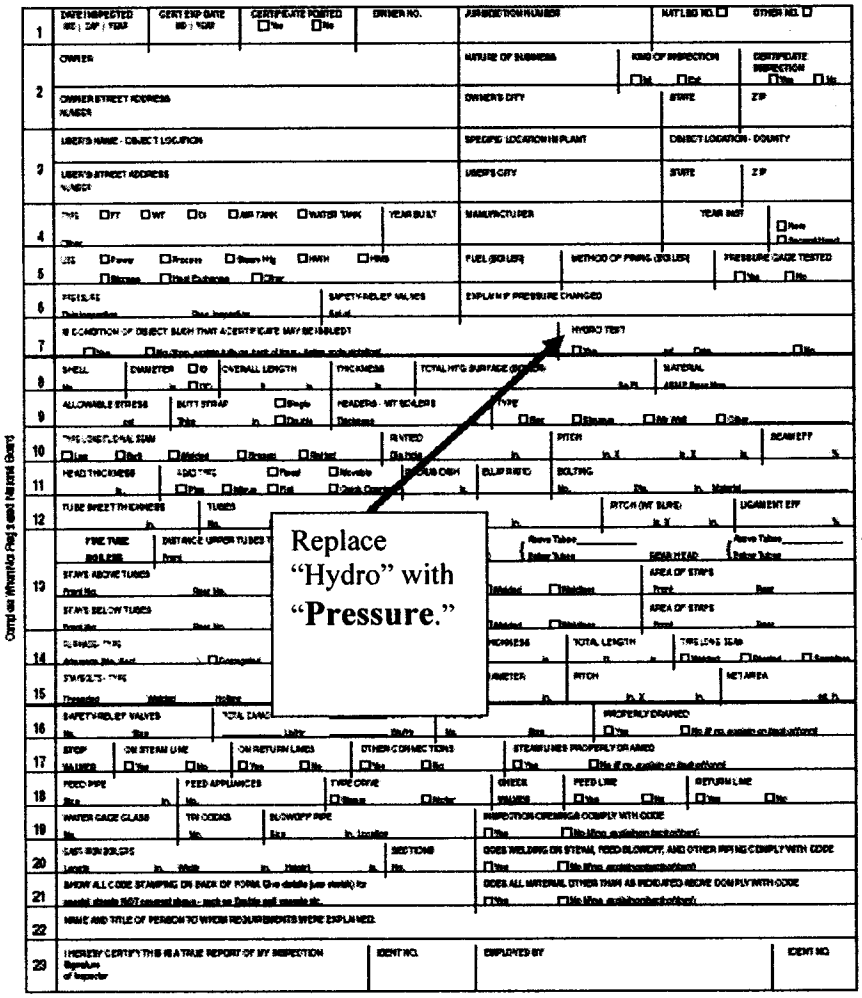
4.3.2 LEAK TESTING
Leak testing for the purpose of detecting significant pressure boundary leakage may be performed. A leak test is conducted by filling the PRI with the normal operating fluid at ambient pressure and temperature. The PRI is visually examined for signs of leakage.
4.3.3 Delete

14/21

rro- g of tion lers ean ıger :ess ool- ical nta- ged tory :nti- lec- ıage ver- s to ı of B1	c) Components subjected to fire damage can exhibit altered mechanical properties, and should be evaluated to determine if the material has retained necessary strength and toughness as specified in the original code of construction. Heating above the lower critical temperature results in a phase transformation that upon rapid cooling can dramatically affect material properties. Evaluation methods may consist of: 1) Portable hardness testing 2) Field metallography or replication 3) Pressure testing 4) Magnetic particle testing 5) Liquid penetrant testing 6) Visual examination 7) Dimensional verification checks d) If visual distortion or changes in the microstructure or mechanical properties are noted, consider replacing the component or a detailed engineering analysis shall be performed to verify continued safe operation. e) Techniques for evaluating fire damage are referenced in applicable standards. See 1.3.	**3) Pressure testing**

4/2

FORM NB-5 BOILER OR PRESSURE VESSEL DATA REPORT
FIRST INTERNAL INSPECTION
Standard Form for Jurisdictions Operating Under the ASME Code



FORM NB-6 BOILER FIRED PRESSURE VESSELS
REPORT OF INSPECTION

1	Date Inspected Mo / Day / Year	Cert Exp Date Mo / Year	Certificate Posted __ Yes __ No	Owner No.	Jurisdiction Number	NB No. __ Other No. __	
2	Owner				Nature of Business	Kind of Inspection Int __ Ext __	Certificate Insp Yes __ No __
	Owner Street Address Number				Owners City	State	ZIP Code
3	User's Name - Object Location				Specific Location in Plant	Object Location - County	
	User's Street Address Number				User's City	State	ZIP Code
4	Type __ FT __ WT __ CI __ Other			Year Built	Manufacturer		
5	Use __ Power __ Process __ Steam Htg __ HW Htg __ HW Storage __ Storage __ Heat Exchange __ Other				Fuel (Boiler)	Method of Firing (Boiler)	Pressure Gage Tested
6	Pressure MAWP This Inspection _____ Prev. Inspection _____			Safety-Relief Valves Set at _____ Total Capacity		Heating Surface or BTU (Input/Output)	
7	Is condition of object such that a certificate may be issued? __ Yes __ No (If no, explain fully under conditions)				Hydro test _____ psi Date _____ No __		
8	Conditions: With respect to the internal surface, describe and state location of any scale, oil or other deposits. Give location and extent of any corrosion and state whether active or inactive. State location and extent of any erosion, grooving, bulging, weeping, cracking or similar condition. Report on any defective rivits, bowed, loose or broken stays. State condition of all tubes, tube ends, coils, nipples, etc. Describe any adverse conditions with respect to pressure gage, water column, gage glass, gage cocks, safety valves, etc. Report condition of setting, linings, baffles, supports, etc. Describe any major changes or repairs made since last inspection.						
9	Requirements: (List Code Violations)						
10	Name and Title of Person to Whom Requirements Were Explained:						
	I Hereby Certify This Is A True Report Of My Inspection						
	Signature of Inspector		Ident. No.	Employed By			Ident. No.

Replace "Hydro" with "**Pressure**."

FORM NB-7 PRESSURE VESSELS
REPORT OF INSPECTION
Standard Form for Jurisdictions Operating Under the ASME Code

1	DATE INSPECTED MO ; DAY ; YEAR	DEPT INSP DATE MO ; YEAR	DEPT CERTIFICATE POSTED ☐Yes ☐No	OWNER NO.	JURISDICTION NUMBER	NATL BD NO. ☐ OTHER NO. ☐	
2	OWNER				NATURE OF BUSINESS	KIND OF INSPECTION ☐Int ☐Ext	CERTIFICATE INSPECTION ☐Yes ☐No
	OWNER'S STREET ADDRESS				OWNER'S CITY	STATE	ZIP
3	USER'S NAME - DISTRICT LOCATION				SPECIFIC LOCATION IN PLANT	DISTRICT LOCATION - COUNTY	
	USER'S STREET ADDRESS				USER'S CITY	STATE	ZIP
4	TYPE ☐AIR TANK ☐WATER TANK ☐OTHER			YEAR BUILT	MANUFACTURER		
5	USE ☐STORAGE ☐PROCESS ☐HEAT EXCHANGE ☐OTHER				MDS	PRESSURE GAGE TESTED ☐Yes ☐No	
6	PRESSURE ALLOWED THIS INSPECTION ____ PREVIOUS INSPECTION ____				SAFETY RELIEF VALVES SET AT ____ TOTAL CAPACITY	EXPLAIN IF PRESSURE CHANGED	
7	IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED ☐YES ☐NO (IF NO EXPLAIN FULLY UNDER CONDITIONS)					HYDRO TEST YES ____ PSI DATE ____ ☐NO	
8	CONDITIONS: With respect to the internal surface, describe and locate all corrosion, cracks, grooving, bulging, warping, cracking or similar conditions. Report on the safe conditions for continued operation.					Give reasons, etc. Describe any major changes or repairs made since last inspection.	
9	RECOMMENDS (LIST CODE VIOLATIONS)						
10	NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED						
	I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION ____ SIGNATURE OF INSPECTOR			COMM NO.	EMPLOYED BY		COMM NO.

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229 NB-7 Rev. 2

Replace "Hydro" with "**Pressure.**"

i) Broken staybolts may be detected by leakage through telltale holes and by hammer testing. Both methods are most effective when the boiler is under hydrostatic pressure of at least 95% MAWP. If a hydrostatic test cannot be applied, the hammer test may be performed alone with the boiler drained.	In Part 2 - Supplement 1, there are several references to hammer testing staybolts while a hydrostatic test is being conducted. The Task Group recommends that this practice be further evaluated to ensure that personnel safety and integrity of the equipment is not jeopardized. **S1.4 LOCOMOTIVE FIRETUBE BOILER INSPECTION**

	S1.4.1 INSPECTION METHODS i.) Broken staybolts may be detected by leakage through telltale holes and by hammer testing. Both methods are most effective when the boiler is under hydrostatic pressure of at least 95% MAWP. If a hydrostatic test cannot be applied, the hammer test may be performed alone with the boiler drained.
NATIONAL BOARD INSPECTION SUPPLEMENT 2 HISTORICAL BOILERS S2.1 SCOPE a) This supplement is provided as a guide to inspection of historical steam boilers of riveted and/or welded construction not falling under the scope of Supplement 1. These historical steam boilers would include: steam tractors, traction engines, hobby steam boilers, portable steam boilers, and other such boilers that are being preserved, restored, and maintained for demonstration, viewing, or educational purposes. 07 Note: This supplement is not to be used for steam locomotive boilers falling under the requirements of the Federal Railroad Administration (FRA). FRA rules for steam locomotive boilers are published in 49 CFR 230. Specific rules and special requirements for inspection, repairs, alterations, and storage of steam locomotive boilers are identified in Supplement 1 of the NBIC. b) The rules specified in this supplement shall be used in conjunction with the applicable rules in this Code. References specified or contained in this Supplement may provide additional information to assist the user when applying the requirements of this supplement. S2.2 INTRODUCTION	Supplement 2, there are several references to pressure testing. S 2.6 contains a safety warning that is in direct contradiction to guidance provided in Section 4.3.1. The Task Group strongly recommends that the safety warning be deleted from Supplement 2. The Task Group recommends that all pressure test requirements currently found in supplement 2 be deleted. Supplement 2 should reference Section 4.3.1.and 4.3.2 where necessary. The Task Group recommends that recurring pressure test requirements for historical boilers be further evaluated to ensure that integrity of the equipment is not jeopardized.

NATIONAL BOARD INSPECTION CO	
b) Common evidence of exposure to fire is: 1) charring or burning of the paint or other protective coat; 2) burning or scarring of the metal; 3) distortion; or 4) burning or melting of the valves. c) A pressure vessel that has been subjected to the action of fire shall be removed from service until it has been properly evaluated. The general intent of this requirement is to remove from service pressure vessels which have been subject to the action of fire that has changed the metallurgical structure or the strength properties of the steel. Visual examination with emphasis given to the condition of the protective coating can be used to evaluate exposure from a fire. This is normally determined by visual examination as described above with particular emphasis given to the condition of the protective coating. If there is evidence that the protective coating has been burned off any portion of the pressure vessel surface, or if the pressure vessel is burned, warped, or distorted, it is assumed that the pressure vessel has been overheated. If, however, the protective coating is only smudged, discolored, or blistered, and is found by examination to be intact underneath, the pressure vessel shall not be considered affected within the scope of this requirement. Vessels that have been involved in a fire and show no distortion shall be requalified for continued service by retesting using the hydrostatic test procedure applicable at the time of original fabrication.	[Replace "hydrostatic" with "pressure" in part "c"] **pressure**

17/2

Dutchman — Generally limited to tube or pipe cross-section replacement. The work necessary to remove a compromised section of material and replace the section with material meeting the service requirements and installation procedures acceptable to the Inspector. Also recognized as piecing.

Examination — In process work denoting the act of performing or completing a task of interrogation of compliance. Visual observations, radiography, liquid penetrant, magnetic particle, and ultrasonic methods are recognized examples of examination techniques.

Exit — A doorway, hallway, or similar passage that will allow free, normally upright unencumbered egress from an area.

Field — A temporary location, under the control of the Certificate Holder, that is used for repairs and/or alterations to pressure-retaining items at an address different from that shown on the Certificate Holder's *Certificate of Authorization*.

Forced-Flow Steam Generator — A steam generator with no fixed steamline and waterline.

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

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

Intervening — Coming between or inserted between, as between the test vessel and the valve being tested.

Jurisdiction — A governmental entity with the power, right, or authority to interpret and enforce law, rules, or ordinances pertaining to boilers, pressure vessels, or other pressure-retaining items. It includes National Board member jurisdictions defined as "jurisdictional authorities."

Jurisdictional Authority — A member of the National Board, as defined in the National Board Constitution.

[Insert new description of "Hydrostatic test".]

Hydrostatic test – A pressure test which is conducted using water or another appropriate liquid as the test medium.

18/b

pe ıry ial et- on so he er- ıs, ar- ed ge n- ol irs at er- . n- e. ire x- en is- er- ed he he ce rs, ng is- ." he ial

Lift Assist Device — A device used to apply an auxiliary load to a pressure relief valve stem or spindle, used to determine the valve set pressure as an alternative to a full pressure test.

Manufacturer's Documentation — The documentation that includes technical information and certification required by the original code of construction.

Mechanical Assembly — The work necessary to establish or restore a pressure retaining boundary, under supplementary materials, whereby pressure-retaining capability is established through a mechanical, chemical, or physical interface, as defined under the rules of the NBIC. A08

Mechanical Repair Method — A method of repair, which restores a pressure retaining boundary to a safe and satisfactory operating condition, where the pressure retaining boundary is established by a method other than welding or blazing, as defined under the rules of the NBIC. A08

NBIC — The *National Board Inspection Code* published by The National Board of Boiler and Pressure Vessel Inspectors.

"NR" Certificate Holder — An organization in possession of a valid "NR" *Certificate of Authorization* issued by the National Board.

National Board — The National Board of Boiler and Pressure Vessel Inspectors.

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

Nuclear Items — Items constructed in accordance with recognized standards to be used in nuclear power plants or fuel processing facilities.

Original Code of Construction — Documents promulgated by recognized national standards writing bodies that contain technical requirements for construction of pressure-retaining items or equivalent to which the pressure-retaining item was certified by the original manufacturer.

Leak Test – An examination that is conducted using the normal operating fluid of a PRI at ambient pressure and temperature. The PRI is visually examined for signs of leakage. A leak test is used to determine if there are significant pressure boundary integrity issues.

[Insert new description of "Leak Test."]

Owner or User — As referenced in lower case letters means any person, firm, or corporation legally responsible for the safe operation of any pressure-retaining item.

Owner-User Inspection Organization — An owner or user of pressure-retaining items that maintains an established inspection program, whose organization and inspection procedures meet the requirements of the National Board rules and are acceptable to the jurisdiction or jurisdictional authority wherein the owner or user is located.

Owner-User Inspector — An individual who holds a valid and current National Board Owner-User Commission.

Piecing — A repair method used to remove and replace a portion of piping or tubing material with suitable material and installation procedure.

Pressure-Retaining Items (PRI) — Any boiler, pressure vessel, piping, or material used for the containment of pressure, either internal or external. The pressure may be obtained from an external source, or by the application of heat from a direct source, or any combination thereof.

Pressure Test — Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in a test performed in accordance with the original code of construction prior to initial operation of an installed unit that is witnessed by an Inspector.

Repair — The work necessary to restore pressure-retaining items to a safe and satisfactory operating condition.

Re-ending — A method used to join original code of construction piping or tubing with replacement piping or tubing material for the purpose of restoring a required dimension, configuration or pressure-retaining capacity.

Re-rating — See alteration.

"R" Ce
possess
rization

Safety
a press
opening
tion to t
pressur

Setting
re
during
tenance

Shop —
is show
from w
repair
items.

Testing
laborat
ity te

Transie
only for
state co

Velocity
that occ
of a pre
of the p
the sam
ing fluic

"VR" C
possess
rization

Water
must be
of test
psi per
tracted)
the gag
the pres

[Insert new description of "Pneumatic Test."]

Pneumatic Test – A pressure test which uses air or another compressible gas as the test medium.

[Replace existing "Pressure Test" with following text and "Note."]

Pressure Test – An examination that is conducted using an external source of pressure to pressurize a fluid (liquid or gas) contained inside a pressure retaining item. The PRI is visually examined for signs of leakage during the application of pressure. A pressure test can be used to aid in the determination of the pressure boundary integrity of a pressure retaining item.

The NBIC recognizes two types of pressure tests; hydrostatic and pneumatic.

Note: The term " pressure test" is sometime used to mean an operational test of a pressure relief device's pressure relieving set point and operating parameter. The above definition does not apply PRD operational testing.

20/20

NB08-0321

Secretary, NBIC Committee
The National Board of Boiler and
Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, OH 43229

The following addition to the NBIC is proposed;

Add requirements to change the service of pressure vessels in Part 1, Installation, Part 2, Inspection, and Part 3 Repairs and Alterations.

Statement of Need

The Federal Railroad Administration has a proposal out on railcars carrying Poison Inhalation Hazard (PIH) that will require a number of existing tank cars to be retired early. There is a potential that some of these tanks will be recycled into stationary tanks for service other then what they were design for.

Additionally, this practice already occurs in some industries without any consideration for any damage mechanisms that made have been present in the initial service. The NBIC does not currently address these types of events.

Background Information

Part 2 – Add in Paragraph 1.5 Inspection Activities verbiage to address change of service for a pressure vessel. These requirements should caution inspectors, owners, and jurisdictional authorities of the inherent dangers involved when changing service. A new supplement or new Subject under 2.3.6, Description and Concerns of Specific Types of Pressure Vessels, should be added to address the specific requirements for inspection of pressure vessels that have been converted from one service to another.