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THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD SUBCOMMITTEE INSTALLATION

MINUTES

Meeting of July 17th, 2019
Kansas City, MO

These minutes are subject to approval and are for committee use only.
They are not to be duplicated or quoted for other than committee use.

The National Board of Boiler & Pressure Vessel Inspectors
1055 Crupper Avenue
Columbus, Ohio 43229-1183
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1. **Call to Order**

Chair, M. Wadkinson, called the meeting to order at 8:00 AM

2. **Introduction of Members and Visitors**

Introductions took place amongst all members and visitors and an attendance sheet was circulated for review and check off.

- Roger Adams was present for Todd Creacy
- Patrick Jennings was present for Brian Moore
- Matt Downs was present for Paul Schuelke
- Joe Brockman was present for Edward Wiggins

With the attached roster and the above noted individuals a quorum was established. There was a motion to approve the roster as published. The motion was unanimously approved.

3. **Announcements**

- The National Board hosted a reception for all committee members and visitors on Wednesday evening at 5:30 p.m. in the Rooftop Ballroom on the top floor of the InterContinental.
- A buffet lunch was provided on Thursday to NBIC Committee members and visitors.
- Committee members who were interested in receiving hard copies of the NBIC were informed to see the NBIC Secretary.
- A gift was distributed to Committee members in honor of the National Board 100th year.
- M. Wadkinson presented an update to the SC on changes to NB-240 with regards to the limits on committee size and interest categories.
- An Introduction of Luis Ponce took place.

4. **Adoption of the Agenda**

There was a motion to adopt the Agenda as published. The motion was unanimously approved.

5. **Approval of the Minutes of January 16th, 2019 Meeting**

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

There was a motion to approve the Minutes of January 16, 2019 as published. The motion was unanimously approved.

6. Review of Rosters (Attachment Pages 1-8)

a. Membership Nominations

i. Randy Austin – Interest Category = User. Randy presented his background to the SC. A vote was taken by the SC for the appointment to the SG and SC. The vote was unanimously approved.

ii. Matt Downs – Interest Category = Manufacturer. Mr. Downs will not be voted on until the January meeting as P. Schuelke's retirement is not official.

iii. Added Patrick Jennings – Interest Category = AIA . Mr. Jennings will not be voted on until the January meeting as B. Moore's retirement is not official.

b. Membership Reappointments

Mr. Brian Moore's membership to the SC expired 7/31/2019. He has communicated to the NBIC Secretary that at the end of the July meetings is when his retirement is going to be effective.

c. Officer Appointment

None

7. Open PRD Items Related to Installation

- NB15-0108B – Address pressure relief devices in new supplement on high temperature hot water boilers – A. Renaldo (PM)
- NB15-0305 – Create Guidelines for Installation of Overpressure Protection by System Design – D. Marek (PM)
- NB15-0308 – Create Guidelines for Installation of Pressure Relief Devices for Organic Fluid Vaporizers – T. Patel (PM)
- NB15-0315 – Review isolation valve requirements in Part 1, 4.5.6 and 5.3.6 – D. DeMichael (PM)
- NB16-0805 – Temperature ratings for discharge piping and fittings – A. Renaldo (PM)
- NB17-0401 – Valve drain plug recommendations for shipping – K. Beise (PM)
- 17-115 – Complete rewrite of Part 4, Section 2 combining common requirements into a general requirements section for all pressure relief devices – A. Renaldo (PM)
- 17-119 – Part 4, 2.2.5 states that pressure setting may exceed 10% range. Clarify by how much – T. Patel (PM)
- 17-128 – Fix contradiction between Part 4, 2.4.1.6 a) and 2.4.4.3 regarding Y bases. – B. Nutter (PM)
- 17-131 – Preface by Part 4, 2.5.7 a) with the phrase "Unless otherwise protected" – J. Ball (PM)
- 18-73 – Update installation requirements for Thermal Fluid Heaters (Part 1, S5.7.6) – T. Patel (PM)
- 18-90 (Interpretation) - Is it acceptable to plug the Valve Casing Drain and provide the required drainage by another drain connection installed at the bottom of the inlet end of the discharge elbow, as long as it is below the level of the valve seat? (Part 1, 2.9.6 h) and Part 4, 2.2.10 h))

Spoke w/T. Beirne, Secretary of PRD and he has informed our group of the following items progress:

NB15-0308 – Proposing Review & Comment letter ballot to MC. After further discussions with Mr. Beirne this item is put on hold as M. Wadkinson has requested an item to be opened up with Section 1.

NB16-0805 – Proposal for letter ballot to MC.

NB17-0401 – This item should not be on the agenda as this has already gone through.

17-131 – Proposal for voice vote to MC.

8. Action Items

Item Number: NB11-1901	NBIC Location: Part 1	Attachment Pages 9-16

General Description: Add guidance for the safe installation of high pressure composite pressure vessels operating in close proximity to the public

Subgroup: FRP

Task Group: R. Smith (PM), M. Richards, S. Konopacki, D. Patten and E. Wiggins

Meeting Action: Proposal – R. Smith (PM) presented a summary and a cleaned up proposal. Discussions took place amongst the SC. There was a motion to approve the proposal to the MC for letter ballot. The motion was unanimously approved.

Item Number: NB16-0102	NBIC Location: Part 1	Attachment Pages 17-20

General Description: Address post installation pressure testing

Subgroup: Installation

Task Group: S. Konopacki (PM), E. Wiggins, P. Cole, R. Smith, M. Wadkinson, D. Patten

Meeting Action: Proposal - S. Konopacki (PM) presented a summary and held discussions amongst the SC. A break out session took place in the SG and a proposal was generated and presented. There was a motion to approve the proposal to the MC for letter ballot. The motion was unanimously approved.

Item Number: 17-159	NBIC Location: Part 1, 4.7	Attachment Pages 21-22

General Description: Result of 17-147; review Part 1, 4.7 for references to hot water storage tanks

Subgroup: SG Installation

Task Group: J. Brockman (PM), D. Patten, and E. Wiggins

Meeting Action: Proposal - The SC held discussions with PRD. Following discussions there was a motion to approve the proposal to the MC for voice vote. The motion was unanimously approved.

Item Number: 18-1	NBIC Location: Part 1, 2.8.1 and 2.8.5	Attachment Pages 23-24

General Description: Review 2.8.1 and 2.8.5 for potential duplication of paragraphs.

Subgroup: SG Installation

Task Group: M. Wadkinson (PM), D. Patten, S. Konopacki, T. Griffen, and R. Dalton

Meeting Action: Proposal - M. Wadkinson (PM) held a break out session in the SG. A proposal was generated, presented and discussed. There was a motion to approve the proposal to the MC for letter ballot. The motion was unanimously approved.

Item Number: 18-2	NBIC Location: Part 1	No Attachment

General Description: Result of NB16-0101, add verbiage regarding commissioning fired boilers & fired pressure vessels with a calibrated combustion analyzer.

Subgroup: SG Installation

Task Group: E. Wiggins (PM), D. Patten, P. Schuelke, M. Wadkinson, and G. Halley

Meeting Action: Progress Report - G. Halley shared background information and discussions took place amongst the SG & SC. A break out session took place in the SG and a proposal was generated and presented. After further discussions it was decided that further clarification and documenting is needed. G. Halley was added to the TG.

Item Number: 18-57	NBIC Location: Part 1	No Attachment

General Description: address the use & definition of the word inspector

Subgroup: SG Installation

Task Group: Brian Moore (PM), R. Smith, T. Griffin, P. Jennings, T. Creacy and R. Spiker

Meeting Action: Progress Report - R. Smith presented a summary and held discussions amongst the SG and SC. As the TG continues to work on this item it is the intention of having a proposal to present at the meeting in January 2020.

Item Number: 18-81	NBIC Location: Part 1, 3.8.1.5	No Attachment

General Description: Should an assembled modular steam heating boiler have a single manual LWCO to protect to total assembly?

Subgroup: SG Installation

Task Group: M. Washington (PM), T. Creacy, K. Watson, M. Wadkinson, J. Downs, and B. Ahee

Meeting Action: Close w/no action - A break out session took place in the SG and discussions were held amongst the SG and SC. It was determined that the words as stated in the code were good, therefore no action is needed. There was a motion to close this item with no action. The motion was unanimously approved.

Item Number: 18-96	NBIC Location: Part 1, 1.6.3	Attachment Pages 25-26

General Description: In reference to item NB16-0905, should "fired or electrically heated pressure vessels" be specified instead of stating "pressure vessels"

Subgroup: SG Installation

Task Group: E. Wiggins (PM), S. Konopacki, G. Hayley, and G. Tompkins

Meeting Action: Close w/no action - A break out session took place in the SG and discussions were held amongst the SG and SC. The TG feels the way it is stated in the code is clear, therefore no action is needed. There was a motion to close this item with no action. The motion was unanimously approved.

Item Number: 18-97	NBIC Location: Part 1, 1.6.9	Attachment Pages 27-28

General Description: In reference to item NB16-0101, should specific fuel fired boilers and pressure vessels be listed in Part 1, 1.6.9

Subgroup: SG Installation

Task Group: R. Spiker (PM), B. Anderson and D. Patten

Meeting Action: Close w/no action - A break out session took place in the SG and discussions were held amongst the SG and SC. After discussions it was determined that no action is needed on this item. There was a motion to close this item with no action. The motion was unanimously approved.

Note: M. Wadkinson continues to work on the project regarding a review of Installation Requirements of CSD-1 to be put in Part I. A break out session was held and individuals of the TG were assigned to look over CSD-1 and Part I between meetings. **Task Group:** D. Patten, S. Konopacki, G. Tompkins, M. Wadkinson, R. Austin, K. Watson and P. Schulke

9. New Items:

Item Number: 19-45	NBIC Location: Part 1, S1	Attachment Pages 29-42

General Description: Revisions to Yankee Dryer Supplement Wording in Part 1

Subgroup: SG Installation

Task Group: ~~None assigned.~~ R. Spiker (PM), J. Jessick, and D. Patten

Explanation of Need: Various technical and editorial revisions for S1.1, S1.2, and S1.4.

Meeting Action: Progress Report - A TG was assigned to be R. Spiker (PM), J. Jessick, and D. Patten This item also affects Part 2 under item 19-46. Part 2 has separated these out into 3 separate items. V. Newton is the PM and will liaison between Part 1 and Part 2 so as to keep all informed. The scope is planned to be the first to be worked on.

Item Number: 19-49	NBIC Location: Part 1, 2.9 & 3.9	Attachment Page 43

General Description: Ensure shipping plugs for PRDs are removed during the installation process

Subgroup: SG Installation

Task Group: ~~None assigned.~~ R. Smith (PM) and S. Konopacki

Explanation of Need: From the January 2019 main committee meeting, the discussion of PRD Item NB17-0401 led to the decision to open an item to address requirements to remove any shipping caps or plugs from pressure relief devices during the installation process.

Meeting Action: Proposal - A TG was assigned to be R. Smith (PM) and S. Konopacki. A break out session took place in the SG and discussions were held amongst the SG and SC. A proposal was generated, presented and discussed. There was a motion to approve the proposal to the MC for voice vote. The motion was unanimously approved.

Item Number: 19-51	NBIC Location: Part 1, 2.9.1.1	Attachment Page 44

General Description: NBIC safety valve requirements for boilers up to 4000lb/hr generating capacity

Subgroup: SG Installation

Task Group: ~~None assigned.~~ M. Wadkinson (PM), J. Brockman, and P. Jennings

Explanation of Need: There is a discrepancy between ASME Section I, PG-67.1 and NBIC Part 1, 2.9.1.1. ASME requires 2 or more safety valves if over 500 sq. ft. If there is combined bare tube and extended heating surface exceeding 500 sq. ft., 2 or more safety valves are required only if the boiler exceeds 4000 lbs./hr. NBIC requires 2 or more safety valves if over 500 sq. ft. It does not make allowances for extended heating surface and generating capacity up to 4000 lbs./hr.

Meeting Action: Proposal - A TG was assigned to be M. Wadkinson (PM), J. Brockman, and P. Jennings. Discussions were held and a proposal was generated, presented and discussed in the SG and SC. There was a motion to approve the proposal to the MC for voice vote. The motion was unanimously approved.

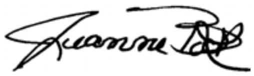
10. Future Meetings

- January 13th -16th, 2020 – San Diego, CA
- July 13th-16th, 2020 – Louisville, KY

11. Adjournment

A motion was made and unanimously approved to adjourn the meeting at 10:19 a.m.

Respectfully submitted,



Jeanne Bock
NBIC Part 1 Secretary

NBIC Subcommittee Installation Attendance - 7/17/2019					
First Last	**Email**	**Company**	**Phone #**	**Signature**	**Attending Reception?**
Paul Schuelke	pschuelke@weil-mccalain.com	Weil-McLain	219 879-6561		
Melissa Wadkinson	Melissa.wadkinson@fulton-management.com	Fulton	315 298-7112	[signature]	✓
Don Patten	dpatten@baycityboiler.com	Bay City Boiler	510 786-3711	[signature]	✓
Jeanne Bock	jbock@nationalboard.org	The National Board	614 431-3233	[signature]	✓
Stanley Konopacki	Stanley.Konopacki@nrg.com	~~GenOn~~ Energy NRG	815 372-4740	[signature]	✓
H. Michael Richards	Hmichaelrichards.pe@gmail.com	Southern Co.	205 706-0748		
Geoffrey Halley	ghalleysji@aol.com	ABMA	~~636 394-3483~~ 314 406 9591	[signature]	✓ 2
Brian Moore Pat Jennings for	brian_moore@hsb.com patrick_jennings@hsb.com	Hartford Steam Boiler ✓	860 722-5657 860 722 5582	[signature]	✓
Edward Wiggins	Edward.Wiggins@bpcllcga.com	XL Insurance America	770 614-3111		
Rex Smith	RSmith@aiallc.org	Authorized Inspection Associates, LLC	281 751-1150	[signature]	✓
Todd Creacy	todd.creacy@zurichna.com	Zurich	817 403-4601		
Joe Brockman	Ronald.Brockman@Libertymutual.com	Liberty mutual	573 469-3836	[signature]	✓
RANDY AUSTIN	RDAUSTIN@LANL.GOV	LOS ALAMOS LAB	505-695 6036	[signature]	✓
RODGER ADAMS	RODGER.ADAMS@ZURICHNA.COM	ZURICH	704-258-8073	[signature]	✓
J.M. Downs	mdowns@weil-mclain.com	Weil-Mclain	219-210 8564	[signature]	ALT. 4 P. Schuelke
William B. Anderson	william.anders@msdh.ms.gov	State MS	615-268 3361	[signature]	✓
JERRY JESSICK	jerry.jessick@gapac.com	GEORGIA PACIFIC	920-819-8570	[signature]	NO

Randall D. Austin

Los Alamos National Laboratory
PO Box 1663, Mail Stop 291
Los Alamos, NM 87545
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Qualifications (Current)

National Board Commissioned Boiler Inspector, IS & AI Commission # 10798, Endorsements R & B

IS – Inservice & Installation Inspector
AI – ASME "Authorized Inspector", (New Construction)
B - ASME Inspector Supervisor (AIS, New Construction)
R - Repair Inspector (NBIC, Repairs & Alterations)

National Board "Review Team Leader", Certificate # 247, Review Team Leader for R & OU

R – "R" Stamp Shops (Repairs and Alterations, NB-415)
OU – Owner User Inspection Agency (NB-371)

Qualified to perform activities in accordance with NB-290, Qualification of National Board Team Leaders and National Board Representatives.

Permit-Required Confined Space Entry Certified, OSHA Course # 2264

Education

Graduated Heritage High School, Littleton CO – 1974

U.S. Navy, Boiler Technician "A" School for 1200 psi Boilers, Great Lakes, IL – 1975 (160 hours)

U.S. Navy, 1200 psi Boiler Operation, San Diego, CA – 1977 (120 hours)

U.S. Navy, Automatic Boiler Control Systems (Hagen, Bailey & General Regulator Controls), San Diego, CA -1977 (80 hours)

U.S. Navy, Prairie-Masker Technician (Anti-Submarine Warfare), San Diego, CA -1977 (40 hours)

U.S. Navy, 1200 psi, Pressure "P" Fired Boiler School, Philadelphia, PA – 1978 (200 hours)

Hartford Steam Boiler, National Board Preparation Course, Chicago, IL – 1988 (144 hours)

National Board Advanced Boiler and Pressure Vessel Inspectors Course, Columbus, OH – 1992 (80 hours)

National Board of Boiler & Pressure Vessel Inspectors / A.S.M.E. Review Team Leader Course, Columbus, OH – 2003 (24 hours)

United States Department of Labor, OSHA Training Institute, Golden, CO – 2007 (40 hours)

Relevant Experience

- U.S. Navy Boiler Technician 1975 – 1980, (Honorable Discharge).
- Boiler Inspector for The State of Colorado, Department of Labor & Employment, Boiler Inspection Branch 1980 - 2002.

- Chief Boiler Inspector (Director) for The State of Colorado, Department of Labor & Employment, Oil & Public Safety, Boiler Inspection Branch 2002 - 2008.

- Chief Boiler Inspector for The State of Arizona, Industrial Commission, Arizona Department of Safety and Health, Boiler Safety Section 2007 - present.

- National Board of Boiler and Pressure Vessel Inspectors Review Team Leader 2003 – present.

- Over 50,000 documented boiler, and pressure vessel inspections performed.

Other Experience

- Member of The National Board of Boiler and Pressure Vessel Inspectors, 2002 - 2018.

- Appointed by The State of Colorado as the representative member to The American Society of Mechanical Engineers (A.S.M.E.) Boiler & Pressure Vessel Conference Committee 2002 – 2008.

- Appointed by The State of Arizona as the representative member to The American Society of Mechanical Engineers (A.S.M.E.) Boiler & Pressure Vessel Conference Committee 2008 – 2018.

- Committee member of The American Society of Mechanical Engineers, Controls and Safety Devices for Automatically Fired Boilers (A.S.M.E. CSD-1) 2005 – present.

- Committee member of The American Society of Mechanical Engineers, Power Piping (ASME B31.1, General Requirements) 2010 – 2015.

- Committee member of The National Board Inspection Code (NBIC), Part 1, Subgroup & Subcommittee Installation, 2016 – 2018.

- Technical Panel Member of UL834, Standard for Heating, Water Supply, and Power Boilers – Electric, Underwriters Laboratories 2011 – present.

- Member of Peer Review Board, The National Board of Boiler and Pressure Vessel Inspectors, 2016 - 2018.

- Main Committee member of National Board Inspection Code, NBIC, 2017 – 2018.

- Colorado Army National Guard from 1980 -1989, Rank Staff Sergeant, Crew Chief 8” Self Propelled Howitzer. Three (3) years as trainer for COANG Leadership Development Course (Basic, Primary and Advanced), (Honorable Discharge).

- Authored numerous Laws (State Statutes), and Rules for Boilers and Pressure Vessels in two jurisdictions.

J. Matt Downs
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Michigan City, IN 46360
(219)879-3947

EDUCATION: Purdue University, North Central, Westville, Indiana
Major: Bachelor's Degree in Mechanical Engineering
Degree: Received Fall 2007
Associate in Mechanical Engineering received fall 2003
Associate in Architectural Engineering received Fall 1996

RELEVANT SCHOOLING:

Building Construction	Mechanical and Electrical Systems Estimating and Bidding Surveying (total stations) Technical Drafting and Computer Aided Design-CAD Scheduling
Math	Algebra and Trigonometry Physics I & II and Dynamics Strength of Materials Statistics and Structural Calculations Calculus I & II, Static's Thermal Dynamics
Millwright	Millwright Apprentice Local Union #1043 Two years on the job & classroom training
Plans & Specifications	Blueprint and specification reading
Software Knowledge	Solid Works, Auto-Cad, Pro Engineer, Microsoft Word, Excel, Access, PowerPoint and Scheduler, Timberline Estimating, Eagle point Engineering & Surveying Software, Auto-Architect, Agile, J.D. Edwards, Prelude, Allan Bradley PLC Programming and others.

ITT fluid Handling- Special Design & Applications
The CI Group- Basic Problem Solving & Root Cause Analysis
Quality Six Sigma Green Belt Certified

EXPERIENCE:

02/06- Present	Weil-McLain, Manufacture of Cast Iron Boilers: New Product Development- Product Engineer-Commercial Project Engineer-Coordinate development and introduction of commercial products. Marketing Commercial Product Manager- Manage existing product lines along with new product introductions American Society of Mechanical Engineers- representative ASME-Member section IV Main Committee, sub group- Materials, Cast, Care and Maintenance. ASME – Section II sub-group Non ferrious alloys
7/04 – 02/06	Geberit Manufacturing: Plumbing Products Manufacturing Engineer, Facilities Manager, Safety Manager Company representative for CSA & UL inspections Develop plant layout, capitol budgets, and assembly fixtures Project Manager for $3.2 Mil. addition, Relocated three company's/ operations to new facility
9/95- 7/04	Weil-McLain, Manufacture of Cast Iron Boilers: New Product Development- Product Engineer/Project Manager Applications Engineer, Commercial Services Engineer, Technical Service and Radiant Engineer, Quality Assurance Inspector in the Machine shop, Returned goods and receiving inspection. Company Representative- ASTM (American Society for Testing of Materials), IAPMO- (International Association of Plumbing and Mechanical Officials_ and NSF (National Sanitation Foundation Labs)
8/93 – 11/07	Student at Purdue University North Central Degree: Architecture Technology, fall of 1996 Mechanical Engineering Degree, fall 2003 Mechanical Engineering Bachelor's Degree, Fall 2007
6/91 – 6/93	Local Union #1043 – Apprentice Millwright, precision alignment/ leveling of motors, gear box assemblies and conveying systems.

Professional references available upon request.

Patrick Jennings - Director of Legislative Affairs
Hartford Steam Boiler Inspection and Insurance Company

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Hartford, CT 06102
860 - 722 - 5582

Patrick_Jennings@hsb.com

SUMMARY

Over thirty years working with boilers in a wide range of job positions including; Technical Subject Matter Expert, Business Development, Boiler Design, Firing System Design, Boiler Design, R&D, field service.

The past eight years have been with Hartford Steam Boiler (HSB) with most of that time as a subject matter expert (boiler) supporting the Insurance and Jurisdictional aspects of HSB's equipment breakdown business.

EXPERIENCE

Hartford Steam Boiler

Director of Legislative Affairs December 2018 to Present.

Working for the Inspection Services group, I interface with subjects related to jurisdictional issues primarily the interface between the statutes, regulations and inspection services work instructions. This includes resolution of jurisdictional issues with the chiefs as needed.

Principal Engineer July 2011 to December 2018

Technical Subject Matter Expert for boilers in support of insurance and jurisdictional inspections business units. Provided technical support to underwriting by developing standards and performing desktop reviews; claims by training, inspection services by training and direct consultation. Support for claims and underwriting included direct consultation for atypical areas or events relating to boilers or energy.

Alstom Power (ABB, Combustion Engineering)

Director of Business Development April 2009 to July 2011
Manager of Business Development April 2008 to April 2009

Led a group of seven proposal managers and one proposal publisher with responsibility for obtaining financial objectives of order intake and as-sold gross and net margins. Responsible for the commercial and technical aspects of all proposals issued from the group. I worked closely with the sales and engineering organizations to perform market analysis, identify opportunities, develop appropriate scope proposals, conduct technical and commercial risk reviews and negotiate contracts.

Consulting Engineer, Performance Design, May 2006 to April 2008

As a Performance Design Engineer (PDE), the job entailed working on pressure part proposals and contract execution. This involved engineering analysis and material selections for both the proposal and contract phase. All jobs proposed and executed finished under budget, on schedule and met all performance targets. Lead author of the boiler portion of the retrofits chapter in the Alstom Power textbook, *Clean Combustion Technologies*.

Supervisor of Proposal Engineering, Sept. 2004 to May 2006

Technically responsible for all Boiler Retrofit (Windsor) proposals issued. The requirement was to ensure that all proposals have clearly identified scope of supply and performance conditions that support performance guarantees. Identify risk areas and potential mitigation strategies.

Business Development Manager, March 1999 to Sept. 2004

Responsible for capturing NOx reduction projects and related firing systems products from utility and industrial companies. As a Business Development Manager I obtained $65 Million in direct contracts with higher than average gross margins for the business unit. These contracts resulted in significant pull through work for construction, technical services and contract extras.

Principal Firing Systems Engineer, June 1994 to March 1999

Primarily responsible for the technical direction of proposals for Low NOx firing system projects that meet customer expectations and achieve guaranteed performance. Supported proposals for standard product lines and three first of a kind firing systems with responsibility for the safe design and project execution.

R&D Firing Systems Engineer, March 1990 to June 1994

Primarily responsible for proposing and executing firing system developmental projects in direct support of business unit requirements and government contracts with values up to four million dollars. Received a patent for technology developed.

Test Engineer, July 1986 to March 1990

As a field services test engineer for technical services working on utility boilers job responsibilities included; developing test plans, identifying resource requirements and executing test programs. I also supported NDE testing on the first Combustion Engineering CFB boiler.

EDUCATION

North Carolina State University, Raleigh NC - B.S. Mechanical Engineering – May 1986

PATENTS

US Patent 5,315,939 – One of the Top 100 Inventions of 1994; Popular Science Magazine

TECHNICAL PAPERS / WRITING (Selected)

Jennings, P; Ashman, J; Dejung, S; Gebert, T; Kolbe, C; Park, H; Popovic, C; Von Roth, D; Shepherd, M (2016). IMIA Working Group Paper 95(16) Supercritical Boilers, *49th Annual IMIA Conference*, Doha, Qatar.

Lead author on the Retrofits chapter in the Alstom Power *Clean Combustion Technologies* (2009) textbook.

Jennings, P. (2004). Alstom's Low NOx Firing Experience on Western Fuels. *Western Fuels Symposium.* Billings, MT.

Jennings, P. (2002). Low NOx Firing Systems and PRB Fuel; Achieving as low as 0.12 LB NOx/MBtu. *Institute of Clean Air Companies, Forum '02.* Houston, TX.

Gessner, T., Hoh, R., Ray, B., Dorazio, T., Sikorski, K., & Jennings, P. (1999). NOx Emissions Retrofit at Reliant Energy, W.A. Parish Generating Station, Unit 7: Achieving 0.15 lb/MBtu. *ASME International Joint Power Generation Conference.* San Francisco, CA.

Gessner, T., Hoh, R., Ray, B., Jennings, P., & Rebula, E. (1999). Results from Reliant Energy, W.A. Parish 7; Achieving < 0.15 lb/MBtu . *EPA-EPRI-DOE Combined Utility Air Pollutant Control Symposium: The Mega Symposium* . Atlanta, GA.

Jennings, P. (1993). Development and Testing of a High Efficiency Advanded Coal Combustor; Industrial Boiler Retrofit. *Proc. 11th International Pittsburgh Coal Conference.* Pittsburgh, PA.

Darroch, M., LaFlesh, R., Hart, D., & Jennings, P. (1991). "In-Furnace Low NOx Solutions for Wall Fired Boilers." *Spring Meeting, AFRC* . Hartford, CT.

NB11-1901

SUPPLEMENT X
INSTALLATION OF HIGH PRESSURE COMPOSITE PRESSURE VESSELS

SX.1 SCOPE

This supplement provides requirements for the installation of high-pressure composite pressure vessels. This supplement is applicable to pressure vessels with an MAWP not exceeding 15,000 psi, and is applicable to the following classes of vessels:

a) Metallic vessel with a Fiber Reinforced Plastic FRP) hoop wrap over the shell part of the vessel both load sharing)

b) Metallic vessel with a full FRP wrap (both load sharing)

c) FRP vessel with a non-load sharing metallic liner

d) FRP vessel with a non-load sharing non-metallic liner

SX.2 SUPPORTS

Design of supports, foundations, and settings shall consider the dead loads, live loads, wind, and seismic loads. Vibration and thermal expansion shall also be considered. The design of supports, foundations, and settings shall be in accordance with ASCE/SEI 7, *Minimum Design Loads for Buildings and Other Structures*. The importance factors used in calculating the seismic and wind loads shall be the highest value specified for any category in ASCE/SEI 7.

SX.3 CLEARANCES

The pressure vessel installation shall allow sufficient clearance for normal operation, maintenance, and inspection. Stacking of pressure vessels is permitted. The minimum clear space between pressure vessels shall be 1 ft. vertical and 2 ft. horizontal. Vessel nameplates shall be visible after installation for inspection. The location of vessels containing flammable fluids shall comply with NFPA 2. The vessel owner shall document the vessel pressure and pipe diameters used as a basis for compliance with NFPA 2 location requirements.

SX.4 PIPING LOADS

Piping loads on vessel nozzles shall be determined by a formal flexibility analysis per ASME B31.12: paragraph IP-6.1.5(b). The piping loads shall not exceed the maximum nozzle loads defined by the vessel manufacturer.

SX.5 MECHANICAL CONNECTIONS

Mechanical connections shall comply with pressure vessel manufacturer’s instructions, and with requirements of the Jurisdiction. Connections to threaded nozzles shall have primary and secondary seals. The seal design shall include a method for detecting a leak in the primary seal. Seal functionality shall be demonstrated at the initial pressurization of the vessel.

SX.6 PRESSURE INDICATING DEVICES

Each pressure vessel shall be equipped with a pressure gage mounted on the vessel. The dial range shall be from 0 psi to not less than 1.25 times the vessel MAWP. The pressure gage shall have an opening not to exceed 0.0550in (1.4mm) (No. 54 drill size) at the inlet connection. In addition, vessel pressure shall be monitored by a suitable remote pressure indicating device with alarm having an indicating range of 0 psi to not less than 1.25 times the vessel MAWP.

SX.7 PRESSURE RELIEF DEVICES

Each pressure vessel shall be protected by pressure relief devices per the following requirements:

a) Pressure relief devices shall be suitable for the intended service.

b) Pressure relief devices shall be manufactured in accordance with a national or international standard and certified for capacity (or resistance to flow for rupture disk devices) by the National Board.

c) Dead weight or weighted lever pressure relief valves are prohibited.

d) Pressure relief valves shall not be fitted with lifting devices.

e) The pressure relief device shall be installed directly on the pressure vessel with no isolation valves between the vessel and the pressure relief device except:

1) When these isolation valves are so constructed or positively controlled below the minimum required capacity, that closing the maximum number of valves at one time will not reduce the pressure relieving capacity, or

2) Upon specific acceptance of the Jurisdiction, an isolation valve between vessel and its pressure relief device may be provided for vessel inspection and repair only. The isolation valve shall be arranged so it can be locked or sealed open.

f) The discharge from pressure relief device(s) shall be directed upward to prevent any impingement of escaping fluid upon the vessel, adjacent vessels, adjacent structures, or personnel. The discharge must be to outdoors, not under any structure or roof that might permit formation of a “cloud”. The pressure relief device(s) discharge piping shall be designed so that it cannot become plugged by animals, insects, rainwater, or other materials.

g) The pressure relief device(s) shall be set at a pressure not exceeding the MAWP of the vessel.

h) The pressure relief device(s) shall have sufficient capacity to ensure the pressure vessel does not exceed the MAWP of that specified in the original code of construction.

i) The owner shall document the basis for selection of the pressure relief device(s) used, including capacity.

j) The owner shall have such analysis available for review by the Jurisdiction.

k) Pressure relief devices and discharge piping shall be supported so that reaction forces are not transmitted to the vessel.

l) Heat detection system: a heat activated system shall be provided so that vessel contents will be vented per f) (above), if any part of the vessel is exposed to a temperature greater than 220°F.

m) Positive methods shall be incorporated to prevent overfilling of the vessel.

SX.8 ASSESSMENT OF INSTALLATION

a) Isolation valve(s) shall be installed directly on each vessel, but not between the vessel and the pressure relief device except as noted in 3.7, e), above.

b) Vessels shall not be buried.

c) Vessels may be installed in a vault subject to a hazard analysis, verified by the manufacturer, owner, user, qualified engineer, or the Jurisdiction, to include as a minimum the following:

1) Ventilation

2) Inlet and outlet openings

3) Access to vessels

4) Clearances

5) Intrusion of ground water

6) Designed for cover loads

7) Explosion control

8) Ignition sources

9) Noncombustible construction

10) Remote monitoring for leaks, smoke, and fire

11) Remote controlled isolation valves

d) Fire and heat detection/suppression provisions shall comply with the requirements of the Jurisdiction and, as a minimum, include relief scenarios in the event of a fire or impending overpressure from heat sources.

e) Installation locations shall provide the following:

1) Guard posts shall be provided to protect the vessels from vehicular damage per NFPA 2. Protection from wind, seismic events shall be provided.

2) Supports and barriers shall be constructed of non-combustible materials.

3) Vessels shall be protected from degradation due to direct sunlight.

4) Access to vessels shall be limited to authorized personnel.

5) Any fence surrounding the vessels shall be provided with a minimum of two gates. The gates shall open outward, and shall be capable of being opened from the inside without a key.

6) Access for initial and periodic visual inspection and NDE of vessels, supports, piping, pressure gages or devices, relief devices and related piping, and other associated equipment.

7) Completed installations shall be validated as required by the Jurisdiction as addressing all of the above, and any requirements of the Jurisdiction, prior to first use. This verification shall be posted in a conspicuous location near the vessel and, when required, on file with the Jurisdiction. Certificates shall be updated as required by mandated subsequent inspections.

8) Piping installation shall comply with ASME B31.12 or NFPA 2.

9) The vessels shall be electrically bonded and grounded per NFPA 55.

SX.9 LADDERS AND RUNWAYS

See NBIC Part 1, Section 1.6.4 *Ladders and Runways*

NB16-0102

Action Item Request Form

8.2 CODE REVISIONS OR ADDITIONS

Request for Code revisions or additions shall provide the following:

Existing Text:

2.10.2 PRESSURE TEST

Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in accordance with the original code of construction. Any pressure piping and fittings such as water columns, blowoff valves, feedwater regulators, superheaters, economizers, stop valves, etc., which are shipped connected to the boiler as a unit, shall be hydrostatically tested with the boiler and witnessed by an Inspector.

2.10.4 SYSTEM TESTING

Prior to final acceptance, an operational test shall be performed on the complete installation. The test data shall be recorded and the data made available to the jurisdictional authorities as evidence that the installation complies with the provisions of the governing code(s) of construction. This operational test may be used as the final acceptance of the unit.

3.10.1 PRESSURE TEST

Prior to initial operation, the completed boiler, individual module, or assembled module, shall be subjected to a pressure test in accordance with the requirements of the original code of construction.

4.6 TESTING AND ACCEPTANCE

a) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. The installer shall inspect the interior of the vessel and its appurtenances where possible prior to making the final closures for the presence of foreign debris.

b) The completed pressure vessel shall be pressure tested in the shop or in the field in accordance with the original code of construction. When required by the Jurisdiction, owner or user, the Inspector shall witness the pressure test of the completed installation, including piping to the pressure gage, pressure relief device, and, if present, level control devices.

4.7.6 TESTING AND ACCEPTANCE

Testing and acceptance shall be in accordance with NBIC Part 1, 4.6

b) Statement of Need

NB10-1201 Covered reformatting multiple items. Pressure Testing was inconsistent between the three sections and really needs to be addressed

c) Background Information

Consolidation of Testing and Final Acceptance to Section 1 General.

Proposed Wording:

1.6.10 TESTING AND FINAL ACCEPTANCE

~~Boilers, heaters, or pressure vessels may not be placed into service until its installation has been inspected and accepted by the appropriate jurisdictional authorities.~~

a) The completed boiler/ pressure vessel shall be pressure tested in the shop and/or in the field in accordance with the original code of construction and documented on the appropriate Manufacturer's Data Report.

b) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. Prior to making the final closure the installer shall inspect the interior of the vessel and its appurtenances for the presence of foreign debris.

c) Subject to the jurisdictional requirements, a leak test may be performed on any components whose pressure test is not documented under the items' Manufacturer's Data Report. This leak test should not exceed 90% of the lowest pressure relief device setpoint. The test data shall be recorded, and the data made available as required.

d) Prior to final acceptance, an operational test shall be performed on the completed installation. The test shall include operating controls, limit controls and safety devices. The test data shall be recorded, and the data made available to the Jurisdictional Authorities as evidence that the installation complies with provisions of the governing code(s) of construction.

2.10.2 PRESSURE TEST

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Prior to initial operation, the completed boiler, including pressure piping, water columns, superheaters, economizers, stop valves, etc., shall be pressure tested in accordance with the original code of construction. Any pressure piping and fittings such as water columns, blowoff valves, feedwater regulators, superheaters, economizers, stop valves, etc., which are shipped connected to the boiler as a unit, shall be hydrostatically tested with the boiler and witnessed by an Inspector.~~

2.10.4 SYSTEM TESTING

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Prior to final acceptance, an operational test shall be performed on the complete installation. The test data shall be recorded and the data made available to the jurisdictional authorities as evidence that the~~

~~installation complies with the provisions of the governing code(s) of construction. This operational test may be used as the final acceptance of the unit.~~

3.10.1 PRESSURE TEST

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Prior to initial operation, the completed boiler, individual module, or assembled module, shall be subjected to a pressure test in accordance with the requirements of the original code of construction.~~

4.6 TESTING AND ACCEPTANCE

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~a) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. The installer shall inspect the interior of the vessel and its appurtenances where possible prior to making the final closures for the presence of foreign debris.~~

~~b) The completed pressure vessel shall be pressure tested in the shop or in the field in accordance with the original code of construction. When required by the Jurisdiction, owner or user, the Inspector shall witness the pressure test of the completed installation, including piping to the pressure gage, pressure relief device, and, if present, level control devices.~~

4.7.6 TESTING AND ACCEPTANCE

See NBIC Part 1, Section 1.6.10, *TESTING AND FINAL ACCEPTANCE*

~~Testing and acceptance shall be in accordance with NBIC Part 1, 4.6~~

NB16-0102

Old wording that has been submitted as a letter ballot to the MC:

a) The completed boiler/ pressure vessel shall be pressure tested in the shop and/or in the field in accordance with the original code of construction.

b) The installer shall exercise care during installation to prevent loose weld material, welding rods, small tools, and miscellaneous scrap metal from getting into the vessel. Prior to making the final closure. The installer shall inspect the interior of the vessel and its appurtenances where possible prior to making the final closures for the presence of foreign debris.

c) Subject to the jurisdictional requirements, Prior to final acceptance, an operational pressure test, with the approval of the jurisdiction if required, shall may be performed on any components whose pressure test is not documented under the items' Manufacturer's Data Report. This pressure test should not exceed 90% of the lowest pressure relief device setpoint. The test data shall be recorded and the data made available as required. This operational test may be used as the final acceptance of the unit.

Comments for Ballot: NB16-01-02	
Welch,Paul voted: Approve 10/19/2016 1:50:39 PM	I recommend approval with a minor change to the proposed wording in para b. second sentence to read: Prior to final acceptance, an operational test, with the approval of the Jurisdiction, shall be performed...
Pillow,James voted: Approve 10/6/2016 8:00:39 AM	I approve the proposal, but suggest a minor editorial change in last sentence of first paragraph as follows. Prior to making the final closures, the installer shall inspect the interior of the vessel and its appurtenances where possible for the presence of foreign debris.
Webb,Michael voted: Disapprove 10/5/2016 3:01:27 PM	At this time, I will vote to "disapprove" this item. My understanding of this action item was to; generally consolidate the pressure testing requirements of the various Part 1, Sections into a more general practice to be described in Part 1, Section 1-General Guidelines. In my read whether intended or my misunderstanding, the product of the SC-Installation effort may have offered the ASME code-required pressure testing to be circumvented as presented in the SC-proposed paragraph "b)". To add, I would propose for consideration the item as presented in the attachment or otherwise presented be inserted as: Part 1, Section 1, 1.4.1 b) with the current 1.4.1 b) re-introduced to become 1.4.1 c). As a note to the attachment: the text in red represents the text implying the operational test may satisfy final acceptance of the unit.–M. Webb, 10-5-16 Reference Document: NB16-0102-letter ballot Part 1 Section 1 G. Guidelines proposed 1.4.1. b. 10-5-16.pdf
Troutt,Robby voted: Disapprove 10/5/2016 8:09:44 AM	My disapproval is based on the lack of reference to a jurisdictional inspection prior to the operational test in paragraph (b). Some jurisdictions do not allow an operational test prior to the initial inspection.
Sekely,Jim voted: Approve 10/3/2016 1:07:21 PM	1.?? b): Change who's to whose

7/16/2019 – Main Committee ballot comments on last page

Item Numbers: 17-131 (Pressure Relief) and 17-159 (Installation) NBIC Location: Part 4, 2.5.7 a) and Part 1, 4.7.3 a)

17-131 General Description: Review overpressure protection requirements for hot water storage tanks that exceed 160 psi.

17-159: General Description: Result of 17-147; review Part 1, 4.7 for references to hot water storage tanks. With the definition of Potable Hot Water Storage Tank items referencing this in Part 1, Section 4.7 need to be updated, modified and or revised.

The following proposal combines the proposals from 17-131 and 17-159.

"Hot water storage tank" is deleted from 4.7.3 a) because is covered in c), and the temperature could exceed 210 deg. F. for those vessels. The item from installation was not changed otherwise. The Part 4, par. 2.5.7 is new but is just Part 1, par. 4.7 slightly rewritten.

Proposal:

NBIC Location: Part 1, 4.7

4.7 REQUIREMENTS FOR HOT WATER STORAGE TANKS/POTABLE HOT WATER STORAGE TANK
4.7.1 SUPPORTS
Each hot water storage tank shall be supported in accordance with NBIC Part 1, 1.6.1.
4.7.2 CLEARANCE AND ACCEPTABILITY
a) The required nameplate (marking or stamping) should be exposed and accessible.
b) The openings when required should be accessible to allow for entry for inspection and maintenance.
c) Each hot water storage tank shall meet the requirements of NBIC Part 1, 4.3.2.
4.7.3 TEMPERATURE AND PRESSURE RELIEF DEVICES
a) Each potable hot water storage tank~~/ hot water storage tank~~ shall be equipped with an ASME/NB certified temperature and pressure relief ~~device~~ valve set at a pressure not to exceed the maximum allowable working pressure and 210°F (99°C).
b) Potable hot water storage tanks exceeding the pressure limit of ASME Code Section IV shall meet the original code of construction and shall be protected by a pressure relief ~~device~~ valve set not to exceed the vessel's maximum allowable working pressure. A temperature limiting device shall be installed so that the water inside the storage tank does not exceed 210°F (99°C).
c) Each hot water storage tank shall be equipped with an ASME/NB certified pressure relief valve set at a pressure not to exceed the maximum allowable working pressure.
d) The temperature and pressure relief ~~device~~ valve shall meet the requirements of NBIC Part 1, 4.5.

4.7.4 THERMOMETERS

a) Each hot water storage/potable hot water storage tank shall be equipped with a thermometer.
b) Each hot water storage/potable hot water storage tank shall have a thermometer so located that it shall be easily readable at or near the outlet. The thermometer shall be so located that it shall at all times indicate the temperature of the water in the storage tank.

4.7.5 SHUT OFF VALVES
a) Each hot water storage/potable hot water storage tank shall be equipped with stop valves in the water inlet piping and the outlet piping in order for the hot water storage tank to be removed from service without having to drain the complete system.
b) Each hot water storage/potable hot water storage tank shall be equipped with a bottom drain valve to provide for flushing and draining of the vessel.

NBIC Location: Part 4, 2.5.7

2.5.7 TEMPERATURE AND PRESSURE RELIEF DEVICES FOR HOT WATER STORAGE TANKS/POTABLE HOT WATER STORAGE TANK

a) Each potable hot water storage tank shall be equipped with an ASME/NB certified temperature and pressure relief ~~device~~ valve set at a pressure not to exceed the maximum allowable working pressure and 210°F. (99°C).
b) Potable hot water storage tanks exceeding the pressure limit of ASME Code Section IV shall meet the original code of construction and shall be protected by a pressure relief ~~device~~ valve set not to exceed the vessel's maximum allowable working pressure. A temperature limiting device shall be installed so that the water inside the storage tank does not exceed 210°F (99°C).
c) Each hot water storage tank shall be equipped with an ASME/NB certified pressure relief valve set at a pressure not to exceed the maximum allowable working pressure.

~~b~~d) The temperature and pressure relief ~~device~~ valves shall meet the requirements of 2.5.1 through 2.5.6 above.

Archived Comments for Ballot: 17-131159-MC	
Amato,Joel 3/5/2019 10:55:03 AM	Do we define "hot water storage tank" and "potable hot water storage tank"? Is there a difference? I think we also need to remain consistent with the terms device and valve.
Ball,Joseph 3/4/2019 8:53:59 AM *Reply To: Newton,Venus*	When a Section VIII vessel is used the new paragraph b) has two separate requirements in two separate sentences. The first is for a pressure relief device for overpressure protection (a separate comment on valve vs. device will be supplied). The second sentence requires a "temperature limiting device" that give the same temperature protection as a T&P valve. This would usually be a control valve of some type. This addresses the problem that T&P valves are not available under Section VIII, and at pressures higher than 160 psig.
Newton,Venus 3/4/2019 6:57:24 AM	The wording is confusing to me. It looks like you not only need a pressure relief device, but that a temperature and pressure relief valve is also always required, even on the Section VIII storage tanks.
Wadkinson,Melissa 2/27/2019 10:10:16 AM	Regarding the use of device vs valve, if the tank exceeds the pressure limitations of Section IV it will be built to Section VIII and over pressure protection does not necessarily have to be a valve.
Richards,Michael 2/25/2019 2:54:00 PM	Concur with Mr. Galanes observation.
Galanes PE,George 1/30/2019 10:58:52 AM	GWG comment; I have no objection to the proposed revisions. I am abstaining because I do see the words valve and device are used interchangeably. We should stick with device rather than valve to be consistent.

Explanation: Duplicate wording in 2.8.1 and 2.8.5.

Summary of changes:

Add "Column" to the title in 2.8.1. Delete 2.8.1 (a) and (c) as they are covered under 2.8.5 (a) and 2.8.5 (d). Relocate 2.8.1 (b) to 2.8.5 (e).

2.8.1 WATER COLUMN

~~a) Each automatically-fired steam boiler shall be equipped with at least two low-water fuel cutoffs. The water inlet shall not feed water into the boiler through a float chamber.~~

~~b) Each electric steam boiler of the resistance element type shall be equipped with an automatic low-water cutoff so located as to automatically cut off the power supply to the heating elements before the surface of the water falls below the visible part of the glass. No low-water cutoff is required for electrode-type boilers.~~

~~c) Designs embodying a float and float bowl shall have a vertical straightaway drainpipe at the lowest point in the water equalizing pipe connections, by which the bowl and the equalizing pipe can be flushed and the device tested~~.

a) The water column shall be directly connected to the boiler. Outlet connections (except for damper regulator, feedwater regulator, low-water fuel cutoff, drains, steam gages, or such apparatus that does not permit the escape of an appreciable amount of steam or water) should not be placed on the piping that connects the water column to the boiler.

b) Straight-run globe valves of the ordinary type shall not be used on piping that connects the water column to the boiler. Where water columns are 7 ft. (2.1 m) or more above the floor level, adequate means for operating gage cocks or blowing out the water glass shall be provided.

c) When automatic shutoff valves are used on piping that connects the water column to the boiler, they shall conform to the requirements of the code of construction for the boiler.

d) When shutoff valves are used on the connections to a water column, they shall be either outside-screw-and-yoke or lever-lifting-type gate valves or stop cocks with levers permanently fastened thereto and marked in line with their passage, or of such other through-flow constructions to prevent stoppage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in open or closed position; and such valves or cocks shall be locked or sealed open.

e) Each steam boiler having a fixed waterline shall have at least one water-gage glass except that boilers operated at pressures over 400 psig (2.8 MPa) shall be provided with two water-gage glasses that may be connected to a single water column or connected directly to the drum. The gage glass connections and pipe connection shall be not less than NPS 1/2 (DN 15). Each water-gage glass shall be equipped with a valved drain.

f) Electric steam boilers shall have at least one water-gage glass. On electrode-type electric boilers, the gage glass shall be located as to indicate the water levels both at startup and maximum steam load conditions, as established by the boiler manufacturer. On resistance element type electric steam boilers, the lowest visible part of the gage glass shall be located at least 1 in. (25 mm) above the lowest permissible water level established by the boiler manufacturer.

g) The lowest visible part of the water-gage glass shall be at least 2 in. (50 mm) above the lowest permissible water level established by the boiler manufacturer.

h) For all installations where the water-gage glass or glasses are not easily viewed by the operator, consideration should be given to install a method of remote transmission of the water level to the operating floor.

i) Boilers of the horizontal firetube type shall be so set that when the water is at the lowest reading in the water-gage glass, it shall be 3 in. (75 mm) above the lowest permissible water level as determined by the manufacturer. Horizontal firetube boilers that do not exceed 16 in. (400 mm) in inside diameter shall have the lowest visible level in the gage glass at least 1 in. (25 mm) above the lowest permissible level as determined by the manufacturer.

j) Each water-gage glass shall be equipped with a top and a bottom shutoff valve of such through-flow construction as to prevent blockage by deposits of sediment and to indicate by the position of the operating mechanism whether they are in the open or closed position. The pressure-temperature rating shall be at least equal to that of the lowest set pressure of any safety valve on the boiler drum and the corresponding saturated steam temperature.

2.8.5 AUTOMATIC LOW-WATER FUEL CUTOFF AND/OR WATER FEEDING DEVICE FOR STEAM OR VAPOR SYSTEM BOILERS

a) Each automatically fired steam-or vapor-system boiler shall have an automatic low-water fuel cutoff so located as to automatically cut off the fuel supply when the surface of the water falls to the lowest visible part of the water-gage glass. If a water feeding device is installed, it shall be so constructed that the water inlet valve cannot feed water into the boiler through the float chamber and so located as to supply requisite feedwater.

b) Such a fuel cutoff or water feeding device may be attached directly to a boiler. A fuel cutoff or water feeding device may also be installed in the tapped openings available for attaching a water glass directly to a boiler, provided the connections are made to the boiler with nonferrous tees or Y's not less than NPS 1/2 (DN 15) between the boiler and water glass so that the water glass is attached directly and as close as possible to the boiler; the run of the tee or Y shall take the water glass fittings, and the side outlet or branch of the tee or Y shall take the fuel cutoff or water feeding device. The ends of all nipples shall be reamed to full-size diameter.

c) In addition to the requirements in a) and b) above, a secondary low-water fuel cutoff with manual reset shall be provided on each automatically fired steam or vapor system boiler.

d) Fuel cutoffs and water feeding devices embodying a separate chamber shall have a vertical drain pipe, extended to a safe point of discharge, and a blowoff valve not less than NPS 3/4 (DN 20), located at the lowest point in the water equalizing pipe connections so that the chamber and the equalizing pipe can be flushed and the device tested.

e) Each electric steam boiler of the resistance element type shall be equipped with an automatic low-water cutoff so located as to automatically cut off the power supply to the heating elements before the surface of the water falls below the visible part of the glass. No low-water cutoff is required for electrode-type boilers.

National Board of Boiler and Pressure Vessel Inspectors
National Board Inspection Code
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PLEASE SUBMIT ONLY ONE COMMENT/RECOMMENDATION PER PAGE
Make additional copies as needed

Comments Must be Received No Later Than: October 15, 2018

Instructions: If unable to submit electronically, please print this form and fax or mail. Print or type clearly.

Date: Sep. 10, 2018

Commenter Name: Alex Garbolevsky

Commenter Address: Hartford Steam Boiler
One State St., 8th Flr., Hartford, CT 06102-5024

Commenter Phone: (860) 722-5098

Commenter Fax: none

Commenter Email: alex_garbolevsky@hsb.com

Section/Subsection Referenced: NBIC Part 1, 1.6.3 (NB16-0905)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ■ Revise Text ☐ Delete Text

Comment: Not all pressure vessels are fired or electrically heated. Would it be more appropriate to use "fired or electrically heated pressure vessels" rather than "pressure vessels" in this text?

Source: ■ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Jonathan Ellis, NBIC Secretary, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, email: jellis@nationalboard.org

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Commenter No. Issued: ______________________ Project Committee Referred To:

Comment No. Issued: ______________________ ______________________

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 Jurisdiction where the pressure-retaining item is to be operated shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

(19) 1.6 GENERAL REQUIREMENTS

The following are general requirements for the boilers, potable water heaters, thermal fluid heaters and pressure vessels covered in NBIC Part 1, Section 2, NBIC Part 1 Section 3, NBIC Part 1 Section 4, and NBIC Part 1 Supplement 5. Refer to each referenced section for additional requirements specific to the type of equipment covered by each section.

(19) 1.6.1 SUPPORTS, FOUNDATIONS, AND SETTINGS

Each boiler, potable water heater, thermal fluid heater and pressure vessel and the associated piping must be safely supported. Design of supports, foundations, and settings shall consider vibration (including seismic where necessary), movement (including thermal expansion and contraction), and loadings (including the weight of the fluid in the system during a pressure test) in accordance with jurisdictional requirement, manufactures recommendations, and/or other industry standards, as applicable.

1.6.2 STRUCTURAL STEEL

a) If the boiler, heater, or vessel is supported by structural steel work, the steel supporting members shall be so located or insulated that the heat from the furnace will not affect their strength.

b) Structural steel shall be installed in accordance with jurisdictional requirements, manufacturer's recommendations, and/or other industry standards, as applicable.

(19) 1.6.3 EXIT

Two means of exit shall be provided for equipment rooms exceeding 500 $ft.^2$ (46.5 m^2) of floor area and containing one or more boilers, potable water heaters, thermal fluid heaters or pressure vessels having a combined fuel capacity of 1,000,000 Btu/hr (293 kW) or more (or equivalent electrical heat input). Each elevation shall be provided with at least two means of exit, each to be remotely located from each other. A platform at the top of a single boiler, potable water heater, thermal fluid heater or pressure vessel is not considered an elevation.

1.6.4 LADDERS AND RUNWAYS

a) All walkways, runways, and platforms shall be:

1) of metal construction or equivalent material;

2) provided between or over the top of boilers, heaters, or vessels that are more than 8 ft. (2.4 m) above the operating floor to afford accessibility for normal operation, maintenance, and inspection;

3) constructed of safety treads, standard grating, or similar material and have a minimum width of 30 in. (760 mm);

4) of bolted, welded, or riveted construction; and

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Commenter Name: Alex Garbolevsky

Commenter Address: Hartford Steam Boiler
One State St., 8th Flr., Hartford, CT 06102-5024

Commenter Phone: (860) 722-5098

Commenter Fax: none

Commenter Email: alex_garbolevsky@hsb.com

Section/Subsection Referenced: NBIC Part 1, 1.6.9 (NB16-0101)

Comment/Recommendation: *Proposed Solution:* ☐ New Text ■ Revise Text ☐ Delete Text

Comment: Does this also apply to "potable water heaters" and "thermal fluid heaters" which are not specifically mentioned?

Source: ■ Own Experience/Idea ☐ Other Source/Article/Code/Standard

Submit Form To: Jonathan Ellis, NBIC Secretary, The National Board of Boiler & Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, OH 43229, email: jellis@nationalboard.org

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Commenter No. Issued: ____________ Project Committee Referred To:

Comment No. Issued: ____________ ____________

f) The size of openings specified in c) above may be reduced when special engineered air supply systems approved by the Jurisdiction are used.

g) Care should be taken to ensure that steam, water and fluid lines are not routed across combustion air openings, where freezing may occur.

1.6.7 LIGHTING

The equipment room should be well lighted and it should have an emergency light source for use in case of power failure.

(19) 1.6.8 CHIMNEY OR STACK

Chimneys or stacks shall be installed in accordance with jurisdictional requirements, manufacturer's recommendations, and/or industry standards, as applicable.

(19) 1.6.9 CARBON MONOXIDE (CO) DETECTOR/ALARM

The owner or user shall install a carbon monoxide (CO) detector/alarm in equipment rooms where fuel fired boilers and/or fuel fired pressure vessels are located in accordance with the authority having Jurisdiction.

(19) 1.6.10 FINAL ACCEPTANCE

Boilers, heaters, or pressure vessels may not be placed into service until its installation has been inspected and accepted by the appropriate jurisdictional authorities.

PURPOSE: Revision of present (2017) NB-23 Code

PRESENTATION: The content of this document can be presented to the Committee, in Kansas City.

BACKGROUND INFORMATION: Suggested revisions are supported by the contributor's 30yr industry experience within large corporate owner/user environments including purchase and design, manufacturing, installation, inspection and repair.

NB23 (2017) Part 1, Supplement 1

S1.1 SCOPE

This supplement provides guidelines for the installation of a ~~Yankee~~ yankee dryer. A ~~Yankee~~ yankee dryer ~~is a pressure vessel with~~ has the following characteristics:

[Contributor's Note: Modern word processing software often includes spelling and grammar checking features that prompt us to capitalize the word yankee; however, this recommends that the NBIC not capitalize when used to discuss a yankee dryer. Citing www.grammarbook.com, "With the passage of time, some words originally derived from proper nouns have taken on a life, and authority, of their own and no longer require capitalization." A valid approach is therefore to capitalize yankee when it is the first word in a sentence like this one, but not elsewhere.]

a) ~~This supplement describes guidelines for the installation of a Yankee dryer. A Yankee dryer~~ It is a rotating steam-pressurized cylindrical vessel commonly used in the paper industry, and ~~is typically made of cast iron,~~ finished to a high surface quality, and characterized by a center shaft connecting the heads. While traditionally made of cast iron, bolted or welded steel vessels are now produced.

b) Yankee dryers are primarily used in the production of tissue-type paper products. When used to produce machine-glazed (MG) paper, the dryer is termed an MG cylinder. A wet paper web is pressed onto the finished dryer surface using one or two pressure (pressing) rolls. Paper is dried through a combination of mechanical dewatering by the pressure roll(s), thermal drying by the pressurized Yankee dryer, and a steam-heated or fuel-fired hood. After drying, the paper web is removed from the dryer.

c) A Yankee dryer is typically manufactured in a range of outside diameters from 8 to 23 ft. (2.4 to 7 m), widths from 8 to 28 ft. (2.4 to 8.5 m), pressurized and heated with steam up to 160 psi (1,100 kPa), and rotated at speeds up to 7,000 ft/min (2,135 m/min). Typical pressure roll loads against the Yankee dryer are up to 600 pounds per linear inch (105 kN/m). A thermal load results from the drying process due to difference in temperature between internal and external shell surfaces. The dryer has an internal system to remove steam and condensate. These vessels can weigh up to 220 tons (200 tonnes).

d) The typical Yankee dryer is an assembly of several large ~~castings~~ components. The cylindrical shell is ~~normally~~ ~~a~~ commonly ASME SA-278 gray cast iron, or SA-516 steel ~~gray iron casting, in accordance with ASME designation SA-278~~. Shells internally may be smooth bore or ribbed. Heads, center shafts, and journals may be gray cast iron, ductile cast iron, or steel.

NB23 (2017) Part 1 Supplement 1	**S1.2 ASSESSMENT OF INSTALLATION** g) In addition to ~~the~~ standard loads on the Yankee dryer due to operation, ~~other~~ nonstandard load events can occur during shipment and installation into the paper machine. These nonstandard load events should be recorded in an incident log. Examples of nonstandard load events include:
NB23 (2017) Part 1 Supplement 1	**S1.4 ASME CODE PRIMARY MEMBRANE STRESS CRITERIA** **c)** In ASME Section VIII, Division 1, it is very important to note that no formulas are given for determining the stresses from thermal operating loads and pressure roll nip load(s). Hence, additional criteria need to be incorporated to establish the maximum allowable operating parameters of the Yankee dryer. Two such additional criteria are based upon the maximum principal and fatigue stress. As the thickness of the shell is reduced, one or more of these criteria will control the various operating parameters. 2) Fatigue Stress Criteria Under normal operation, the stresses due to the steam pressure, inertial and thermal operating loads are considered to be steady-state stresses. When acting simultaneously, the sum of these stresses must be judged against the cyclic, or alternating, stress due to the pressure roll nip load. Fatigue stress criteria limit the alternating stress at a given mean stress using fatigue failure criteria described by the Goodman or Smith Diagram. The purpose of this limitation is to prevent crack initiation in the outside wall due to the combination of stresses. ~~As the thickness of the shell is reduced, one or more of these criteria will control the various operating parameters.~~ Consider that a specific reference to the Goodman or Smith diagrams can be interpreted as a jurisdictional requirement by those using the Code, at the exclusion of other available diagrams. This may prompt the Committee to remove the reference.
NB23 (2017) Part 1 Supplement 1 and Part 2 Supplement 5	**OBSERVATION**: The wording of Part 1, S1.1, SCOPE and the wording of Part 2, S5.1, SCOPE serve identical purpose within the Code, but are not identically written. **RECOMMENDATION**: Ensure that wording in Part 2, S5.1, is identical to that found in Part 1, S1.1.
NB23 (2017) Part 1 Supplement 1 and Part 2 Supplement 5	**OBSERVATION**: The wording of Part 1, S1.2, ASSESSMENT OF INSTALLATION and the wording of Part 2, S5.2, ASSESSMENT OF INSTALLATION serve identical purpose within the Code, but are not identically written. **RECOMMENDATION**: Ensure that wording in Part 2, S5.2, is identical to that found in Part 1, S1.2. Note that wording will be the same, but **paragraph numberings** will be different.

NB23 (2017) Part 1 Supplement 1 and Part 2 Supplement 5	**OBSERVATION**: The wording of Part 1, S1.3, and the wording of Part 2, S5.2.1, DETERMINATION OF ALLOWABLE OPERATING PARAMETERS serve identical purpose within the Code, but are not identically written. **RECOMMENDATION**: Ensure that wording in Part 2, S5.2.1, is identical to that found in Part 1, S1.3. Note that wording will be the same, but **paragraph numberings** will be different.
NB23 (2017) Part 2 Supplement 5	**S5.2 ASSESSMENT OF INSTALLATION** g) In addition to ~~the~~ standard loads on the dryer due to normal operation, ~~other~~ nonstandard load events can occur during operation and maintenance of the paper machine. These nonstandard load events should be recorded in an incident log. Examples of nonstandard load events include:
NB23 (2017) Part 2 Supplement 5	**S5.2 ASSESSMENT OF INSTALLATION** h) If nonstandard load events have occurred, then the Inspector should ensure that an appropriate assessment of the structural integrity ~~on~~ of the dryer has been performed.
NB23 (2017) Part 2 Supplement 5	**S5.2.3** ~~a) Yankee dryers are designed and intended to have the shell thickness reduced over the life of the vessel as a result of routine wear and grinding. Yankee shell grinding is routinely performed to restore the quality or shape of the papermaking surface.~~ [Contributor's Note: the recommendation is to strike this paragraph because it is nearly identical to **S5.2.1**, paragraph a), which appears a few paragraphs earlier, within the Code.

PURPOSE: Revision of present (2017) NB-23 Code

PRESENTATION: The content of this document can be presented to the Committee, in Kansas City.

BACKGROUND INFORMATION: Suggested revisions are supported by the contributor's 30yr industry experience within large corporate owner/user environments including purchase and design, manufacturing, installation, inspection and repair.

NB23 (2017) Part 1, Supplement 1	**S1.1 SCOPE** This supplement provides guidelines for the installation of a ~~Yankee~~ yankee dryer. A ~~Yankee~~ yankee dryer ~~is a pressure vessel with~~ has the following characteristics: *[Contributor's Note: Modern word processing software often includes spelling and grammar checking features that prompt us to capitalize the word yankee; however, this recommends that the NBIC not capitalize when used to discuss a yankee dryer. Citing www.grammarbook.com, "With the passage of time, some words originally derived from proper nouns have taken on a life, and authority, of their own and no longer require capitalization." A valid approach is therefore to capitalize yankee when it is the first word in a sentence like this one, but not elsewhere.]* a) ~~This supplement describes guidelines for the installation of a Yankee dryer. A Yankee dryer~~ It is a rotating steam-pressurized cylindrical vessel commonly used in the paper industry, and ~~is typically made of cast iron,~~ finished to a high surface quality, and characterized by a center shaft connecting the heads. While traditionally made of cast iron, bolted or welded steel vessels are now produced. b) Yankee dryers are primarily used in the production of tissue-type paper products. When used to produce machine-glazed (MG) paper, the dryer is termed an MG cylinder. A wet paper web is pressed onto the finished dryer surface using one or two pressure (pressing) rolls. Paper is dried through a combination of mechanical dewatering by the pressure roll(s), thermal drying by the pressurized Yankee dryer, and a steam-heated or fuel-fired hood. After drying, the paper web is removed from the dryer. c) A Yankee dryer is typically manufactured in a range of outside diameters from 8 to 23 ft. (2.4 to 7 m), widths from 8 to 28 ft. (2.4 to 8.5 m), pressurized and heated with steam up to 160 psi (1,100 kPa), and rotated at speeds up to 7,000 ft/min (2,135 m/min). Typical pressure roll loads against the Yankee dryer are up to 600 pounds per linear inch (105 kN/m). A thermal load results from the drying process due to difference in temperature between internal and external shell surfaces. The dryer has an internal system to remove steam and condensate. These vessels can weigh up to 220 tons (200 tonnes). d) The typical Yankee dryer is an assembly of several large ~~castings~~ components. The cylindrical shell is ~~normally a~~ commonly ASME SA-278 gray cast iron, or SA-516 steel ~~gray iron casting, in accordance with ASME designation SA-278~~. Shells internally may be smooth bore or ribbed. Heads, center shafts, and journals may be gray cast iron, ductile cast iron, or steel.

NB23 (2017) Part 1 Supplement 1	**S1.2 ASSESSMENT OF INSTALLATION** g) In addition to ~~the~~ standard loads on the Yankee dryer due to operation, ~~other~~ nonstandard load events can occur during shipment and installation into the paper machine. These nonstandard load events should be recorded in an incident log. Examples of nonstandard load events include:
NB23 (2017) Part 1 Supplement 1 This section is only for part 1	**S1.4 ASME CODE PRIMARY MEMBRANE STRESS CRITERIA** **c)** In ASME Section VIII, Division 1, it is very important to note that no formulas are given for determining the stresses from thermal operating loads and pressure roll nip load(s). Hence, additional criteria need to be incorporated to establish the maximum allowable operating parameters of the Yankee dryer. Two such additional criteria are based upon the maximum principal and fatigue stress. As the thickness of the shell is reduced, one or more of these criteria will control the various operating parameters. 2) Fatigue Stress Criteria Under normal operation, the stresses due to the steam pressure, inertial and thermal operating loads are considered to be steady-state stresses. When acting simultaneously, the sum of these stresses must be judged against the cyclic, or alternating, stress due to the pressure roll nip load. Fatigue stress criteria limit the alternating stress at a given mean stress using fatigue failure criteria described by the Goodman or Smith Diagram. The purpose of this limitation is to prevent crack initiation in the outside wall due to the combination of stresses. ~~As the thickness of the shell is reduced, one or more of these criteria will control the various operating parameters.~~ Consider that a specific reference to the Goodman or Smith diagrams can be interpreted as a jurisdictional requirement by those using the Code, at the exclusion of other available diagrams. This may prompt the Committee to remove the reference.
NB23 (2017) Part 1 Supplement 1 **and Part 2 Supplement 5**	**OBSERVATION**: The wording of Part 1, S1.1, SCOPE and the wording of Part 2, S5.1, SCOPE serve identical purpose within the Code, but are not identically written. **RECOMMENDATION**: Ensure that wording in Part 2, S5.1, is identical to that found in Part 1, S1.1.
NB23 (2017) Part 1 Supplement 1 **and Part 2 Supplement 5**	**OBSERVATION**: The wording of Part 1, S1.2, ASSESSMENT OF INSTALLATION and the wording of Part 2, S5.2, ASSESSMENT OF INSTALLATION serve identical purpose within the Code, but are not identically written. **RECOMMENDATION**: Ensure that wording in Part 2, S5.2, is identical to that found in Part 1, S1.2. Note that wording will be the same, but **paragraph numberings** will be different.

NB23 (2017) Part 1 Supplement 1 **and Part 2 Supplement 5**	**OBSERVATION**: The wording of Part 1, S1.3, and the wording of Part 2, S5.2.1, DETERMINATION OF ALLOWABLE OPERATING PARAMETERS serve identical purpose within the Code, but are not identically written. **RECOMMENDATION**: Ensure that wording in Part 2, S5.2.1, is identical to that found in Part 1, S1.3. Note that wording will be the same, but **paragraph numberings** will be different.
NB23 (2017) Part 2 Supplement 5	**S5.2 ASSESSMENT OF INSTALLATION** g) In addition to ~~the~~ standard loads on the dryer due to normal operation, ~~other~~ nonstandard load events can occur during operation and maintenance of the paper machine. These nonstandard load events should be recorded in an incident log. Examples of nonstandard load events include:
NB23 (2017) Part 2 Supplement 5	**S5.2 ASSESSMENT OF INSTALLATION** h) If nonstandard load events have occurred, then the Inspector should ensure that an appropriate assessment of the structural integrity ~~on~~ of the dryer has been performed.
NB23 (2017) Part 2 Supplement 5	**S5.2.3** ~~a) Yankee dryers are designed and intended to have the shell thickness reduced over the life of the vessel as a result of routine wear and grinding. Yankee shell grinding is routinely performed to restore the quality or shape of the papermaking surface.~~ [Contributor's Note: the recommendation is to strike this paragraph because it is nearly identical to **S5.2.1**, paragraph a), which appears a few paragraphs earlier, within the Code.

Item 19-XX1
Submitted by Jerry Jessick
(920) 819-8570, jerry.jessick@gapac.com

Date: 7/9/2019

PURPOSE: Revision of present (2017) NB-23 Code

BACKGROUND INFORMATION: Suggested revisions are supported by the contributor's 30yr industry experience within large corporate owner/user environments including purchase and design, manufacturing, installation, inspection and repair.

Part 1 - Supplement 1/Part 2 - Supplement 5

OBSERVATION: The wording of Part 1, S1.1, SCOPE and the wording of Part 2, S5.1, SCOPE serve identical purpose within the Code, but are not identically written.

RECOMMENDATION: Ensure that wording in Part 2, S5.1, is identical to that found in Part 1, S1.1.

Part 1

INSTALLATION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S1.1 SCOPE

This supplement provides guidelines for the installation of a ~~Yankee~~ yankee dryer. A ~~Yankee~~ yankee dryer ~~is a pressure vessel with~~ has the following characteristics:

[Contributor's Note: Modern word processing software often includes spelling and grammar checking features that prompt us to capitalize the word yankee; however, this recommends that the NBIC not capitalize when used to discuss a yankee dryer. Citing www.grammarbook.com, "With the passage of time, some words originally derived from proper nouns have taken on a life, and authority, of their own and no longer require capitalization." A valid approach is therefore to capitalize yankee when it is the first word in a sentence like this one, but not elsewhere.]

a) ~~This supplement describes guidelines for the installation of a Yankee dryer. A Yankee dryer~~ It is a rotating steam-pressurized cylindrical vessel commonly used in the paper industry, and ~~is typically made of cast iron,~~ finished to a high surface quality, and characterized by a center shaft connecting the heads. While traditionally made of cast iron, bolted or welded steel vessels are now produced.

b) Yankee dryers are primarily used in the production of tissue-type paper products. When used to produce machine-glazed (MG) paper, the dryer is termed an MG cylinder. A wet paper web is pressed onto the finished dryer surface using one or two pressure (pressing) rolls. Paper is dried through a combination of mechanical dewatering by the pressure roll(s), thermal drying by the pressurized Yankee dryer, and a steam-heated or fuel-fired hood. After drying, the paper web is removed from the dryer.

c) A Yankee dryer is typically manufactured in a range of outside diameters from 8 to 23 ft. (2.4 to 7 m), widths from 8 to 28 ft. (2.4 to 8.5 m), pressurized and heated with steam up to 160 psi (1,100 kPa), and rotated at speeds up to 7,000 ft/min (2,135 m/min). Typical pressure roll loads against the Yankee dryer are up to 600 pounds per linear inch (105 kN/m). A thermal load results from the drying process due to difference in temperature between internal and external shell surfaces. The dryer has an internal system to remove steam and condensate. These vessels can weigh up to 220 tons (200 tonnes).

d) The typical Yankee dryer is an assembly of several large ~~castings~~components. The cylindrical shell is ~~normally a gray iron casting, in accordance with~~ commonly ASME ~~designation~~ SA-278 gray cast iron, or SA-516 steel. Shells internally may be smooth bore or ribbed. Heads, center shafts, and journals may be gray cast iron, ductile cast iron, or steel.

Part 2

INSPECTION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S5.1 SCOPE

This supplement provides guidelines for the inservice inspection of a Yankee dryer. A Yankee dryer is a pressure vessel with the following characteristics:

a) Yankee dryers are primarily used in the production of tissue-type paper products. When used to produce machine-glazed (MG) paper, the dryer is termed an MG cylinder. A wet paper web is pressed onto the finished dryer surface using one or two pressure (pressing) rolls. Paper is dried through a combination of mechanical dewatering by the pressure roll(s); thermal drying by the pressurized Yankee dryer; and a steam-heated or fuel-fired hood. After drying, the paper web is removed from the dryer.

b) The dryer is typically manufactured in a range of outside diameters from 8 to 23 ft. (2.4 m to 7 m), widths from 8 to 28 ft. (2.4 m to 8.5 m), pressurized and heated with steam up to 160 psi (1,100 kPa), and rotated at speeds up to 7,000 ft./min (2,135 m/min). Typical pressure roll loads against the Yankee dryer are up to 600 pounds per linear inch (105 kN/m). A thermal load results from the drying process due to difference in temperature between internal and external shell surfaces. The dryer has an internal system to remove steam and condensate. These vessels can weigh up to 220 tons (200 tonnes).

c) The typical Yankee dryer is an assembly of several large castings. The shell is normally a gray iron casting, in accordance with ASME designation SA-278. Shells internally may be smooth bore or ribbed. Heads, center shafts, and journals may be gray cast iron, ductile cast iron, or steel.

Item 19-XX2
Submitted by Jerry Jessick
(920) 819-8570, jerry.jessick@gapac.com

Date: 7/9/2019

PURPOSE: Revision of present (2017) NB-23 Code

BACKGROUND INFORMATION: Suggested revisions are supported by the contributor's 30yr industry experience within large corporate owner/user environments including purchase and design, manufacturing, installation, inspection and repair.

Part 1 - Supplement 1/Part 2 - Supplement 5

OBSERVATION: The wording of Part 1, S1.2, ASSESSMENT OF INSTALLATION and the wording of Part 2, S5.2, ASSESSMENT OF INSTALLATION serve identical purpose within the Code, but are not identically written.

RECOMMENDATION: Ensure that wording in Part 2, S5.2, is identical to that found in Part 1, S1.2. Note that wording will be the same, but paragraph numberings will be different.

Part 1

INSTALLATION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S1.2 ASSESSMENT OF INSTALLATION

a) The Inspector verifies that the owner or user is properly controlling the operating conditions of the dryer. The Inspector does this by reviewing the owner's comprehensive assessments of the complete installation.

b) The dryer is subjected to a variety of loads over its life. Some of the loads exist individually, while others are combined. Considerations of all the loads that can exist on a Yankee dryer are required to determine the maximum allowable operating parameters. There are four loads that combine during normal operation to create the maximum operating stresses, usually on the outside surface of the shell at the axial center line. These loads and the associated protection devices provided to limit these loads are:

   1) Pressure load due to internal steam pressure. Overpressure protection is provided by a safety relief valve;
   2) Inertial load due to dryer rotation. Over-speed protection is usually provided by an alarm that indicates higher-than-allowable machine speed;
   3) Thermal gradient load due to the drying of the web. Protection against unusual drying loads is usually provided by logic controls on the machine, primarily to detect a "sheet-off" condition that changes the thermal load on the shell exterior from being cooled by the tissue sheet to being heated by the hot air from the hood; and
   4) Pressure roll load (line or nip load) due to pressing the wet web onto the dryer. Overload protection is usually provided by a control valve that limits the pneumatic or hydraulic forces on the roll loading arms such that the resultant nip load does not exceed the allowable operating nip load.

c) Steam pressure, inertial, and thermal gradient loads impose steady-state stresses. These stresses typically change when the dryer shell thickness (effective thickness for ribbed dryers) is reduced to restore a paper-making surface, the grade of tissue is changed or speed of the dryer is changed.

d) The pressure roll(s) load imposes an alternating stress on the shell face. The resulting maximum stress is dependent on the magnitude of the alternating and steady-state stresses.

e) Section VIII, Division 1, of the ASME Code only provides specific requirements for the analysis of pressure loads. Although the Code requires analysis of other loads, no specific guidance for thermal, inertial, or pressure roll loads is provided. Hence, additional criteria must be applied by the manufacturer to account for all the steady-state and alternating stresses.

f) To maintain product quality, the dryer surface is periodically refurbished by grinding. This results in shell thickness reduction. Therefore, the manufacturer does not provide a single set of maximum allowable operating parameters relating steam pressure, rotational speed, and pressure roll load for a single design shell thickness. The manufacturer, or another qualified source acceptable to the Inspector, instead provides a series of curves that graphically defines these maximum allowable operating parameters across a range of shell thicknesses. This document is known as the "De-rate Curve." (See NBIC Part 1, Figure S1.1).

g) In addition to ~~the~~ standard loads on the Yankee dryer due to operation, ~~other~~ nonstandard load events can occur during shipment and installation into the paper machine. These nonstandard load events should be recorded in an incident log. Examples of nonstandard load events include:

1) Damage to the protective packaging of the Yankee dryer during transport;
2) Scratches, gouges, dents in the Yankee dryer shell during packaging removal or installation into the paper machine;
3) Excessive heating of the Yankee dryer shell during the installation and testing of the hot air hood. If the hot air hood will be generating air that is hotter than the Yankee dryer shell material's maximum allowable working temperature (MAWT), then temperature sensors should be installed to monitor and record the Yankee dryer shell temperature during the hood testing; and
4) Impact load from improperly installed rolls, wires, nuts, dropped wrenches, etc., that may travel through the pressure roll nip causing external impact loads on the Yankee dryer shell.

h) If nonstandard load events (incidents) have occurred during installation, then the Inspector should ensure that an appropriate assessment of the structural integrity of the Yankee dryer has been performed. For additional details see Yankee dryer supplements in NBIC Part 2 and Part 3.

Part 2

INSPECTION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S5.2 ASSESSMENT OF INSTALLATION

a) The Inspector verifies that the owner or user is properly controlling the operating conditions of the dryer. The Inspector does this by reviewing the owner's comprehensive assessments of the complete installation, operating environment, maintenance, and operating history.

b) The dryer is subjected to a variety of loads over its life. Some of the loads exist individually, while others are combined. Consideration of all the loads that can exist on a Yankee dryer is required to determine the maximum allowable operating parameters. There are four loads that combine during normal operation to create the maximum operating stresses, usually on the outside surface of the shell at the axial center line. These are:

1) Pressure load due to internal steam pressure;
2) Inertial load due to dryer rotation;
3) Thermal gradient load due to the drying of the web; and
4) Pressure roll load (line or nip load) due to pressing the wet web onto the dryer.

c) Steam pressure, inertial, and thermal gradient loads impose steady-state stresses. These stresses typically change when the dryer shell thickness (effective thickness for ribbed dryers) is reduced to restore a paper-making surface, the grade of tissue is changed or speed of the dryer is changed.

d) The pressure roll(s) load imposes an alternating stress on the shell face. The resulting maximum stress is dependent on the magnitude of the alternating and steady-state stresses.

e) ASME Section VIII, Div. 1, only provides specific requirements for the analysis of pressure loads. Although the code requires analysis of other loads, no specific guidance for thermal, inertial, or pressure roll loads is provided. Hence, additional criteria must be applied by the manufacturer to account for all the steady-state and alternating stresses

f) To maintain product quality, the dryer surface is periodically refurbished by grinding. This results in shell thickness reduction. Therefore, the manufacturer does not provide a single set of maximum allowable operating parameters relating steam pressure, rotational speed, and pressure roll load for a single design shell thickness. The manufacturer, or another qualified source acceptable to the Inspector, instead provides a series of curves that graphically defines these maximum allowable operating parameters across a range of shell thicknesses. This document is known as the “De-Rate Curve.” See NBIC Part 2, Figure S5.2.

g) In addition to the loads on the dryer due to normal operation, ~~other~~ nonstandard load events can occur during operation and maintenance of the paper machine. These nonstandard load events should be recorded in an operation or maintenance log. Examples of nonstandard load events include:

1) Excessive thermal load due to local or global heating rate during warm-up;
2) Excessive thermal load due to local or global cooling rate during shut-down;
3) Excessive thermal load due to inappropriate use or malfunctioning auxiliary heating devices causing localized heating;
4) Excessive thermal load due to the misapplication or uncontrolled application of water or other fluids for production, cleaning, or fire fighting; and
5) Impact load.

h) If nonstandard load events have occurred, then the Inspector should ensure that an appropriate assessment of the structural integrity ~~on~~ of the dryer has been performed.

Item 19-XX3
Submitted by Jerry Jessick
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Date: 7/9/2019

PURPOSE: Revision of present (2017) NB-23 Code

BACKGROUND INFORMATION: Suggested revisions are supported by the contributor's 30yr industry experience within large corporate owner/user environments including purchase and design, manufacturing, installation, inspection and repair.

Part 1 - Supplement 1/Part 2 - Supplement 5

OBSERVATION: The wording of Part 1, S1.3, and the wording of Part 2, S5.2.1, DETERMINATION OF ALLOWABLE OPERATING PARAMETERS serve identical purpose within the Code, but are not identically written.

RECOMMENDATION: Ensure that wording in Part 2, S5.2.1, is identical to that found in Part 1, S1.3. Note that wording will be the same, but paragraph numberings will be different.

Part 1

INSTALLATION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S1.3 DETERMINATION OF ALLOWABLE OPERATING PARAMETERS

a) A Yankee dryer is designed and intended to have its shell thickness reduced over the life of the vessel through routine grinding and machining. The Yankee dryer shell is ground or machined on the outside surface to restore the quality or shape of the papermaking surface essential to the manufacturing of tissue or other paper products.

b) Design documentation, called the "De-rate Curve," is required and dictates the maximum allowable operating parameters as shell thickness is reduced (see NBIC Part 1, Figure S1.1). Calculations, used to determine those parameters, are in accordance with ASME Code requirements for primary membrane stress by the vessel manufacturer or design criteria based on relevant stress categories, e.g., fatigue and maximum principal stress. Calculation of these parameters requires that the respective stresses, resulting from the imposed loads, be compared to the appropriate material strength properties. Hence, knowledge of the applied stresses in the shell and the tensile and fatigue properties of the material are essential.

c) Yankee dryers are subjected to a variety of loads that create several categories of stress. Yankee dryers are designed such that the stress of greatest concern occurs at the centerline of the shell.

   1) Steam Pressure Load — The internal steam pressure is one of the principal design loads applied to the Yankee dryer. The steam pressure expands the shell radially, causing a predominately circumferential membrane tensile stress. Because the shell is constrained radially by the heads at either end of the shell, the steam pressure also causes a primary bending stress in the vicinity of the head-to-shell joint. The ends of the shell are in tension on the inside and compression on the outside due to the steam pressure. The steam pressure also causes a bending stress in the heads.

2) Inertia Load — The rotation of the Yankee dryer causes a circumferential membrane stress in the shell similar to that caused by the pressure load. This stress is included in the design of the shell and increases with dryer diameter and speed.

3) Thermal Load — The wet sheet, applied to the shell, causes the outside surface to cool and creates a thermal gradient through the shell wall. This thermal gradient results in the outside surface being in tension and the inside surface in compression. With this cooling, the average shell temperature is less than the head temperature, which creates bending stresses on the ends of the shell and in the heads. The ends of the shell are in tension on the outside and compression on the inside.

    a. Other thermal loadings also occur on a Yankee dryer. The use of full-width showers for a variety of papermaking purposes affects the shell similar to a wet sheet. The use of edge sprays produce high bending stress in the ends of the shell due to the mechanical restraint of the heads.
    b. Warm-up, cool-down, hot air impingement from the hood, moisture profiling devices, fire fighting, and wash-up can all produce non-uniform thermal stresses in the pressure-retaining parts of the Yankee dryer. Heating or cooling different portions of the Yankee dryer at different rates causes these non-uniform stresses.

4) Nip Load — The nip load from the contacting pressure roll(s) results in an alternating, high cycle, bending stress in the shell. This stress is greatest at the centerline of the shell. The load of the pressure roll deflects the shell radially inward causing a circumferential compressive stress on the outside surface and a tensile stress on the inside. Because the shell has been deflected inward at the pressure roll nip, it bulges outward about 30 degrees on each side of the nip. The outward bulge causes a tensile stress on the outside shell surface at that location and a corresponding compressive stress on the inside. Since the shell is passing under the pressure roll, its surface is subjected to an alternating load every revolution.

Part 2

INSPECTION OF YANKEE DRYERS (ROTATING CAST-IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES

S5.2.1 DETERMINATION OF ALLOWABLE OPERATING PARAMETERS

a) A Yankee dryer is designed and intended to have its shell thickness reduced over the life of the vessel through routine wear and grinding. The Yankee dryer shell is ground on the outside surface to restore the quality or shape of the papermaking surface, essential to the manufacturing of tissue or other paper products.

b) Design documentation is required that dictates the maximum allowable operating parameters as shell thickness is reduced. Calculations used to determine those parameters are in accordance with ASME Code requirements for primary membrane stress and design criteria based upon other relevant stress categories; (e.g., fatigue and maximum principal stress). Calculation of these parameters requires that the respective stresses, resulting from the imposed loads, be compared to the appropriate material strength properties. Hence, knowledge of the applied stresses in the shell and the tensile and fatigue properties of the material are essential.

c) Yankee dryers are subjected to a variety of loads that create several categories of stress. Yankee dryers are designed such that the stress of greatest concern typically occurs on the outside surface at the axial centerline of the shell.

1) Steam Pressure Load — The internal steam pressure is one of the principal design loads applied to the Yankee dryer. The steam pressure expands the shell radially, causing a predominately circumferential membrane tensile stress. Because the shell is constrained radially by the heads at either end of the shell, the steam pressure also causes a primary bending stress in the vicinity of the head-to-shell joint. The ends of the shell are in tension on the inside and compression on the outside due to the steam pressure. The steam pressure also causes a bending stress in the heads.

2) Inertia Load — The rotation of the Yankee dryer causes a circumferential membrane stress in the shell similar to that caused by the steam pressure load. This stress is included in the design of the shell and increases with dryer diameter and speed.

3) Thermal Gradient Load — The wet sheet, applied to the shell, causes the outside surface to cool and creates a thermal gradient through the shell wall. This thermal gradient results in the outside surface being in tension and the inside surface in compression. With this cooling, the average shell temperature is less than the head temperature, which creates bending stresses on the ends of the shell and in the heads. The ends of the shell are in tension on the outside and compression on the inside.

   a. Other thermal loading also occurs on a Yankee dryer. The use of full width showers for a variety of papermaking purposes affects the shell similar to a wet sheet. The use of edge sprays produces high bending stress in the ends of the shell due to the mechanical restraint of the heads.
   b. Warm-up, cool-down, hot air impingement from the hood, moisture profiling devices, fire fighting, and wash-up can all produce non-uniform thermal stresses in the pressure-containing parts of the Yankee dryer. Heating or cooling different portions of the Yankee dryer at different rates causes these non-uniform stresses.

4) Line Load — The line load from the contacting pressure roll(s) results in an alternating, high cycle, bending stress in the shell. This stress is greatest at the centerline of the shell. The load of the pressure roll deflects the shell radially inward causing a circumferential compressive stress on the outside surface and a tensile stress on the inside. Because the shell has been deflected inward at the pressure roll nip, it bulges outward about 30 degrees on each side of the nip. The outward bulge causes a tensile stress on the outside shell surface at that location and a corresponding compressive stress on the inside. Since the shell is passing under the pressure roll, its surface is subjected to an alternating load every revolution.

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2.9.1 VALVE REQUIREMENTS – GENERAL (19)

a) Only direct spring loaded, pilot operated, or power actuated pressure relief valves designed to relieve steam shall be used for steam service.

b) Pressure relief valves shall be manufactured in accordance with a national or international standard.

c) Deadweight or weighted-lever pressure relief valves shall not be used.

d) For high-temperature water boilers, safety relief valves shall have a closed bonnet, and valve bodies shall not be constructed of cast iron.

e) Pressure relief valves with an inlet connection greater than NPS 3 (DN 80) used for pressure greater than 15 psig (103 kPa), shall have a flange or a welded inlet connection. The dimensions of flanges subjected to boiler pressure shall conform to the applicable standards.

f) When a pressure relief valve is exposed to outdoor elements that may affect operation of the valve, the valve may be shielded with a cover. The cover shall be vented and arranged to permit servicing and normal operation of the valve.

g) Shipping caps or plugs shall be removed prior to installation.

3.9.1 PRESSURE RELIEF VALVE REQUIREMENTS – GENERAL

The following general requirements pertain to installing, mounting, and connecting pressure relief valves on heating boilers.

a) Shipping caps or plugs shall be removed prior to installation.

2.9.1.1 NUMBER

At least one National Board capacity certified pressure relief valve shall be installed on the boiler. If the boiler has more than 500 ft2. (46.5 m2) of heating surface, or if an electric boiler has a power input of more than 3.76 million Btu/hr (1,100 kW), two or more National Board capacity certified pressure relief valves shall be installed**. For a boiler with combined bare tube and extended water-heating surface exceeding 500 ft2 (47 m2), two or more pressure relief valves are required only if the maximum designed steaming capacity of the boiler exceeds 4,000 lb/hr (1 800 kg/h).**