



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

**NATIONAL BOARD  
SUBCOMMITTEE  
REPAIRS AND ALTERATIONS**

**MINUTES**

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Meeting of January 16<sup>th</sup>, 2019  
San Antonio, TX

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  
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## 1. Call to Order

The meeting was called to order at 8:00 a.m. on July 17, 2018 by Chairman, Mr. Rob Troutt.

## 2. Introduction of Members and Visitors

3. The attendees are identified on the attendance sign in sheet ([Attachment Pages 1-2](#)). With the attached attendance listing, a quorum was established.

## 4. Announcements

The following announcements were made to the subgroup by Mr. Terrence Hellman.

- The National Board will be hosting a reception for all committee members and visitors on Wednesday evening at 5:30pm at the Agave Bar on the Riverwalk.
- A presentation on how Code interpretations/revisions/additions can now be entered through the National Board Business Center was given.

## 5. Adoption of the Agenda

Items 18-102 and Item NB15-1405 were added to the Agenda. Nominations for membership were not addressed except for the addition of Nominations for Subcommittee Vice Chair. A motion was made to adopt the agenda as revised. The motion was unanimously approved.

## 6. Approval of the Minutes of July 18<sup>th</sup>, 2018 Meeting

The minutes are available for review on the National Board website, [www.nationalboard.org](http://www.nationalboard.org).

## 7. Review of Rosters

### a. Membership Nominations

- Nominations for SC Repairs and Alterations Vice Chair were taken, G. Galanes nominated Ms. Kathy Moore. With no other nominations, a voice vote was taken confirming Ms. Moore's position as the Vice Chair for Subcommittee Repairs & Alteration unanimously.

### b. Membership Reappointments

All of the listed reappointments were approved unanimously. Mr. Toth and Mr. Moedinger (not present at the meeting) submitted email correspondence confirming their intent to remain on the committee.

- i. Mr. Schaefer, Mr. Toth, Mr. Moedinger, and Mr. Hopkins all have memberships to SC R&A that expire on 1/31/2019
- ii. Mr. Michael Gorman, Mr. Terry Cowley, Mr. Bernard Shelley, Mr. Juan Bustillos, Mr. Doug Eisberg, and Mr. Dale Keeler are all up for reappointment to Subgroup FRP. Their reappointments were approved by a vote at the subgroup level.
- iii. Mr. David Griner, Mr. Steven Butler, Mr. David Conrad, Mr. Robert Franzen, Mr. Stephen Lee, Mr. Richard Stone, and Mr. Doyle McCormack are all up for reappointment to Subgroup Locomotive. Their reappointments were approved by a vote at the subgroup level.

## 8. Interpretations

<b>Item Number: 17-143</b>	<b>NBIC Location: Part 3</b>	<b>No Attachment</b>
<b>General Description:</b> Can an "R" stamp certified shop manufacture and use parts for use on the pressure boundary to complete the repair of a boiler?		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> Paul Welch (PM), Linn Moedinger		
<b>Meeting Action:</b> Progress Report: Mr. Moedinger gave a progress report that work is still being done on the item and it will be put out to Letter Ballot to Repair and Alteration SG.		

<b>Item Number: 18-28</b>	<b>NBIC Location: Part 3</b>	<b>No Attachment</b>
<b>General Description:</b> Weld metal buildup classification. (This item was originally included in 17-175 before being split into its own item at the January 2018 SC R&A meeting.)		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> George Galanes		
<b>Meeting Action:</b> Mr. Galanes presented that Interpretation 17-07 was sent to the inquirer because it was similar to his original question. A response was received by the NBIC Secretary that the Interpretation satisfied the inquirer's question. A motion to close with no action was made and unanimously approved.		

<b>Item Number: 18-33</b>	<b>NBIC Location: Part 3, 3.4.4 c)</b>	<b>No Attachment</b>
<b>General Description:</b> Providing an additional stiffener ring to compensate for corrosion levels being above allowance		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> Kathy Moore (PM), Paul Shanks, David Martinez		
<b>Meeting Action:</b> Ms. Kathy Moore presented that additional information was requested by the Task Group multiple times without a response. A motion to close with no action was made and unanimously approved.		

<b>Item Number: 18-34</b>	<b>NBIC Location: Part 3, 8.4</b>	<b>No Attachment</b>
<b>General Description:</b> Does an R certificate holder assume responsibility for safety/integrity of a vessel outside the scope of repair?		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> Nathan Carter (PM), Michael Quisenberry		
<b>Meeting Action:</b> Progress Report: Mr. Nathan Carter reported that the Task Group is awaiting comment from the National Board's legal representation on this Item.		

<b>Item Number: 18-53</b>	<b>NBIC Location: Part 3</b>	<b><a href="#">Attachment Page 3</a></b>
<p><b>General Description:</b> Is changing the corrosion allowance noted on the original Manufacturer's Data Report considered an alteration per NBIC, when this task is performed solely for the purpose of establishing minimum required thicknesses on an internal Owner / User mechanical integrity database?</p> <p><b>Subgroup:</b> Repairs and Alterations</p> <p><b>Task Group:</b> Brian Boseo (PM)</p> <p><b>Meeting Action:</b> Progress Report: Mr. Boseo presented that there has been no response from the inquirer for more information. Mr. Boseo stated that one more attempt will be made to request more information, and if no response is received by the July 2019 meeting, this item will be closed.</p>		

<b>Item Number: 18-77</b>	<b>NBIC Location: Part 3, 3.4.2</b>	<b><a href="#">Attachment Pages 4-6</a></b>
<p><b>General Description:</b> Does statement "later edition/addenda of the original code of construction" means a pressure-retaining item may be re-rated to the latest (most current) edition of the code or any edition/addenda of the code since 1968 edition?</p> <p><b>Subgroup:</b> Repairs and Alterations</p> <p><b>Task Group:</b> G. Galanes (PM)</p> <p><b>Meeting Action:</b> Mr. Galanes presented interpretation 95-20 as a potential response to the inquirer. After discussion, P. Edwards cited Interpretation 98-14 and NBIC Part 3, 3.4.2 better answered the request. A motion to have the NBIC Secretary respond to the inquirer with Interpretation 98-14 and reference to NBIC Part 3, Paragraph 3.4.2 was made and unanimously approved.</p>		

<b>Item Number: 18-85</b>	<b>NBIC Location: Part 3, 2.3 and Table 2.3</b>	<b><a href="#">Attachment Page 7</a></b>
<p><b>General Description:</b> For the SWPS AWS B2.1-1-233:2006, is the root or 1st pass using GTAW-S (Short Circuiting Transfer mode) allowed to be used in all positions?</p> <p><b>Subgroup:</b> Repairs and Alterations</p> <p><b>Task Group:</b> (Jim Sekely – PM)</p> <p><b>Meeting Action:</b> Mr. Sekely presented a revision to the SWPS summary verbiage in Table 2.3, satisfying the Inquirer's question. The interpretation was withdrawn by the Inquirer (Mr. Terrence Hellman) and a motion was made to have Item 18-85 presented to the Main Committee as an Action Item to approve the proposed revision. The motion was unanimously approved.</p>		

<b>Item Number: 18-86</b>	<b>NBIC Location: Part 3, 2.5.3</b>	<b><a href="#">Attachment Page 8-9</a></b>
<p><b>General Description:</b> Are other means of NDE methods such as Ultrasonic Angle Beam (UTA) and/or Ultra Sonic Strait Beam (UTS), as referenced in ASME Section V, acceptable to be used in conjunction with NBIC Part 3, 2.5.3 Alternate welding methods without postweld heat treatment, paragraph e), in order to satisfy the original code of construction examination requirements?</p> <p><b>Subgroup:</b> Repairs and Alterations</p> <p><b>Task Group:</b> Jamie Walker – PM, N. Carter, M. Quisenberry</p> <p><b>Meeting Action:</b> Mr. Walker presented a proposed Question and Reply stating that alternative NDE</p>		

methods have been approved and clarified in the upcoming release of the NBIC 2019 Edition. A motion was made and unanimously approved to accept the proposal.

**Item Number: 18-91**                      **NBIC Location: Part 3, 2.5.3.2, 2.5.3.3, 2.5.3.4**                      **Attachment Page 10**

**General Description:**  
Inquiry 1: Does NBIC Part 3, 2.5.3.2, 2.5.3.3, and 2.5.3.4 permit the use of Nickel-Chrome alloy (F-No.43) filler metal?  
  
Inquiry 2: Does the word “austenitic” in NBIC Part 3, 2.5.3.2(i), 2.5.3.3(g)(2), and 2.5.3.4(g)(2) refer only to filler metals that meet A-No.8 or A-No.9 requirements?  
  
**Subgroup:** Repairs and Alterations  
  
**Task Group:** G. Galanes – PM  
  
**Meeting Action:** Mr. Galanes presented the proposal. The Subgroup reviewed the proposed reply of “No” and a motion was made to have the NBIC Secretary issue the response and close. The motion was unanimously approved.

**Item Number: 18-92**                      **NBIC Location: Part 3, 3.4.1**                      **Attachment Pages 11-14**

**General Description:** Certifying engineer of UDS for re-rating of pressure vessel  
  
**Subgroup:** Repairs and Alterations  
  
**Task Group:** Brian Morelock – PM  
  
**Meeting Action:** The group discussed the interpretation and a motion was made to approve the proposal as the response from the NBIC Secretary, and close. The motion was unanimously approved. The NBIC Response letter to include reference to ASME Interpretation VIII-2-07-09, however the ASME interpretation reference will not be included in the published NBIC Interpretation Item.

**Item Number: 18-99**                      **NBIC Location: Part 3, 3.3.5 & 3.4.5**                      **Attachment Page 15-18**

**General Description:** Repair and alteration of Section VIII Div 2 items without a MDR and/or UDS  
  
**Subgroup:** Repairs and Alterations  
**A**  
**Task Group:** Brian Morelock – PM  
  
**Meeting Action:** Mr. Morelock presented a proposed Question and a Reply of “No. The Repair/Alteration Plan is required to be compatible with the USD and MDR per the NBIC Part 3, Section 3.3.5 and 3.4.5.” A motion was made and unanimously approved to accept the proposal and have the NBIC Secretary include in the response letter, the statement, “Recommend seeking Jurisdictional guidance where the vessel will be installed/operated.” The verbiage recommending Jurisdictional guidance will not be included in the published NBIC Interpretation Item.

## 9. Action Items

<b>Item Number: NB15-1405</b>	<b>NBIC Location: Part 3, 1.2</b>	<b>Attachment Pages 19-24</b>
<b>General Description:</b> Impact testing of P-11B Material		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> N. Carter (PM), P. Davis, G. Galanes, P. Shanks		
<b>History:</b> In January 2015 Mr. Wielgoszinski provided a report. After consideration, Mr. Wielgoszinski decided to withdraw the inquiry (IN14-0401) and requested a new item to address impact testing of P11B material. A motion was made to close this interpretation and open up an action Item. The new action item will be: <b>NB15-1405 Part 3-Impact testing of P-11B Material</b> , (From IN14-0401) This Item has not been included in the minutes or agendas since July 2015. On 01/15/2019, this item was put back on the SG R&A Agenda and a new task group was formed.		
<b>Meeting Action:</b> Progress Report: On 01/15/2019, this item was put back on the SG R&A Agenda and a new task group was formed.		
<b>Item Number: NB15-2208</b>	<b>NBIC Location: Part 3</b>	<b>No Attachment</b>
<b>General Description:</b> Develop supplement for repairs and alterations based on international construction standards		
<b>Subgroup:</b> Graphite		
<b>Task Group:</b> Greg Becherer (PM)		
<b>History:</b> Item was discussed at the Subgroup Graphite meeting in October 2018. Mr. Becherer is still working on developing a proposal for this item		
<b>Meeting Action:</b> Progress Report: No information was received from Graphite Subgroup at the time of this meeting. No action taken.		
<b>Item Number: NB16-1402</b>	<b>NBIC Location: Part 3</b>	<b>No Attachment</b>
<b>General Description:</b> Life extension for high pressure vessels above 20 years		
<b>Subgroup:</b> FRP		
<b>Task Group:</b> M. Gorman (PM)		
<b>Meeting Action:</b> Progress Report: No information was received from FRP Subgroup at the time of this meeting. No action taken.		
<b>Item Number: NB16-1403</b>	<b>NBIC Location: Part 3, S4</b>	<b>No Attachment</b>
<b>General Description:</b> Add information on repair of high pressure vessels.		
<b>Subgroup:</b> FRP		
<b>Task Group:</b> N. Sirosh (PM)		
<b>Meeting Action:</b> Progress Report: No information was received from FRP Subgroup at the time of this meeting. No action taken.		

<b>Item Number: NB16-1502</b>	<b>NBIC Location: Part 3</b>	<b>No Attachment</b>
<p><b>General Description:</b> Develop supplement for repairs and alterations based on international construction standards</p> <p><b>Subgroup:</b> SG Repairs and Alterations</p> <p><b>Task Group:</b> International Repair Supplement Task Group, Chuck Withers (PM)</p> <p><b>Meeting Action:</b> Progress Report: Mr. Withers was not present and could not present the item. No action taken.</p>		

<b>Item Number: 17-134</b>	<b>NBIC Location: Part 3, Section 5</b>	<b>No Attachment</b>
<p><b>General Description:</b> Proposed Revision for registration of Form R-1 with the National Board containing ASME pressure part data reports attached.</p> <p><b>Subgroup:</b> Repairs and Alterations</p> <p><b>Task Group:</b> P. Shanks (PM), Rob Troutt, Joel Amato, Kathy Moore, Paul Edwards</p> <p><b>Meeting Action:</b> Progress Report: P. Shanks gave a progress report.</p>		

<b>Item Number: 17-137</b>	<b>NBIC Location: Part 3, S4.18.2</b>	<b>No Attachment</b>
<p><b>General Description:</b> Remove "sand" blasting and replace with "abrasive" in Part 3, S4.18.2</p> <p><b>Subgroup:</b> FRP</p> <p><b>Task Group:</b> Terry Cowley</p> <p><b>Meeting Action:</b> Progress Report: No information was received from FRP Subgroup at the time of this meeting. No action taken.</p>		

<b>Item Number: 17-166</b>	<b>NBIC Location: Part 3, S3</b>	<b>No Attachment</b>
<p><b>General Description:</b> Remove nozzle replacement and tube replacement from graphite routine repair list.</p> <p><b>Subgroup:</b> Graphite</p> <p><b>Task Group:</b> Francis Brown (PM)</p> <p><b>Meeting Action:</b> Progress Report: No information was received from Graphite Subgroup at the time of this meeting. No action taken.</p>		

<b>Item Number: 17-167</b>	<b>NBIC Location: Part 3, S3.2 d)</b>	<b>No Attachment</b>
<p><b>General Description:</b> Clarify repair inspection requirements for machined only graphite parts.</p> <p><b>Subgroup:</b> Graphite</p> <p><b>Task Group:</b> Aaron Viet (PM)</p>		

**Meeting Action:** Progress Report: No information was received from Graphite Subgroup at the time of this meeting. No action taken.

**Item Number: 18-12** **NBIC Location: Part 3** **Attachment Page 25-27**

**General Description:** Adding Weld Buildup to WM #6

**Subgroup:** SG Repairs and Alterations

**Task Group:** John Siefert PM, George Galanes

**Meeting Action:** Mr. George Galanes presented that this Item was opened at the January 2018 meeting and the proposed revision to Welding Method 6 to limit weld build up to 100 square inches on only Grade 91 tubes. A motion was made to put the proposal out to Subgroup Repairs & Alterations and Subcommittee Repairs & Alterations for Review and Comment. The motion was unanimously approved.

**Item Number: 18-13** **NBIC Location: Part 3** **Attachment Pages 28-31**

**General Description:** Weld Methods 7 addition for dissimilar weld metal-Gr. 91.

**Subgroup:** SG Repairs and Alterations

**Task Group:** John Siefert PM, George Galanes

**Meeting Action:** Mr. George Galanes presented that this Item was opened at the January 2018 meeting and the proposed addition of a Welding Method 7. Welding Method 7 is being introduced to permit dissimilar metal weld repair with no PWHT between Grade 91 boiler tubes to austenitic steels and low alloy ferritic steels. This action permits DMW of Grade 91 tubes within the boiler setting following welding method 6 with no PWHT. A motion was made to put the proposal out to Subgroup Repairs & Alterations and Subcommittee Repairs & Alterations for Review and Comment. The motion was unanimously approved.

**Item Number: 18-65** **NBIC Location: Part 3, Section 3** **No Attachment**

**General Description:** Draft rules for “used” material in repairs and/or alterations.

**Subgroup:** SG Repairs and Alterations

**Task Group:** Jamie Walker – PM, Marty Toth, Pat Becker, Michael Quisenberry, Issac Osborn, Paul Shanks, R. Underwood

**Meeting Action:** Progress Report: Mr. J. Walker presented a progress report. As a result of Interpretation Item 18-30, the SG decided to open this Item to draft rules for “used” material utilized in repairs and/or alterations.

**Item Number: 18-66** **NBIC Location: Part 3, Section 5** **No Attachment**

**General Description:** Move Report Forms to a new Supplement.

**Subgroup:** SG Repairs and Alterations

**Task Group:** Marty Toth – PM, Ben Schaefer

**Meeting Action:** Progress Report: B. Schaefer presented a Progress Report on ongoing work to move the Reports of Repair and their instructions to a new Supplement.



<b>Item Number: 18-67</b>	<b>NBIC Location: Part 3, Section 2&amp;9</b>	<b>Attachment Pages 32-33</b>
<b>General Description:</b> Provide definitions for brazing, fusing and welding that are more closely aligned with the definitions in ASME Section IX.		
<b>Subgroup:</b> SG Repairs and Alterations		
<b>Task Group:</b> Jim Pillow – PM, Paul Edwards, Walter Sperko		
<b>Meeting Action:</b> J. Pillow presented revised text as a result of Action Item 18-40. A motion was made and unanimously approved to accept the proposed text defining brazing, fusing, and welding more in line with ASME Section IX.		

**New Items:**

<b>Item Number: 18-68</b>	<b>NBIC Location: Part 3, Section 2</b>	<b>No Attachment</b>
<b>General Description:</b> PWHT and Pre-Heat requirements for repairs and alterations		
<b>Subgroup:</b> SG Repairs and Alterations		
<b>Task Group:</b> George Galanes (PM)		
<b>Meeting Action:</b> G. Galanes presented this item for discussion. The Subcommittee came to the determination that the NBIC already addresses PWHT and Pre-Heat requirements adequately and this item is not needed. A motion was made and unanimously passed to close this item with a response letter will be sent to the requester.		

<b>Item Number: 18-75</b>	<b>NBIC Location: Part 3</b>	<b>Attachment Pages 34-37</b>
<b>General Description:</b> Flush patches in stayed and un-stayed areas of tubesheets		
<b>Subgroup:</b> SG Repairs and Alterations		
<b>Task Group:</b> Michael Quisenberry (PM), Kathy Moore, Marty Toth, Rick Sturm		
<b>Meeting Action:</b> M. Quisenberry presented a revision to Part 3, Section 3, paragraph 3.3.4.6 incorporating verbiage from Supplement 1.2.11.2 for historic boilers to address flush patches and using NDE alternatives to volumetric methods. A motion was made and unanimously approved to have this proposal submitted via Letter Ballot for Review and Comment to Subgroup Repairs & Alterations and Subcommittee Repairs & Alterations.		

<b>Item Number: 18-78</b>	<b>NBIC Location: Part 3, 3.2.2 c) 1)</b>	<b>Attachment Page 38</b>
<b>General Description:</b> Addition to Part 3, 3.2.2 c) to allow for parts to be transferred w/o Partial Data Reports for repairs and alterations		
<b>Subgroup:</b> SG Repairs and Alterations		
<b>Task Group:</b> Wayne Jones (PM)		
<b>Meeting Action:</b> Mr. Jones presented and the item was discussed. A motion was made and unanimously approved to close and send a response stating, “The revision has been considered, but the NBIC does not recognize corporate entities, thus the proposed revision will not be incorporated into the		

NBIC”.

**Item Number: 18-82** **NBIC Location: Part 3, 2.2.3** **Attachment Page 39**

**General Description:** Alternative language in Part 3, 2.2.3 to clarify that it is allowable for a company affiliated w/ the "R" certificate holder to conduct performance qualifications

**Subgroup:** SG Repairs and Alterations

**Task Group:** (Jim Pillow – PM)

**Meeting Action:** Mr. Pillow presented a proposal, but after discussion, a motion was made and unanimously approved to close and send a response stating, “The proposal was considered, but will not be incorporated into the NBIC”.

**Item Number: 18-83** **NBIC Location: Part 3, 3.4.4 e)** **Attachment Page 40**

**General Description:** Alternative language in Part 3, 3.4.4 e) to clarify that it is the current MRRC that must be considered when changes are effected

**Subgroup:** SG Repairs and Alterations

**Task Group:** (Tom White – PM)

**Meeting Action:** Mr. White presented. The proposal was revised to remove the specific reference to “In a boiler..” and a motion was made and unanimously approved to accept the proposal as revised.

**Item Number: 18-84** **NBIC Location: Part 3, S1.2.8** **No Attachment**

**General Description:** Additional subparagraph in Part 3, S1.2.8 about the use of patch bolts being in accordance with ASME BPVC

**Subgroup:** Locomotive

**Task Group:** (R. Musser – PM)

**Meeting Action:** Progress Report

**Item Number: 18-87** **NBIC Location: Part 3, 1.6** **Attachment Page 41**

**General Description:** Review the use of "Authorized Nuclear Inspection Agency" within the NBIC

**Subgroup:** NR Task Group

**Task Group:** (P. Edwards – PM)

**Meeting Action:** Discussion regarding Part 4, S6.4 b) 2) was revised under 16-0603 and approved for publication in the 2019 Edition. Inserting the word “Nuclear” in reference to an Authorized Inspection Agency was subsequently approved in response to PR18-0403, however on further review this action is incorrect. The ASME QAI-1 Standard does not include “Nuclear” in reference to accredited AIAs (only in reference to Supervisors and Inspectors). In addition, the ASME QAI-1 Standard does not address “inspection of repaired nuclear pressure relief valves” by AIAs. Action was proposed to revise Part 4, S6.4 b) 2) with the verbiage indicated in the Attachment for Item 18-87 (Attachment Page 2) and forward to the Subcommittee Pressure Relief Devices prior to presentation to the Main Committee. The proposal was motioned and unanimously approved.

<b>Item Number: 18-88</b>	<b>NBIC Location: Part 3, S2.6 &amp; S2.9</b>	<b>Attachment Pages 42-43</b>
<b>General Description:</b> Revise NBIC Part 3, paragraphs S2.6(a) and S2.9 to change incorrect reference of “NBIC Part 3, paragraph 1.6” to “NBIC Part 3, paragraph 1.5.”		
<b>Subgroup:</b> Historical		
<b>Task Group:</b> (R. Underwood – PM)		
<b>Meeting Action:</b> Mr. Underwood presented a proposed editorial change. A motion was made and unanimously approved to revise the text as proposed.		

<b>Item Number: 18-93</b>	<b>NBIC Location: Part 3, S3.2, S3.4 4.4.2 6)</b>	<b>No Attachment</b>
<b>General Description:</b> Test Duration		
<b>Subgroup:</b> Graphite		
<b>Task Group:</b> J. Clements (PM)		
<b>Meeting Action:</b> Progress Report: No members from the Graphite Subgroup were present at the time of this meeting. No action taken.		

<b>Item Number: 18-94</b>	<b>NBIC Location: Part 3, S3.2 f), h); S3.4 a), b), c) etc.</b>	<b>No Attachment</b>
<b>General Description:</b> G-mark Requirements for Various Repairs/Alteration to Graphite		
<b>Subgroup:</b> Graphite		
<b>Task Group:</b> C. Cary (PM)		
<b>Meeting Action:</b> Progress Report: No members from the Graphite Subgroup were present at the time of this meeting. No action taken.		

<b>Item Number: 18-95</b>	<b>NBIC Location: Part 3, S1.1.4</b>	<b>No Attachment</b>
<b>General Description:</b> Revision to Part 3, S1.1.4 to account for new rules for riveted construction		
<b>Subgroup:</b> Locomotive		
<b>Task Group:</b> (L. Moedinger – PM)		
<b>History:</b> This item came about as the result of this public review comment: “it may be worth considering a revision to S1.1.4 - FORMULA AND CALCULATIONS FOR STEAM LOCOMOTIVE BOILERS since rules for riveted construction (Part PR) were modernized in 2013 and Locomotive Boilers (Part PL) was added to Section I in 2015. The current [2017 NBIC] text reads: "a) Most steam locomotive boilers were manufactured in the first half of the 20th century or before. The calculations, formula, and shop practices used are now distant history and quite difficult to obtain. The rules for riveted construction were last published by ASME in Section I Code, 1971 Edition.””		
<b>Meeting Action:</b> Progress Report: Mr. Moedinger presented work is still be done on this item. No action taken.		

<b>Item Number: 18-98</b>	<b>NBIC Location: Part 3, S2.7.2</b>	<b><a href="#">Attachment Pages 44-45</a></b>
<b>General Description:</b> Revise S2.7.2 of NBIC Part 3, Supplement 2 to refer to existing replacement part requirements of 3.2.2 of Part 3.		
<b>Subgroup:</b> Historical		
<b>Task Group:</b> (R. Underwood – PM)		
<b>Meeting Action:</b> Mr. Underwood presented and a motion to accept the proposal was made and unanimously approved.		

<b>Item Number: 18-100</b>	<b>NBIC Location: Part 3, 3.3.2</b>	<b><a href="#">Attachment Pages 46-59</a></b>
<b>General Description:</b> Revision adding heat exchanger tubes with an outside diameter of ¾” or smaller to NBIC Part 3.3.2 Routine Repairs		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> (David Martinez – PM), B. Schaefer, N. Carter		
<b>Meeting Action:</b> Progress Report: Mr. Martinez reported on a this item and presented interpretations (98-04 and 98-29) that may satisfy the revision request, however after a presentation from TEiC regarding the use of explosive welding of tubes to be considered as a routine repair, Mr. Martinez recommend this be considered progress report to continue working to address explosive welding as a Routine Repair.		

<b>Item Number: 18-102</b>	<b>NBIC Location: Part 3, Table 2.3</b>	<b><a href="#">Attachment Page 60-76</a></b>
<b>General Description:</b> Revise Table 2.3 in Part 3 to add the listed SWPSs that were revised by the AWS B2 Committee in 2018		
<b>Subgroup:</b> Repairs and Alterations		
<b>Task Group:</b> (Jim Sekely – PM)		
<b>Meeting Action:</b> Progress Report: Mr. Sekely presented a proposed addition of 8 SWPS into Table 2.3 that were revised by the AWS B2 Committee in 2018. After discussion, there was confusion regarding the formatting of the submitted revision. Mr. Sekely agreed to submit this as a Progress Report to allow formatting and metrification changes to be addressed prior to next meeting.		

## 10. Future Meetings

- July 15<sup>th</sup>-18<sup>th</sup>, 2019 – Kansas City, MO at the Intercontinental Hotel
- January 2020 – TBD

## 11. Adjournment

A motion was made and unanimously approved to adjourn the meeting at 11:00 AM..

Respectfully submitted,

A handwritten signature in black ink, reading "Terrence Hellman". The signature is written in a cursive style with a long, sweeping underline.

Terrence Hellman  
SG Repairs and Alterations Secretary

✓ = Attending Reception

Signature - Interest Category

SC Repairs and Alterations Attendance Sheet - <sup>1/16/2019</sup> ~~1/23/18~~

Name	Company	Phone Number	Email	Signature
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Action Item 18-53: Interpretation Request

**Inquirer:** Angel Rodriguez [AGRodriguez@dow.com](mailto:AGRodriguez@dow.com)

**Subject:**

Definition of Alteration (NBIC Part 3, Section 9, 9.1)

Examples of Alteration (NBIC Part 3, 3.4.3)

**Question:**

Is changing the corrosion allowance noted on the original Manufacturer's Data Report considered an alteration per NBIC, when this task is performed solely for the purpose of establishing minimum required thicknesses on an internal Owner / User mechanical integrity database?



## Item Number: 18-77 NBIC Location: Part 3, 3.4.2

### Attachment Page 20 General Description:

a) Inquiry: For re-rating a new minimum wall thickness for a pressure-retaining item using a later edition/addenda of the original code of construction per Section 3.4.2, does statement "later edition/addenda of the original code of construction" means a pressure-retaining item may be rerated to the latest (most current) edition of the code or any edition/addenda of the code since 1968 edition?

b) Reply 01: Yes Reply 02: No, a pressure-retaining item may be re-rated to any edition/addenda of the code since 1968 edition c) This question came up during a re-rating calculation of a pressure vessel, which satisfies all of the requirements of Section 3.4.2. The statement "later edition/addenda of the original code of construction" has been interpreted differently by person doing the calculation and by the checker. Therefore, depending on which edition of the code is used, calculation will show either an issue with the existing nozzle weld size or everything will be fine as is.

The above request for interpretation has been answered in a previous interpretation;

See NBIC Interpretation 98-14 which was used to support the wording in 3.4.2. Later editions can be used provided 3.4.2 rules are followed. Later can be any edition that is most applicable to the work.

#### **INTERPRETATION 98-14**

**Subject:** Appendix 6, Examples of Repairs and Alterations  
 RC-1050 Replacement Parts  
 RC-3022 Re-rating  
 RC-3020 Design

1998 Edition

**Question 1:** Does the example of an alteration given in Appendix 6, paragraph C.7, for replacement of a pressure retaining part with a material of different allowable stress from that used in the original design, apply to use of the same material when later editions/addenda of the original code of construction permit higher allowable stresses for that material?

**Reply 1:** Yes, when use of the higher allowable stress value results in a reduction in material thickness.

**Question 2:** Does the example of a repair given in Appendix 6, paragraph B.17, for replacement of a pressure retaining part with a material of different nominal composition and equal or greater allowable stress from that used in the original design, apply to use of the same material when later editions/addenda of the original code of construction permit higher allowable stresses for that material?

**Reply 2:** Yes, provided there is no reduction in material thickness.

**Question 3:** When a replacement part is constructed using higher allowable stress values permitted by a later edition/addenda of the original code of construction and the replacement part is thinner than the part being replaced, is it required that an "R" Certificate Holder perform calculations and inspections to verify that the connecting welds and the affected portions of the pressure-retaining items are in compliance with the original code of construction?

**Reply 3:** Yes.

**Question 4:** May a pressure-retaining item be re-rated using a later edition/addenda of the original code of construction which permits higher allowable stress values for the material than was used in the original construction?

**Reply 4:** Yes, in compliance with the following minimum criteria:

- a. The "R" Certificate Holder verifies (by calculations and other means) that the re-rated item can be satisfactorily operated at the new service conditions (e.g., stiffness, buckling, external mechanical loadings, etc.),
- b. The pressure-retaining item is not used for lethal service,
- c. The pressure-retaining item is not in high-cycle operation or fatigue service (i.e., loadings other than primary membrane stress are controlling design considerations.),
- d. The pressure-retaining item was constructed to the 1968 Edition or later edition/addenda of the original code of construction,
- e. The pressure-retaining item is shown to comply with all relevant requirements of the edition/addenda of the code of construction which permits the higher allowable stress values (e.g., reinforcement, toughness, examination, pressure testing, etc.),
- f. The pressure-retaining item has a satisfactory operating history and current inspection of the pressure-retaining item verifies that the item exhibits no unrepaired damage (e.g., cracks, corrosion, erosion, etc.),
- g. The re-rating is acceptable to the Inspector and, where required, the jurisdiction,
- h. All other requirements of Part RC are met, and
- i. Use of this Interpretation is documented in the Remarks Section of Form R2.

**Question 5:** May a new minimum required wall thickness be calculated for a pressure retaining item by using a later edition/addenda of the original code of construction which permits higher allowable stress values for the material than was used in the original construction?

**Reply 5:** Yes, in compliance with the following minimum criteria:

- a. The "R" Certificate Holder verifies (by calculations and other means) that the affected portions of the pressure-retaining item can be satisfactorily operated (e.g., stiffness, buckling, external mechanical loadings, etc.),
- b. The pressure-retaining item is not used for lethal service,
- c. The pressure-retaining item is not in high-cycle operation or fatigue service (i.e., loadings other than primary membrane stress are controlling design considerations.),
- d. The pressure-retaining item was constructed to the 1968 Edition or later edition/addenda of the original code of construction,
- e. The pressure-retaining item is shown to comply with all relevant requirements of the edition/addenda of the code of construction which permits the higher allowable stress values (e.g., reinforcement, toughness, examination, pressure testing, etc.),
- f. The pressure-retaining item has a satisfactory operating history and current inspection of the pressure-retaining item verifies that the item exhibits no unrepaired damage (e.g., cracks, etc.). Areas of corrosion or erosion may be left in place provided the remaining wall thickness is greater than the new minimum thickness,
- g. The design change is acceptable to the Inspector and, where required, the jurisdiction,
- h. All other requirements of Part RC are met, and

- i. Use of this Interpretation is documented in the Remarks Section of Form R2.

**Item Number: 18-85**

**General Description:** Correct the Title of SWPS AWS B2.1-1-233:2006 and AWS B2.1-1-235:2006 deleting "Flat Position Only" from the Title as it relates Part 3, Table 2.3

**Sub Group:** Repairs and Alterations

**Task Group:** Jim Sekely

**Present Wording****Proposed Wording**

<p>B2.1-1-233: 2006 Standard Welding Procedure Specification for Argon Plus 25% Carbon Dioxide Shielded Gas Metal Arc Welding (Short Circuiting Transfer Mode) followed by Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, <del>Flat Position Only</del>, As-Welded or PWHT Condition, Primarily Pipe Applications.</p>	<p>B2.1-1-233: 2006 Standard Welding Procedure Specification for Argon Plus 25% Carbon Dioxide Shielded Gas Metal Arc Welding (Short Circuiting Transfer Mode) followed by Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, As-Welded or PWHT Condition, Primarily Pipe Applications.</p>
<p><del>B2.1-1-235: 2006</del> Standard Welding Procedure Specification for Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, <del>Flat Position Only</del>, As-Welded or PWHT Condition, Primarily Pipe Applications.</p>	<p>B2.1-1-235: 2006 Standard Welding Procedure Specification for Argon Plus 2% Oxygen Shielded Gas Metal Arc Welding (Spray Transfer Mode) of Carbon Steel (M-1/P-1/S-1, Groups 1 and 2), 1/8 in. (3.2 mm) through 1 ½ in. (38 mm) Thick, ER70S-3, As-Welded or PWHT Condition, Primarily Pipe Applications.</p>

Interpretation Request: Item 18-86  
 Submitted by: Ryan Orlesky <[ryan.orlesky@gov.mb.ca](mailto:ryan.orlesky@gov.mb.ca)>

Item Number: 18-86	NBIC Location: Part 3, 2.5.3	Attachment Page 8
<p><b>General Description:</b> Are other means of NDE methods such as Ultrasonic Angle Beam (UTA) and/or Ultra Sonic Strait Beam (UTS), as referenced in ASME Section V, acceptable to be used in conjunction with NBIC Part 3, 2.5.3 Alternate welding methods without postweld heat treatment, paragraph e), in order to satisfy the original code of construction examination requirements?</p>		
<p><b>Subgroup:</b> Repairs and Alterations</p>		
<p><b>Task Group:</b> None Assigned.</p>		

### Request for code interpretation

**Subject:** Alternative NDE methods acceptable to the Inspector and the Jurisdiction

**Background:** When an repair organization uses an alternative welding method without PWHT referenced in NBIC Part 3, 2.5.3 to repair a defect as described in NBIC Part 3, 3.3.4.1. and the defect of the repair is >3/8" or through the full thickness of the pressure retaining item, NBIC Part 3, 2.5.3 e) requires RT to be used where it was required by the original code of construction, or shall be fully examined using MT or PT method and gives no other alternatives.

Other paragraphs in Part 3 allow alternatives.

- **NBIC Part 3, 4.2** last sentence mentions *"Where this is not possible or practicable, alternative NDE methods acceptable to the Inspector and the Jurisdiction where the pressure-retaining item is installed, where required, may be used."*
- **Supplement 7 Para S7.4 b)** *Radiographic or ultrasonic examinations are considered to be suitable alternative non-destructive examination methods to ensure complete removal of the defect, as described in NBIC Part 3, 3.3.4.1.*

ASME Section VIII-1 2017

- When applying the rules of the original code for pressure vessels the original code might not be available and the organization doing the repair would use the latest code. For pressure vessels ASME Section VIII-1 2017 Para UW-51 (4) Allows the use of UT as an alternative as long as the material is ¼" or greater.

**Question:** May alternative NDE methods be used to meet the requirements of NBIC Part 3, 2.5.3 e)? – With respect to the RT requirement in 2.5.3 e); is it the intent of the reference to alternative methods acceptable to the original code of construction in paragraph 4.2 a) that UT examination may be used in place of RT examination when the original code of construction allows such examination?

**Reply:** Yes, as permitted in NBIC Part 3, 4.2 a), and with acceptance of the Inspector and the Jurisdiction, where required. Yes. These provisions have already been approved and clarified in the upcoming release of the NBIC 2019 Edition.



## National Board Interpretation 18-91

Item Number: 18-91 NBIC Location: Part 3, 2.5.3.2, 2.5.3.3, 2.5.3.4

General Description: NBIC 2017 Edition, Part 3 Alternative Welding Methods

**Committee Question 1:** Does the 2017 Edition of the NBIC Part 3, 2.5.3.2, 2.5.3.3, and 2.5.3.4 ~~permit~~ prohibit the use of Nickel-Chrome alloy (FNo.43) filler metal?

**Committee Reply 1: No.**

Rationale: Part 3, 2.5.3.2 (i) For the welding process in NBIC Part 3, 2.5.3.2 c), use of austenitic or ferritic filler metals is permitted.

Part 3, 2.5.3.3 and 2.5.3.4 (g) (2) For the welding processes in NBIC Part 3, 2.5.3.3 c), use of austenitic or ferritic filler metal is permitted.

**Committee Question 2:** ~~Does the word “austenitic”~~ Does the 2017 Edition of the NBIC Part 3, 2.5.3.2(i), 2.5.3.3(g)(2), and 2.5.3.4(g)(2) prohibit “austenitic” filler metals that meet A-No.8 or A-No.9 requirements?

**Committee Reply 2: No**

Subgroup: Repairs and Alterations

Task Group: None Assigned.

**Interpretation IN18-92**  
**Proposed Interpretation**

<b>Inquiry:</b>	IN18-92
<b>Source:</b>	
<b>Subject:</b>	NBIC Part 3 Section Part 3, 3.4.1
<b>Edition:</b>	2017
<b>General Description:</b>	Certifying engineer of UDS for re-rating of pressure vessel
<b>Question 1:</b>	Can UDS certified by an engineer in para. 2-A.2.2.(b) or (c) of the current ASME Section VIII Div. 2 2017 Edition be accepted for the re-rating work based on the ASME Sec. VIII Div. 2 2004 Edition with 2005 addenda?
<b>Reply 1:</b>	Yes or No
<b>Committee's Question 1:</b>	Provided that a single Edition/Addenda of ASME Section VIII, Division 2 is selected for the repair/alteration activity, may the 2007 or later Edition/Addenda of ASME Section VIII, Division 2 be used for rerating a 2004 or earlier Edition/Addenda of ASME Section VIII, Division 2?
<b>Committee's Reply 1:</b>	Yes. Per NBIC, Part 3, 1.2 a).
<b>Question 2:</b>	Can the above engineer authorized in Colombia be recognized as an engineer in para. 2-A.2.2. (b) of the current ASME Section VIII Div.2?
<b>Reply 2:</b>	Yes or No
<b>Committee's Question 2:</b>	With regard to Question 1, may a registered engineer authorized outside the United States or Canada be recognized as an engineer in paragraph 2-A.2.2. (b) of the current ASME Section VIII Division 2?
<b>Committee's Reply 2:</b>	This is outside the scope of the NBIC.
<b>Rationale:</b>	NBIC Part 3, Sections 5.7.3, 5.7.5, Fig. 5.7.5-b
<b>SC Vote</b>	
<b>NBIC Vote</b>	

Response letter to include: See ASME Interpretation VIII-2-07-09

**Rationale:**

**NBIC, Part 3, 1.2 a)**

1.2 a), When the standard governing the original construction is the ASME Code or ASME RTP-1, repairs and alterations to pressure-retaining items shall conform, insofar as possible, to the section and edition of the ASME Code most applicable to the work planned.



When the standard governing the original construction is the ASME Code or ASME RTP-1, repairs and alterations to pressure-retaining items shall conform, insofar as possible, to the Section and Edition of the ASME Code most applicable to the work planned. When the standard governing the original construction is the ASME Code or ASME RTP-1, repairs and alterations to pressure-retaining items shall conform, insofar as possible, to the Section and Edition of the ASME Code most applicable to the work planned.

<https://cstools.asme.org/Interpretation/InterpretationDetail.cfm?TrackingNumber=8954>

**2017 Edition, ASME Section VIII, Division 2, 2-A.2.2 and 2-A.2.3.**

**2-A.2.2** Any Engineer who signs and certifies a User's Design Specification shall meet one of the criteria shown below.

(a) A Registered Professional Engineer who is registered in one or more of the states of the United States of America or the provinces of Canada and experienced in pressure vessel design.

(b) An Engineer experienced in pressure vessel design who meets all required qualifications to perform engineering work and any supplemental requirements stipulated by the user. The Engineer shall have received authority to perform engineering work from a licensing or registering authority. The Engineer shall identify the location and the licensing or registering authorities under which he has received the authority to perform engineering work.

(c) An Engineer experienced in pressure vessel design who meets all required qualifications to perform engineering work and any supplemental requirements stipulated by the user. The Engineer shall be registered

(1) in the International Professional Engineers Agreement, or

(2) in the Asian Pacific Economic Cooperation (APEC Engineer)

**2-A.2.3** The Engineer certifying the User's Design Specification shall comply with the requirements of the location to practice engineering where that Specification is prepared unless the jurisdiction where the vessel will be installed has different certification requirements

**Research Notes:**

**NBIC INTERPRETATION 17-08**

**Subject:** Repair/Alteration Plans for ASME VIII, Division 2, Class 1 Pressure Vessels

**Edition:** 2017

**Question:** Does the NBIC require a Repair/Alteration Plan for an ASME Section VIII, Division 2, Class 1 vessel to be certified by an engineer when a Manufacturer's Design Report was not required to be certified under the original code of construction?

**Reply:** No.

**Background Information IN18-92 from the Inquirer:**

1. Inquiry-1 (Certification of UDS)

We are working on re-rating of a pressure vessel in accordance with National Board Inspection Code (NBIC).

And NBIC requires that the re-rating shall be established in accordance with the requirements of the construction standard to which the pressure-retaining item was built. The original vessel was designed and constructed in accordance with ASME Sec. VIII, Div. 2, 2004 Edition with 2005 Addenda, which requires User's Design Specification (UDS) certified by a Professional Engineer registered in USA or Canada. On the other hand, the current ASME Sec. VIII, Div. 2, 2017 Edition accepts UDS certified by an engineer stipulated in the following para. 2-A.2.2.(b) and (c) also. (Please refer to "3. [For Information]" below.)

**Can UDS certified by an engineer in para. 2-A.2.2.(b) or (c) of the current ASME Section VIII Div. 2 2017 Edition be accepted for the re-rating work based on the ASME Sec. VIII Div. 2 2004 Edition with 2005 addenda?**

2. Inquiry-2 (Engineer to certify UDS)

The pressure vessel for the re-rating was fabricated for one user in 2008 and resold to new user in Colombia last year.

The new user changed design conditions of the vessel and prepared new UDS for the re-rating. The new UDS was certified by an engineer who has the authority given by **El Consejo Profesional Nacional de Ingenierías Eléctrica, Mecánica y profesiones afines** (The National Professional Council of Electrical, Mechanical and Professions Engineering) in Colombia. Link: <https://www.consejoprofesional.org.co/>

**Can the above engineer authorized in Colombia be recognized as an engineer in para. 2-A.2.2.(b) of the current ASME Section VIII Div.2?**

3. [For Information] ASME Div.2 Requirements for Engineer to Certify UDS  
[Old ASME: Sec. VIII, Div. 2, 2004 Edition with 2005 Addenda]

**AG-301.2 Certification of User's Design Specification.**

A Professional Engineer, registered in one or more of the states of the United States of America or the provinces of Canada and experienced in pressure vessel design, shall certify to the compliance of the User's Design Specifications with the above requirements.

[Current ASME: Sec. VIII, Div. 2, 2017 Edition]

**2-A.2.2** Any Engineer who signs and certifies a User's Design Specification shall meet one of the criteria shown below.

(a) A Registered Professional Engineer who is registered in one or more of the states of the United States of America or the provinces of Canada and experienced in pressure vessel design.

(b) An Engineer experienced in pressure vessel design who meets all required qualifications to perform engineering work and any supplemental requirements stipulated by the user. The Engineer shall have received authority to perform engineering work from a licensing or registering authority. The Engineer shall identify the location and the licensing or registering authorities under which he has received the authority to perform engineering work.

(c) An Engineer experienced in pressure vessel design who meets all required qualifications to perform engineering work and any supplemental requirements

stipulated by the user. The Engineer shall be registered (1) in the International Professional Engineers Agreement, or (2) in the Asian Pacific Economic Cooperation (APEC Engineer)

**ASME Interpretations:**

**Interpretation: VIII-2-13-04**

Subject: 2-A.2.2 and 2-B.2.2, Design Reports (2010 Edition, 2011 Addenda)

Date Issued: April 25, 2013

File: 12-2276

Question: Is it required by the rules of ASME Section VIII, Division 2 that the Authorized Inspector be responsible for ensuring the accuracy of the engineer's credentials regarding registration in the U.S., Canada, internationally, or as authorized by a registering authority?

Reply: No.

**Interpretation IN18-99**  
**Proposed Interpretation**

<b>Inquiry:</b>	IN18-99
<b>Source:</b>	Sunil Sharma
<b>Subject:</b>	NBIC Part 3 Section Part 3, 3.3.5 and 3.4.5
<b>Edition:</b>	2017
<b>General Description:</b>	Repair and alteration of Section VIII Division 2 items
<b>Question 1:</b>	Is it permissible to perform repair on Section VIII Division 2 item based on a Repair Plan that is certified as compatible with original manufacturer's drawings and data report (and not UDS and design report) when user or the original manufacturer are unable to provide copies of UDS and/or design report?
<b>Reply 1:</b>	Yes, provided all the following requirements are met: <ul style="list-style-type: none"> <li>a. Repair plan prepared by user and certified in accordance with Section VIII Div 2 identifies the missing UDS and design report</li> <li>b. User has confirmed in the repair plan that original service condition of the pressure retaining item have not been altered and the pressure vessel will continue to operate under conditions specified in the UDS</li> <li>c. Inspector needs to be satisfied with repair plan.</li> <li>d. Absence of original UDS and design report shall be reported on R-1 form.</li> </ul>
<b>Committee's Question 1:</b>	<b>Is it permissible to perform a repair or alteration on an ASME Section VIII, Division 2 pressure vessel in accordance with the NBIC when the original User's Design Specification (UDS) and/or the Manufacturer's Design Report (MDR) is not available?</b>
<b>Committee's Reply 1:</b>	<b>No. The Repair/Alteration Plan is required to be compatible with the UDS and MDR per the NBIC Part 3, Sections 3.3.5 and 3.4.5.</b>
<b>Question 2:</b>	Is it permissible to consider the case in question 1 as Alteration to Section VIII Div 2 Class 1 where the R stamp holder performs complete design analysis using design data provided in original drawings and data report and ensure compliance with ASME Section VIII Division 2-2017 Class 1?
<b>Reply 2:</b>	Yes, provided all the following requirements are met: <ul style="list-style-type: none"> <li>a. User has confirmed that the original service condition of the pressure retaining item have not been altered and the pressure vessel will continue to operate under conditions specified in the UDS.</li> <li>b. User has confirmed that vessel is not subjected to cyclic loading conditions that require fatigue analysis.</li> <li>c. Alteration plan is prepared by the R certificate holder to confirm that drawings and data report do not require</li> </ul>

	<p>fatigue analysis and design of pressure retaining item can be established without requiring design by analysis method for thickness determination.</p> <p>d. Inspector needs to be satisfied with alteration plan.</p> <p>e. Absence of original UDS and design report shall be reported on R-2 form.</p>
<b>Rationale:</b>	NBIC Part 3, Sections 3.3.5.2 and 3.4.5.1
<b>SC Vote</b>	
<b>NBIC Vote</b>	

**Include in response letter:** Recommend seeking Jurisdictional guidance where the vessel will be installed/operated.

**Rationale:**

**3.3.5.2 REPAIR PLAN**

The user shall prepare, or cause to have prepared, a detailed plan covering the scope of the repair.

a) Engineer Review and Certification

The repair plan shall be reviewed and certified by an engineer meeting the criteria of ASME Section VIII, Division 2 or 3, as applicable, for an engineer signing and certifying a Manufacturer's Design Report. The review and certification shall be such as to ensure the work involved in the repair is compatible with the User's Design Specification and the Manufacturer's Design Report.

**Note:** The engineer qualification criteria of the Jurisdiction where the pressure vessel is installed should be verified before selecting the certifying engineer.

b) Authorized Inspection Agency Acceptance

Following review and certification, the repair plan shall be submitted for acceptance to the Authorized Inspection Agency/Owner-User Inspection Organization whose Inspector will make the acceptance inspection and sign the Form R-1.

**3.4.5.1 ALTERATION PLAN**

a) Engineer Review and Certification

The alteration plan shall be reviewed and certified by an engineer meeting the criteria of ASME Section VIII, Division 2 or 3, as applicable, for an engineer signing and certifying a Manufacturer's Design Report.

The review and certification shall be such as to ensure the work involved in the alteration is compatible with the user's design specification and the Manufacturer's Design Report.

**Note:** The engineer qualification criteria of the jurisdiction where the pressure vessel is installed should

be verified before selecting the certifying engineer.

b) User's Design Specification

If the alteration is such that the work is not compatible with, or changes one or more requirement(s) of the original user's design specification, the user's design specification shall be revised by the user with the new parameters or changes. The revisions shall be certified by an engineer meeting the criteria of ASME Section VIII, Division 2 or 3, as applicable, for an engineer signing and certifying a Manufacturer's Design Report.

**Note:** The engineer qualification criteria of the Jurisdiction where the pressure vessel is installed should be verified before selecting the certifying engineer.

c) Manufacturer's Design Report

- 1) The "R" Certificate Holder shall prepare, or cause to have prepared a supplement to the *Manufacturer's Design Report* to reconcile the new parameters or changes with the user's design specification.
- 2) The supplement to the Manufacturer's Design Report shall be certified by an engineer meeting the criteria of ASME Section VIII, Division 2 or 3, as applicable, for an engineer signing and certifying a Manufacturer's Design Report.

**Note:** The engineer qualification criteria of the Jurisdiction where the pressure vessel is installed should be verified before selecting the certifying engineer.

d) Authorized Inspection Agency Acceptance

Following review and certification, the alteration plan shall be submitted for acceptance to the Authorized Inspection Agency/Owner-User Inspection Organization whose inspector will make the acceptance inspection and sign the Form R-2.

**Background Information IN18-99 from the Inquirer:**

**Explanation of Need:**

- Several R stamp holders have faced a situation where the copies of UDS and design report are not available from the user or from the original manufacturer. Absence of such records (being responsibility of the user to retain) should not stop R stamp holder to perform proper repairs and /or alterations. In some cases, there may be a genuine reason (for example war or natural calamity) where the records were lost.

**Background Information:**

- Vessel certified as per 1992 A1994 Section VIII Div 2 requires repairs for replacement of nozzle of identical size and material specification.
- Owners as well as original manufacturer are unable to provide copies of UDS and Design Report, Drawings, and Copy of MDR are available.

**Question 1:**

- Is it permissible to perform repair on Section VIII Div 2 item based on Repair Plan that is certified as compatible with original manufacturer's drawings and data report (and not UDS and design report) when user or the original manufacturer are unable to provide copies of UDS and/or design report?

**Proposed Reply to Question 1:**

- Yes, provided all the following requirements are met:

- a. Repair plan prepared by user and certified in accordance with Section VIII Div 2 identifies the missing UDS and design report
- b. User has confirmed in the repair plan that original service condition of the pressure retaining item have not been altered and the pressure vessel will continue to operate under conditions specified in the UDS
- c. Inspector needs to be satisfied with repair plan.
- d. Absence of original UDS and design report shall be reported on R-1 form.

**Question 2:**

- Is it permissible to consider the case in question 1 as Alteration to Section VIII Div 2 Class 1 where the R stamp holder performs complete design analysis using design data provided in original drawings and data report and ensure compliance with ASME Section VIII Division 2-2017 Class 1?

**Proposed Reply to Question 2:**

- Yes, provided all the following requirements are met:
  - a. User has confirmed that the original service condition of the pressure retaining item have not been altered and the pressure vessel will continue to operate under conditions specified in the UDS
  - b. User has confirmed that vessel is not subjected to cyclic loading conditions that require fatigue analysis.
  - c. Alteration plan is prepared by the R certificate holder to confirm that drawings and data report do not require fatigue analysis and design of pressure retaining item can be established without requiring design by analysis method for thickness determination.
  - d. Inspector needs to be satisfied with alteration plan.
  - e. Absence of original UDS and design report shall be reported on R-2 form.

## Item NB15-1405 (*formally IN14-0401*)

The following is a history of record number NB15-1405, formally inquiry record 14-0401, found in NBIC committee Minutes from inception in 2014.

<p><b>January 2014</b> (see attachment "A")</p>	<p><b>Main Committee Minutes:</b>  <b>IN14-0401 - Part 3, I.2</b> - Question 1: The NBIC Part 3 paragraph 1.2 states that a repair shall be carried out "insofar as possible to the section and edition of the ASME code most applicable to the work planned." If a vessel is constructed using SA-517-E (P-11B) material to ASME Section VIII Div. 1, where production and weld procedure impact tests were required during construction, would a repair to a crack in the shell require production and weld procedure impact testing under the NBIC?  Proposed Reply 1: Yes. (No attachment)  Question 2: If the answer to Question 1 is yes and there was no SA-517-E material from the original lot available, would the repair require the addition of new base material (e.g. a flush patch around the area of the crack) so that production impact tests could be performed with the original base metal to the new base metal?  Proposed Reply 1: Yes.  Question 3: If the vessel described in Question 1 was to be altered by adding an SA-675 (P-1) pump flange to the shell, would production and weld procedure impact tests be required using the same lot P-1 and P-11B base materials as used in the alteration?  Proposed Reply 1: Yes.  <b>January 2014</b>  A task group of Walt Sperko, Bob Wielgoszinski (PM), and George Galanes will work on this inquiry.</p> <p><b>SC RA Minutes:</b>  <b>January 2014</b>  Bob Wielgoszinski presented a document request for interpretation associated with welded repairs to UHT vessels. A task group of Walt Sperko, Bob Wielgoszinski (PM), and George Galanes will work on this inquiry.</p> <p><b>SG RA Specific Minutes:</b>  <b>January 2014</b>  Bob Wielgoszinski presented a document request for interpretation associated with welded repairs to UHT vessels. A task group of Walt Sperko, Bob Wielgoszinski (PM), and George Galanes will work on this inquiry.</p>
<p><b>January 2015</b> (see attachment "B")</p>	<p><b>Main Committee Minutes</b>  <b>Item Number:</b> IN14-0401 <b>NBIC Location:</b> Part 3, 1.2 <b>Attachment Pages</b> 72-73  <b>General Description:</b> Interpretation questions regarding requirements for production impact tests after repair or alteration of a vessel  <b>Subgroup:</b> Repairs and Alterations  <b>Task Group:</b> Unknown  <b>Meeting Action:</b> Mr. Galanes gave a report. The Subcommittee on Repairs and Alterations voted unanimously close this interpretation with no response. The Subcommittee on Repairs and Alterations opened a new action item NB15-1405 to</p>



	<p>address production impact tests. Mr. Wielgoszinski explained the subject of the interpretation and the new action item. The NBIC Committee voted unanimously to close this interpretation with no response.</p> <p><b>SC RA Minutes:</b>  <b>January 2015</b>  Mr. Wielgoszinski provided a report. After consideration, Mr. Wielgoszinski decided to withdraw the inquiry and requested a new item to address impact testing of P11B material.  A motion was made to close this interpretation and open up an action Item.  The new action item will be:  <b>NB15-1405 Part 3-Impact testing of P-11B Material, SC R and A</b> (From IN14-0401)  A task group was formed with Bob Wielgoszinski, as project manager and member Ben Schaefer, Walt Sperko, Monty Bost, and Dave Ford. (Attachment Pages 8-9)</p>
<b>July 2015</b>	<b>No report. Not included on MC or RA agendas.</b>
<b>January 2016</b>	<b>No minutes available.</b>
<b>July 2016</b>	<b>No report. Not included on MC or RA agendas.</b>
<b>January 2017</b>	<b>No report. Not included on MC or RA agendas.</b>
<b>July 2017</b>	<b>No report. Not included on MC or RA agendas.</b>
<b>January 2018</b>	<b>No report. Not included on MC or RA agendas.</b>

## Request for Interpretation

Robert V. Wielgoszinski  
Hartford Steam Boiler of CT

<b>Item</b>	IN 14-0401
<b>Purpose</b>	Code Interpretation & possible revision to present Code rules
<b>Scope:</b>	Repairs and alterations to vessels constructed of ferritic materials with tensile properties enhanced by heat treatment, i.e. Part UHT material.
<b>Background</b>	<p>During the construction of liquid propane vessels it is typical to use SA-517 Gr. E (P-No. 11B) for use as heads and shells for propane transport tanks. The ASME Code requires the base materials, welding materials, and the WPS's to be qualified with impact tests. Also, the Code requires production impact testing to be performed. This is where the actual vessel material, actual filler materials, are welded with the actual WPS to be used in production, and the weld coupon is impact tested to meet the specified results of Section VIII. To do so, the Manufacturer of the vessel is sure to purchase enough extra base and filler material to perform these tests.</p> <p>When repairs / alterations are made to these vessels the NBIC requires the rules of the original construction Code to be followed. As such, any new material to be added to a vessel or any WPS's used or any filler metal used for the repair must then be impact tested and meet the results stated in Section VIII. Also, production impacts must therefore be made since this is a mandatory Section VIII requirement. This is usually accomplished by making a weld coupon out of existing material cut from the vessel and welding it to the new material to be added to the vessel, and then impact testing specimens from that coupon. But, not all repairs / alterations lend themselves the ability to take existing material from the vessel. If a small nozzle is added to the vessel, only a few inches of material is taken from the vessel. Or say a crack is to be weld repaired or there is weld metal build up to be made on some worn or wasted area. Then there is no extra material to be taken away from the vessel to run coupons for production impacts. Strict interpretation of the ASME Code would now require a piece of steel to be removed to run production impacts and then a flush patch installed over the area removed.</p> <p>Some individuals look at the words in NBIC, Part 3, Section 1, paragraph 1.2, where it says, "...the standard governing the original construction shall conform, <u>insofar as possible...</u>" gives one the leeway to not require production impacts because it's not possible. Others indicated that it is possible but not practical to cut perfectly good material out of a vessel when there is no need to. And others will say that the ASME clearly requires existing material to be removed to run impact tests. One thing is clear though, and that is there is lack of uniformity in applying these rules. So we are looking to the NBIC to provide some guidance in this matter. The Jurisdiction in this case is the US DOT, and 49CFR Chapter 1 § 180.413(a)(1) states that the NBIC is to be followed for repairs and modifications. DOT is also looking to the NBIC for clarification.</p>

	Depending on the responses to the inquiry it may be prudent revise the Code to be more specific in this area of UHT materials.
<b>Proposed Questions</b>	<p><b>Question 1:</b> The NBIC Part 3 paragraph 1.2 states that a repair shall be carried out “insofar as possible to the section and edition of the ASME code most applicable to the work planned.” If a vessel is constructed using SA-517-E (P-11B) material to ASME Section VIII Div. 1, where production and weld procedure impact tests were required during construction, would a repair to a crack in the shell require production and weld procedure impact testing under the NBIC?</p> <p><b>Proposed Reply 1:</b> Yes.</p> <p><b>Question 2:</b> If the answer to Question 1 is yes and there was no SA-517-E material from the original lot available, would the repair require the addition of new base material (e.g. a flush patch around the area of the crack) so that production impact tests could be performed with the original base metal to the new base metal?</p> <p><b>Proposed Reply 1:</b> Yes.</p> <p><b>Question 3:</b> If the vessel described in Question 1 was to be altered by adding an SA-675 (P-1) pump flange to the shell, would production and weld procedure impact tests be required using the same lot P-1 and P-11B base materials as used in the alteration?</p> <p><b>Proposed Reply 1:</b> Yes.</p>

**Attachment "B"**

This is the attachment that was included in the NBIC Minutes from the January 2015 meeting. It is identical to the original inquiry except for the new item number assigned as a revision.

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IN14-0401

NB15-1405

## Action Item NB15-1405 from Request for Interpretation

Robert V. Wielgoszinski  
Hartford Steam Boiler of CT

<b>Item</b>	NB15-1405 ( <i>was IN 14-0401</i> )
<b>Purpose</b>	Code <del>interpretation</del> & possible revision to present Code rules
<b>Scope:</b>	Repairs and alterations to vessels constructed of ferritic materials with tensile properties enhanced by heat treatment, i.e. Part UHT material.
<b>Background</b>	<p>During the construction of liquid propane vessels it is typical to use SA-517 Gr. E (P-No. 11B) for use as heads and shells for propane transport tanks. The ASME Code requires the base materials, welding materials, and the WPS's to be qualified with impact tests. Also, the Code requires production impact testing to be performed. This is where the actual vessel material, actual filler materials, are welded with the actual WPS to be used in production, and the weld coupon is impact tested to meet the specified results of Section VIII. To do so, the Manufacturer of the vessel is sure to purchase enough extra base and filler material to perform these tests.</p> <p>When repairs / alterations are made to these vessels the NBIC requires the rules of the original construction Code to be followed. As such, any new material to be added to a vessel or any WPS's used or any filler metal used for the repair must then be impact tested and meet the results stated in Section VIII. Also, production impacts must therefore be made since this is a mandatory Section VIII requirement. This is usually accomplished by making a weld coupon out of existing material cut from the vessel and welding it to the new material to be added to the vessel, and then impact testing specimens from that coupon. But, not all repairs / alterations lend themselves the ability to take existing material from the vessel. If a small nozzle is added to the vessel, only a few inches of material is taken from the vessel. Or say a crack is to be weld repaired or there is weld metal build up to be made on some worn or wasted area. Then there is no extra material to be taken away from the vessel to run coupons for production impacts. Strict interpretation of the ASME Code would now require a piece of steel to be removed to run production impacts and then a flush patch installed over the area removed.</p> <p>Some individuals look at the words in NBIC, Part 3, Section 1, paragraph 1.2, where it says, "...the standard governing the original construction shall conform, <u>insofar as possible...</u>" gives one the leeway to not require production impacts because it's not possible. Others indicated that it is possible but not practical to cut perfectly good material out of a vessel when there is no need to. And others will say that the ASME clearly requires existing material to be removed to run impact tests. One thing is clear though, and that is there is lack of uniformity in applying these rules. So we are looking to the NBIC to provide some guidance in this matter. The</p>

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IN14-0401

NB15-1405

	<p>Jurisdiction in this case is the US DOT, and 49CFR Chapter 1 § 180.413(a)(1) states that the NBIC is to be followed for repairs and modifications. DOT is also looking to the NBIC for clarification.</p> <p>Depending on the responses to the inquiry it may be prudent revise the Code to be more specific in this area of UHT materials.</p>
<p><b>Proposed Questions</b></p>	<p><b>Question 1:</b> The NBIC Part 3 paragraph 1.2 states that a repair shall be carried out "insofar as possible to the section and edition of the ASME code most applicable to the work planned." If a vessel is constructed using SA-517-E (P-11B) material to ASME Section VIII Div. 1, where production and weld procedure impact tests were required during construction, would a repair to a crack in the shell require production and weld procedure impact testing under the NBIC?  <b>Proposed Reply 1:</b>  Yes.</p> <p><b>Question 2:</b> If the answer to Question 1 is yes and there was no SA-517-E material from the original lot available, would the repair require the addition of new base material (e.g. a flush patch around the area of the crack) so that production impact tests could be performed with the original base metal to the new base metal?  <b>Proposed Reply 1:</b>  Yes.</p> <p><b>Question 3:</b> If the vessel described in Question 1 was to be altered by adding an SA-675 (P-1) pump flange to the shell, would production and weld procedure impact tests be required using the same lot P-1 and P-11B base materials as used in the alteration?  <b>Proposed Reply 1:</b>  Yes.</p>

**Subject** Code Revision to Part 3, 2.5.3.6  
**File Number** NB18-12 **Prop. on Pg.** 2  
**Proposed** 1  
**Revision**  
**Statement of Need** The revision is to Welding Method 6 to allow for weld build-up limited to 100 square inches on only Grade 91 tube OD surfaces for local erosion or mechanical damage.

**Project Manager** John Siefert/G.  
 Galanes

**SubGroup** **SG Meeting Date**  
**Negatives**

Background;

Welding Method 6 was successfully introduced into the NBIC, part 3 to permit butt weld repair with no PWHT. This action permits weld build-up of the Grade 91 tubes within the boiler setting and same limitations to repair erosion or mechanical damage without the need for complete tube replacement. To ensure adequate controls, the size of the repair are using a weld overlay is limited to 100 square inches.

The size limitation for the weld build-up repair of 100 square inches is predicated on similar language which appears in Part 3 Supplements 2 and 4. For weld build-up repairs, section 2.5.3.6 c) 5) f) does not limit the F-No. 43 filler materials because the need for the weld build-up may be due to corrosion or erosion. In these examples, it may be necessary to use an optimized filler material which is otherwise prohibited in section 2.5.3.6 c) 5) d) for full thickness repairs.

**Item 18-12****2.5.3.6 WELDING METHOD 6**

This welding method provides requirements for welding only Grade 91 tube material within the steam boiler setting. When using this welding method, the following applies:

- a) This method is limited to butt welds, weld build-up repairs, or attachments (the attachment material may be dissimilar) in tubing NPS 5 (DN 125) or less in diameter and ½ in. (13 mm) or less in wall thickness for which the applicable rules of the original code of construction did not require notch toughness testing;
- b) Application shall be limited to only boiler tube repairs at a location internal to the boiler setting;
- c) Upon the completion of weld repair, the repair area shall be kept above the dew point temperature so that condensation does not form on the repair surface before returned to service or a moisture-barrier coating shall be applied to the surface.

- 1) The material shall be limited to P-No 15E, Group 1, Grade 91, creep strength enhanced ferritic steel (CSEF).
- 2) The welding shall be limited to the SMAW and/or GTAW processes, manual or automatic, using suitably controlled maintenance procedures to avoid contamination by hydrogen producing sources. The surface of the metal shall be free of contaminants and kept dry.
- 3) The welding procedure qualification test coupon shall be P-No 15 E, Group 1, Grade 91.
- 4) Qualification thickness limits of base metal and weld deposit thickness shall be in accordance with ASME Section IX, QW-451.
- 5) The Welding Procedure Specification (WPS) shall be qualified in accordance with the requirements of ASME Section IX. No postweld heat treatment shall be applied to the test coupon.

Additionally, the WPS shall include the following requirements:

- a. The minimum preheat for the GTAW process shall be 200°F (100°C). The minimum preheat for the SMAW process shall be 300°F (150°C). The preheat temperature shall be checked to ensure the minimum preheat temperature is maintained during welding and until welding is completed. The maximum interpass temperature shall be 550°F (290°C).
- b. When the SMAW process is specified for a fill pass layer, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm). When the GTAW-process is specified any limits in filler size is to be shown on the WPS.
- c. Regardless of the welding process (SMAW and/or GTAW), only the use of stringer beads shall be permitted.
- d. The filler metal shall be limited to an austenitic, nickel-base filler metal ~~having a designation F-No. 43~~ to those assigned to F-number 43 in Section IX, QW-432 and limited

to the following consumables: ERNiCr-3, ENiCrFe-3, ENiCrFe-2, ASME B&PV Code Cases 2733 and 2734 (e.g. EPRI P87); or

e. A martensitic, iron-base filler metal to those assigned to F-number 4 or F-number 6 in ASME Section IX, QW-432 having a designation ~~F-No. 4 or F-No. 6~~ and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.

f. For weld build-up repairs due to wastage, the filler metal shall be limited to those assigned to F-number 43 in ASME Section IX, QW-432.



**Subject** Code Revision to Part 3, 2.5.3.6

**File Number** NB18-13

**Prop. on Pg.**

2

**Proposed**

**Revision**

**Statement of**

**Need**

The revision is to add a new Welding Method 7 to allow for dissimilar metal welding of Grade 91 to austenitic steels and low alloy steels in a boiler setting and limited to butt welds, in accordance with approved welding method 6.

**Project Manager**

John Siefert/G.  
Galanes

**SubGroup**

**Negatives**

**SG Meeting Date**

Background;

Welding Method 7 is being introduced to permit dissimilar metal weld repair with no PWHT between Grade 91 boiler tubes to austenitic steels and low alloy ferritic steels.

This action permits DMW of Grade 91 tubes within the boiler setting following welding method 6 with no PWHT.

**NB Item 18-13****2.5.3.7 WELDING METHOD 7**

This repair method provides requirements for dissimilar metal welding (DMW) of Grade 91 tube material to either austenitic or low alloy ferritic steel tubing within the steam boiler setting. When using this welding method, the following applies:

- a) This method is limited to butt welds in tubing NPS 5 (DN 125) or less in diameter and ½ in. (13 mm) or less in wall thickness for which the applicable rules of the original code of construction did not require notch toughness testing;
- b) Application shall be limited to only boiler tube repairs at a location internal to the boiler setting;
- c) Upon the completion of weld repair, the repair area shall be kept above the dew point temperature so that condensation does not form on the repair surface before returned to service or a moisture-barrier coating shall be applied to the surface.

For DMW of Grade 91 to austenitic steel steel tubing:

- 1) The materials shall be limited to P-No 15E, Group 1, Grade 91, creep strength enhanced ferritic steel (CSEF) joined to either P-No. 8, P-No. 42, P-No. 43, or P-No. 45, as permitted for welded construction by the applicable rules of the original code of construction..
- 2) The welding shall be limited to the SMAW and GTAW processes, manual or automatic, using suitably controlled maintenance procedures to avoid contamination by hydrogen producing sources. The surface of the metal shall be free of contaminants and kept dry.
- 3) The welding procedure qualification test coupon shall be P-No 15 E, Group 1, Grade 91 joined to either P-No. 8, P-No. 42, P-No. 43, or P-No. 45 and as required for the repair application.
- 4) Qualification thickness limits of base metal and weld deposit thickness shall be in accordance with ASME Section IX, QW-451.
- 5) The Welding Procedure Specification (WPS) shall be qualified in accordance with the requirements of ASME Section IX. No postweld heat treatment shall be applied to the test coupon. Additionally, the WPS shall include the following requirements:
  - a). The minimum preheat for the GTAW process shall be 200°F (100°C). The minimum preheat for the SMAW process shall be 300°F (150°C). The preheat temperature shall be checked to ensure the minimum preheat temperature is maintained during welding and until welding is completed.

The maximum interpass temperature shall be 550°F (290°C).

b). When the SMAW process is specified for a fill pass layer, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm). When the GTAW-process is specified any limits in filler size is to be shown on the WPS.

c). Regardless of the welding process (SMAW or GTAW), only the use of stringer beads shall be permitted.

d). The filler metal shall be limited to an austenitic, nickel-base filler metal to those assigned to F-number 43 in ASME Section IX, QW-432 and limited to the following consumables: ERNiCr-3 (e.g., Filler Metal 82), ENiCrFe-3 (e.g., INCONEL Welding Electrode 182), ENiCrFe-2 (e.g., INCO-WELD A), ASME B&PV Code Cases 2733 and 2734 (e.g. EPRI P87):

e. A martensitic, iron-base filler metal having a designation F-No. 4 or F-No. 6 and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.

For DMW of Grade 91 to low alloy (P-No 5A) steel tubing:

1) The materials shall be limited to P-No 15E, Group 1, Grade 91, creep strength enhanced ferritic steel (CSEF) joined to P-No. 5A steel.

2) The welding shall be limited to the SMAW and/or GTAW processes, manual or automatic, using suitably controlled maintenance procedures to avoid contamination by hydrogen producing sources. The surface of the metal shall be free of contaminants and kept dry.

3) The welding procedure qualification test coupon shall be P-No 15 E, Group 1, Grade 91 joined to P-No. 5A steels.

4) Qualification thickness limits of base metal and weld deposit thickness shall be in accordance with ASME Section IX, QW-451.

5) The Welding Procedure Specification (WPS) shall be qualified in accordance with the requirements of ASME Section IX. No postweld heat treatment shall be applied to the test coupon. Additionally, the WPS shall include the following requirements:

(a). The minimum preheat for the GTAW process shall be 200°F (100°C). The minimum preheat for the SMAW process shall be 300°F (150°C). The preheat

temperature shall be checked to ensure the minimum preheat temperature is maintained during welding and until welding is completed. The maximum interpass temperature shall be 550°F (290°C).

(b). When the SMAW process is specified for a fill pass layer, the electrode diameter is restricted to a maximum size of 1/8 in. (3.2 mm). When the GTAW-process is specified any limits in filler size is to be shown on the WPS.

(c). Regardless of the welding process (SMAW or GTAW), only the use of stringer beads shall be permitted.

(d). The filler metal shall be limited to a martensitic, iron-base filler metal to those assigned to F-number 4 or F-number 6 in ASME Section IX, QW-432 and limited to the following consumables: E8015-B8, E8018-B8 or ER80S-B8.

## REQUEST FOR CODE REVISION

The following are proposed revisions to Part 3 Section 9 Glossary. The proposal provides definitions for brazing, fusing and welding that are more closely aligned with the definitions in ASME Section IX.

## EXPLANATION

Comments received on item NB18-40 requested that the definitions for brazing, fusing and welding be revised to be more closely aligned with ASME Section IX.

<b>CURRENT – 2019 EDITION</b>	<b>PROPOSED</b>	<b>2017 Section IX – Information Only</b>
<b>PART 3, SECTION 9 REPAIRS AND ALTERATIONS— GLOSSARY OF TERMS</b> <b>9.1 DEFINITIONS</b>	NO CHANGE	
<u>Brazing – see Welding</u>	<b><u>Brazing - a group of metal joining processes which produce coalescence of materials by heating them to a suitable temperature, and by using a filler metal having a liquidus above 840°F (450°C) and below the solidus of the base materials. The filler metal is distributed between the closely fitted surfaces of the joint by capillary action.</u></b>	<i>brazing</i> : a group of metal joining processes which produces coalescence of materials by heating them to a suitable temperature, and by using a filler metal having a liquidus above 840°F (450°C) and below the solidus of the base materials. The filler metal is distributed between the closely fitted surfaces of the joint by capillary action.
<u>Fusing – see Welding</u>	<b><u>Fusing - the coalescence of two plastic members by the combination of controlled heating and the application of pressure approximately normal to the interface between them.</u></b>	<i>fusing</i> : the coalescence of two plastic members by the combination of controlled heating and the application of pressure approximately normal to the interface between them.
<u>Welding (Brazing, Fusing) – a group of processes which produce a localized coalescence of metallic or nonmetallic materials.</u>	<b><u>Welding - a group of processes which produce a localized coalescence of metallic or nonmetallic materials by heating the materials to the suitable temperature, with or</u></b>	<i>weld</i> : a localized coalescence of metals or nonmetals produced either by heating the materials to the welding temperature, with or without the

	<p><b><u>without the application of pressure, and with or without the use of filler material.</u></b></p>	<p><b>application of pressure, or by the application of pressure alone and with or without the use of filler material.</b></p>
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## NBIC Action Item NB18-75

**Inquirer:** Michael Quisenberry ([michael@allentri.com](mailto:michael@allentri.com))

**Subject:** NBIC 2017 PART 3, SECTION 3 (PARA. 3.3.4.6 PATCHES)

**Statement of Need**

At present, the detailed technical requirements associated with making repairs to PRI's are inconsistent across equipment types even when the same physical activities are being conducted.

**Background**

When replacing tubes in a Scotch Marine Firetube Boiler it is often necessary to cut a temporary opening in the front tubesheets in order to remove wasted tubes. The removed tubesheet material will be reinstalled in the form of a flush patch once the retube is complete. Currently this flush patch weld in a "modern" boiler is required to be volumetrically examined whereas in historic boilers it is acceptable to use NDE alternatives to volumetric methods. The text in red below has been taken from the supplement for historic boilers and added to the main body of part 3 for the purposes of consistency and to address flush patches in stayed and unstayed areas.

**3.3.4.6**

## a) Flush Patches

- 1) The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush where required by the applicable original code of construction. Examples of flush welded patches are shown in NBIC Part 3, Figure 3.3.4.6-a. The welds shall be subjected to the nondestructive examination method used in the original code of construction or an alternative acceptable to the Inspector.
- 2) Before installing a flush patch, the defective material should be removed until sound material is reached. The patch should be rolled to the proper shape or curvature. The edges should align without overlap. In stayed areas, the weld seams should come between staybolt rows or riveted seams. Patches shall be made from a material whose composition and thickness meet the intended service. Patches may be any shape or size. If the patch is rectangular, a minimum radius of not less than three times the material thickness shall be provided at the corners. Square corners are not permitted. The completed welds shall meet the requirements of the original code of construction.

**b) Flush Patches in Stayed Areas of Tubesheets**

- 1) Patches may be of any size or shape provided they are adequately supported by staybolts, rivets, tubes, or other forms of construction. Patches on

stayed surfaces should be designed so weld seams pass between staybolt rows. (See NBIC Part 3, Figure S1.2.11.2). *taken from S1.2.11.2-a*

2) Patches are to be flush type, using full penetration welds. If the load on the patch is carried by other forms of construction, such as staybolts, rivets, or tubes, then volumetric NDE of the welds is not required; (taken from S2.13.10.3)  
*taken from S1.2.11.2-b*

3) All rectangular or angled patches shall have adequate radius at all corners. Minimum radius to be not less than three times plate thickness. (taken from S1.2.11.2) *taken from S1.2.11.2-d*

4) Patches shall fit flush on the waterside of the sheet. Misalignment shall not exceed one-quarter plate thickness on edge alignment with the sheet water side.  
*taken from S1.2.11.2-e*

### c) Flush Patches in Unstayed Areas of Tubesheets

1) Welded repairs to boiler unstayed areas shall have volumetric NDE performed in accordance with the approved code of construction or ASME Section I, when the size of the repaired area is greater than 3 in. (75mm) in diameter of the largest existing stay. The completed repair must be stress relieved. Alternative Methods without Postweld Heat Treatment identified in NBIC Part 3, 2.5.3 may be used. *taken from S2.13.9.3-a*

2) The weld around a flush patch shall be a full penetration weld and the accessible surfaces shall be ground flush. Examples of flush welded patches are shown in Figure NBIC Part 3, S2.13.9.3. *taken from S2.13.9.3-a*

3) The patch should be rolled or pressed to the proper shape or curvature. The edges of the patch should align with original material without overlap. Patches shall fit flush on the waterside of the sheet. If the patch is square or rectangular, an adequate radius, of at least three times the material thickness should be provided at the corners. *taken from S2.13.9.3-d*

### b) Tube Patches

In some situations it is necessary to weld a flush patch on a tube, such as when replacing tube sections and accessibility around the complete circumference of the tube is restricted, or when it is necessary to repair a small bulge. This is referred to as a window patch. Suggested methods for window patches are shown in NBIC Part 3, Figure 3.3.4.6-b.







**Item Number: 18-78 NBIC Location: Part 3, 3.2.2 c) 1) Attachment Page 20**

**General Description:** Addition to Part 3, 3.2.2 c) to allow for parts to be transferred w/o Partial Data Reports for repairs and alterations

**Subgroup:** SG Repairs and Alterations

**Task Group:** None Assigned

Current Wording:

3.2.2.c)1) ASME stamping and completion of an ASME Manufacturer's Partial Data Report is not required for parts fabricated by the "R" Certificate Holder that will be used on pressure retaining items being repaired or altered by the same "R" Certificate Holder. The controls for this activity shall be described in the quality control system.

Proposed Wording:

2) ASME Stamping and completion of an ASME Manufacturer's Partial Data Report is not required for parts fabricated by one "R" Certificate Holder at one location under the operational control of a corporate/single organization, if the part will be used on pressure retaining items being repaired or altered by another R Certificate Holder at another location under the operational control of the same corporate/organization provided AIA of Record is same at both locations. The controls for this activity shall be described in the quality control system of both locations.

Statement of need;

Most of the Manufacturers in Middle East, having facilities at multiple locations, are also Repair organizations holding R Certificate of Authorization. Not all locations are having the same equipment and facilities. Hence, part fabrication is done at one location and transferred to another location which carries out further work which includes assembly at site. ASME BPV Codes allow parts to be transferred without Partial Data Reports for new construction. The same procedure is requested to be allowed for repairs and alterations also.

**Proposed Reply:**

**The revision has been considered, but the NBIC does not recognize corporate entities, thus the proposed revision will not be incorporated into the NBIC.**

**WY Jones**

### 2.2.3 PERFORMANCE QUALIFICATION

Welders and welding operators shall be qualified for the welding processes that are used. The performance of personnel shall be qualified for each process used. Such qualification shall be in accordance with the requirements of the original code of construction, the construction standard, code selected or ASME Section IX. Use of a Standard Welding Procedure Specification shown in NBIC Part 3, 2.3 is permitted for performance qualification testing. The "R" Certificate Holder, or an affiliated company under same corporate ownership, shall be responsible for the qualification.

**Proposed Reply:**

The proposal was considered, but will not be incorporated into the NBIC.

**CURRENT TEXT:****3.4.4 EXAMPLES OF ALTERATIONS**

- a) An increase in the maximum allowable working pressure (internal or external) or temperature of a pressure-retaining item regardless of whether or not a physical change was made to the pressure-retaining item;
- b) A decrease in the minimum temperature;
- c) The addition of new nozzles or openings in a boiler or pressure vessel except those classified as repairs;
- d) A change in the dimensions or contour of a pressure-retaining item;
- e) In a boiler, an increase in the heating surface or steaming capacity as described on the original Manufacturer's Data Report;

<b>Item Number: 18-83</b>	<b>NBIC Location: Part 3, 3.4.4 e)</b>	<b>Attachment Page 24</b>
<b>General Description:</b> Alternative language in Part 3, 3.4.4 e) to clarify that it is the current MRRC that must be considered when changes are effected		
<b>Subgroup:</b> SG Repairs and Alterations		
<b>Task Group:</b> None Assigned.		

**PROPOSED REVISION:****3.4.4 EXAMPLES OF ALTERATIONS**

- e) ~~In a boiler,~~ an increase in the heating surface or steaming capacity as described on the original Manufacturer's Data Report;

**18-87, Edwards, 01-15-19****Reference: Part 4, Supplement 6, S6.4.b.2**

**Discussion:** Part 4, S6.4.b.2 was revised under 16-0603 and approved for publication in the 2019 Edition. Inserting the word “*Nuclear*” in reference to an Authorized Inspection Agency was subsequently approved in response to PR18-0403, however on further review this action is incorrect. The ASME QAI-1 Standard does not include “*Nuclear*” in reference to accredited AIAs (only in reference to Supervisors and Inspectors). In addition, the ASME QAI-1 Standard does not address “*inspection of repaired nuclear pressure relief valves*” by AIAs.

**Proposal:** Action is proposed to revise Part 4, S6.4.b.2 in accordance with the following:

~~Have a contract or agreement with an Authorized Nuclear Inspection Agency that is qualified in accordance with the requirements of ASME QAI-1, Qualifications for Authorized Inspection to provide inspection of repaired pressure relief devices;~~ Have a contract or agreement with an Authorized Inspection Agency that is accredited in accordance with the requirements of ASME QAI-1, “Qualifications for Authorized Inspection” to provide nuclear inspection services;

## Item 18-88

1/14/19

### Request for NBIC Part 3, Supplement 2 Revision

Robert V. Underwood-The Hartford Steam Boiler Inspection & Insurance Company

<b>Purpose</b>	To change incorrect references in NBIC Part 3, Supplement 2, paragraphs S2.6 (a) and S2.9.
<b>Scope:</b>	Revise S2.6 (a) and S2.9 to change reference from “NBIC Part 3 paragraph 1.6” to “NBIC Part 3, paragraph 1.5.”
<b>Background</b>	<p>NBIC Part 3, paragraph 1.6 previously addressed requirements of “R” Stamp accreditation. A few editions ago this paragraph was changed to reference “NR” Stamp accreditation requirements. “R” Stamp accreditation requirements were moved to paragraph 1.5.</p> <p>References to 1.6 were not revised in existing S2.6 (a) and S2.9 when this change was made.</p>
<b>Proposed Revision</b>	See below for proposed revision

#### S2.6 ACCREDITATION

a) Organizations performing welded repairs shall be accredited as described in NBIC Part 3, ~~4.61.5~~.

#### S2.9 WELDING

Welding shall be performed in accordance with the requirements of the approved construction standard in consultation with the Inspector. A repair organization accredited as described in NBIC Part 3, ~~4.61.5~~ may use the Standard Welding Procedure Specifications shown in 2.3, as applicable. Welders shall be qualified for the welding processes used. Qualification shall be in accordance with the approved construction standard, or ASME Section IX.

**EXISTING S2.6 and S2.9****S2.6 ACCREDITATION**

Should be 1.5, not 1.6

- a) Organizations performing welded repairs shall be accredited as described in NBIC Part 3, 1.6.
- b) Organizations and/or individuals performing non-welded repairs do not need to have an "R" stamp unless required by the Jurisdiction. However, they must be competent in the type of repair they are performing.

**S2.9 WELDING**

Should be 1.5, not 1.6

Welding shall be performed in accordance with the requirements of the approved construction standard in consultation with the Inspector. A repair organization accredited as described in NBIC Part 3, 1.6 may use the Standard Welding Procedure Specifications shown in 2.3, as applicable. Welders shall be qualified for the welding processes used. Qualification shall be in accordance with the approved construction standard, or ASME Section IX.



**Item 18-98**

1/14/19

**Request for NBIC Part 3, Supplement 2 Revision**

Robert V. Underwood-The Hartford Steam Boiler Inspection &amp; Insurance Company

<b>Purpose</b>	Add reference to Replacement Part requirements.
<b>Scope:</b>	Add sentence to S2.7.2 to reference Replacement Parts in 3.2.2.
<b>Background</b>	<p>S2.7.2 addresses replacement parts used for repairs and alterations to historical boilers, however it lacks detail.</p> <p>Detailed requirements on replacement parts are found in 3.2.2 of Part 3. Recommend adding a sentence in S2.7.2 to refer back to 3.2.2 in Part 3.</p>
<b>Proposed Revision</b>	See below for TWO options

## S2.7.2 REPLACEMENT PARTS

~~Replacement parts formed by casting, forging, or die forming, and on which no welding has been performed shall be supplied as material. Such parts shall be marked with the material identification required by the construction standard used for the repair. Replacement parts fabricated by welding shall be manufactured by an organization certified as required by the construction standard used for the repair. Replacement pressure parts shall be in accordance with Part 3, 3.2.2.~~

### Existing 3.2.2

- c) When ASME Code is the original code of construction, replacement parts subject to internal or external pressure fabricated by welding, which require inspection by an Authorized Inspector shall be fabricated by an organization having an appropriate ASME *Certificate of Authorization*. The item shall be inspected and stamped as required by the applicable section of the ASME Code. A completed ASME *Manufacturer's Partial Data Report* shall be supplied by the manufacturer.
- 1) ASME stamping and completion of an ASME Manufacturer's Partial Data Report is not required for parts fabricated by the "R" Certificate Holder that will be used on pressure retaining items being repaired or altered by the same "R" Certificate Holder. The controls for this activity shall be described in the quality control system.
  - 2) The "R" Certificate Holder, using replacement parts fabricated and certified to an ASME Code edition and addenda different from that used for the original construction, shall consider and seek technical advice, where appropriate, for change or conflicts in design, materials, welding, heat treatment, examinations and tests to ensure a safe repair/alteration is performed. Note that work once classified as a repair could now be considered an alteration.
- d) When the original code of construction is other than ASME Code, replacement parts subject to internal or external pressure, fabricated by welding, shall be manufactured by an organization certified as required by the original code of construction. The item shall be inspected and stamped as required by the original code of construction. Certification to the original code of construction, as required by the original code of construction or equivalent, shall be supplied with the item. When this is not possible or practicable, the organization fabricating the part shall have a National Board "R" *Certificate of Authorization*; replacement parts shall be documented on Form R-3 and the "R" Symbol Stamp applied as described in NBIC Part 3, Section 5.
- e) Replacement parts addressed by 3.2.2 c) or d) above shall receive a pressure test as required by the original code of construction. If replacement parts have not been pressure tested as required by the original code of construction prior to installation they may be installed without performing the original code of construction pressure test provided the owner, the Inspector and, when required, the Jurisdiction accept the use of one or a combination of the examination and test methods shown in Part 3, Section 4, paragraph 4.4.1 (for repairs) or 4.4.2 (for alterations). The R Certificate Holder responsible for completing the R Form shall note in the Remarks section of the R Form the examination(s) and test(s) performed, and the reason the replacement part was not tested in accordance with the original code of construction.

Item Number 18-100

NBIC Location: Part 3.3.2.2

Attachment Page 25

**General Description:** Revision adding heat exchanger tubes with an outside diameter of ¾" or smaller to NBIC Part 3.3.2 Routine Repairs

**Subgroup:** Repairs and Alterations

**Task Group:** David Martinez

**Answer:** Replacing tubes 5" NPS and under is already given as an example of a routine repair.

#### 2017 NATIONAL BOARD INSPECTION CODE SECTION 3

#### 3.3.2 ROUTINE REPAIRS

e) **The following repairs may be considered as routine repairs** and shall be limited to these categories:

- 1) Welded repairs or **replacements of** valves, fittings, **tubes**, or pipes **NPS 5 (DN 125) in diameter and smaller**, or sections thereof, where neither postweld heat treatment nor NDE other than visual is required by the original code of construction. This includes their attachments such as clips, lugs, skirts, etc., but does not include nozzles to pressure-retaining items;

### **Supporting Interpretations (98-04 and 98-29)**

#### **INTERPRETATION 98-04**

**Subject:** RC-2031 **Routine Repair**

1995 Edition with the 1996 Addendum

**Question 1:** Does RC-2031(a)(1)\* limit **routine repairs** to a single **tube** or pipe?

**Reply 1:** No.

**Question 2:** **May the repair of more than one tube or pipe be classified as a routine repair?**

**Reply 2:** **Yes, subject to the acceptance of the jurisdiction and the Inspector.**

#### **INTERPRETATION 98-29**

**Subject:** Appendix 6 Tube Placement (**Note that the term tube replacement is used below rather than tube placement**)

1998 Edition

**Question 1:** Is the replacement of heat exchanger tube material with a material that has a different nominal composition and an allowable stress equal to or greater than the original material considered a repair?

**Reply 1:** Yes, provided that the thickness of the replacement material is equal to or greater than the original material thickness, and, provided the replacement material satisfies the material and design requirements of the original code of construction under which the vessel was built.

**Question 2:** Is the replacement of heat exchanger tube material with a material that has a different nominal composition and an allowable stress less than the original material considered an alteration?

**Reply 2:** Yes. See Appendix 6, C7.

**Question 3:** May tube replacement(s) be considered a routine repair if authorization is obtained in accordance with RC-2030\*\*?

**Reply 3:** Yes, provided the tube material is NPS 5 or less.

**Question 4:** Does the NBIC require a tube replacement, which is considered to be a repair, to be documented on an R-1 Form when no welding is performed?

**Reply 4:** No. The NBIC does not address the documentation of non-welded repairs.

\* RC-2031(a)(1) – Does not limit the number of tubes that can be replaced

\*\* RC-2030 – Authorization of the inspector to initiate a repair after determining that the repair methods are acceptable, and subject to acceptance of the jurisdiction, may give approval for routine repairs provided the Inspector assures that the “R” Certificate holder has acceptable procedures covering the repairs.

### 3.3.2 ROUTINE REPAIRS (Current Edition)

a) Routine repairs are repairs for which the requirements for in-process involvement by the Inspector and stamping by the “R” Certificate Holder may be waived as determined appropriate by the Jurisdiction and the Inspector. All other applicable requirements of this code shall be met. Prior to performing routine repairs, the “R” Certificate Holder should determine that routine repairs are acceptable to the Jurisdiction where the pressure-retaining item is installed;

b) The Inspector, with the knowledge and understanding of jurisdictional requirements, shall be responsible for meeting jurisdictional requirements and the requirements of this code;

c) The “R” Certificate Holder’s Quality System Program shall describe the process for identifying, controlling, and implementing routine repairs. Routine repairs shall be documented on Form R-1 with this statement in the Remarks section: “Routine Repair”;



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# INQUIRY FOR ADDITIONAL CODE RULES

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## Explosive Plugging of Heat Exchanger Tubes

Written By: Marty Russell

Date: 12/20/18

TEi Construction Services, Inc.

170 Tucapau Road Duncan, SC 29334

Office: 864-336-4434

Cell: 864-345-5622

## 1.0 Purpose

The purpose of this inquiry is to gain new or additional code rules for the explosive plugging of heat exchanger tubes.

## 2.0 Background

The National Board Inspection Code (NBIC) published Interpretation 15-04 Explosive Weld Plugs Tube Repair in 2015 which states the following:

**Question:** *Is explosion welding of plugs into leaking heat exchanger tubes considered a repair per the NBIC Part 3?*

**Reply:** *Yes.*

National Board Inspection Code (NBIC) Part 3 Section 3.3.3 Examples of Repairs, Paragraph F 2015 edition stated the following:

- *Replacement of boiler and heat exchanger tubes where welding is involved.*

National Board Inspection Code (NBIC) Part 3 Section 3.3.3 Examples of Repairs, Paragraph F 2017 edition was revised to state the following:

- *Replacement or plugging of boiler and heat exchanger tubes where welding is involved.*

Explosive plugging of heat exchanger tubes has now been considered repairs in accordance with the publication of NBIC Interpretation 15-04 and revision of NBIC Part 3 Section 3.3.3 Examples of Repairs, Paragraph F 2017 edition since explosive welding is defined as an acceptable welding process in ASME Section VIII, UW-27 (2).

## 3.0 Code Revision

We would like to request a revision adding heat exchanger tubes with an outside diameter of  $\frac{3}{4}$ " or smaller to be added in NBIC Part 3.3.2 Routine Repairs. Example as stated below (Reference Attached redline):

*6) Plugging of heat exchanger tubes  $\frac{3}{4}$ " and smaller when explosive plugging is used as method of plugging tubes.*

## 4.0 Need for Revision

Explosive plugging is performed mostly during emergency outages and is very time critical in getting units back online and operating. Approximately 90% of all plugging occurs within 24-48 hours of contact from the customer. Allowing explosive plugging as a routine repair would be more cost and schedule effective where jurisdictions allow routine repairs.

## 5.0 Justification

Other forms of heat exchanger tube plugging such a mechanical plugs and drive in plugs are performed without NBIC guidance. Explosive plugging is very similar to the mechanical and drive in type plugs and shares the same risks involved if a failure



were to occur. All three types of plugging mentioned can damage the tube sheet with the explosive plugging being less likely since it is done using written procedures.

Explosive plugging of heat exchanger tubes is not intrusive of the tube sheet and does not rely on fusion to join the two materials. It is a pressure weld in which the explosive force joins the two materials. Unlike fusion welding, there is not a heat affected zone and Post Weld Heat Treatment is not needed nor required.

The only acceptance method that can be used is a pressure test. It is inherent in the process that visual inspection and/or NDE cannot be performed.

Below are pictures of installed, sectioned, and the unexploded plug:

*Figure 1 8 Installed Explosive Plugs*





Figure 2 Sectioned Samples of Explosive Plugs After Installation



Figure 3 Explosive Plug Prior To Installation







Videos of the explosive plugging process can be obtained by contacting Marty Russell at the numbers or email listed on the cover page. I would like to thank you for your time and we are looking forward to hearing from you on this inquiry.

**Attachments:**

2015 Interpretation 15-04

NBIC 2015 Paragraph 3.3.3 f)

NBIC 2017 Paragraph 3.3.3 f)

ASME Section VIII Div. 1 UW-27

NBIC 2017 Paragraph 3.3.3 Redline of Revision

Regards,

A handwritten signature in blue ink that reads "Marty Russell".

Marty Russell

Quality Program Manager

TEiC Heat Exchanger Services

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Office: 864-336-4434

Cell: 864-345-5622

## 2015 Interpretations

c) considering it as repair not routine repair as PWHT is involved in the repair?

**Reply:** Yes (with the authorization and knowledge of the Inspector)

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**INTERPRETATION 15-04**

**Subject:** Part 3, Section 3

**Edition:** 2015

**Question:** Is explosion welding of plugs into leaking heat exchanger tubes considered a repair per the NBIC Part 3?

**Reply:** Yes.

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**INTERPRETATION 15-03**

**Subject:** Part 3, 3.2.6

**Edition:** 2015

**Question:** Are fillet welded patches permitted by the NBIC for repairs or alterations to pressure retaining items?

**Reply:** Fillet welded patches are not addressed by the NBIC.

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**INTERPRETATION 15-02**

**Subject:** Part 3, 5.12.2

**Edition:** 2015

**Question:** When a pressure relief valve is repaired, are field labels for type/model number, capacity, CDTP, and/or BP required on the repair nameplate if the values are not changed from the original manufacturer's nameplate or stamping?

**Reply:** No.

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**INTERPRETATION 15-01**

**Subject:** Part 1, 3.3.4

**Edition:** 2015

**Question:** Is it permissible to install boilers less than the minimum 36" clearance if recommended by the manufacturer and approved by the Jurisdiction?

**Reply:** Yes, in accordance with Part 1, Section 3.3.4 a).

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- 4) Corrosion resistance weld overlay not exceeding 100 sq. in. (64,520 sq. mm).

### 3.3.3 EXAMPLES OF REPAIRS

- a) Weld repairs or replacement of pressure parts or attachments that have failed in a weld or in the base material;
- b) The addition of welded attachments to pressure parts, such as:
- 1) Studs for insulation or refractory lining;
  - 2) Hex steel or expanded metal for refractory lining;
  - 3) Ladder clips;
  - 4) Brackets having loadings that do not affect the design of the pressure-retaining item to which they are attached; and
  - 5) Tray support rings.
- c) Corrosion resistant strip lining, or weld overlay;
- d) Weld buildup of wasted areas;
- e) Replacement of heat exchanger tubesheets in accordance with the original design;
- f) Replacement of boiler and heat exchanger tubes where welding is involved;
- g) In a boiler, a change in the arrangement of tubes in furnace walls, economizers, or super heater sections;
- h) Replacement of pressure-retaining parts identical to those existing on the pressure-retaining item and described on the original *Manufacturer's Data Report*. For example:
- 1) Replacement of furnace floor tubes and/or sidewall tubes in a boiler;
  - 2) Replacement of a shell or head in accordance with the original design;
  - 3) Rewelding a circumferential or longitudinal seam in a shell or head;
  - 4) Replacement of nozzles of a size where reinforcement is not a consideration.
- i) Installation of new nozzles or openings of such a size and connection type that reinforcement and strength calculations are not a consideration required by the original code of construction;
- j) The addition of a nozzle where reinforcement is a consideration may be considered to be a repair, provided the nozzle is identical to one in the original design, located in a similar part of the vessel, and not closer than three times its diameter from another nozzle. The addition of such a nozzle shall be restricted by any service requirements;
- k) The installation of a flush patch to a pressure-retaining item;
- l) The replacement of a shell course in a cylindrical pressure vessel;
- m) Welding of gage holes;
- n) Welding of wasted or distorted flange faces;
- o) Replacement of slip-on flanges with weld neck flanges or vice versa;

- d) Alternative welding methods without postweld heat treatment as described in NBIC Part 3, 2.5.3 shall not be used for routine repairs.
- e) The following repairs may be considered as routine repairs and shall be limited to these categories:
  - 1) Welded repairs or replacements of valves, fittings, tubes, or pipes NPS 5 (DN 125) in diameter and smaller, or sections thereof, where neither postweld heat treatment nor NDE other than visual is required by the original code of construction. This includes their attachments such as clips, lugs, skirts, etc., but does not include nozzles to pressure-retaining items;
  - 2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;
  - 3) Weld buildup of wasted areas in heads, shells, flanges and fittings not exceeding an area of 100 in.<sup>2</sup> (64,520 mm<sup>2</sup>) or a thickness of 25% of nominal wall thickness or 1/2 in. (13 mm), whichever is less;
  - 4) Corrosion resistance weld overlay not exceeding 100 in.<sup>2</sup> (64,520 mm<sup>2</sup>).
  - 5) Seal welding a mechanical connection for leak tightness where by-design, the pressure retaining capability is not dependent on the weld for strength and requires no postweld heat treatment.

### (17) 3.3.3 EXAMPLES OF REPAIRS

- a) Weld repairs or replacement of pressure parts or attachments that have failed in a weld or in the base material;
- b) The addition of welded attachments to pressure parts, such as:
  - 1) Studs for insulation or refractory lining;
  - 2) Hex steel or expanded metal for refractory lining;
  - 3) Ladder clips;
  - 4) Brackets having loadings that do not affect the design of the pressure-retaining item to which they are attached; and
  - 5) Tray support rings.
- c) Corrosion resistant strip lining, or weld overlay;
- d) Weld buildup of wasted areas;
- e) Replacement of heat exchanger tubesheets in accordance with the original design;
- f) Replacement or plugging of boiler and heat exchanger tubes where welding is involved;
- g) In a boiler, a change in the arrangement of tubes in furnace walls, economizers, or super heater sections;
- h) Replacement of pressure-retaining parts identical to those existing on the pressure-retaining item and described on the original *Manufacturer's Data Report*. For example:
  - 1) Replacement of furnace floor tubes and/or sidewall tubes in a boiler;
  - 2) Replacement of a shell or head in accordance with the original design;
  - 3) Rewelding a circumferential or longitudinal seam in a shell or head;
  - 4) Replacement of nozzles of a size where reinforcement is not a consideration.

(5) The Manufacturer shall be responsible for Code compliance of the vessel or part, including Certification Mark stamping and providing Data Report Forms properly executed and countersigned by the Inspector.

### UW-27 WELDING PROCESSES

(a) The welding processes that may be used in the construction of vessels under this Part of this Division are restricted as follows:

(1) arc welding processes: atomic hydrogen, electro-gas, gas metal arc, gas tungsten arc, plasma arc, shielded metal arc, stud, and submerged arc

(2) pressure welding processes: flash, induction, resistance, pressure thermit, explosive,<sup>70</sup> pressure gas, and inertia and continuous drive friction welding

(3) other welding processes: electron beam, electro-slag, laser beam, oxyfuel gas, thermit, and friction stir

(4) hybrid welding using a combination of any of the processes listed in (1), (2), and (3) above

(b) Other than pressure inherent to the welding processes, no mechanical pressure or blows shall be applied except as permitted for peening in UW-39.

(c) Definitions are given in Section IX which include variations of these processes.

(d) Arc stud welding and resistance stud welding may be used only for non-pressure-bearing attachments having a load- or non-load-carrying function, except for material listed in Table UHT-23, provided that, in the case of ferrous materials, the heat treatment requirements of UCS-56 are complied with and the requirements of UW-28(b) and UW-29(a) are met prior to start of production welding. Studs shall be limited to 1 in. (25 mm) diameter maximum for round studs and an equivalent cross-sectional area for studs with other shapes.

(e) The electroslag welding process may be used for butt welds only in ferritic steels and austenitic stainless steels of types listed in UW-5(d), provided the requirements of UW-11(a)(6) and UW-11(d) are satisfied. [See UW-5(e).]

(f) The electrogas welding process may be used for butt welds only in ferritic steels and austenitic stainless steels of types listed in UW-5(d), provided the requirements of UW-11(a)(6) are satisfied. When a single pass is greater than 1½ in. (38 mm) in ferritic materials, the joint shall be given a grain refining (austenitizing) heat treatment. [See UW-5(e).]

### UW-28 QUALIFICATION OF WELDING PROCEDURE

(a) Each procedure of welding that is to be followed in construction shall be recorded in detail by the manufacturer.

(b) The procedure used in welding pressure parts and in joining load-carrying nonpressure parts, such as all permanent or temporary clips and lugs, to pressure parts shall be qualified in accordance with Section IX.

(c) The procedure used in welding non-pressure-bearing attachments which have essentially no load-carrying function (such as extended heat transfer surfaces, insulation support pins, etc.), to pressure parts shall meet the following requirements.

(1) When the welding process is manual, machine, or semiautomatic, procedure qualification is required in accordance with Section IX.

(2) When the welding is any automatic welding process performed in accordance with a Welding Procedure Specification (in compliance with Section IX as far as applicable), procedure qualification testing is not required.

(d) Welding of all test coupons shall be conducted by the Manufacturer. Testing of all test coupons shall be the responsibility of the Manufacturer. Alternatively, AWS Standard Welding Procedure Specifications that have been accepted by Section IX may be used provided they meet all other requirements of this Division. Qualification of a welding procedure by one Manufacturer shall not qualify that procedure for any other Manufacturer except as provided in Section IX, QG-106.

### UW-29 TESTS OF WELDERS AND WELDING OPERATORS

(a) The welders and welding operators used in welding pressure parts and in joining load-carrying nonpressure parts (attachments) to pressure parts shall be qualified in accordance with Section IX.

(1) The qualification test for welding operators of machine welding equipment shall be performed on a separate test plate prior to the start of welding or on the first workpiece.

(2) When stud welding is used to attach load-carrying studs, a production stud weld test of each welder or welding operator shall be performed on a separate test plate or tube prior to the start of welding on each work shift. This weld test shall consist of five studs, welded and tested by the bend or torque stud weld testing procedure described in Section IX.

(b) The welders and welding operators used in welding non-pressure-bearing attachments, which have essentially no load-carrying function (such as extended heat transfer surfaces, insulation support pins, etc.), to pressure parts shall comply with the following:

(1) When the welding process is manual, machine, or semiautomatic, qualification in accordance with Section IX is required.

(2) When welding is done by any automatic welding process, performance qualification testing is not required.

(3) When stud welding is used, a production stud weld test, appropriate to the end use application requirements, shall be specified by the Manufacturer and carried out on a separate test plate or tube at the start of each shift.

### 3.2.5 CALCULATIONS

For alterations, calculations shall be completed prior to the start of any physical work. All design calculations shall be completed by an organization experienced in the design portion of the standard used for construction of the item. All calculations shall be made available for review by the Inspector accepting the design.

### 3.2.6 REFERENCE TO OTHER CODES AND STANDARDS

Other codes, standards, and practices pertaining to the repair and alteration of pressure retaining items can provide useful guidance. Use of these codes, standards and practices is subject to review and acceptance by the Inspector, and when required, by the Jurisdiction. The user is cautioned that the referenced codes, standards and practices may address methods categorized as repairs; however, some of these methods are considered alterations by the NBIC.

In the event of a conflict with the requirements of the NBIC, the requirements of the NBIC take precedence. Some examples are as follows:

- a) National Board *BULLETIN* - National Board Classic Articles Series;
- b) ASME PCC-1, Guidelines for Pressure Boundary Bolted Flange Joint Assembly;
- c) ASME PCC-2, Repair of Pressure Equipment and Piping.

### 3.2.7 CHANGE OF SERVICE

- a) See NBIC Part 2, Supplement 9 for requirements and guidelines to be followed when a change of service or service type is made to a pressure retaining item.
- b) Whenever there is a change of service, the local jurisdiction where the pressure retaining item is to be operated, shall be notified for acceptance, when applicable. Any specific jurisdictional requirements shall be met.

## 3.3 REPAIRS TO PRESSURE-RETAINING ITEMS

### 3.3.1 DEFECT REPAIRS

Before a repair is made to a defect in a welded joint or base metal, care should be taken to investigate its cause and to determine its extent and likelihood of recurrence.

### 3.3.2 ROUTINE REPAIRS

- a) Routine repairs are repairs for which the requirements for in-process involvement by the Inspector and stamping by the "R" Certificate Holder may be waived as determined appropriate by the Jurisdiction and the Inspector. All other applicable requirements of this code shall be met. Prior to performing routine repairs, the "R" Certificate Holder should determine that routine repairs are acceptable to the Jurisdiction where the pressure-retaining item is installed;
- b) The Inspector, with the knowledge and understanding of jurisdictional requirements, shall be responsible for meeting jurisdictional requirements and the requirements of this code;
- c) The "R" Certificate Holder's Quality System Program shall describe the process for identifying, controlling, and implementing routine repairs. Routine repairs shall be documented on Form R-1 with this statement in the Remarks section: "Routine Repair";

(17)

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- d) Alternative welding methods without postweld heat treatment as described in NBIC Part 3, 2.5.3 shall not be used for routine repairs.
- e) The following repairs may be considered as routine repairs and shall be limited to these categories:
  - 1) Welded repairs or replacements of valves, fittings, tubes, or pipes NPS 5 (DN 125) in diameter and smaller, or sections thereof, where neither postweld heat treatment nor NDE other than visual is required by the original code of construction. This includes their attachments such as clips, lugs, skirts, etc., but does not include nozzles to pressure-retaining items;
  - 2) The addition or repair of nonload bearing attachments to pressure-retaining items where postweld heat treatment is not required;
  - 3) Weld buildup of wasted areas in heads, shells, flanges and fittings not exceeding an area of 100 in.<sup>2</sup> (64,520 mm<sup>2</sup>) or a thickness of 25% of nominal wall thickness or 1/2 in. (13 mm), whichever is less;
  - 4) Corrosion resistance weld overlay not exceeding 100 in.<sup>2</sup> (64,520 mm<sup>2</sup>).
  - 5) Seal welding a mechanical connection for leak tightness where by-design, the pressure retaining capability is not dependent on the weld for strength and requires no postweld heat treatment.
  - 6) Plugging of heat exchanger tubes 3/4" and smaller when explosive plugging is used as method of plugging tubes.

### (17) 3.3.3 EXAMPLES OF REPAIRS

- a) Weld repairs or replacement of pressure parts or attachments that have failed in a weld or in the base material;
- b) The addition of welded attachments to pressure parts, such as:
  - 1) Studs for insulation or refractory lining;
  - 2) Hex steel or expanded metal for refractory lining;
  - 3) Ladder clips;
  - 4) Brackets having loadings that do not affect the design of the pressure-retaining item to which they are attached; and
  - 5) Tray support rings.
- c) Corrosion resistant strip lining, or weld overlay;
- d) Weld buildup of wasted areas;
- e) Replacement of heat exchanger tubesheets in accordance with the original design;
- f) Replacement or plugging of boiler and heat exchanger tubes where welding is involved;
- g) In a boiler, a change in the arrangement of tubes in furnace walls, economizers, or super heater sections;
- h) Replacement of pressure-retaining parts identical to those existing on the pressure-retaining item and described on the original *Manufacturer's Data Report*. For example:
  - 1) Replacement of furnace floor tubes and/or sidewall tubes in a boiler;
  - 2) Replacement of a shell or head in accordance with the original design;
  - 3) Rewelding a circumferential or longitudinal seam in a shell or head;
  - 4) Replacement of nozzles of a size where reinforcement is not a consideration.



18-102

Revise Table 2.3 adding the listed SWPSs that were revised by the AWS B2 Committee in 2018.
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**PROPOSED REVISION****TABLE 2.3**

<b><u>B2.1-1-016: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-1-017: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, E6010, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-1-019: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for CO<sub>2</sub> Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, E70T-1C and E71T-1C, in the As-Welded, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-1-020: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for 75% Ar/25%CO<sub>2</sub> Shielded Flux Cored Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, E70T-1M and E71T-1M, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-1-021: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for Gas Tungsten Followed by Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, ER70S-2 and E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-1-022: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, E6010 (Vertical Uphill) Followed by E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-8-023: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Austenitic Stainless Steel (M-8/P-8, Group 1) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, in the As-Welded Condition, Primarily Plate and Structural Applications.</u>
<b><u>B2.1-2-026: 2018</u></b>	<u>Standard Welding Procedure Specification (SWPS) for Shielded Metal Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2) 1/8" [3 mm] through 1-1/2 inch [38 mm] Thick, E6010 (Vertical Downhill) Followed by E7018, in the As-Welded or PWHT Condition, Primarily Plate and Structural Applications.</u>

**AWS B2.1-1-016:2018**  
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**Approved by the**  
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**April 10, 2018**

**Standard Welding Procedure Specification (SWPS) for  
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Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch  
[38 mm] Thick, E7018, in the As-Welded or PWHT  
Condition, Primarily Plate and Structural Applications**

**2nd Edition**

**Supersedes AWS B2.1-1-016-94R**

Prepared by the  
American Welding Society (AWS) B2 Committee on Procedure and Performance Qualification

Under the Direction of the  
AWS Technical Activities Committee

Approved by the  
AWS Board of Directors

## **Abstract**

This standard contains the essential welding variables for carbon steel in the thickness range of 1/8 inch [3 mm] through 1-1/2 inch [38 mm], using manual shielded metal arc welding. It cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and the allowable joint designs for fillet and groove welds. This SWPS was developed primarily for plate and structural applications.



## Foreword

This foreword is not part of this standard but is included for informational purposes only.

The American Welding Society and the Welding Research Council have joined in a cooperative effort to generate standard welding procedures for industry. The need for pretested welding procedures that are supported by adequate test data and that satisfy the technical requirements for the commonly used construction codes and specifications has been expressed by many individuals and organizations. The purpose of a welding procedure qualification is to provide test data for assessing the properties of a weld joint.

This Standard Welding Procedure Specification is an outgrowth of the coordinated work of the Welding Procedures Committee of the Welding Research Council and the AWS B2 Committee on Procedure and Performance Qualification. The Welding Procedures Committee has provided the data documented on the Summary of Procedure Qualification Records.

The welding terms used in this specification shall be interpreted in accordance with the definitions given in the latest edition of AWS A3.0M/A3.0, *Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*.

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This SWPS is the first revision of AWS B2.1-1-016-94R. All references to ASME "S" material numbers have been deleted from this edition. A Standard Units of Measure clause was added and the Safety clause was updated. Metric conversions have been updated and Annex A on requesting an official interpretation on an AWS standard is included.

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**Standard Welding Procedure Specification (SWPS) for  
CO<sub>2</sub> Shielded Flux Cored Arc Welding of Carbon Steel  
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[38 mm] Thick, E70T-1C and E71 T-1C, in the As-Welded  
Condition, Primarily Plate and Structural Applications**

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This SWPS is the first revision of AWS B2.1-1-019-94 that was amended to correct the permitted positions for E70T-1 electrode. Also, all references to ASME "S" material numbers have been deleted. The latest welding gas designators adopted by AWS A5.32M /A5.32 (ISO 14175 MOD) has been included. A Standard Units of Measure clause was added and the Safety clause was updated. Metric conversions were updated and Annex A on requesting an official interpretation on an AWS standard is included.

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**Standard Welding Procedure Specification (SWPS) for  
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Arc Welding of Carbon Steel (M-1/P-1, Group 1 or 2)  
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ER70S-2 and E7018, in the As-Welded or PWHT  
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Prepared by the  
American Welding Society (AWS) B2 Committee on Procedure and Performance Qualification

Under the Direction of the  
AWS Technical Activities Committee

Approved by the  
AWS Board of Directors

## **Abstract**

This standard contains the essential welding variables for carbon steel in the thickness range of 1/8 inch [3 mm] through 1-1/2 inch [38 mm], using manual shielded metal arc welding. It cites the base metals and operating conditions necessary to make the weldment, the filler metal specifications, and the allowable joint designs for fillet and groove welds. This SWPS was developed primarily for plate and structural applications.



## Foreword

This foreword is not part of this standard but is included for informational purposes only.

The American Welding Society and the Welding Research Council have joined in a cooperative effort to generate standard welding procedures for industry. The need for pretested welding procedures that are supported by adequate test data and that satisfy the technical requirements for the commonly used construction codes and specifications has been expressed by many individuals and organizations. The purpose of a welding procedure qualification is to provide test data for assessing the properties of a weld joint.

This Standard Welding Procedure Specification is an outgrowth of the coordinated work of the Welding Procedures Committee of Welding Research Council and the AWS B2 Committee on Procedure and Performance Qualification. The Welding Procedures Committee has provided the data documented on the Summary of Procedure Qualification Records.

The welding terms used in this specification shall be interpreted in accordance with the definitions given in the latest edition of AWS A3.0M/A3.0, *Standard Welding Terms and Definitions Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*.

The AWS B2 Committee on Procedure and Performance Qualification was formed in 1979 to provide welding standards concerning the subject of qualification. The primary document developed by this committee is AWS B2.1/B2.1M, *Standard for Welding Procedure and Performance Qualification*. This document established the foundation and framework for Standard Welding Procedure Specifications (SWPSs). The first two SWPSs were published in 1990. Since then SWPSs are continuing to be developed and published by the American Welding Society.

This SWPS is the first revision of AWS B2.1-1-021-94. All references to ASME "S" material numbers have been deleted from this edition. A Standard Units of Measure clause was added, and the Safety clause was updated. Metric conversions were updated and Annex A on requesting an official interpretation on an AWS standard is included.

A vertical line in the margin or underlined text in clauses, tables, or figures indicates an editorial or technical change from the previous edition.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, B2 Committee on Procedure and Performance Qualification, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

**AWS B2.1-8-023:2018**  
**An American National Standard**

**Approved by the**  
**American National Standards Institute**  
**April 10, 2018**

**Standard Welding Procedure Specification (SWPS)**  
**for Shielded Metal Arc Welding of Austenitic Stainless**  
**Steel (M-8/P-8 Group 1) 1/8 inch [3 mm] through**  
**1-1/2 inch [38 mm] Thick, in the As-Welded Condition,**  
**Primarily Plate and Structural Applications**

**2nd Edition**

**Supersedes AWS B2.1-8-023-94R**

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**AWS B2.1-1-026:2018**  
**An American National Standard**

**Approved by the**  
**American National Standards Institute**  
**April 10, 2018**

**Standard Welding Procedure Specification (SWPS) for  
Shielded Metal Arc Welding of Carbon Steel (M-1/P-1,  
Group 1 or 2) 1/8 inch [3 mm] through 1-1/2 inch  
[38mm] Thick, E6010 (Vertical Downhill) Followed  
by E7018, in the As-Welded or PWHT Condition,  
Primarily Plate and Structural Applications**

**2nd Edition**

**Supersedes AWS B2.1-1-026-94R**

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Under the Direction of the  
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