

Date Distributed: December 17, 2012



**THE
NATIONAL
BOARD**
OF BOILER AND
PRESSURE VESSEL
INSPECTORS

SUBGROUP ON HISTORICAL BOILERS

AGENDA

*Meeting of January 14, 2013
Mobile, Alabama*

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 – 10:00 a.m.**
2. **Announcements**
3. **Adoption of the Agenda**
4. **Approval of Minutes**
5. **Review of the Roster (Attachment 1)**
6. **Action Items (Attachment 2)**

NB11-0201- Part 2 S2, SG on Historical Boilers Limits for bulged stayed firebox sheets. (No Attachment)

July 2010

A task group of R. Bryce (Chair), D. Cook and F. Johnson was assigned.

January 2011

A progress report was given.

July 2011

Mr. Cook gave a progress report. Finite Element Analysis (FEA) is being considered as a tool for establishing limits.

January 2012

Dr. Bryce gave a detailed progress report along with handout. After discussion, the Task Group was reaffirmed with the addition of D. Rupert.

July 2012

Dr. Bryce gave a detailed progress report along with handout. After discussion, the item was sent back to the task group for more work.

January 2013

Dr. Bryce is expected to report.

NB11-0204 Parts 2 & 3 Supplement 2 SG on Historical Boilers - Review NDE requirements of stayed areas. (No Attachment)

July 2010

A task group of M. Wahl (Chair), J. Larson and F. Johnson was assigned.

January 2011

Mr. Wahl gave a progress report.

July 2011

No progress.

January 2012

A progress report was given by Mr. Wahl.

July 2012

A progress report was given by Mr. Wahl.

January 2013

Mr. Wahl is expected to report.

NB11-1101 Part 2, S2.6.2 b) SG on Historical Boilers - This section should be revised to provide more guidance for evaluating local pitting corrosion versus general corrosion. (Attachment 2, pp. 1-2)

January 2011

Mr. Wahl gave a progress report.

July 2011

Don Cook and Dennis Rupert were added to the task group.

January 2012

A progress report was given by Mr. Wahl.

July 2012

A progress report was given by Mr. Wahl.

January 2013

Mr. Rupert is expected to report.

NB12-1201 Part 2, S2.10.2 SG on Historical Boilers – Review requirements for stayed areas. (Attachment 2, pp. 3-5)

January 2012

A task group of D. Cook, T. Dillon, and R. Bryce was assigned.

July 2012

A progress report was given by Dr. Bryce.

January 2013

Dr. Bryce is expected to report.

7. New Business

8. Future Meetings

July 15-19, 2013, Columbus, Ohio

January

9. Adjournment

Respectfully Submitted,

Bill Smith
Secretary

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NB11-1101

New Item

Request for Code Change below to address thickness readings for adjusting MAWP if general or localized pitting is observed.

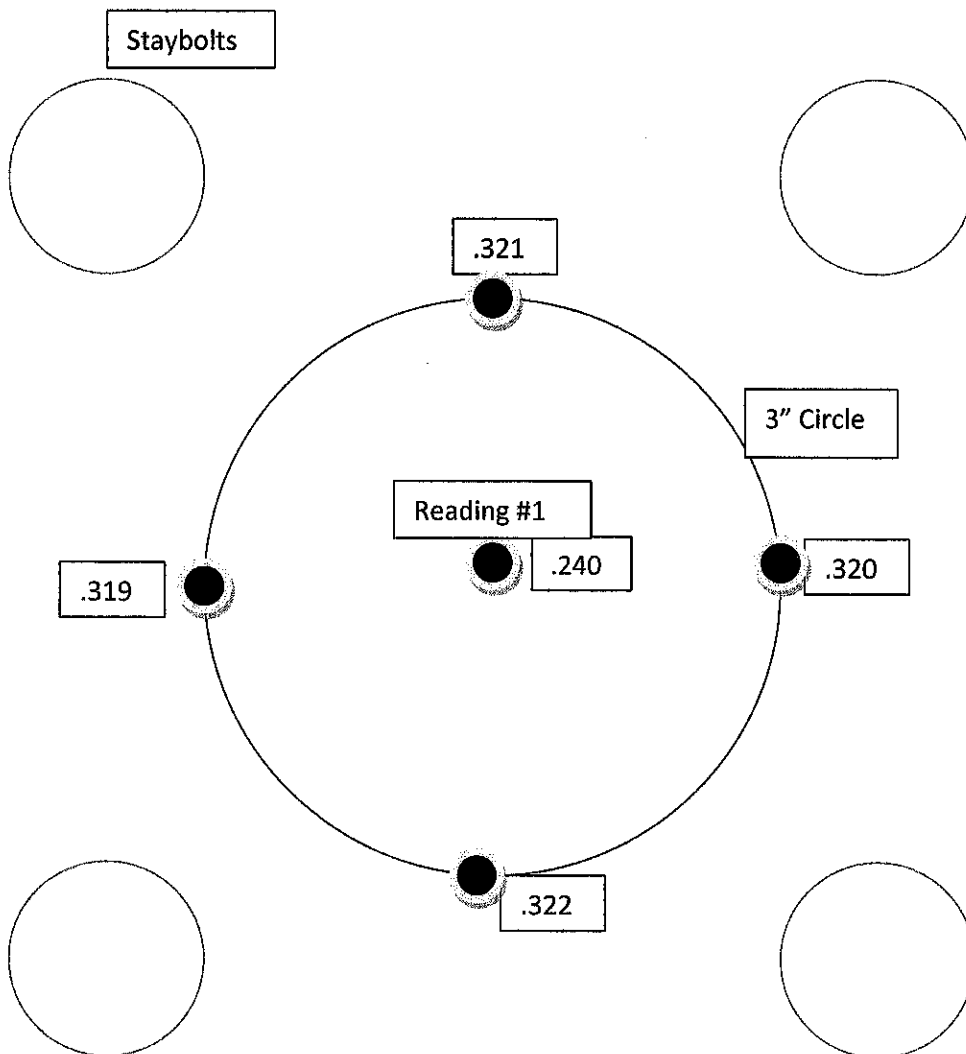
Part II, Section 6, Paragraph S2.6.2 b) should be revised to provide more guidance for evaluating local pitting corrosion versus general corrosion. See example below;

Once region of corrosion pitting is detected by UT (.240" in the attached illustration), a three-inch circle should be drawn around the pitted region. After four readings around the perimeter of the circle are determined by UT and show significant difference with the original lowest reading, the lowest of the four readings should be used as the actual thickness for that particular subsection of the boiler (e.g., the staybolt quadrant as shown, or the grid section of the barrel).

The lowest center reading is assumed to be a localized pit, and can be disregarded in the MAWP calculation because of surrounding material that provides some level of reinforcement.

Sample Readings

Exhibit 1



Subject: 2010 Edition, Part 2, Supplement 2, S2.10.4 – Average Staybolt Pitch

File Number: NB12-1201

Prop. Page: 140

Proposal: Update text in S2.10.4, S2.10.6 to include provisions and mathematics for rectangular staybolt patterns found on many historical boilers.

Current text:

S2.10.4 STAYED SURFACES

The maximum allowable working pressure for stayed flat plates and those parts which, by these rules, require staying as flat plates with stays or staybolts of uniform diameter symmetrically spaced, shall be calculated using the following formula or Tables S2.10.4 and S2.10.4.1:

$$A07 \quad P = \frac{T^2 \times S \times C}{p^2}$$

See definitions of nomenclature in S2.10.6

A08 S2.10.4.1 STAYBOLTS

Table S2.10.4.1 may be used to determine the MAWP for corroded staybolts. The table A09 is based on a stress value of 7,500 psi (51.7 MPa) for staybolts that was the value used in the ASME Section 1, 1971 Edition. The table identifies a calculated MAWP based on measuring the staybolt spacing on the crown sheet and the minimum diameter of the corroded staybolt. See Table S2.10.4.1.

Reword as follows:

S2.10.4 STAYED SURFACES

The maximum allowable working pressure for stayed flat plates and those parts which, by these rules, require staying as flat plates with stays or staybolts of uniform diameter symmetrically spaced, shall be calculated using the following formula or Table S2.10.4.

$$P = \frac{t^2 \times S \times C}{p^2}$$

S2.10.4.1 STAYBOLTS

The maximum allowable working pressure for symmetrically spaced corroded staybolts shall be calculated using the following formula or Table S2.10.4.1. The table is based on

a stress value of 7,500 psi (51.7 MPa) for staybolts and identifies a calculated MAWP based on measuring the staybolt spacing on the crown sheet and the minimum diameter of the corroded staybolt. Refer to ASME Section 1, 1971 Edition, Table PG-23.3 for allowable loads for all staybolts.

$$P = \frac{\pi \left[\frac{d}{2} \right]^2 \times S}{p^2}$$

S2.10.4.2 UNEQUAL STAY PITCHES

When the pitches of stays are unequal and form a rectangle, alternative equations are to be used, where:

S2.10.4.2.a The equation for stayed surfaces, given in S2.10.4, is to be replaced with the following equation:

$$P = \frac{2 \times l^2 \times S \times C}{l^2 + w^2}$$

S2.10.4.2.b The equation for staybolts, given in S2.10.4.1, is to be replaced with the following equation:

$$P = \frac{\pi \left[\frac{d}{2} \right]^2 \times S}{l \times w}$$

S2.10.6 NOMENCLATURE

[...]

- p = maximum pitch measured between straight lines passing through the centers of the staybolts in the different rows, which lines may be horizontal, vertical, or inclined, inches or mm
- l = the pitch of stays in one row, passing through the centers of the staybolts, which line may be horizontal, vertical, or inclined, inches or mm
- w = the distance between two rows of staybolts, inches or mm
- d = minimum diameter of corroded staybolt, inches or mm

[...]

Explanation: All known course materials and interpretations of all editions of ASME interpret PG-46.1 (STAYED SURFACES) to require application of the largest dimension of the rectangular pattern as the dimension of ‘*p*’ in the familiar equation:

$$P = \frac{t^2 \times S \times C}{p^2}$$

(also used in S2.10.4). This wording and interpretation is duplicated in ASME Section VIII UG-47. However, ASME 1971 PFT-27.1 and ASME 2002 PFT-26.1 both use similar wording stating “*The full pitch dimensions of the stays shall be employed in determining the area to be supported by a stay...*”. We interpret this wording to mean true dimensions of a rectangle.

All editions of the Canadian Interprovincial Standard (1910-1938) provide a variation for the same equation for flat stayed surfaces. Specifically, the dimensions of a theoretical square with the same hypotenuse as that of the rectangle, is used. It is believed that, in this respect, the ASME code is a simplification of the older Canadian code and underlying theories. Additionally, traction engine blueprints and registration documents have shown that many historical boilers were built to this Canadian standard. For these reasons, this proposal is based on this precedent.

Unequal Stay Pitches

216. When the pitches of stays are unequal $\frac{l^2 + w^2}{2}$ is to be taken instead of P^2 in the formulae given in Section 213 to 215.

l = the pitch of stays in inches in one row.
w = distance in inches between two rows of stays.

As shown in the following diagram, the black rectangle and the blue square share the same hypotenuse, although the blue square actually covers more surface area. The origins of this theory appear to be based in consideration for *unsupported* area *and* distance between stays, not *supported* area of each stay.