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THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

NATIONAL BOARD INSPECTION CODE SUBCOMMITTEE INSTALLATION

AGENDA

Meeting of July 13th, 2022
Indianapolis, IN

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

1. **Call to Order**

   The Chair will call the meeting to order at 8:00 am Eastern Time. For those attending in-person, the meeting will be held in Renaissance Place on the second floor of the hotel.

2. **Introduction of Members and Visitors**

3. **Check for a Quorum**

4. **Awards/Special Recognition**

   Mr. Rex Smith – 5 Years as a member of Subcommittee Installation.

5. **Announcements**

   - The National Board will be hosting a reception on Wednesday evening from 6:30pm to 8:30pm in City Way Gallery.

   - The National Board will be hosting breakfast and lunch on Thursday. Breakfast will be served from 7:00am to 8:00am, and lunch will be served from 11:30am to 12:30pm. Both meals will be served at the hotel in Market Table.

   - This meeting is the last at which items can be approved for inclusion in the 2023 NBIC edition.

6. **Adoption of the Agenda**

7. **Approval of the Minutes of the January 19, 2022 Meeting**

   The minutes from the January 2022 meeting can be found on the Committee Information page under the Inspection Code tab on the National Board's website.

8. **Review of Rosters (Attachment Page 1)**

   a. **Membership Nominations**

      Mr. Rodger Adams (Authorized Inspection Agencies) and Mr. Jeff Kleiss (Manufacturers) have expressed interest in becoming subgroup members.

   b. **Membership Reappointments**

      Mr. Randy Austin's membership to Subgroup Installation is set to expire prior to the January 2023 NBIC meetings.

      Mr. Randy Austin Mr. Matt Downs' memberships to Subcommittee Installation are set to expire prior to the January 2023 NBIC meetings.

   c. **Officer Appointments**

      None.

9. Open PRD Items Related to Installation

- NB15-0305 – Create Guidelines for Installation of Overpressure Protection by System Design – D. Marek (PM)
- NB15-0315 – Review isolation valve requirements in Part 1, 4.5.6 and 5.3.6 – D. DeMichael (PM)
- 17-119 – Part 4, 2.2.5 states that pressure setting may exceed 10% range. Clarify by how much – T. Patel (PM). This Item is on hold pending ASME action.
- 19-83 – Address Alternate Pressure Relief Valve Mounting Permitted by ASME CC2887-1 – D. Marek (PM).
- 22-08 – Review and improve guidance for T&P valve installation relating to probe.
- 22-15 – What is the meaning of "service limitations" as used in Part 4, 2.4.5?
- 22-16 – Allow the use of pressure relief valves on potable water heaters.

10. Interpretations

There are no Part 1 interpretation requests to address.

11. Action Items

Item Number: 20-27	NBIC Location: Part 1, 1.6.9 & S6.3	No Attachment
General Description: Carbon Monoxide Detector/Alarm NBIC 2019 **Subgroup:** SG Installation **Task Group:** E. Wiggins (PM), G. Tompkins, R. Spiker, R. Smith, S. Konopacki, R. Austin, T. Creacy, and J. Kleiss **Explanation of Need:** These codes are being enforced by some jurisdictions on existing installations. Inspectors need to know what codes we need to enforce. Do the detectors have specific levels of CO when an alarm is to go off? Is there a requirement for an audible alarm or decibel level of the alarm? Where in the boiler room should the alarm/monitor be mounted? **January 2022 Meeting Action: Progress Report** Mr. Wiggins summarized the discussion the Subgroup had with National Board staff regarding this Item. It was unanimously agreed to send this Item to the Executive Committee to discuss.		

Item Number: 20-33	NBIC Location: Part 1	No Attachment
General Description: Flow or Temp Sensing Devices forced Circulation Boilers **Subgroup:** SG Installation **Task Group:** M. Downs (PM), D. Patten, M. Wadkinson **Explanation of Need:** Incorporation of applicable CSD-1 requirements. **January 2022 Meeting Action: Progress Report** There were no updates for this Item.		

Item Number: 20-44	NBIC Location: Part 1	No Attachment

General Description: CW Vacuum Boilers

Subgroup: SG Installation

Task Group: R. Spiker (PM), M. Washington, and M. Byrum

Explanation of Need: Incorporation of applicable CSD-1 requirements.

January 2022 Meeting Action: **Progress report**
Mr. Spiker stated that the task group will work on some new language for this proposal.

Item Number: 20-62	NBIC Location: Part 1, 1.4.5.1	No Attachment

General Description: Update the National Board Boiler Installation Report

Subgroup: SG Installation

Task Group: T. Clark (PM), E. Wiggins, R. Spiker, T. Creacy, P. Jennings, G. Tompkins, and D. Patten.

Explanation of Need: The form has not been updated in years. The form will be part of the National Boards Jurisdictional Reporting System which is currently under development.

January 2022 Meeting Action: Progress Report
Mr. Clark stated that the task group is working on a new proposal to have ready for the July meeting.

Item Number: 20-86	NBIC Location: Part 1, 2.10.1 a)	Attachment Page 1

General Description: Testing and Acceptance: Boiling-out Procedure

Subgroup: SG Installation

Task Group: E. Wiggins (PM), D. Patten, M. Washington, and S. Konopacki (remote).

Explanation of Need: This was brought to my (Mr. Eddie Wiggins) attention by Ernest Brantley. Mr. Brantley indicated during an acceptance inspection, he found boiler with excessive oil on the tubes and tube sheet after boiler was delivered and installed. He could not find any reference to boil- out to remove this extraneous material.

January 2022 Meeting Action: Progress Report
Mr. Wiggins explained that Mr. Patten had submitted some new verbiage for this Item and that it will be out for letter ballot to the Subgroup.

12. New Items:

Item Number: 22-10	**NBIC Location: Part 1, S1**	**Attachment Page 2**
General Description: Changes to Yankee Dryer P1_S1 **Subgroup:** SG Installation **Task Group:** J. Jessick (PM) **Explanation of Need:** Various updates including to recognize steel in addition to cast iron, and to promote consistency of Supplements of each Part. **July 2022 Meeting Action:**		

Item Number: 22-13	**NBIC Location: Part 1, 3.8.2.2**	**Attachment Page 9**
General Description: Align hot water boiler thermometer requirements with ASME Section IV **Subgroup:** SG Installation **Task Group:** None assigned. **Explanation of Need:** NBIC Part 1 does not expressly permit the use of temperature sensors or digital displays as thermometers for hot-water heating or supply boilers, even though they are permitted under ASME Section IV, HG-612. NBIC Part 1 also does not address the required temperature range of thermometers, inconsistent with ASME Section IV. **July 2022 Meeting Action:**		

13. New Business:

14. Future Meetings

- January 2023 – Charleston, SC
- July 2023 – TBD

13. Adjournment

Respectfully submitted,

Michelle Vance
Subcommittee Installation Secretary

NBIC Item # 20-86

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

Recommended Verbiage – DP 1/14/21

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

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

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

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

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

SUPPLEMENT 1
INSTALLATION OF YANKEE DRYERS ~~(ROTATING PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES~~

S1.1 SCOPE

(21)

This supplement provides guidelines for the installation of a yankee dryer. Additional guidelines are found in Part 2 for Inspection, and Part 3 for Repair and Alteration.

a) A yankee dryer is a rotating steam-pressurized cylindrical vessel commonly used in the paper industry. It is characterized by a center shaft connecting the heads. While traditionally made of cast iron, bolted or welded steel vessels are in use.

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) 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).

d) The typical yankee dryer is an assembly of several large components. The cylindrical shell is commonly ASME SA-278 gray cast iron or SA-516 steel. Internally, shells may be smooth bore or ribbed. Heads, center shafts, and journals may be gray cast iron, ductile cast iron, or steel.

~~This supplement provides guidelines for the installation of a yankee dryer. A yankee dryer has the following characteristics:~~

~~a) 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 in use.~~

~~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.~~

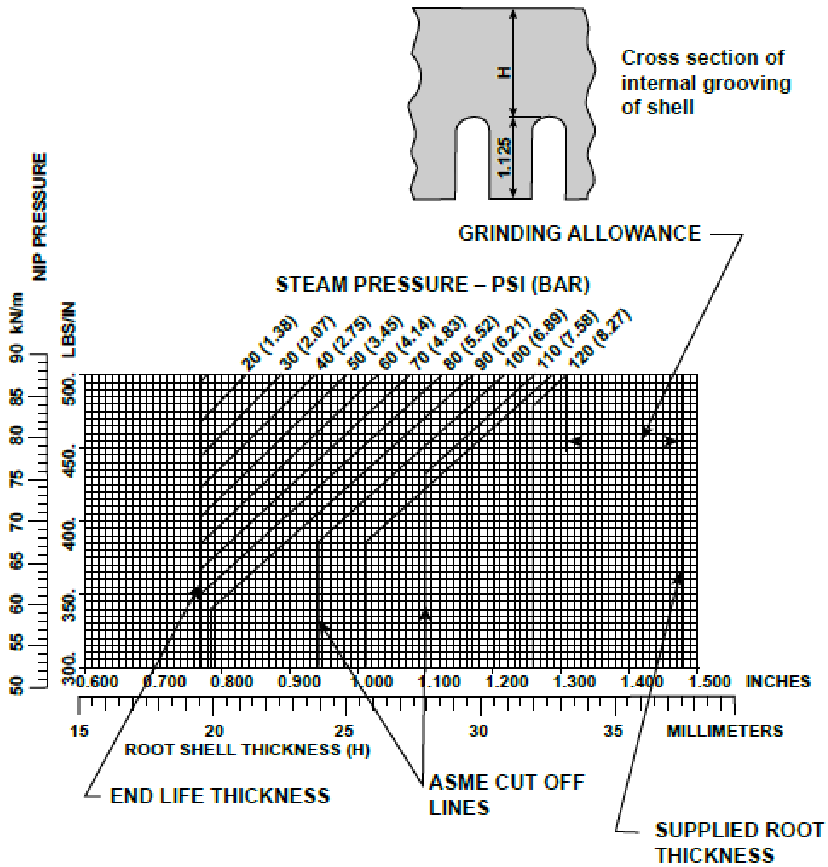
~~c) A yankee dryer is typically manufactured in a range of outside diameters from 8 to 23 ft. (2.4 to 7 m), widths from 8 to 28 ft. (2.4 to 8.5 m), pressurized and heated with steam up to 160 psi (1,100 kPa), and rotated at speeds up to 7,000 ft/min (2,135 m/min). Typical pressure roll loads against 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 components. The cylindrical shell is commonly ASME 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.~~

~~**FIGURE S1.1**~~

~~A TYPICAL MANUFACTURER'S "DE-RATE CURVE"~~

~~NOTE: There are several safe operating pressures for a given shell thickness.~~



S1.2 ~~ASSESSMENT OF INSTALLATION~~INSTALLATION ASSESSMENT

a) The Inspector verifies that the owner or user is prepared to properly controll~~ing~~ the ~~operating conditions~~operation of the dryer such that maximum operating conditions are not exceeded. ~~The Inspector does this by reviewing the owner's comprehensive assessments of the complete installation.~~ The maximum operating conditions are provided by the OEM or a source acceptable to the Inspector and can be in the form of a derate curve or drawing with listed parameters.

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:

~~b)~~

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) ASME Section VIII, Div.~~ision~~ 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~~)~~. In cases where no derate curve is provided the manufacturer, or another qualified source, may provide a set of operating conditions and a minimum shell thickness.

g) Thermal spray (metallizing) materials may be applied to extend and improve dryer operations and provide a more wear resistant surface. Thermal spray coatings are often applied to the exterior of steel shells and may be applied to cast iron shells. Once applied, the metallization may be ground periodically before it is removed or replaced. Thermal spray coatings do not add strength to the component and are not included in shell thickness calculation. Grinding that reduces thickness of the pressure containing shell material to which metallization has been applied must be evaluated for any necessary pressure and safety device re-settings.

~~g)~~h) In addition to the 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 and installation~~;~~

2) Scratches, gouges, dents of~~in~~ the Yankee dryer ~~shell~~ during packaging removal or installation into the paper machine, or undesirable mechanical contact between the yankee and other surfaces~~;~~

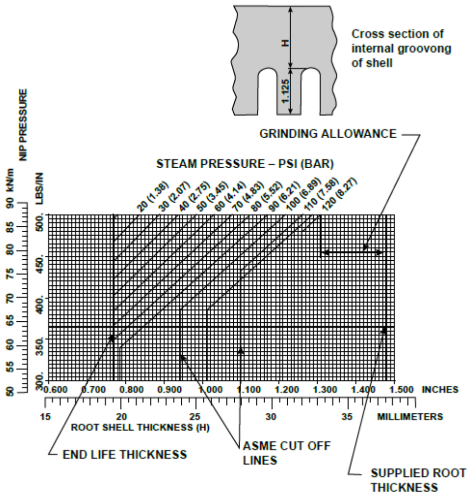
3) Excessive heating of the Yankee dryer shell during the installation and testing of the hot air hood. If the hot air hood will be generating air that is hotter than the Yankee dryer shell material's maximum allowable working temperature (MAWT), then temperature sensors should be installed to monitor 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.

4)

~~h)~~i) 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.

FIGURE S1.1



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 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, firefighting, 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.

~~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.~~

S1.4 ASME CODE PRIMARY MEMBRANE STRESS CRITERIA

a) Yankee dryers are typically designed and fabricated in accordance with ASME Section VIII, Division 1~~, The maximum allowable stress for cast iron is specified in UCI-23 and UG-22 of the ASME Code~~.

b) ASME Section VIII, Division 1, requires design stresses to be calculated such that any combination of loading expected to occur simultaneously during normal operation of the Yankee dryer will not result in a general primary stress exceeding the maximum allowable stress value of the material. In the ASME Code, the combination of loading resulting in the primary membrane stress in the shell is interpreted to be only composed of the circumferential stress from steam pressure. Sometimes, the stress from the inertial loading is included in this consideration.

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.

1) Maximum Principal Stress Criteria

The maximum principal stress in a Yankee dryer shell is the sum of the stresses that are simultaneously applied to the shell and is always aligned in the circumferential direction. The purpose of these criteria is to recognize the paper making application of the Yankee dryer and to prevent catastrophic failure by including all stresses. The ASME Code does not provide specific formulas for the full array of Yankee dryer shell stresses encountered in tissue making.

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.

S1.5 PRESSURE TESTING

a) Water pressure testing in the field is not recommended because of the large size of Yankee dryers and the resulting combined weight of the Yankee dryer and the water used in the testing. This combined weight can lead to support structure overload. Several failures of Yankee dryers have occurred during field pressure testing using water. If this test must occur, the following review is recommended:

1) The testing area should be evaluated for maximum allowable loading, assuming the weight of the Yankee dryer, the weight of the water filling the Yankee dryer, and the weight of the support structure used to hold the Yankee dryer during the test; and

2) The manufacturer should be contacted to provide information on building the Yankee dryer support structure for the water pressure test. Typically, the Yankee dryer is supported on saddles that contact the Yankee dryer shell at each end near the head-to-shell joint. The manufacturer can provide information on saddle sizing and location so that the Yankee dryer is properly supported for the test.

b) When pressure testing is desired to evaluate the Yankee dryer for fitness for service, an alternative to water pressure testing is acoustic emission testing using steam or air pressure. Typically, the test pressure used is the operating pressure. Caution needs to be exercised to ensure personnel safety. Entry to the test area needs to be controlled and all personnel need to maintain a safe distance from the Yankee dryer during the test. The steam or air test pressure should never exceed the maximum allowable working pressure (MAWP) of the Yankee dryer.

S1.6 NONDESTRUCTIVE EXAMINATION

a) Nondestructive examination (NDE) methods should be implemented by individuals qualified and experienced with the material to be tested using written NDE procedures~~. For Yankee dryers, cast iron knowledge and experience are essential~~.

b) Typical nondestructive examination methods should be employed to determine indication length, depth, and orientation (sizing) of discontinuities in Yankee dryers. Magnetic Particle, specifically the wet fluorescent method, and Dye Penetrant methods are applicable in the evaluation of surface-breaking indications. Ultrasound testing is the standard method for evaluation of surface-breaking and embedded indications. Radiographic methods are useful in the evaluation of embedded indications. Acoustic E~~m~~mission Testing can be used to locate and determine if a linear indication is active, e.g., propagating crack. Metallographic Analysis is useful in differentiating between original casting discontinuities and cracks.

c) When nondestructive testing produces an indication, the indication is subject to interpretation as false, relevant, or nonrelevant. If it has been interpreted as relevant, the necessary subsequent evaluation will result in a decision to accept, repair, replace, monitor, or adjust the maximum allowable operating parameters.

PROPOSED REVISION OR ADDITION

Item No.

A 22-13

Subject/Title

Align hot water boiler thermometer requirements with ASME Section IV

NBIC Location

Part: Installation; Section: 3; Paragraph: 3.8.2.2

Project Manager and Task Group

Source (Name/Email)

Tom Clark / thomas.g.clark@dcbs.oregon.gov

Statement of Need

NBIC Part 1 does not expressly permit the use of temperature sensors or digital displays as thermometers for hot-water heating or supply boilers, even though they are permitted under ASME Section IV, HG-612. NBIC Part 1 also does not address the required temperature range of thermometers, inconsistent with ASME Section IV.

Background Information

Questions have arisen in the field as to whether or not digital thermometers are allowed to be installed on hot-water heating and supply boilers as NBIC does not expressly permit them. Additionally, we have encountered boiler installations with thermometers that do not have adequate range to comply with ASME code.

Existing Text	Proposed Text
Each hot-water heating or hot-water supply boiler shall have a thermometer so located and connected that is shall be easily readable. The thermometer shall be so located that it shall at all times indicate the temperature of the water in the boiler at or near the outlet.	Each hot-water heating or hot-water supply boiler shall have a thermometer so located and connected that is shall be easily readable. The thermometer shall be so located that it shall at all times indicate the temperature of the water in the boiler at or near the outlet. The thermometer shall have a minimum reading of 70°F (20°C) or less, and a maximum reading at least equal to 320°F (160°C) but not more than 400°F (205°C). Temperature sensors with digital displays may be used so long as the display remains on at all times and the sensor and display comply with the above requirements.

	VOTE:						
COMMITTEE	Approved	Disapproved	Abstained	Not Voting	Passed	Failed	Date