### ASME BPV II Part B Specification Review Form

***NOTE: This form is a coversheet that is for information only***

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended Subtitle for ASME Specification:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identical with ASTM Specification B653/B653M – 11 (R16) except that Supplementary Requirement S4 shall be mandatory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Previous ASTM Version adopted by ASME:</strong></td>
<td><strong>ASTM Revisions reviewed:</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11, 11(R16)</td>
<td></td>
</tr>
</tbody>
</table>

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### Review Checklist

**Part I – New Material Addition**

Has a new grade, type, or class of material(s) been added to the specification since the last ASME adoption?  
| YES ☐ | NO ☒ |

If a new grade, type, or class of material(s) has been added, then will the specification adoption result in the need for a revision to either an ASME BPV Code Volume or an ASME Code Case?  
| YES ☐ | NO ☐ | NA ☒ |

Reason for answer:

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**Part II – A Change to an Existing Material**

Have any of the following items changed for a material(s) that, as of the last ASME adoption, was already in the ASTM specification:  

- A mechanical property?  
  | YES ☐ | NO ☒ |

- A scope or thickness range?  
  | YES ☐ | NO ☒ |

- Any chemical requirements or physical properties?  
  | YES ☐ | NO ☒ |

- A heat treatment temperature or range?  
  | YES ☐ | NO ☒ |

If ANY of the above answers is YES, then does the material(s) with the changed property appear in either an ASME BPV Code Volume or an ASME Code Case?  
| YES ☐ | NO ☐ | NA ☒ |

If the material(s) with the changed property appears in an ASME BPV Code Volume(s)/Code Case(s), then will the adoption of this specification result in the need for the Volume/Code Case to be revised?  
| YES ☐ | NO ☐ | NA ☒ |

Reason for answer:

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**Part III – Other Significant Changes / BPV II Table II-200**

Did other change(s) occur in the ASTM specification of which ASME BPV II needs to be aware?  
| YES ☐ | NO ☒ |

Were any changes in the ASTM specification made as a result of an ASME request?  
| YES ☐ | NO ☒ |

Has any change(s) been made to the ASTM specification that was not already identified in Parts I-II and which is objectionable to ASME?  
| YES ☐ | NO ☒ |
Will any of the proposed changes make any grade, type, or class of material(s) obsolete?  

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☒</td>
</tr>
</tbody>
</table>

With this adoption, does Mandatory Appendix II, Table II-200-1 need to restrict the usage of certain versions of this ASTM specification?  

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☒</td>
</tr>
</tbody>
</table>

Part IV – Other ASTM Changes & Recommended ASME Corrections

Other Changes to the ASTM Specification  
(since the last ASME Spec Adoption)

No changes since the last ASTM specification. This edition was reapproved.

Recommended Corrections for Adoption into ASME BPV II

Addition of Supplementary Requirement S4. Fittings Manufactured for ASME Construction. Para. 2.2.3 was added to require Supplementary Requirement S4.

NOTE: The intent is that the ASTM proprietary footnotes and notes be removed and not printed. The editors have historically deleted the “boilerplate” and, in addition, have taken care of additional details such as adding the ASME logo and adding the recommended subtitle shown above.

Respectfully submitted: Richard Sutherlin  

____________________________  
Thursday, August 06, 2020, 7:54 AM

Phone 541-990-6814  
email rsuther223@comcast.net
SPECIFICATION FOR SEAMLESS AND WELDED ZIRCONIUM AND ZIRCONIUM ALLOY WELDING FITTINGS

SB-653/SB-653M

(Identical with ASTM Specification B653/B653M-11 except that the following additional requirements apply.)

All fittings welded with filler metal intended for applications under the rules of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code shall conform to the following: Manufacturer of such products are limited to manufacturers holding the appropriate ASME Certificate of Authorization and Code Certification Mark. In addition to conforming to this specification, the manufacturer shall meet all applicable requirements of Section VIII, Division 1 of the Code. The materials used to fabricate the fitting shall conform to ASME SB Specifications. The product shall be subject to all applicable requirements of Section VIII, Division 1 of the Code, including welding, heat treatment, nondestructive examination, authorized inspections at point of manufacture, and application of the Code Certification Mark.

The applicable ASME Partial Data Report Form signed by an Authorized Inspector and a certified mill test report shall be furnished for each lot of fittings. The term “lot” applies to all fittings of the same mill heat of material, size, and wall thickness, which are heat treated, if applicable, in one furnace charge. Each fitting shall be marked in such a manner to identify each such piece with the “lot” and the certified mill test report.

Identical with ASTM Specification B653/B653M – 11 (R16) except that Supplementary Requirement S4 shall be mandatory.
Designation: B653/B653M – 11 (Reapproved 2016)

Standard Specification for Seamless and Welded Zirconium and Zirconium Alloy Welding Fittings

This standard is issued under the fixed designation B653/B653M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers fittings, factory made from three grades of zirconium and zirconium alloys. The term welding fittings applies to butt-welding parts such as 45° and 90° elbows, 180° returns, caps, tees, reducers, lap-joint stub ends, and other types.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

B493 Specification for Zirconium and Zirconium Alloy Forgings
B523/B523M Specification for Seamless and Welded Zirconium and Zirconium Alloy Tubes
B551/B551M Specification for Zirconium and Zirconium Alloy Strip, Sheet, and Plate
B614 Practice for Descaling and Cleaning Zirconium and Zirconium Alloy Surfaces
B658/B658M Specification for Seamless and Welded Ziron-

2.2 ANSI Standards:

B16.9 Wrought Steel Butt-Welding Fittings
B36.19 Stainless Steel Pipe

2.3 Manufacturers’ Standardization Society of the Valve and Fittings Industry Standards:

SP-25 Standard Marking System for Valves, Fittings, Flanges, and Unions
SP-43 Standard Practice for Light Weight Stainless Steel Fittings

2.4 American Society of Mechanical Engineers:

ASME Boiler and Pressure Vessel Code, Sections VIII and IX

3. Terminology

3.1 Lot Definitions:

3.1.1 weld fittings, n—definition is to be mutually agreed upon between manufacturer and the purchaser.

4. Classification

4.1 The fittings are furnished in three grades as follows:

4.1.1 Grade R60702 (PZ 2)—Unalloyed zirconium.
4.1.2 Grade R60704 (PZ 4)—Zirconium-tin.
4.1.3 Grade R60705 (PZ 5)—Zirconium-niobium

5. Ordering Information

5.1 Orders for materials under this specification shall include the following information:

5.1.1 Quantity,
5.1.2 Name of material (zirconium fittings),
5.1.3 Grade number (see 4.1),
5.1.4 ASTM designation and year of issue,
5.1.5 Hydrostatic test requirements (see 10.2),
5.1.6 Inspection requirements (see 11.1).

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1 This specification is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.02 on Zirconium and Hafnium.

2 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard’s Doctratable Summary page on the ASTM website.


5.1.7 Finish (see Section 9), and
5.1.8 Additions to the specification and supplementary requirements, if required.

Note 1—A typical ordering description is as follows: 15 pieces, zirconium, 4-in. [100 mm], Schedule 40, 90° long radius elbows, descaled, ASTM B653 - 01, Grade R60702. Supplementary Requirement S3, Stress Relief Heat Treatment.

6. Materials and Manufacture

6.1 Forging, forming, or shaping operations may be performed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, fusion welding, machining, or by a combination of these operations. The forming procedure shall be so applied that it will not produce injurious defects in the fittings.

6.2 Fittings containing welded seams or other joints made by welding shall comply with the following provisions:

6.2.1 Welded by welders, welding operators, and welding procedures qualified under the provisions of Section IX of the ASME Boiler and Pressure Vessel Code.

6.2.2 Filler metal, when used, shall be the same grade as the base metal.

6.2.3 All welds on grade R60705 shall be stress relief annealed within 14 days after welding to prevent delayed hydride cracking, in accordance with Supplementary Requirements Section S3, Stress Relief Heat Treatment.

6.2.3 Supplementary requirement S4 is mandatory.

7. Chemical Composition

7.1 The material shall conform to the requirements as to chemical composition prescribed in Table 1.

8. Tensile Requirements

8.1 The material shall conform to the requirements as to the tensile properties prescribed in Table 1.

9. Workmanship, Finish, and Appearance

9.1 For fittings covered by ANSI B16.9 or MSS SP-43, or for fittings to be used with pipe ordered to ANSI B36.19, the sizes, shapes, and dimensions of the fittings shall be as specified in those standards.

9.2 The fittings shall be free of injurious external and internal imperfections of a nature that will interfere with the purpose for which the fittings are intended. Minor defects may be removed by grinding, providing the wall thickness is not decreased to less than the minimum thickness, and further provided that the ground-out area shall be fairied out.

10. Hydrostatic Tests

10.1 All fittings shall be capable of withstanding without failure, leakage, or impairment of their serviceability, a test pressure prescribed in the applicable standards in Table 1 for the pipe or tubing with which the fitting is planned to be used.

10.2 Hydrostatic tests shall be performed when required by the purchase order.

11. Inspection

11.1 The manufacturer shall inspect the material covered by this specification prior to shipment. If so specified in the purchase order, the purchaser or his representative may witness the testing and inspection of the material at the place of manufacture. In such cases the purchaser shall state in his purchase order which tests he desires to witness. The manufacturer shall give ample notice to the purchaser as to the time and place of the designated tests. If the purchaser’s representative does not present himself at the time agreed upon for the testing, the manufacturer shall consider the requirement for the purchaser’s inspection at the place of manufacture to be waived.

11.2 The manufacturer shall afford the inspector representing the purchaser, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. This inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

12. Rejection

12.1 Rejection for failure of the material to meet the requirements of this specification shall be reported to the manufacturer. Unless otherwise specified, rejected material may be returned to the manufacturer at the manufacturer’s expense, unless the purchaser receives, within three weeks of the notice of rejection, other instructions for disposition.

13. Certification

13.1 A producer or supplier shall furnish the purchaser with a certificate that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. The certificate shall include a report of the test results.

13.2 All material incorporated within the fitting shall be identified and shall be in accordance with the applicable standards in Table 1.

<table>
<thead>
<tr>
<th>Grade*</th>
<th>Pipe Product and ASTM Designation</th>
<th>Tube Product and ASTM Designation</th>
<th>Plate Product and ASTM Designation</th>
<th>Bar Product and ASTM Designation</th>
<th>Forging Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ 4 (R60704)</td>
<td>B658/B658M</td>
<td>B523/B523M</td>
<td>Grade R60702</td>
<td>Grade R60702</td>
<td>Grade R60702</td>
</tr>
<tr>
<td>PZ 5 (R60705)</td>
<td>B658/B658M</td>
<td>B523/B523M</td>
<td>Grade R60704</td>
<td>Grade R60704</td>
<td>Grade R60704</td>
</tr>
</tbody>
</table>

* When fittings are of welded construction, the symbol shown shall be supplemented by the letter "W."

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14. Referee

14.1 In the event of disagreement between the manufacturer and the purchaser on the conformance of the material to the requirements of this specification or any special test specified by the purchaser, a mutually acceptable referee shall perform the tests in question. The results of the referee’s testing shall be used in determining conformance of the material to this specification.

15. Product Marking

15.1 Unless otherwise specified, the manufacturer’s name or trademark, the schedule number, material, and size shall be stamped (see Note 2), stenciled, electroetched, or otherwise suitably marked on each fitting. In addition, each fitting shall be marked with the identification grade symbol and suffix for the respective specification listed in Table 1. On wall thicknesses thinner than Schedule 40S, no stamps or other indented markings shall be used. When the size does not permit complete marking, identification marks may be omitted in the sequence shown in MSS SP-25.

Note 2—When steel stamps are used, they should be applied prior to heat treatment and care should be taken so that the marking is not deep enough to cause cracks or to reduce the wall thickness of the fitting below the minimum allowed.

16. Packaging and Package Marking

16.1 The fittings shall be packaged suitably in such a manner as to assure safe delivery to its destination when properly transported by common carrier.

17. Keywords

17.1 fitting; pipe; zirconium; zirconium alloy

SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not be considered unless specified in the order, in which event the test shall be made by the manufacturer at the purchaser’s expense.

S1. Surface Inspection

S1.1 Liquid penetrant inspection may be performed on all outside-diameter surfaces of the fittings and inside-diameter surfaces where practicable. Acceptance shall be in accordance with Appendix 8, Section VIII of the ASME Boiler and Pressure Vessel Code.

S2. Radiographic Inspections of Welds

S2.1 Radiographic inspection may be performed on all weldments of the fittings in accordance with paragraph UW-51, Section VIII, of the ASME Boiler and Pressure Vessel Code.

S3. Stress-Relief Heat Treatment

S3.1 The stress-relieving treatment shall consist of holding the fitting at a minimum temperature of 1100°F [600°C] for not less than 30 min per inch [25 mm] of the maximum thickness in a nonreducing atmosphere.

S3.2 The minimum time at this temperature is 15 min. All stress-relieved parts shall be cleaned subsequently and shall be free of oxide scale contamination (see Practice B614).
### Table II-200-1
Other Acceptable ASTM Editions (Cont’d)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Latest Adopted ASTM</th>
<th>Description</th>
<th>Other Acceptable ASTM Editions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB-622</td>
<td>10</td>
<td>Identical except that certification and test reports have been made mandatory in para. 5.1.4 and section 15, E527 removed from References, “Remainder” element defined in Table 1, maximum silicon content for R20033 corrected by errata to “0.50” in Table 1, and acceptable ASTM editions are limited to 06 and later for N06200 material.</td>
<td>87a through 10</td>
</tr>
<tr>
<td>SB-625</td>
<td>99</td>
<td>Identical except that certification has been made mandatory.</td>
<td>83 through 99</td>
</tr>
<tr>
<td>SB-626</td>
<td>17</td>
<td>Identical except that certification and test reports have been made mandatory per para. 5.1.6 and in SB-751, and acceptable ASTM editions are limited to 06 and later for N06200 material, 10e1 and later for N06059 material, and 10e2 and later for R20033 material.</td>
<td>87a through 17 except 01</td>
</tr>
<tr>
<td>SB-637</td>
<td>03</td>
<td>Identical except that certification has been made mandatory.</td>
<td>84a through 03</td>
</tr>
<tr>
<td>SB-649</td>
<td>95</td>
<td>Identical except that certification has been made mandatory.</td>
<td>87 through 95</td>
</tr>
<tr>
<td>SB-653/SB-653M</td>
<td>11 (R16)</td>
<td>Identical except for additional subtitle for Section VIII, Div. 1 requirements. Identical except that Supplementary Requirement S4 shall be mandatory.</td>
<td>02 through 11 (R16)</td>
</tr>
<tr>
<td>SB-658/SB-658M</td>
<td>11 c1</td>
<td>Identical.</td>
<td>85 through 11 c1</td>
</tr>
<tr>
<td>SB-666/SB-666M</td>
<td>15</td>
<td>Identical.</td>
<td>...</td>
</tr>
<tr>
<td>SB-668</td>
<td>99</td>
<td>Identical except that certification has been made mandatory.</td>
<td>84 through 99</td>
</tr>
<tr>
<td>SB-672</td>
<td>95</td>
<td>Identical.</td>
<td>85 through 95</td>
</tr>
<tr>
<td>SB-673</td>
<td>91</td>
<td>Identical.</td>
<td>88 through 91</td>
</tr>
<tr>
<td>SB-674</td>
<td>05</td>
<td>Identical except for editorial changes in 4.1 and 7.1. Certification and test reports have been made mandatory. For N08904, ASTM editions prior to 05 are not acceptable.</td>
<td>83 through 05</td>
</tr>
<tr>
<td>SB-675</td>
<td>02(R13)</td>
<td>Identical except that certification has been made mandatory.</td>
<td>...</td>
</tr>
<tr>
<td>SB-676</td>
<td>03(R14)</td>
<td>Identical except that certification has been made mandatory.</td>
<td>02 through 03(R14)</td>
</tr>
<tr>
<td>SB-677</td>
<td>99</td>
<td>Identical except that certification has been made mandatory.</td>
<td>84 through 99</td>
</tr>
<tr>
<td>SB-688</td>
<td>96(R14)</td>
<td>Identical except certification has been made mandatory, and heat treatment has been specified.</td>
<td>96 through 96(R14)</td>
</tr>
<tr>
<td>SB-690</td>
<td>02(R13)</td>
<td>Identical except for corrections to Table 2, clarified hydrotest requirements, and mandatory certification.</td>
<td>93 through 02(R13)</td>
</tr>
<tr>
<td>SB-691</td>
<td>02(R13)</td>
<td>Identical except that certification and mill test reports have been made mandatory.</td>
<td>86 through 02(R13)</td>
</tr>
<tr>
<td>SB-704</td>
<td>00</td>
<td>Identical except that certification has been made mandatory in para. 3.1.8 and editorial corrections have been made.</td>
<td>82(R90) through 00</td>
</tr>
<tr>
<td>SB-705</td>
<td>05(R14)</td>
<td>Identical except that certification has been made mandatory, and ASTM B571 removed from para. 2.1 and replaced in para. 10.1 by B775.</td>
<td>82(R90) through 05(R14)</td>
</tr>
<tr>
<td>SB-706</td>
<td>00(R11)</td>
<td>Identical except that certification and test reports have been made mandatory.</td>
<td>00(R11)</td>
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<tr>
<td>SB-709</td>
<td>93</td>
<td>Identical.</td>
<td>84 through 93</td>
</tr>
<tr>
<td>SB-710</td>
<td>99</td>
<td>Identical except that certification has been made mandatory.</td>
<td>87 through 99</td>
</tr>
<tr>
<td>SB-729</td>
<td>99</td>
<td>Identical except that certification has been made mandatory.</td>
<td>87 through 99</td>
</tr>
<tr>
<td>SB-751</td>
<td>03</td>
<td>Identical except certification and a test report have been made mandatory.</td>
<td>...</td>
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</tbody>
</table>