THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

Date Distributed: February 9, 2022

NATIONAL BOARD INSPECTION CODE SUBCOMMITTEE INSPECTION

MINUTES

Meeting of January 19, 2022
San Diego, CA

These minutes are subject to approval and are for the 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
Phone: (614)888-8320
FAX: (614)847-1828

1. **Call to Order**
   Chairman, Jim Getter called the meeting to order at 8:02 am (PST).

2. **Introduction of Members and Visitors**
   A roll call was taken of all Members, both in person and remote. All visitors, both in person and remote, stated their name, what company they are with, and their interest. **(Attachment Page 1)**

3. **Check for a Quorum**
   With the members in attendance, both in person and remote, a quorum was established.

4. **Awards/Special Recognition**
   None.

5. **Announcements**
   Secretary, Ms. Metzmaier made the announcements to the Subcommittee. **(Attachment Pages 2-3)**

6. **Adoption of the Agenda**
   A motion was made to adopt the agenda, and the motion was seconded. The below listed items were added to the agenda and another motion was made to adopt the revised agenda. The motion was seconded and unanimously approved
   - Add Tim Bolden as a Membership Nominee for SG Inspection
   - Add Brandon Wilson as a Membership Nominee for SG Inspection
   - Add Item 22-01

7. **Approval of the Minutes of the July 14th, 2021, Meeting**
   A motion was made to approve the minutes from the July 14, 2021, meeting. The motion was seconded and unanimously approved.

8. **Review of Rosters**
   a. **Membership Nominations**
      Tim Bolden would like to become a member of SG Inspection. Interest category AIA.
      Brandon Wilson would like to become a member of SG Inspection. Interest category of General Interest.

      Mr. Bolden and Mr. Wilson both spoke to the SC to let them know why they would like to be a member of the SG. A motion was made to recommend both nominees for membership to the SG. The motion was seconded and unanimously approved.

   b. **Membership Reappointments**
      The following **Subgroup** members are up for reappointment: Mr. Venus Newton.
      Mr. Newton confirmed he would like to remain a member of the SG.

      The following **Subcommittee** members are up for reappointment: Mr. Ernest Brantley.
      Mr. Brantley confirmed he would like to remain a member of the SC.

      A motion was made to recommend reappointment for both members to the SG & SC respectively. The motion was seconded and unanimously approved.

   c. **Officer Appointments**
      None.

9. Open PRD Items Related to Inspection

- Item 21-76 - Update ASME paragraph reference in Part 4, 3.2.4.3 and Part 2, 2.5.5.3

10. Interpretations.

Item Number: 21-65	**NBIC Location: Part 2, 2.3.6.2 b) 4)**	**Attachment Page 4**
General Description: Air receiver tank manual drain valve **Subgroup:** Inspection **Task Group:** None assigned **Explanation of Need:** The inquirer remembers this requirement some 12 years ago but could no longer find the specific code requirement. Their client wants to know where and what code provides this requirement.		
January 2022 Meeting Action: Mr. Getter stated to the SC that a task group was created during the SG meeting. Mr. Barker stated him, and Mr. Hackworth discussed this item after the SG meeting, and both agreed they could come up with a response to the Interpretation. The SC created a reply to the Interpretation. A motion was made to accept the response to the interpretation. The motion was seconded and **unanimously approved.**		

11. Action Items

d. TG FRP Items

Item Number: NB16-1402	**NBIC Location: Part 2, New Supplement**	**No Attachment**
General Description: Life extension for high pressure FRP vessels above 20 years **Subgroup:** FRP **Task Group:** M. Gorman (PM)		
January 2022 Action: PROGRESS REPORT: Mr. Newton questioned why this item has been opened for 6 years. Mr. Graf gave the group some information on what is taking the FRP TG so long to come up with the proposal. They had a proposal, but once they started discussing it, they realized it needed more work. They are hoping to have a proposal for next meeting. The SC stated they would like the proposal to be submitted by next meeting; otherwise, they will close the item and ask the TG to open new separate items to break up the proposal.		

e. TG Historical Items

Item Number: 20-26	**NBIC Location: Part 2, S2**	**No Attachment**
General Description: Concern for Historical Boiler Inspections Nationwide **Subgroup:** Historical **Task Group:** T. Dillon (PM), R. Underwood, L. Moedinger, M. Wahl, D. Rupert, K. Anderson, M. Sansone & J. Wolf **Explanation of Need:** Currently Jurisdictions are not uniform in adoption of how and when inspections are performed.		
January 2022 Action: Mr. Getter reported to the SC stating there was a progress report given at the Historical TG meeting.		

Item Number: 21-03	NBIC Location: Part 2, S2	No Attachment

General Description: Inspection of through stays and diagonal stays (submitted by David Rose)

Subgroup: Historical
Task Group: D. Rose (PM), R. Bryce, R. Forbes, C. Jowett

Explanation of Need: The code is silent on the inspection of through stays and diagonal stays. Additionally, new repair methods are available from ASME that can be incorporated.

January 2022 Action:
Mr. Rose stated to the SC that this is a progress report, and the item is being sent to LB to the Historical TG for Review and Comment. Mr. Creaser had a few questions regarding this item, which Mr. Rose was able to address.

Item Number: 21-34	NBIC Location: Part 2, S2	No Attachments

General Description: Working Pressure Calculations for Curved Stayed Surfaces

Subgroup: Historical
Task Group: Mike Wahl (PM), R. Bryce, and T. Dillon

Background: In January 2021, Dr. Bryce initiated the conversation with the group for this topic. He is proposing the group open an item to address working pressure calculations for curved stayed surfaces. After discussion a task group was formed

January 2022 Action:
Mr. Getter reported to the SC stating there was a progress report given at the Historical TG meeting.

Item Number: 21-48	NBIC Location: Part 2, S2.6.3.4	Attachment Page 5

General Description: Correction of references in S2.6.3.4 a) 1) and 2).

Subgroup: Historical
Task Group: None assigned

Background: the sentences in S2.6.2 (b&c) were re-lettered sometime between 2013 and 2019 and the references back to them in S2.6.3.4 were not changed at the same time. This also applies to S2.6.3.4 a) 1 & 2. This correction may be needed in other sentences, but I have not identified the need yet.

January 2022 Action:
The proposal showing the reference corrections were presented to the SC. A motion was made to accept the proposal as submitted. The motion was seconded and **unanimously approved**.

Item Number: 21-66	NBIC Location: Part 2, S2.7.3.2	No Attachment

General Description: Correct Water Treatment

Subgroup: Historical
Task Group: None assigned

Background: As a jurisdiction we would like to define a process for treating the water that is used in historical boilers. Historical boiler owners in the province of Manitoba are stating that corrosion inhibitors do not have a noticeable capacity for slowing the effects of corrosive compounds in non-treated water. The request for this item is triggered from a discussion with historical boiler owners in the province of Manitoba. The owners are requesting a clarification for what the expectations are for treating the water used in the historical boilers.

January 2022 Action:
Mr. Rose spoke on this item stating the Historical TG said this is a Jurisdictional issue and outside of the scope of the National Board. A motion was made to **close this item with no action**. Motion was seconded and unanimously approved. Dr. Bryce will reach out to the submitter of this item to let him know why the item was closed with no action.

f. TG Locomotive Items

Item Number: 20-70	NBIC Location: Part 2, S1.4.2.29	Attachment Page 6

General Description: Inspection of Furnace Slides (submitted by Mr. Mark Ray)

Subgroup: Locomotive
Task Group: M. Ray (PM)

Explanation of Need: Furnace slide supports which are locked in-place by corrosion will adversely impact the thermal expansion of the boiler and lead to staybolt breakage.

January 2022 Action:
The ballot to SC passed between the July and January meetings, however, there was an editorial change found. The document was revised, and presented to the SC. A motion was made to accept the revised proposal. The motion was seconded and **unanimously approved**.

g. SG Inspection Items

Item Number: 19-46	NBIC Location: Part 2, S5	Attachment Pages 7-18

General Description: Revisions to Yankee dryer supplement in Part 2

Subgroup: Inspection
Task Group: T. Barker (PM), V. Newton, D. Lesage, J. Jessick

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

January 2022 Action:
The SC reviewed the proposal which passed unanimously though SG. The SC made a few changes to the document and made a motion to approve the document as revised. The motion was seconded and **unanimously approved.**

Item Number: 20-46	NBIC Location: Part 2, 5.3.2	No Attachment

General Description: Updates to Forms NB-5, NB-6, & NB-7

Subgroup: Inspection
Task Group: D. Buechel (PM), M. Sansone, V. Scarcella, D. LeSage

Explanation of Need: On the current forms NB-5, NB-6, & NB-7 there are fields that are already on the ASME Manufactures Data Report making them repetitive. Other fields that ask for in- depth technical information would be hard if not impossible for an inspector to determine and are irrelevant to the inspection process.

January 2022 Action:
PROGRESS REPORT -- Mr. Buechel gave a progress report on this item. He stated they have updated the task group and will be working with the new members to improve the proposal.

Task Group update: Remove D. LeSage & M. Sansone. Add J. Petersen & M. Mooney

DISCUSSION ITEM: The group discussed how to go about getting more Jurisdictional representation on the Subcommittee. With the resignation of D. LeSage from the SC we are short on Jurisdictional representation. Mr. Creaser stated he will speak with the members of the BOT and work with Mr. Goosens to see who would be available and who would be a good asset to become a member of the SC.

Item Number: 20-57	NBIC Location: Part 2, 4.4.1 a)	No Attachment

General Description: Evaluate revision to Part 2, 4.4 FFS Scope roles and responsibilities and API 579-1/ASME FFS-1

Subgroup: Inspection
Task Group: M. Horbaczewski (PM) and B. Ray.
Submitted by: George Galanes

Explanation of Need: Currently, there is confusion surrounding implementation of FFS for Part 2 inspection activities, where the FFS form is located and Part 3 activities regarding Part 3, 3.3.4.8 because it references Part 2 for FFS. In addition, we need to have a Part 2 Inspection member to be assigned to assist in the development of roles and responsibilities.

January 2022 Action:
Mr. Horbaczewski gave a progress report for this item stating they should have something for the July meeting.

NOTE: Item 21-42 will be closed with no action, and the "General Description" of this item has been updated to incorporate information from Item 21-42.

Item Number: 21-25	NBIC Location: Part 2	No Attachment

General Description: Autoclave/Quick Opening Device PP

Subgroup: Inspection
Task Group: V. Scarcella (PM), T. Bolden, M. Horbachewski, J. Peterson, J. Clark, W. Hackworth, M.A. Shah.
Submitted by: Kevin Hawes

Explanation of Need: Upon our AIA (Intact) QRR I produced a Power point presentation on Autoclave inspections. Your NB team leader Gary Scribner suggested I forward this inspection presentation to the NB for review of content as mention of good reference material for next NBIC edition. I have attached a copy of this PP for your considerations.

January 2022 Action:
Mr. Bolden gave a progress report on this item stating they are still working on some photographs. The task group is working with Mr. Scribner to obtain the photographs. The document was presented at the SC meeting for further discussion. They discussed if this topic should remain in the body of the NBIC or if it should be moved to its own supplement.

TASK GROUP UPDATE: Add Chuck Becker

12. New Items:

Item Number: 21-40	NBIC Location: Part 2	No Attachment

General Description: Define "Remote" in the NBIC Glossary

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: With the use of indirect inspection equipment from borescopes to tethered drones/vehicles for confined space inspections, there is a need to clarify what is considered a "remote" inspection vs an "indirect" inspection.

January 2022 Action:
Mr. Getter stated a task group was assigned during the SG meeting.

Item Number: 21-41	NBIC Location: Part 2, 4.2 c)	No Attachment

General Description: Requirements for NDE procedures and personnel

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: Lacking qualification requirements has resulted in poor NDE.

January 2022 Action:
Mr. Getter stated a task group was assigned during the SG meeting.

Item Number: 21-42	NBIC Location: Part 2, 5.3.3	No Attachment

General Description: Review ASME 579 to make sure we are aligned for FSS requirements

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: FSS is a critical component of high-risk equipment, and we need to make sure those that comply with ASME 579 are also in compliance with Part II.

January 2022 Action:
Mr. Horbaczewski stated to the SC that this item was closed with no action and is being incorporated into Item 20-57. A motion was made to **close the item with no action**. The motion was seconded and **unanimously approved**.

Item Number: 21-46	NBIC Location: Part 2, 1.3 & 9.1	No Attachment

General Description: Defining "Listed and Labeled"

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: Main Committee asked about having these defined in the NBIC.

January 2022 Action:
Mr. Getter stated to the SC that a task group was assigned during the SG meeting. Mr. Graf stated, him and Mr. Ray did a search in the NBIC for "Listed and Labeled" to see if it was necessary to add a definition. The TG will work on the item and see if they can have something ready soon and send it to LB between meetings.

Item Number: 21-47	NBIC Location: Part 2, 2.2.4 & 2.2.5	No Attachment

General Description: To provide better guidance as it relates to carbon monoxide

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: Need to provide more comprehensive items to be reviewed to guide the inspector on carbon monoxide and combustion air.

January 2022 Action:
Mr. Getter stated a task group was assigned during the SG meeting.

Item Number: 21-50	NBIC Location: Part 2, 2.3.6.4 & S7	No Attachment

General Description: Ensure IIAR PV Integrity codes are aligned with NBIC II

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: NH3 growing exposure.

January 2022 Action:
Mr. Getter stated a task group was assigned during the SG meeting. Mr. Graf addressed the SC to ask if they want the TG to reference IIAR or would they rather they make sure the wording in the NBIC is aligned with IIAR. The committee has stated they would like more than just a reference in the proposal.

NOTE: Item 21-56 will be combined with this action item, and Item 21-56 will be closed with no action.

Item Number: 21-56	NBIC Location: Part 2, 2.3.6.4 f) 5) c.	No Attachment

General Description: Clarify what action is necessary after determining the acceptance criteria.

Subgroup: Inspection
Task Group: None assigned

Explanation of Need: There is no guidance in the Liquid Ammonia 2.3.6.4 f) 5) paragraphs for the acceptance criteria for corroded areas of considerable size as there are for dents and bulges, for example.

January 2022 Action:
Mr. Getter stated to the SC that during the SG meeting this item was closed with no action and is being combined with Item 21-50. A motion was made to **close the item with no action**. The motion was seconded and **unanimously approved**.

Item Number: 22-01	NBIC Location: Part 2, Section 9	Attachment Page 19

General Description: Add "Interference Fit" to the Glossary.

Subgroup: Inspection
Task Group: J. Jessick
Submitted by: T. Barker

Explanation of Need:

January 2022 Action:
Mr. Getter presented the proposal to the SC showing the new definition for "Interference Fit". An editorial change was made to the proposal and a motion was made to approve the proposal as revised. The motion was seconded and **unanimously approved**.

DISCUSSION: Mr. Getter brought up to the Committee to keep in mind the idea of a Part 5. He also asked if there were any other volunteers for the task group. Mr. Horbaczewski has stated he'd like to be a part of the task group. Mr. Weilgoszinski also spoke on this topic stating, he wanted us to keep in mind that this may not become a separate Part, but rather a supplement for Fitness for Service.

13. Future Meetings

- July 2022 – TBD
- January 2023 – TBD

Mr. Getter discussed the future meetings with the SC.

14. Adjournment

A motion was made to adjourn the meeting at 10:27 am (PST). The motion was seconded and unanimously approved.

Respectfully submitted,

Jodi Metzmaier
Subcommittee Inspection Secretary

Subcommittee Inspection Attendance - January 19, 2022

MEMBERS:	Interest Category	In Person	Remote	Not In Attendance
Jim Getter - Chair	Manufacturers	x		
Mark Horbaczewski - Vice Chair	Users	x		
Jodi Metzmaier - Secretary	NBBI	x		
Tim Barker	Authorized Inspection Agencies	x		
Ernest Brantley	Authorized Inspection Agencies		x	
David Buechel	Authorized Inspection Agencies	x		
James Calvert	National Board Certificate Holders	x		
James Clark	Manufacturers		x	
Darrell Graf	National Board Certificate Holders	x		
William Hackworth	Authorized Inspection Agencies	x		
Jerry Jessick	Users	x		
Donnie LeSage	Jurisdictional Authorities	x		
John Mangas	General Interest	x		
Joe Morgan	Users		x	
Venus Newton	Authorized Inspection Agencies		x	
Jeffrey Petersen	Users	x		
Brent Ray	Users	x		
James Roberts	Manufacturers	x		
David Rose	Users		x	
Jason Safarz	General Interest		x	
Matt Sansone	Jurisdictional Authorities			x
Vincent Scarcella	Authorized Inspection Agencies	x		
Thomas Vandini	National Board Certificate Holders	x		

VISITORS:	Company/Title/Interest	In Person	Remote
Pierre Bantolo	Naval Facilities Engineering Systems Command SW Region	x	
Tim Bolden	Continental Casualty Insurance Company (CNA)	x	
Lee Burton	Air Products & Chemicals	x	
Shelley Fisher	NAVFAC SOUTHWEST SAN DIEGO CA	x	
Herbert Johnson	NAVFAC EXWC	x	
Dennis Sendek	NAVFAC Southwest	x	
Jesus Silva	Naval Facilities Engineering Command (U.S Navy)	x	
Sean Skiles	Fulton Equipment Pacific dba Fulton Pacific Boiler Solutions	x	
Nuri Cesur	TÜVNORD		x
Chuck Becker	Quality Steel	x	
Brandon Wilson	Diamond Technical Services, Inc.	x	
Jeff Castle	Zurich		x
David Warshall	NY City Dept of Boilers		x
Stan Staniszewski	US DOT		x
Eben Creaser	Chief of New Brunswick	x	
Luis Ponce	NBBI	x	
Greg Goosens	NBBI	x	
Gary Scribner	NBBI	x	

Announcements

- Zoom Notes:
  - Make sure all participants have their actual name on their zoom account.
  - Request attendees to add an "M" for Member, "V" for Visitor, or "S" for Staff at the end of their name. Example: Jodi Metzmaier - S
    - Click "Participants", click "more" next to your name, click "rename," and add the applicable letter.
  - Make Chair "co-host" if they are signed in on zoom.
  - Remind everyone to stay muted until they would like to speak.
    - We can use "raise hand" feature if needed.

- **Chair's Choice – Normal voice voting, or just negative voice voting.**
  - **Voice voting for the negatives, not voting, and abstentions only.** Once the motion and second have been established, the chair will ask for any negatives, not voting and abstentions.

- **For new member voting,** we will let the nominees speak on their behalf, if they are joining us via Zoom, we will send them to a "breakout room" while the group has a discussion and votes. Once the vote is completed, the nominees will be allowed back into the main meeting "room". If the nominee is at the meeting, we will ask them to leave the room for discussion and vote.

- The National Board will be hosting a reception on Wednesday evening from 5:30pm to 7:30pm at The Smoking Gun. Information for the Smoking Gun can be found on the National Board website under the **Inspection Code** tab → NBIC Meeting Information.

- The National Board will host a 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 Le Fontainebleau. Members, visitors, and guests are all welcome.
  PLEASE REGISTER IF YOU HAVE NOT ALREADY DONE SO.

- Coffee stations will be provided outside of the meeting rooms on each floor.

- The 2021 NBIC is now mandatory, effective **January 1, 2022**.

- Meeting schedules, meeting room layouts, and other helpful information can be found on the National Board website under the **Inspection Code** tab → NBIC Meeting Information.

- If the meeting ends early use the extra time to work with your task groups.
  - This can be done through Zoom/WebEx if needed.

- Remember to add any attachments that you'd like to show during the meeting (proposals, reference documents, power point, etc.) to the cloud prior to the meeting.
  - If needed, we can go over how to do this.
  - ALL power point attachments need to be sent to Jonathan prior to the meeting for approval.

Announcements

- Always submit attachments in word format showing "strike through/underline"
    - Does anyone need to know how to do this?

- Naming format reminder:
    - *Item number - person who made the revision - date update*

- As a reminder, anyone who would like to become a member of a group or committee:
    - must attend at least 2 meetings prior to being put on the agenda for membership consideration. The nominee will be on the agenda for voting during their 3rd meeting.
    - The nominee should submit the formal request along with their resume to Jonathan PRIOR TO the meeting. *nbicsecretary@nbbi.org*
    - If needed, we can also create a ballot for voting on a new member between meetings. To do this, you will need to contact Jonathan.

- Thank you to everyone who registered online for this meeting. The online registration is very helpful for planning our reception, meals, the room set up, etc. Please continue to use the online registration for each meeting.

ode requirements.
THE NATIONAL BOARD
OF BOILER AND PRESSURE VESSEL INSPECTORS

PROPOSED INTERPRETATION

Item No.

21-65

Subject/Title

Air receiver tank manual drain valve

Project Manager and Task Group

Source (Name/Email)

Luciano Tuason / Luciano.Tuason@tuvsud.com

Statement of Need

In preparing an inspection of a Texas cement plant, I put this requirement indicated in my proposed reply above.

Background Information

I remember this requirement some 12 years ago, but I could no longer find the specific code requirement. The client want to know where and what code provide this requirement.

Proposed Question

Is the requirement for air receiver tank manual drain valve mandatory even if the system has an automatic condensate drain?

Proposed Reply

Yes.

Committee's Question 1

Does the NBIC require an air receiver to have a manual drain in addition to an automatic drain?

Committee's Reply 1

It is the committee's opinion that this is a specific Jurisdictional requirement. The NBIC requires a manual drain or an automatic drain, but not both. Reference NBIC, Part 2, 2.3.6.2 b) 4).

Rationale

Committee's Question 2

Committee's Reply 2

Rationale

Item 21-48
NBIC Part 2
1/14/222
Item submitted by John Cady

S2.6.3.4 GENERALIZED THINNED AREAS

a) For corroded areas exceeding the specifications in S2.6.3.1, S2.6.3.2, and S2.6.3.3, the remaining thickness may be averaged over an area not exceeding the UT-grid size specified in S2.6.2 ~~c)~~b) or S2.6.2 ~~d)~~c).

1) The least measured remaining thickness within the grid indicated in S2.6.2 ~~c)~~b) or S2.6.2 ~~d)~~c) as applicable shall not be less than 50% of the required thickness per the calculation for MAWP.

2) The average remaining thickness recognized from the grid indicated in S2.6.2 ~~c)~~b) or S2.6.2 ~~d)~~c) as applicable shall not be less than 75% of the required thickness per the calculation for MAWP.

Item #20-70
NBIC Part 2 **Proposal V2**

Task Group Locomotive Boilers

Summary

Many steam locomotive operators do not inspect the sliding firebox supports on their locomotives (when they are equipped). Inspections have found them to be rusted in-place causing breakage of connection bolts and other damage to the locomotive firebox and mudring.

Furnace slide supports which are locked in-place by corrosion will adversely impact the thermal expansion of the boiler and lead to staybolt breakage.

Proposal

S1.4.2.29 BOILER ATTACHMENT BRACKETS

The boiler attachment brackets and associated components and fasteners used to secure the boiler to the frame shall be inspected for:

a) Correct installation;
b) Damaged or missing components;
c) Looseness;
d) Leakage;
e) Loose, bent, broken, or damaged rivets, nuts, bolts and studs;
f) Defective rivets; and
g) Provision for expansion~~;~~ and free movement of ~~sliding~~ supports.
~~h) Corrosion which may preclude free movement of sliding supports.~~

SUPPLEMENT 5
INSPECTION OF YANKEE DRYERS ~~(ROTATING CAST IRON PRESSURE VESSELS) WITH FINISHED SHELL OUTER SURFACES~~

S5.1 SCOPE

This supplement provides guidelines for the in service inspection of a ~~Yankee~~yankee dryer as defined in NBIC Part 1 Supplement 1. ~~A Yankee dryer is a pressure vessel with the following characteristics:~~

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.

~~a)~~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~~yankee dryer; and a steam-heated or fuel-fired hood. After drying, the paper web is removed from the dryer.

~~b)~~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~~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)~~d) The typical ~~Yankee~~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 li~~nternally, shells may be smooth bore or ribbed. Heads, center shafts, and journals may be gray cast iron, ductile cast iron, or steel.

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~~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;

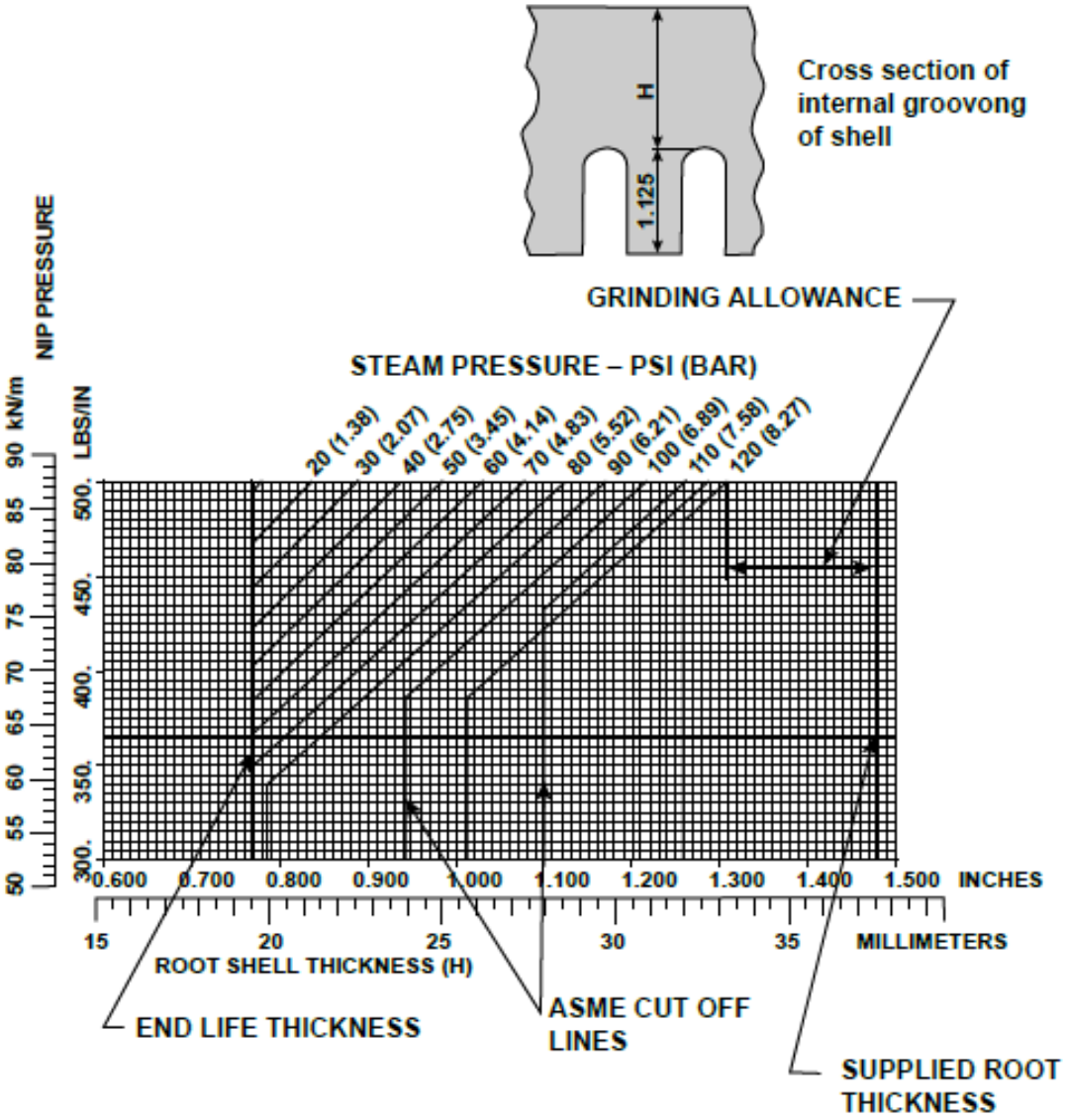
2) Inertial load due to dryer rotation;

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~~changed, or speed of the dryer is changed.

~~FIGURE S5.2~~
~~DE-RATE CURVE~~



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. 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.

~~a)~~h) In addition to the loads on the dryer due to normal operation, other nonstandard load events can occur. 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~~Local or overall thermal loads due to exceeding the warm-up rate;

2) ~~Excessive thermal load due to local or global cooling rate during shut-down~~Local or overall thermal loads due to exceeding the cool-down rate;

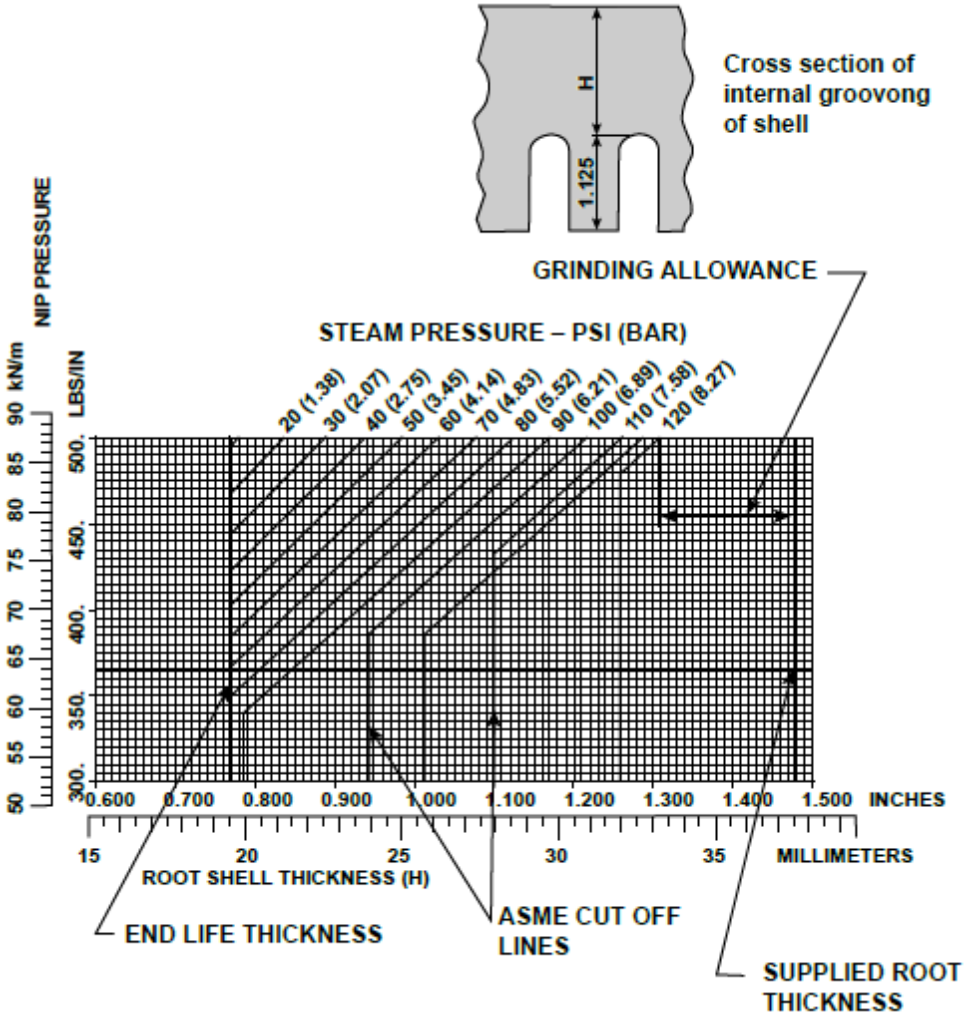
3) ~~Excessive t~~Thermal load due to inappropriate use or malfunctioning auxiliary heating devices causing localized heating;

4) ~~Excessive t~~Thermal load due to the misapplication or uncontrolled application of water or other fluids for production, cleaning, or ~~fire fighting~~firefighting; and

5) Impact load.

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

FIGURE S5.2
DE-RATE CURVE



S5.2.1 DETERMINATION OF ALLOWABLE OPERATING PARAMETERS

a) A ~~Yankee~~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~~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~~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~~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~~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~~firefighting, and wash-up can all produce non-uniform thermal stresses in the pressure-containing parts of the ~~Yankee~~yankee dryer. Heating or cooling different portions of the ~~Yankee~~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.

S5.2.2 ~~ADJUSTING THE MAXIMUM~~ ALLOWABLE OPERATING PARAMETERS ~~OF THE YANKEE DRYER DUE TO A REDUCTION IN SHELL THICKNESS FROM GRINDING OR MACHINING~~ AND SHELL THICKNESS

a) The maximum allowable operating parameters are a function of shell thickness and are addressed in one of the following two manners in the industry.

1) Adjusted throughout life of dryer

The maximum allowable operating parameters are reduced throughout the life of the dryer as the shell thickness is reduced. This method is commonly used for cast iron shells.

Required design documentation called a de-rate curve dictates the maximum allowable operating parameters based on imposed loads over a range of shell thicknesses. The documentation shall be obtained from the original dryer manufacturer or from another qualified source acceptable to the Inspector.

After the maximum allowable operating parameters are adjusted per the de-rate curve, the appropriate load limiting devices are reset (e.g., steam safety relief valve, line load limiting device).

2) Held constant throughout life of dryer

The maximum allowable operating parameters are held constant throughout the life of the dryer, until the shell thickness is reduced to a minimum end-of-life value. This method is commonly used for steel shells.

Required design documentation dictates the maximum allowable operating parameters and the minimum shell thickness. The documentation shall be obtained from the original dryer manufacturer or from another qualified source acceptable to the Inspector.

b) The current shell thickness and maximum allowable operating conditions shall be documented throughout the life of the ~~Yankee~~yankee dryer.

~~a) The outside surface of the Yankee dryer shell is routinely ground to restore the quality of the papermaking surface. The papermaking surface degrades due to wear, corrosion, and local thinning. As the shell thickness is reduced, the maximum allowable operating parameters are adjusted. Adjustment of the maximum allowable operating parameters requires accurate shell thickness measurements.~~

~~b) Over the life of the Yankee dryer, the adjustment of the maximum allowable operating parameters will require that the original design pressure and/or the pressure roll line load be reduced. After the maximum allowable operating parameters are adjusted per the De-rate Curve, the appropriate load limiting devices are reset (e.g., steam safety relief valve, line load limiting device).~~

~~S5.2.3 DOCUMENTATION OF SHELL THICKNESS AND ADJUSTED MAXIMUM ALLOWABLE OPERATING PARAMETERS~~ **(21)**

~~a) Design documentation, a De-rate Curve, is required, which dictates the maximum allowable operating parameters, based on imposed loads over a range of shell thickness. The documentation shall be obtained from the original dryer manufacturer or from another qualified source acceptable to the Inspector.~~

~~b) Yankee dryer shell grinding requires accurate shell thickness measurements in conjunction with the Derate Curve in order to set load-limiting devices. The resulting shell thickness and maximum allowable operating parameters after grinding shall be documented, and the Inspector notified that load-limiting device settings have changed.~~

S5.3 ~~CAUSES OF~~ DETERIORATION AND DAMAGE

Three types of deterioration or damage typically encountered in ~~Yankee~~yankee dryers are local thinning, cracking, and corrosion. Many times, the mechanisms are interrelated, one being the precursor of another.

S5.3.1 LOCAL THINNING

a) Internally, a Local Thin Area (LTA) can occur on the pressure-retaining surfaces due to steam and condensate erosion, mechanical wear and impact, and removal of material flaws. These assume features ranging from broad shallow areas washed out by erosion, to more groove-like flaws, including gouges and indentations from contacting metal parts.

b) Externally, the process is typically one of wear-corrosion in circumferential bands. Except on the shell edges, local thinning never achieves significant depth because the papermaking process will tolerate only the smallest departure from surface contour. On the shell edges, beyond the papermaking surface, wear-corrosion may advance to comparatively greater depths. However, the stresses are far less in this area than under the papermaking surface, so the wear is inconsequential in considerations of load-carrying ability. Only in the instance of steam leakage between flanges has the resultant local thinning ever been implicated in ~~Yankee~~yankee failure.

c) Steam leakage is detrimental to the long-term structural integrity of the vessel, in that the escaping steam, under high velocity, erodes ever-widening paths in the ~~cast-iron~~ surfaces over which it passes, thinning the cross-section. Steam cutting of connecting bolts is another possible outcome. Either result reduces load-carrying capacity of the part. A safety hazard can also be created for operating personnel, who may be burned by the high-velocity steam jets.

~~d) Interface leakage, including joints and bolted connections.~~

~~1) Joint Interface Corrosion~~

~~Jacking forces, which develop from the expansion of corrosion products between head-to-shell flanges, cause flange separation and create leakage paths between the flanges and/or through the bolt holes.~~

~~2) Insufficient Joint Clamping Force~~

~~Through inadequate design, improper assembly, loss of washer/gasket, or stress corrosion cracking of connecting bolts, the clamping force between mating flanges is insufficient to retain internal pressure.~~

~~3) Washer/Gasket Functional Loss~~

~~Deterioration, caused by corrosion or expulsion, provides a path for escaping steam and condensate.~~

~~4) Flange Machining Variation~~

~~Variations in surface contour of flange faces may create leakage paths.~~

~~e) Through-Wall Leakage~~

~~Cast iron inherently exhibits shrinkage porosity. Where porosity linkages occur between internal and external surfaces, a path for steam leakage is made available. Such leakage is largely an operational issue, as holes are formed in the paper product, demanding expedient attention.~~

S5.3.2 CRACKING

~~Cracks in cast-iron parts are problematic because of the relatively low fracture toughness compared with standard, more ductile pressure vessel materials and because strengthening repair through welding is prohibited.~~

~~Furthermore,~~ Yankee dryers are subject to both low-cycle and high-cycle fatigue loading; c~~. C~~onsequently, considerable emphasis is placed upon ~~quality inspection for~~crack detection and timely remediation of cracks~~, the central causes of which (in Yankee dryers) are:~~. Possible causes include:

S5.3.2.0 EXCEEDING MAXIMUM ALLOWABLE OPERATING CONDITIONS

~~a) Overpressurization~~

~~As shell thickness is routinely diminished through time,~~ Yankee dryers are designed to operate within the ~~pressure~~ limitations set down by ASME Section VIII and the safety factors inherent to the ~~"De-rate Curve" calculated~~documentation provided by the vessel manufacturer or equally qualified source. Failure to maintain operation within the ~~steam pressure~~parameters established by those criteria can ~~, in the extreme,~~ lead to cracking.

~~b) Pressure Roll Overload~~

~~Included in Yankee dryer shell design is a fatigue factor of safety. Exceeding allowable roll load, in combination with other stress-elevating or strength-reducing conditions, can precipitate fatigue cracking and failure.~~

S5.3.2.1 ~~THROUGH~~ JOINTS AND BOLTED CONNECTIONS

a) Joint Interface Corrosion

Jacking forces, which develop from the expansion of corrosion products between head-to-shell flanges, cause flange separation and create leakage paths between the flanges and/or through the bolt holes. The products of corrosion occupy a larger volume than the base metal. The forces created by this expansion are sufficient to cause cracking in flanges or bolts. Without remediation, expansion will continue until failure occurs. Corrosion products form in the presence of moisture in the crevice created between flanges, wherever the clamping force is insufficient to maintain contact between the mating surfaces. ~~Jacking forces, which develop from the expansion of corrosion products between head-to-shell flanges, cause flange separation and create leakage paths between the flanges and/or through the bolt holes.~~

b) Insufficient Joint Clamping Force

Through inadequate design, improper assembly, loss of washer/gasket, or stress corrosion cracking of connecting bolts, the clamping force between mating flanges is insufficient to retain internal pressure.

c) Washer/Gasket Functional Loss

Deterioration, caused by corrosion or ~~expulsion~~gasket damage, provides a path for escaping steam and condensate.

d) Flange Machining Variation

Variations in surface contour of flange faces may create leakage paths.

S5.3.2.2 THROUGH-WALL LEAKAGE

Cast iron inherently exhibits shrinkage porosity. Where porosity linkages occur between internal and external surfaces, a path for steam leakage is made available. Such leakage in a cast iron~~the~~ shell is largely an operational issue, as holes are formed in the paper product, demanding expedient attention. Steel shells are not cast, and any through-wall leakage would likely be due to a through-wall crack which should be addressed immediately.

S5.3.2.3 IMPACT FROM OBJECTS PASSING THROUGH THE ~~YANKEE/~~PRESS~~URE ROLL~~ NIP

An object passing through the nip can create a localized impact that leads to elevated stress within fatigue loaded material.
~~Because of cast iron's low fracture toughness, it is especially intolerant of local, high-impact loads.~~

S5.3.2.4 STRESS MAGNIFICATION AROUND DRILLED HOLES

Surface defects, caused by porosity and indentations, are frequently repaired with driven plugs, having some level of interference fit. Pumping ports, threaded for a tapered pipe fitting, are often installed as a standard ~~Yankee~~yankee design feature for sealant injection into flange interfaces. When installed, both produce an area of increased stress, local to the hole's edge. In the case of driven plugs, this stress can be exaggerated by excessive interference fits and by closely-grouped or overlapping plugs. Over-torque of threaded, tapered plugs can cause cracks to develop at the periphery of the hole.

S5.3.2.5 ~~THERMAL STRESS AND/OR MICRO-STRUCTURAL CHANGE FROM~~ EXCESSIVE LOCAL HEATING AND COOLING

Transient thermal stresses are usually the highest encountered by a ~~Yankee~~yankee dryer. Temperature differential through and between parts can be of such magnitude as to exceed the strength of the material. When abnormal thermal loads occur, nondestructive examination is crucial to ensure the vessel's fitness-for-service. Micro-structural change and transient thermal stresses, sufficiently high to cause cracking in ~~Yankee~~yankee dryers, have resulted, or could result, from:

a) Bearing failure;

b) Rapid warm-up;

c) Excessive steam temperature;

d) Heat from fires;

e) Application of water sprays to fight fires and remove paper jams;

f) Continuous and excessive local cooling from water sprays;

g) Operating heating or cooling systems while the ~~Yankee~~yankee dryer is stationary; (e.g., high-temperature air impingement hoods, infra-red heating devices, coating showers);

h) Welding and electrical arcs ~~on cast-iron parts~~; and

i) Excessive local temperature due to improper thermal spray application.

~~S5.3.2.6 JOINT INTERFACE CORROSION~~

~~The products of corrosion occupy a larger volume than the base metal. The forces created by this expansion are sufficient to cause cracking in cast-iron flanges. Without remediation, expansion will continue until failure occurs. Corrosion products form in the presence of moisture in the crevice created between flanges, wherever the clamping force is insufficient to maintain contact between the mating surfaces.~~

S5.3.2.6~~7~~ STRESS-CORROSION CRACKING OF STRUCTURAL BOLTS

Stress-corrosion cracking (SCC) is the result of the combination of a corroding agent, material sensitivity, tensile stress, and temperature. At stress levels sufficiently high to induce SCC in the presence of a corrosive medium, attack proceeds along or through grain boundaries perpendicular to the direction of maximum tensile stress. Cracking can initiate with little or no evidence of general corrosion.

S5.3.3 CORROSION

Corrosion culminates with a failure in component functionality by diminishing load-carrying capacity or by generating forces beyond the material's strength. In addition to SCC, corrosion-jacking of joints ~~(head-to-shell joint)~~, wear-corrosion, and deterioration of washers described above, oxygen pitting, and general corrosion wastage need to be considered as potential failure causes. These latter two corrosion conditions are the result of inadequate boiler water treatment. ~~Oxygen pitting has been encountered, but rarely.~~.

S5.4 INSPECTIONS

a) ~~Yankee dryers should be inspected on a routine periodic basis. However, as a minimum, T~~the ~~Yankee~~yankee dryer should be inspected internally and externally at least one time every two years. The degree and frequency of inspection should be determined based on OEM recommendations, owner/user experience, and risk-based considerations.

b) As appropriate, the following items should be included depending on material of construction and design:~~:~~

1) Head-to-shell joint;

2) Shell out-of-roundness;

3) Shell centerline thickness;

4) Tilt of head flange;

5) Integrity and security of internal parts;

6) Spigot fit of flanged joints (head-to-shell, head-to-journal);

7) Integrity of structural bolts and studs; ~~and~~

8) Previously identified areas of deterioration and damage; and~~;~~

9) Welds within pressure-retaining items.

~~1) Head-to-shell joint;~~

~~2)1) Shell out-of-roundness;~~

~~3)1) Shell centerline thickness;~~

~~4)1) Tilt of head flange;~~

~~5)1) Integrity and security of internal parts;~~

~~6)1) Spigot fit of flanged joints (head-to-shell, head-to-journal);~~

~~7)~~1) ~~Integrity of structural bolts and studs; and~~

~~8)~~1) ~~Previously identified areas of deterioration and damage.~~

c) When a nonstandard load event occurs, or a material non-conformity is noted, an inspection should be performed to assess fitness for continued service. This inspection may involve testing methods not typically used in routine inspections and may also involve removal of material samples for destructive testing.

S5.5 NONDESTRUCTIVE EXAMINATION

a) Nondestructive examination (NDE) methods shall be implemented by individuals qualified and experienced with the material to be tested using written NDE procedures. For cast ~~Yankee~~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~~yankee dryers. Magnetic particle, specifically the wet fluorescent method, and dye penetrant methods are applicable in the evaluation of surface-breaking indications. Ultrasonic testing is the standard method for evaluation of surface-breaking and embedded indications. Radiographic methods are useful in the evaluation of embedded indications. Acoustic emission testing can be used to locate and determine if a linear indication is active, i.e., propagating crack. Metallographic analysis is useful in differentiating between original casting discontinuities and cracks.

c) When nondestructive examination produces an indication, the indication is subject to interpretation as false, relevant, or non-relevant. 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.

~~c)~~d) The inspection shall include review of the NDE history.

S5.6 PRESSURE TESTING

a) Water pressure testing in the field is not recommended because of the large size of the ~~Yankee~~yankee dryers and the resulting combined weight of the ~~Yankee~~yankee dryer and the water used in testing. This combined weight can lead to support structure overload. Several failures of ~~Yankee~~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~~yankee dryer, the weight of the water filling the ~~Yankee~~yankee dryer, and the weight of the support structure used to hold the ~~Yankee~~yankee dryer during the test.

2) The building and supporting structures should be assessed for overload.

~~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 testing area and 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.~~

~~PL 5~~

3) The ~~Yankee~~yankee manufacturer should be contacted to provide information on building the ~~Yankee~~yankee dryer support structure for the water pressure test. Typically, the ~~Yankee~~yankee dryer is supported on saddles that contact the ~~Yankee~~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~~yankee dryer is properly supported for the test.

b) Steam or air is recommended when pressure testing is performed. Acoustic emission testing is recommended in conjunction with pressure testing when there are concerns for deterioration or fitness for service.~~When pressure testing is desired to evaluate forms of deterioration, acoustic emission testing, with steam or air, is recommended. Typically, the test pressure used is the operating pressure~~.

~~**S5.7 TABLES AND FIGURES**~~

~~c)~~ ~~FIGURE S5.2, De-Rate Curve.~~

Item 22-01

January 18, 2022

Add the below definition to the Glossary:

Interference Fit

An interference fit, also known as a press fit or friction fit, is a form of fastening between two tight fitting mating parts that produces a joint which is held together by friction after the parts are pushed together.

NOTE: This definition is directly from Wikipedia