

# Date Distributed: July 17, 2018

**NATIONAL BOARD**

**SUBGROUP**

**LOCOMOTIVE BOILERS**

 Minutes

Meeting of April 24th, 2018

Columbus, Ohio

The National Board of Boiler & Pressure Vessel Inspectors

1055 Crupper Avenue

Columbus, Ohio 43229-1183

Phone: (614)888-8320

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* **Call to Order**

**0910**

* **Introduction of Members and Visitors**

|  |  |
| --- | --- |
| * 1. **L. Moedinger- Chair**
 | * 1. **M. Janssen- Vice Chair**
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| * 1. **R. Ferrell Secretary**
 | * 1. **R. Musser**
 |
| * 1. **C. Cross**
 | * 1. **D. McCormack**
 |
| * 1. **D. Griner – by telephone**
 | * 1. **G. Mark Ray**
 |
| * 1. **P. Welch**
 | * 1. **S. Butler**
 |
| * 1. **D. Conrad**
 | * 1. **R. Franzen**
 |
| * 1. **S. Lee**
 | * 1. **R. Stone- absent**
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| * 1. **G. Scerbo-absent**
 | * 1. **M. Jordan-absent**
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* **Announcements**
* **Adoption of the Agenda-unanimous**
* **Approval of the Minutes of July 17th, 2017 Meeting**
* **Review of Rosters**
	1. **Membership Appointments-none**
* **NBIC Business**
1. **Interpretations**

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| **Item Number: 17-143** | **NBIC Location: Part 3 3.2.2**  | **Attachment Page 6** |
| **General Description:** An R certificate holder wants to manufacture a sub assembly and use it on a power boiler. |
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| **Subgroup:** Locomotive**Task Group:** P Welch PM**July 2017:** Item discussed. Mr. Welch will supply wording for the reply which will be letter balloted to this sub-group following the July 2017 meeting.**April 2017**: Progress Report |

1. **Action Items – Old Business**

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| **Item Number: 13-1401** |  **NBIC Location: Part 3, S1.9.2** | **No Attachment** |
| **General Description:** Add wording in this section regarding boiler tube welding |
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| **Subgroup:** Locomotive**Task Group:** R. Stone (PM) |
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| **January 2017:** No action was taken on this item.**July 2017:** No action was taken on this item. PM will review ballot comments from R&A and comments will be provided on NBIC Share.org for SG Locomotive review.**April 2018-closed** unanimousand open new item **18-5** to be more concise in requirements(PM) M Janssen, JD Conrad |

**NB13-1406 closed**

**NB13-1407 closed**

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| **Item Number: 13-1408** | **NBIC Location: Part 3, S1** | **Attachment Pages 8-12** |
| **General Description:** Add requirements for repair and alteration of locomotive boilers with threaded boiler studs of the taper thread and straight thread varieties |
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| **Subgroup:** Locomotive**Task Group:** R. Stone (PM) |
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| **Current Status:** Approved by NBIC Main Committee via letter ballot. Closed by SG unanimous |

**NB 13-1409 closed** unanimous

**NB14-1101 closed** unanimous

**NB14-1801 (PM) D Griner close 1801** and evaluate for new item(s).Unanimous

**NB14-1802 Close new item 18-6 for Part 2 (PM) R Franzen, M Janssen S1.4.2.9**

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| **Item Number: NB16-1801** | **NBIC Location: Part 3, S1** | **Attachment Pages 16,17** |
| **General Description:** Review Part 3 S1 for revisions based on the publication of ASME Section 1, Part PL |
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| **Subgroup:** Locomotive**Task Group:** L. Moedinger (PM)**July 2017:** No action was taken on this item.**April 2018** Item **passed** as attached unanimous |

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| **Item Number: NB16-2504** | **NBIC Location: Part 3, S1** |  **No Attachment**  |
| **General Description:** Evaluate adding SA-234 to the piping reference table S1.1.3.1 |
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| **Subgroup:** Locomotive**Task Group:** D. Griner, M. Janssen**July 2017:** Progress report was presented.**April 2018**: **Closed** **unanimous** |

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| **Item Number: 17-145** | **NBIC Location: Part 3, S1.2.2-S1.25** | **No Attachment** |
| **General Description:** Clarify repair vs. alteration for locomotive boilers |
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| **Subgroup:** Locomotive**Task Group:** PM L Moedinger.**April 2018:closed unanimous** |

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| **Item Number: 17-155** | **NBIC Location: Part 3, S1.2.14** | **Attachment Page 7** |
| **General Description:** Throttle pipes, dry pipes, superheater headers, and front end steam pipes |
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| **Subgroup:** Locomotive**Task Group:** PM R. Stone**July 2017:** Passed for a letter ballot to SG Locomotives **April 2018**:Passed unanimous  |

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| **Item Number: 17-156** | **NBIC Location: Part 3, S1.1.2** | **Attachment Page 15** |
| **General Description:** Requirements forWelding and Brazing Activities |
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| **Subgroup:** Locomotive**Task Group:** PM G.M Ray**April 2018**: Progress report |

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| **Item Number: 17-157** | **NBIC Location: Part 3, S1.2.7.1** | **Attachment Page 13**  |
| **General Description:** Bolts Nuts and Washers |
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| **Subgroup:** Locomotive**Task Group:** PM R. Stone**July 2017:** Passed and moved to letter ballot at SCRA (**no record that this was done after the meeting. This was delayed with the software change to Aptify and is being released to SCRA**)**April 2018**:Closed with no action by SG |

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| **Item Number: 17-160** | **NBIC Location: Part 3, S1** | **Attachment Page 14**  |
| **General Description:** Partial Knuckle replacement riveted to welded |
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| **Subgroup:** Locomotive**Task Group:** PM R. Frazen**April 2018**:Passed unanimous |

**New items:**

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| **Item Number: 18-5 NBIC Location: Part 3. S1.2.9.6 Attachment Page18** |
| **General Description**: Installation of Boiler Flues**Subgroup**: Locomotive**Task group**: L Moedinger**April 2018**: Passed Unanimous |

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| **Item Number: 18-6 NBIC Location: Part 2 . S1.4.2.9 No Attachment**  |
| **General Description**: was NB14-1802, Riveted Stay bolt dimensions **Subgroup**: Locomotive**Task group**: (PM) M JanssenApril 2018:  |

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| **Item Number: 18-7 NBIC Location: Part 3. S1.2.5.1 Attachment Page 19** |
| **General Description**: Fillet welded Staybolts**Subgroup**: Locomotive**Task group**: L MoedingerApril 2018: Passed Unanimous |

* **Future Meetings**
* July 16th-19th, 2018 – Columbus, Ohio
* January 15th-18th, 2018 – TBD
* **Adjournment**

Respectfully submitted,

Robert Ferrell

SG Locomotives Secretary



The Sub Groups response: Can an "R" stamp certificate holder manufacture and use parts or sub-assemblies for use as part of the pressure boundary in the repair of a power boiler? YES

To: Allan Bornhorst,QC Supervisor

 Geotech Industries

From: NBIC Committee

The committee feels that providing any more information on your method of repair would be providing consulting services which is against NBIC committee protocol.

**17-155**

NBIC Part 3          Paragraph(s): S1.2.14

Title: **Throttle Pipes, Dry Pipes, Superheater Headers & Front End Steam Pipes**
Date Opened: July 17, 2017 (reworked from NB13-1405)
Background:
The reason for adding this section is to provide guidance for repair of these locomotive boiler components.  Two accidents have occurred to steam locomotives over the past 30 years when the dry pipe collapsed and caused the locomotive to operate out of control.  Although neither accident caused injury equipment damage did occur.  In addition other accidents that resulted in injury and fatalities have occurred to steam locomotives during the years of 1910 - 1950 when these were in normal railroad service.

**Proposed Action:**  **New Paragraph** For letter ballot after July 2017

**S1.2.14 Throttle Pipes, Dry Pipes, Superheater Headers & Front End Steam Pipes**

1) Cracks in throttle pipes, dry pipes, superheater headers, and front end steam pipes made from steel may be repaired by welding. All welded repairs shall be done in accordance with NBIC Part 3.

2) Throttle castings, dry pipes, super heater headers, and front end steam pipes constructed of cast iron may be repaired by brazing. Brazing shall be done according to a procedure qualified to ASME Section IX, appropriate to the type of repair, and shall be acceptable to the Inspector and the jurisdiction if applicable. Cast iron shall not be fusion welded.

3) Weld build-up may be used for repair of steel components in accordance with NBIC Part 3.

4) Throttle pipes, dry pipes and superheater headers, should be supported by hangers, brackets or other structural methods as needed.

**NB13-1408**

NBIC Part 3 S1.2.7.2 Patch Bolts S1.2.7.3 from S1.2.8

Revised title and section: **S1.2.7.2 TAPER THREAD BOILER STUDS (SEE NBIC PART 3, FIGURES**

**S1.2.7.2-a, S1.2.7.2-b & S1.2.7.2-c)**

Taper thread boiler studs are designed to thread directly into the boiler shell and are used to secure locomotive boiler components or related locomotive components such as pipe brackets for boiler piping, dome cover and feed water check valves. The stud end that threads into the boiler shell is machined with a boiler-type taper thread and the mating hole in the boiler shell is tapped with the same boiler-type taper thread. The opposite end of the stud is machined with standard straight machine screw-type threads to permit attachment of the components along with a nut and washer.

Taper thread boiler studs used on locomotive boilers shall be maintained, repaired or replaced in accordance with the directions of the original equipment manufacturer. If this information is not available, the following procedures shall be used.

1. Taper thread boiler studs and the mating tapped holes shall be made to the required size and taper to create a tight and leak free joint upon final tightening. The stud taper threads shall have a good uniform fit along the entire length of the tapped hole threads and not just at the top or bottom edges of either the stud or hole. When the hole threads are to be tapped in new material or re-tapped for repair or cleaning the taper tap shall be run through the entire hole depth in order to form all threads correctly. The length of the taper thread section shall be sized so that upon the stud being tightened at final assembly at least one full thread shall be above the boiler shell exterior surface and no less than flush with the interior surface. (See Fig.S1.2.7.2-c)

1. When taper thread boiler studs are installed into blind holes on the boiler shell or sheet the taper section length shall be confirmed to be shorter than the hole depth in order to prevent the stud from contacting the hole bottom upon being tightened at final assembly.

1. Studs and boiler shell surfaces that are cracked or damaged shall be either repaired or replaced per items “f” and “g” of this section.

1. Changes to the taper, thread pitch or thread form of the taper thread boiler stud or its mating tapped hole in the boiler shall be suitable for the service intended.

1. Replacement taper thread boiler studs of a different strength, grade specification or size than the original shall be suitable for the service intended.

1. A worn or damaged taper thread stud hole may be repaired by re-tapping it to a larger diameter and installing a taper thread boiler stud that has a corresponding larger diameter boiler thread end than the original stud. The largest portion of the tapered section of the stud shall not exceed the original stud straight section (shank) diameter by 33%.The larger diameter boiler stud shall be made with a 1/8 inch (3mm) radius from the stud body into the larger diameter boiler thread end.

1. Oversize cracked or damaged boiler studs holes in the boiler shell may be repaired by weld build-up or by replacing the damaged plate section using a flush patch. If weld build-up is performed, the existing boiler stud threads shall be removed from the hole by reaming, grinding or machining prior to welding. All welding and welded repairs shall be performed per NBIC Part 3.

* 1. Taper thread boiler studs, nuts and washers that have wastage, corrosion or mechanical damage, sufficient to impair the holding power or function of the fastener shall be replaced.

* 1. Taper thread boiler studs and nuts that have damaged threads may be repaired by re-threading.
	2. Replacement taper thread boiler studs, nuts and washers shall have the same fitup, alignment and thread engagement length as the original.

* 1. The use of replacement taper thread boiler studs, nuts and washers of a different strength, grade specification or size than the original shall be suitable for the service intended.

Notes: If a taper thread boiler stud or nut is heated to a metal temperature that exceeds 1100°F (593°C), it will be damaged or suffer a reduction of hardness and should be replaced.





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**Subgroup Locomotives National Board Item No. 17-157**

Current Level: Subgroup discussion

NBIC Part 3 Paragraph(s): S1.2.7.1 Title: Bolts, Nuts & Washers

Date Opened: April 2013

Background:

To provide guidance for the repair and replacement of the bolts, nuts and washers used on locomotive boilers for assembly of pressure retaining components.

**Proposed Action:** Item moved to letter ballot to SG locomotives July 17, 2017

S1.2.7.1 Bolts, Nuts, & Washers

Bolts, nuts, and washers that have wastage, corrosion, or mechanical damage, sufficient to impair the holding power capability or function of the fastener shall be replaced, as permitted in NBIC Part 3, 3.3.3.

Upon disassembly, bolts and nuts that have been tack welded shall not be re-used.

**Note 1**: Material requirements can be found in Table S1.1.3.1

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**NB17-156**

**Approved by SGL April 2018**

**S1.1.2 REQUIREMENTS FOR WELDING AND BRAZING ACTIVITIES**

a) Before performing any welding activities, consideration shall be given to ensure the weldability of locomotive boiler materials.

b) Special jurisdictional approval may be required prior to starting welding activity on locomotive boilers.

c) Performance of welded repairs on locomotive boilers shall meet the requirements of NBIC Part 3.

d) Performance of brazed repairs on locomotive boilers shall meet the requirements of ASME Section IX.

NB16-1801 approved April 2018 by SGL

Materials -

NBIC S1.1.3.1-d); Maximum staybolt *tensile strength* shall be 7,500 psi? Errata. Should be tensile stress

Bolts and Studs;

NBIC Table S1.1.3.1; SA-307 A and B. Add SA-675 grade 60, 65, 70

Threaded Staybolts;

NBIC Table S1.1.3.1; SA-31 Gr. A, SA-675 ~~47 ksi to 65 ksi inclusive~~. Remove 47ksi to 65 ksi inclusive. Add grade 45, 50, and 55

Staybolt Sleeves and Caps;

NBIC Table S1.1.3.1; SA-105, SA-675, and SA-696. Add SA-216 WCA and SA-217 WC1

Threaded Staybolts –

NBIC S1.2.2 a); The thread pitch shall be either 11 or 12.

Current wording:

~~All threaded staybolts shall have either 11- or 12-thread pitch. Staybolt threads shall have a good close fit in sheets. Changing the staybolt thread pitch from 11 to 12 or the reverse shall be considered a repair.~~

Proposed wording:

All threaded staybolts shall have a pitch between 10 and 13 threads per inch inclusive, (2 mm to 2.5 mm). Staybolt threads shall have a good close fit in sheets. Changing the staybolt thread pitch from any pitch within the allowed range to another pitch within the allowed range shall be considered a repair.

NBIC S1.2.2 h)

Current wording:

~~Installation of larger diameter staybolts shall be considered a repair.~~

Proposed wording:

Installation of different diameter staybolts shall be considered a repair provided the stay stress does not exceed 7500 psi. Cautionary Note: Larger diameter staybolts will transfer stresses to other structures and will be subject to higher extreme fiber stresses.

NBIC S1.2.5 d)

Current wording:

~~Installation of different diameter staybolts shall be considered a repair.~~

Proposed wording:

Installation of different diameter staybolts shall be considered a repair provided the stay stress does not exceed 7500 psi. Cautionary Note: Larger diameter staybolts will transfer stresses to other structures and will be subject to higher extreme fiber stresses.

Arch tubes –

NBIC S1.2.9.3;

Current wording:

~~The minimum wall thickness of replacement arch tubes shall be as shown in Table S1.2.9.3.~~

Proposed wording:

The minimum wall thickness of replacement arch tubes shall be as determined by the following formulas.

 *(U.S. Customary Units)*



 *(SI Units)*



where

*D* = outside diameter of tube, in. (mm)

*P* = maximum allowable working pressure, psi (MPa)

*t* = thickness of tube wall, in. (mm)

**Delete Table S1.2.9.3**

Thermic Syphons –

NBIC S1.2.9.4 b);

Current wording:

~~All weld repairs to the unstayed sections of the syphon neck and body shall be radiographically examined.~~

Proposed wording:

Except for the attachment weld to the throat sheet, welds on the thermic syphon unit shall be full penetration, and the unit shall be stress relieved in accordance with ASME, Section I, PW-39. Volumetric examination is not required.

Water Gage Connection –

NBIC S1.2.13.1 a);

Current wording:

~~Water gage glasses shall be applied so that the lowest water reading in the water glass gage glass of a horizontal firetube boiler on level track shall be at least 3 inches above the highest point of the~~ *~~tubes, flues, or crownsheet~~*~~”.~~

Proposed wording:

NBIC S1.2.13.1 a); Water gage glasses shall be applied so that the lowest water reading in the water glass gage glass of a horizontal firetube boiler on level track shall be not less than 3 inches above the highest point of the crownsheet.

**18-5**

**S1.2.9.6 INSTALLATION OF BOILER FLUES**

Maximum allowable working pressure and nominal wall thickness for flues shall be determined using TABLE S1.2.9.1 and TABLE S1.2.9.1M

Except as otherwise specified in this Part, flues shall be attached per the requirements of ASME Section I,PFT-12.2; however, flues shall not be attached by welding alone.

All flues smaller than 3 in. (75 mm) O.D. shall be expanded and beaded or expanded and welded on the firebox end. At least 1 in 10 distributed evenly on the front flue sheet shall be expanded and beaded or expanded and welded. All flues 3 in. (75 mm) O.D. and larger shall be expanded and beaded or expanded and welded at both ends. All adjacent flues smaller than 3 in. (75 mm) O.D. that are within the area occupied by the larger superheater flues shall be expanded and beaded or expanded and welded at both ends. At least 1 in 10 of the remaining flues smaller than 3 in.(75 mm) O.D. shall be beaded or welded on the front flue sheet, in addition to expanding. Where less than all flues are welded or beaded on the front flue sheet, those welded or beaded shall be distributed as evenly as practicable throughout the flue pack.

Flues shall be re-expanded upon completion of seal welding or beading, or both. The new reduced wall thickness of the enlarged flue end shall be reviewed to confirm that upon completion of the flue expansion process the new wall thickness will be sufficient for the MAWP.

When required by the original design, the ends of boiler flues shall be swaged to a smaller or larger diameter as required to fit the tube sheet holes. The swaging shall create smooth surfaces, smooth curves, and a uniform diameter reduction across the entire swaged length.

When flues are applied by expanding and seal welding, the seal weld shall protrude beyond the sheet a distance of 1/8 in. to 1/4 in. (3 mm to 6 mm) inclusive [see Figure S1.2.9.1-b] and the end of the flue shall not protrude past the weld. The end of the flue shall be ground or polished to eliminate any sharp edges.

Prior to welding, beading, or both; ensure that the flue is satisfactorily seated in the sheet. Seal welding may be done with water in the boiler, provided the water is heated to between 100°F and 120°F (38°C and 50°C).

Some acceptable types of attachments are shown in ASME Section I,Figure PFT-12.1, illustrations (a) through

(g).

Ferrous or nonferrous ferrules may be used on either or both ends of flues. When seal welding over ferrous ferrules used in straight-expanded and seal-welded flues, the weld shall attach to the sheet and not just to the ferrule. Care shall be taken to avoid contamination of seal welds when nonferrous ferrules are used.

Cautionary Note: Boiler flues shall be cut to or made to the correct length required for installation when the boiler and flues are at equal temperature. The use of heating or stretching the flue during installation to obtain the required length by thermal or mechanical expansion is prohibited.

NB18-7

Fillet Welded Staybolts

NBIC Part 3, S1.2.5.1;

The replacement of threaded staybolts with fillet welded staybolts is permissible. The work shall be done in accordance with the ASME BPVC, Section I, Part PL-30 and Figure PL-30.4.2-1. When replacing a threaded staybolt with a fillet welded staybolt, the existing threads in the sheets must be removed prior to installation. Cautionary Note: Larger minimum diameter staybolts will transfer stresses to other structures and will be subject to higher extreme fiber stresses.

Repairs to un-threaded fillet welded staybolts shall be performed in accordance with the original code of construction. If the original code of construction is not known, repairs shall be performed as follows in accordance with an appropriate code of construction that allows fillet welded staybolts:

1. The replacement of un-threaded fillet welded staybolts is permissible.
2. Existing un-threaded fillet welded staybolts that leak shall be repaired by re-welding after mechanically removing the entire weld. Only the leaking stays are to be re-welded.
3. Minor leakages (sweat pores) may be repaired by gently caulking the fillet weld. However, identifiable cracks shall be repaired by re-welding.