

**SECTION V**

**2017**

ASME Boiler and  
Pressure Vessel Code  
An International Code

**Nondestructive  
Examination**

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AN INTERNATIONAL CODE

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ASME Boiler and Pressure Vessel Committee  
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<sup>\*</sup> The 2015 Edition of Section III was the last edition in which Section III, Division 1, Subsection NH, *Class 1 Components in Elevated Temperature Service*, was published. The requirements located within Subsection NH were moved to Section III, Division 5, Subsection HB, Subpart B for the elevated temperature construction of Class A components.

## **INTERPRETATIONS**

Interpretations are issued in real time in ASME's Interpretations Database at <http://go.asme.org/Interpretations>. Historical BPVC interpretations may also be found in the Database.

## **CODE CASES**

The Boiler and Pressure Vessel Code committees meet regularly to consider proposed additions and revisions to the Code and to formulate Cases to clarify the intent of existing requirements or provide, when the need is urgent, rules for materials or constructions not covered by existing Code rules. Those Cases that have been adopted will appear in the appropriate 2017 Code Cases book: "Boilers and Pressure Vessels" or "Nuclear Components." Supplements will be sent or made available automatically to the purchasers of the Code Cases books up to the publication of the 2019 Code.

# FOREWORD\*

In 1911, The American Society of Mechanical Engineers established the Boiler and Pressure Vessel Committee to formulate standard rules for the construction of steam boilers and other pressure vessels. In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees:

- (a) Committee on Power Boilers (I)
- (b) Committee on Materials (II)
- (c) Committee on Construction of Nuclear Facility Components (III)
- (d) Committee on Heating Boilers (IV)
- (e) Committee on Nondestructive Examination (V)
- (f) Committee on Pressure Vessels (VIII)
- (g) Committee on Welding, Brazing, and Fusing (IX)
- (h) Committee on Fiber-Reinforced Plastic Pressure Vessels (X)
- (i) Committee on Nuclear Inservice Inspection (XI)
- (j) Committee on Transport Tanks (XII)
- (k) Technical Oversight Management Committee (TOMC)

Where reference is made to “the Committee” in this Foreword, each of these committees is included individually and collectively.

The Committee’s function is to establish rules of safety relating only to pressure integrity, which govern the construction\*\* of boilers, pressure vessels, transport tanks, and nuclear components, and the inservice inspection of nuclear components and transport tanks. The Committee also interprets these rules when questions arise regarding their intent. The technical consistency of the Sections of the Code and coordination of standards development activities of the Committees is supported and guided by the Technical Oversight Management Committee. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks, or nuclear components, or the inservice inspection of nuclear components or transport tanks. Users of the Code should refer to the pertinent codes, standards, laws, regulations, or other relevant documents for safety issues other than those relating to pressure integrity. Except for Sections XI and XII, and with a few other exceptions, the rules do not, of practical necessity, reflect the likelihood and consequences of deterioration in service related to specific service fluids or external operating environments. In formulating the rules, the Committee considers the needs of users, manufacturers, and inspectors of pressure vessels. The objective of the rules is to afford reasonably certain protection of life and property, and to provide a margin for deterioration in service to give a reasonably long, safe period of usefulness. Advancements in design and materials and evidence of experience have been recognized.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities and inservice inspection and testing activities. The Code does not address all aspects of these activities and those aspects that are not specifically addressed should not be considered prohibited. The Code is not a handbook and cannot replace education, experience, and the use of engineering judgment. The phrase *engineering judgment* refers to technical judgments made by knowledgeable engineers experienced in the application of the Code. Engineering judgments must be consistent with Code philosophy, and such judgments must never be used to overrule mandatory requirements or specific prohibitions of the Code.

The Committee recognizes that tools and techniques used for design and analysis change as technology progresses and expects engineers to use good judgment in the application of these tools. The designer is responsible for complying with Code rules and demonstrating compliance with Code equations when such equations are mandatory. The Code neither requires nor prohibits the use of computers for the design or analysis of components constructed to the

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\* The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI’s requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Code.

\*\* *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and pressure relief.

requirements of the Code. However, designers and engineers using computer programs for design or analysis are cautioned that they are responsible for all technical assumptions inherent in the programs they use and the application of these programs to their design.

The rules established by the Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design, or as limiting in any way the manufacturer's freedom to choose any method of design or any form of construction that conforms to the Code rules.

The Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the Committee has the authority to provide official interpretations of this Code. Requests for revisions, new rules, Code Cases, or interpretations shall be addressed to the Secretary in writing and shall give full particulars in order to receive consideration and action (see Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees). Proposed revisions to the Code resulting from inquiries will be presented to the Committee for appropriate action. The action of the Committee becomes effective only after confirmation by ballot of the Committee and approval by ASME. Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute (ANSI) and published at <http://go.asme.org/BPVCPublicReview> to invite comments from all interested persons. After public review and final approval by ASME, revisions are published at regular intervals in Editions of the Code.

The Committee does not rule on whether a component shall or shall not be constructed to the provisions of the Code. The scope of each Section has been established to identify the components and parameters considered by the Committee in formulating the Code rules.

Questions or issues regarding compliance of a specific component with the Code rules are to be directed to the ASME Certificate Holder (Manufacturer). Inquiries concerning the interpretation of the Code are to be directed to the Committee. ASME is to be notified should questions arise concerning improper use of an ASME Certification Mark.

When required by context in this Section, the singular shall be interpreted as the plural, and vice versa, and the feminine, masculine, or neuter gender shall be treated as such other gender as appropriate.

## **STATEMENT OF POLICY ON THE USE OF THE CERTIFICATION MARK AND CODE AUTHORIZATION IN ADVERTISING**

ASME has established procedures to authorize qualified organizations to perform various activities in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. It is the aim of the Society to provide recognition of organizations so authorized. An organization holding authorization to perform various activities in accordance with the requirements of the Code may state this capability in its advertising literature.

Organizations that are authorized to use the Certification Mark for marking items or constructions that have been constructed and inspected in compliance with the ASME Boiler and Pressure Vessel Code are issued Certificates of Authorization. It is the aim of the Society to maintain the standing of the Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the Certification Mark who comply with all requirements.

Based on these objectives, the following policy has been established on the usage in advertising of facsimiles of the Certification Mark, Certificates of Authorization, and reference to Code construction. The American Society of Mechanical Engineers does not “approve,” “certify,” “rate,” or “endorse” any item, construction, or activity and there shall be no statements or implications that might so indicate. An organization holding the Certification Mark and/or a Certificate of Authorization may state in advertising literature that items, constructions, or activities “are built (produced or performed) or activities conducted in accordance with the requirements of the ASME Boiler and Pressure Vessel Code,” or “meet the requirements of the ASME Boiler and Pressure Vessel Code.” An ASME corporate logo shall not be used by any organization other than ASME.

The Certification Mark shall be used only for stamping and nameplates as specifically provided in the Code. However, facsimiles may be used for the purpose of fostering the use of such construction. Such usage may be by an association or a society, or by a holder of the Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the Certification Mark. General usage is permitted only when all of a manufacturer’s items are constructed under the rules.

## **STATEMENT OF POLICY ON THE USE OF ASME MARKING TO IDENTIFY MANUFACTURED ITEMS**

The ASME Boiler and Pressure Vessel Code provides rules for the construction of boilers, pressure vessels, and nuclear components. This includes requirements for materials, design, fabrication, examination, inspection, and stamping. Items constructed in accordance with all of the applicable rules of the Code are identified with the official Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the Certification Mark shall not be used on any item that is not constructed in accordance with all of the applicable requirements of the Code.

Items shall not be described on ASME Data Report Forms nor on similar forms referring to ASME that tend to imply that all Code requirements have been met when, in fact, they have not been. Data Report Forms covering items not fully complying with ASME requirements should not refer to ASME or they should clearly identify all exceptions to the ASME requirements.

# SUBMITTAL OF TECHNICAL INQUIRIES TO THE BOILER AND PRESSURE VESSEL STANDARDS COMMITTEES (17)

## 1 INTRODUCTION

(a) The following information provides guidance to Code users for submitting technical inquiries to the applicable Boiler and Pressure Vessel (BPV) Standards Committee (hereinafter referred to as the Committee). See the guidelines on approval of new materials under the ASME Boiler and Pressure Vessel Code in Section II, Part D for requirements for requests that involve adding new materials to the Code. See the guidelines on approval of new welding and brazing materials in Section II, Part C for requirements for requests that involve adding new welding and brazing materials (“consumables”) to the Code.

Technical inquiries can include requests for revisions or additions to the Code requirements, requests for Code Cases, or requests for Code Interpretations, as described below:

(1) *Code Revisions.* Code revisions are considered to accommodate technological developments, to address administrative requirements, to incorporate Code Cases, or to clarify Code intent.

(2) *Code Cases.* Code Cases represent alternatives or additions to existing Code requirements. Code Cases are written as a Question and Reply, and are usually intended to be incorporated into the Code at a later date. When used, Code Cases prescribe mandatory requirements in the same sense as the text of the Code. However, users are cautioned that not all regulators, jurisdictions, or Owners automatically accept Code Cases. The most common applications for Code Cases are as follows:

(-a) to permit early implementation of an approved Code revision based on an urgent need

(-b) to permit use of a new material for Code construction

(-c) to gain experience with new materials or alternative requirements prior to incorporation directly into the Code

(3) *Code Interpretations*

(-a) Code Interpretations provide clarification of the meaning of existing requirements in the Code and are presented in Inquiry and Reply format. Interpretations do not introduce new requirements.

(-b) If existing Code text does not fully convey the meaning that was intended, or conveys conflicting requirements, and revision of the requirements is required to support the Interpretation, an Intent Interpretation will be issued in parallel with a revision to the Code.

(b) Code requirements, Code Cases, and Code Interpretations established by the Committee are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or Owners to choose any method of design or any form of construction that conforms to the Code requirements.

(c) Inquiries that do not comply with the following guidance or that do not provide sufficient information for the Committee’s full understanding may result in the request being returned to the Inquirer with no action.

## 2 INQUIRY FORMAT

Submittals to the Committee should include the following information:

(a) *Purpose.* Specify one of the following:

(1) request for revision of present Code requirements

(2) request for new or additional Code requirements

(3) request for Code Case

(4) request for Code Interpretation

(b) *Background.* The Inquirer should provide the information needed for the Committee’s understanding of the Inquiry, being sure to include reference to the applicable Code Section, Division, Edition, Addenda (if applicable), paragraphs, figures, and tables. Preferably, the Inquirer should provide a copy of, or relevant extracts from, the specific referenced portions of the Code.

*(c) Presentations.* The Inquirer may desire to attend or be asked to attend a meeting of the Committee to make a formal presentation or to answer questions from the Committee members with regard to the Inquiry. Attendance at a BPV Standards Committee meeting shall be at the expense of the Inquirer. The Inquirer's attendance or lack of attendance at a meeting will not be used by the Committee as a basis for acceptance or rejection of the Inquiry by the Committee. However, if the Inquirer's request is unclear, attendance by the Inquirer or a representative may be necessary for the Committee to understand the request sufficiently to be able to provide an Interpretation. If the Inquirer desires to make a presentation at a Committee meeting, the Inquirer should provide advance notice to the Committee Secretary, to ensure time will be allotted for the presentation in the meeting agenda. The Inquirer should consider the need for additional audiovisual equipment that might not otherwise be provided by the Committee. With sufficient advance notice to the Committee Secretary, such equipment may be made available.

### **3 CODE REVISIONS OR ADDITIONS**

Requests for Code revisions or additions should include the following information:

*(a) Requested Revisions or Additions.* For requested revisions, the Inquirer should identify those requirements of the Code that they believe should be revised, and should submit a copy of, or relevant extracts from, the appropriate requirements as they appear in the Code, marked up with the requested revision. For requested additions to the Code, the Inquirer should provide the recommended wording and should clearly indicate where they believe the additions should be located in the Code requirements.

*(b) Statement of Need.* The Inquirer should provide a brief explanation of the need for the revision or addition.

*(c) Background Information.* The Inquirer should provide background information to support the revision or addition, including any data or changes in technology that form the basis for the request, that will allow the Committee to adequately evaluate the requested revision or addition. Sketches, tables, figures, and graphs should be submitted, as appropriate. The Inquirer should identify any pertinent portions of the Code that would be affected by the revision or addition and any portions of the Code that reference the requested revised or added paragraphs.

### **4 CODE CASES**

Requests for Code Cases should be accompanied by a statement of need and background information similar to that described in 3(b) and 3(c), respectively, for Code revisions or additions. The urgency of the Code Case (e.g., project underway or imminent, new procedure) should be described. In addition, it is important that the request is in connection with equipment that will bear the Certification Mark, with the exception of Section XI applications. The proposed Code Case should identify the Code Section and Division, and should be written as a Question and a Reply, in the same format as existing Code Cases. Requests for Code Cases should also indicate the applicable Code Editions and Addenda (if applicable) to which the requested Code Case applies.

### **5 CODE INTERPRETATIONS**

*(a)* Requests for Code Interpretations should be accompanied by the following information:

*(1) Inquiry.* The Inquirer should propose a condensed and precise Inquiry, omitting superfluous background information and, when possible, composing the Inquiry in such a way that a "yes" or a "no" Reply, with brief limitations or conditions, if needed, can be provided by the Committee. The proposed question should be technically and editorially correct.

*(2) Reply.* The Inquirer should propose a Reply that clearly and concisely answers the proposed Inquiry question. Preferably, the Reply should be "yes" or "no," with brief limitations or conditions, if needed.

*(3) Background Information.* The Inquirer should provide any need or background information, such as described in 3(b) and 3(c), respectively, for Code revisions or additions, that will assist the Committee in understanding the proposed Inquiry and Reply.

If the Inquirer believes a revision of the Code requirements would be helpful to support the Interpretation, the Inquirer may propose such a revision for consideration by the Committee. In most cases, such a proposal is not necessary.

*(b)* Requests for Code Interpretations should be limited to an Interpretation of a particular requirement in the Code or in a Code Case. Except with regard to interpreting a specific Code requirement, the Committee is not permitted to consider consulting-type requests such as the following:

*(1)* a review of calculations, design drawings, welding qualifications, or descriptions of equipment or parts to determine compliance with Code requirements

- (2) a request for assistance in performing any Code-prescribed functions relating to, but not limited to, material selection, designs, calculations, fabrication, inspection, pressure testing, or installation
- (3) a request seeking the rationale for Code requirements

## 6 SUBMITTALS

(a) *Submittal.* Requests for Code Interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt. If the Inquirer is unable to use the online form, the Inquirer may mail the request to the following address:

Secretary  
ASME Boiler and Pressure Vessel Committee  
Two Park Avenue  
New York, NY 10016-5990

All other Inquiries should be mailed to the Secretary of the BPV Committee at the address above. Inquiries are unlikely to receive a response if they are not written in clear, legible English. They must also include the name of the Inquirer and the company they represent or are employed by, if applicable, and the Inquirer's address, telephone number, fax number, and e-mail address, if available.

(b) *Response.* The Secretary of the appropriate Committee will provide a written response, via letter or e-mail, as appropriate, to the Inquirer, upon completion of the requested action by the Committee. Inquirers may track the status of their Interpretation Request at <http://go.asme.org/Interpretations>.

# PERSONNEL

## ASME Boiler and Pressure Vessel Standards Committees, Subgroups, and Working Groups

January 1, 2017

### TECHNICAL OVERSIGHT MANAGEMENT COMMITTEE (TOMC)

|   |   |
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| T. P. Pastor, <i>Chair</i>                  | J. F. Henry                             |
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| D. B. DeMichael                             | B. F. Shelley                           |
| R. P. Deubler                               | W. J. Sperko                            |
| P. D. Edwards                               | D. Srnica                               |
| J. G. Feldstein                             | R. W. Swayne                            |
| R. E. Gimple                                | C. Withers                              |
| T. E. Hansen                                | J. E. Batey, <i>Contributing Member</i> |
| G. W. Hembree                               |   |

### HONORARY MEMBERS (MAIN COMMITTEE)

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|--------------|------------------|
| F. P. Barton | V. G. Knecht     |
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| G. E. Feigel | T. G. McCarty    |
| O. F. Hedden | G. C. Millman    |
| M. H. Jawad  | R. A. Moen       |
| A. J. Justin | R. F. Reedy, Sr. |

### ADMINISTRATIVE COMMITTEE

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| R. W. Barnes                                | M. D. Rana     |
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| D. L. Berger                                | W. J. Sperko   |
| G. W. Hembree                               |                |

### MARINE CONFERENCE GROUP

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|---|-----------------|
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| J. S. Brzuszkiewicz, <i>Staff Secretary</i> | N. Prokopuk     |
| J. G. Hungerbuhler, Jr.                     | J. D. Reynolds  |

### CONFERENCE COMMITTEE

|  |   |
|--|---|
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| J. T. Amato — Minnesota                        | M. Mailman — Northwest Territories, Canada    |
| W. Anderson — Mississippi                      | D. E. Mallory — New Hampshire                 |
| R. D. Austin — Arizona                         | W. McGivney — City of New York, New York      |
| R. J. Brockman — Missouri                      | S. V. Nelson — Colorado                       |
| J. H. Burpee — Maine                           | A. K. Oda — Washington                        |
| M. Byrum — Alabama                             | M. Poehlmann — Alberta, Canada                |
| C. B. Cantrell — Nebraska                      | J. F. Porcella — West Virginia                |
| S. Chapman — Tennessee                         | C. F. Reyes — City of Los Angeles, California |
| D. C. Cook — California                        | M. J. Ryan — City of Chicago, Illinois        |
| B. J. Crawford — Georgia                       | D. Sandfoss — Nevada                          |
| E. L. Creaser — New Brunswick, Canada          | M. H. Sansone — New York                      |
| J. J. Dacanay — Hawaii                         | A. S. Scholl — British Columbia, Canada       |
| C. Dautrich — North Carolina                   | T. S. Seime — North Dakota                    |
| R. Delury — Manitoba, Canada                   | C. S. Selinger — Saskatchewan, Canada         |
| P. L. Dodge — Nova Scotia, Canada              | J. E. Sharier — Ohio                          |
| D. Eastman — Newfoundland and Labrador, Canada | N. Smith — Pennsylvania                       |
| J. J. Esch — Delaware                          | R. Spiker — North Carolina                    |
| A. G. Frazier — Florida                        | D. J. Stenrose — Michigan                     |
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| D. R. Hannon — Arkansas                        | R. K. Sturm — Utah                            |
| E. G. Hilton — Virginia                        | S. R. Townsend — Prince Edward Island, Canada |
| C. Jackson — City of Detroit, Michigan         | R. D. Troutt — Texas                          |
| M. L. Jordan — Kentucky                        | M. C. Vogel — Illinois                        |
| E. Kawa, Jr. — Massachusetts                   | T. Waldbillig — Wisconsin                     |
| A. Khssassi — Quebec, Canada                   | M. Washington — New Jersey                    |
| J. Klug — City of Milwaukee, Wisconsin         |   |
| K. J. Kraft — Maryland                         |   |
| K. S. Lane — Alaska                            |   |
| L. C. Leet — City of Seattle, Washington       |   |

### INTERNATIONAL INTEREST REVIEW GROUP

|              |                    |
|--------------|--------------------|
| V. Felix     | C. Minu            |
| Y.-G. Kim    | T. S. G. Narayanan |
| S. H. Leong  | Y.-W. Park         |
| W. Lin       | A. R. R. Nogales   |
| O. F. Manafa | P. Williamson      |

**COMMITTEE ON POWER BOILERS (BPV I)**

|                                     |   |
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| U. D'Urso, <i>Staff Secretary</i>   | J. T. Pillow                              |
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| K. K. Coleman                       | D. E. Tompkins                            |
| P. D. Edwards                       | D. E. Tuttle                              |
| J. G. Feldstein                     | J. Vattappilly                            |
| G. W. Galanes                       | R. V. Wielgoszinski                       |
| T. E. Hansen                        | F. Zeller                                 |
| J. F. Henry                         | Y. Li, <i>Delegate</i>                    |
| J. S. Hunter                        | H. Michael, <i>Delegate</i>               |
| G. B. Komora                        | B. W. Roberts, <i>Contributing Member</i> |
| W. L. Lowry                         | D. N. French, <i>Honorary Member</i>      |
| F. Massi                            | T. C. McGough, <i>Honorary Member</i>     |
| L. Moedinger                        | R. L. Williams, <i>Honorary Member</i>    |
| P. A. Molvie                        |   |

**Subgroup on Design (BPV I)**

|                                  |  |
|----------------------------------|--|
| J. Vattappilly, <i>Chair</i>     | P. A. Molvie                                 |
| D. I. Anderson, <i>Secretary</i> | L. S. Tsai                                   |
| D. Dewees                        | M. Wadkinson                                 |
| H. A. Fonzi, Jr.                 | C. F. Jeerings, <i>Contributing Member</i>   |
| J. P. Glaspie                    | S. V. Torkildson, <i>Contributing Member</i> |
| G. B. Komora                     |  |

**Subgroup on Fabrication and Examination (BPV I)**

|                            |                     |
|----------------------------|---------------------|
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| P. Becker                  | C. T. McDaris       |
| D. L. Berger               | R. E. McLaughlin    |
| S. Fincher                 | R. J. Newell        |
| G. W. Galanes              | Y. Oishi            |
| P. F. Gilston              | J. T. Pillow        |
| J. Hainsworth              | R. V. Wielgoszinski |

**Subgroup on General Requirements and Piping (BPV I)**

|                                |  |
|--------------------------------|--|
| E. M. Ortman, <i>Chair</i>     | R. E. McLaughlin                             |
| D. Tompkins, <i>Vice Chair</i> | B. J. Mollitor                               |
| F. Massi, <i>Secretary</i>     | J. T. Pillow                                 |
| P. Becker                      | D. E. Tuttle                                 |
| D. L. Berger                   | M. Wadkinson                                 |
| P. D. Edwards                  | R. V. Wielgoszinski                          |
| G. W. Galanes                  | C. F. Jeerings, <i>Contributing Member</i>   |
| T. E. Hansen                   | S. V. Torkildson, <i>Contributing Member</i> |
| M. Lemmons                     | R. Uebel, <i>Contributing Member</i>         |
| W. L. Lowry                    |  |

**Subgroup on Locomotive Boilers (BPV I)**

|                                |                |
|--------------------------------|----------------|
| L. Moedinger, <i>Chair</i>     | S. D. Jackson  |
| S. M. Butler, <i>Secretary</i> | M. A. Janssen  |
| P. Boschan                     | S. A. Lee      |
| J. R. Braun                    | G. M. Ray      |
| R. C. Franzen, Jr.             | R. B. Stone    |
| G. W. Galanes                  | M. W. Westland |
| D. W. Griner                   |                |

**Subgroup on Materials (BPV I)**

|                                |   |
|--------------------------------|---|
| G. W. Galanes, <i>Chair</i>    | F. Masuyama                               |
| J. F. Henry, <i>Vice Chair</i> | D. W. Raho                                |
| M. Lewis, <i>Secretary</i>     | J. M. Tanzosh                             |
| S. H. Bowes                    | J. Vattappilly                            |
| D. A. Canonico                 | F. Zeller                                 |
| K. K. Coleman                  | M. Gold, <i>Contributing Member</i>       |
| K. L. Hayes                    | B. W. Roberts, <i>Contributing Member</i> |
| J. S. Hunter                   |   |
| O. X. Li                       |   |

**Subgroup on Solar Boilers (BPV I)**

|                                |  |
|--------------------------------|--|
| E. M. Ortman, <i>Chair</i>     | F. Jennings                                  |
| R. E. Hearne, <i>Secretary</i> | D. J. Koza                                   |
| H. A. Fonzi, Jr.               | F. Massi                                     |
| G. W. Galanes                  | S. V. Torkildson, <i>Contributing Member</i> |
| J. S. Hunter                   |  |

**Germany International Working Group (BPV I)**

|                                 |  |
|---------------------------------|--|
| H. Michael, <i>Chair</i>        | T. Ludwig                                    |
| H. P. Schmitz, <i>Secretary</i> | R. A. Meyers                                 |
| M. Bremicker                    | F. Miunske                                   |
| P. Chavdarov                    | P. Paluszkiwicz                              |
| B. Daume                        | H. Schroeder                                 |
| J. Fleischfresser               | A. Spangenberg                               |
| E. Helmholdt                    | M. Sykora                                    |
| R. Kauer                        | J. Henrichsmeyer, <i>Contributing Member</i> |
| S. Krebs                        |  |

**India International Working Group (BPV I)**

|                                |                  |
|--------------------------------|------------------|
| U. Revisanakaran, <i>Chair</i> | G. V. S. Rao     |
| A. J. Patil, <i>Vice Chair</i> | M. G. Rao        |
| H. Dalal, <i>Secretary</i>     | N. Satheesan     |
| K. Asokkumar                   | G. U. Shanker    |
| M. R. Kalahasthi               | D. Shrivastava   |
| I. Kalyanasundaram             | S. Venkataramana |
| A. R. Patil                    |                  |

**Task Group on Modernization of BPVC Section I**

|                                   |                  |
|-----------------------------------|------------------|
| D. I. Anderson, <i>Chair</i>      | R. E. McLaughlin |
| U. D'Urso, <i>Staff Secretary</i> | P. A. Molvie     |
| J. L. Arnold                      | E. M. Ortman     |
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| C. J. Johns                   | W. Ren        |
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K. A. Kavanagh  
Y.-S. Kim

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J. Rogers  
D. J. Roszman  
C. T. Smith  
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D. T. Meisch  
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E. C. Renaud  
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E. C. Renaud  
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C. Jones  
O. Jovall  
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| O. Jovall                     | F. Lin, <i>Contributing Member</i>       |
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| V. Broz                           | A. B. Meichler, <i>Contributing Member</i>  |
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| K. Kim                            | C. Waldon                                |
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**Working Group on Magnets (BPV III-4)**

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**Working Group on Materials (BPV III-4)**

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**Working Group on Vacuum Vessels (BPV III-4)**

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| M. W. Davies                    | L. Shi, <i>Contributing Member</i> |
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**Working Group on High Temperature Gas-Cooled Reactors (BPV III-5)**

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| E. V. Imbro                   | G. L. Zeng                         |
| R. I. Jetter                  | X. Li, <i>Contributing Member</i>  |
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**Working Group on High Temperature Liquid-Cooled Reactors (BPV III-5)**

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| H. J. Kim                      | H. Park      |
| J. Kim                         | J.-S. Park   |
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|                            |            |
|----------------------------|------------|
| M. Wadkinson, <i>Chair</i> | J. A. Hall |
| J. Calland                 | A. Heino   |
| J. M. Downs                | B. J. Iske |

**Subgroup on Water Heaters (BPV IV)**

|                          |              |
|--------------------------|--------------|
| J. Calland, <i>Chair</i> | R. E. Olson  |
| L. Badziagowski          | M. A. Taylor |
| J. P. Chicoine           | T. E. Trant  |
| C. Dinic                 | R. D. Troutt |
| B. J. Iske               |              |

**Subgroup on Welded Boilers (BPV IV)**

|                            |                     |
|----------------------------|---------------------|
| P. A. Molvie, <i>Chair</i> | J. L. Kleiss        |
| L. Badziagowski            | R. E. Olson         |
| T. L. Bedeaux              | G. Scribner         |
| B. Calderon                | R. D. Troutt        |
| J. Calland                 | M. Wadkinson        |
| C. Dinic                   | R. V. Wielgoszinski |

**COMMITTEE ON NONDESTRUCTIVE EXAMINATION (BPV V)**

|   |   |
|---|---|
| G. W. Hembree, <i>Chair</i>                 | R. W. Kruzic                            |
| F. B. Kovacs, <i>Vice Chair</i>             | C. May                                  |
| J. S. Brzuszkiewicz, <i>Staff Secretary</i> | A. B. Nagel                             |
| S. J. Akrin                                 | T. L. Plasek                            |
| J. E. Batey                                 | F. J. Sattler                           |
| P. L. Brown                                 | P. B. Shaw                              |
| M. A. Burns                                 | G. M. Gatti, <i>Delegate</i>            |
| B. Caccamise                                | X. Guiping, <i>Delegate</i>             |
| C. Emslander                                | A. S. Birks, <i>Contributing Member</i> |
| N. Y. Faransso                              | J. Bennett, <i>Alternate</i>            |
| N. A. Finney                                | H. C. Graber, <i>Honorary Member</i>    |
| A. F. Garbolevsky                           | O. F. Hedden, <i>Honorary Member</i>    |
| J. F. Halley                                | J. R. MacKay, <i>Honorary Member</i>    |
| J. W. Houf                                  | T. G. McCarty, <i>Honorary Member</i>   |
| S. A. Johnson                               |   |

**Executive Committee (BPV V)**

|   |                |
|---|----------------|
| F. B. Kovacs, <i>Chair</i>                  | N. Y. Faransso |
| G. W. Hembree, <i>Vice Chair</i>            | N. A. Finney   |
| J. S. Brzuszkiewicz, <i>Staff Secretary</i> | S. A. Johnson  |
| J. E. Batey                                 | A. B. Nagel    |
| B. Caccamise                                |                |

**Subgroup on General Requirements/Personnel Qualifications and Inquiries (BPV V)**

|                               |  |
|-------------------------------|--|
| C. Emslander, <i>Chair</i>    | S. A. Johnson                                |
| J. W. Houf, <i>Vice Chair</i> | F. B. Kovacs                                 |
| S. J. Akrin                   | D. I. Morris                                 |
| J. E. Batey                   | A. B. Nagel                                  |
| N. Carter                     | A. S. Birks, <i>Contributing Member</i>      |
| N. Y. Faransso                | J. P. Swezy, Jr., <i>Contributing Member</i> |
| N. A. Finney                  |  |
| G. W. Hembree                 |  |

**Special Working Group on NDE Resource Support (SG-GR/PQ & I)  
(BPV V)**

|                            |                    |
|----------------------------|--------------------|
| N. A. Finney, <i>Chair</i> | R. Kelso           |
| D. Adkins                  | C. Magruder        |
| J. Anderson                | J. W. Mefford, Jr. |
| D. Bajula                  | K. Page            |
| J. Bennett                 | D. Tompkins        |
| C. T. Brown                | D. Van Allen       |
| T. Clausing                | T. Vidimos         |
| J. L. Garner               | R. Ward            |
| K. Hayes                   | M. Wolf            |

**Subgroup on Surface Examination Methods (BPV V)**

|                              |   |
|------------------------------|---|
| S. A. Johnson, <i>Chair</i>  | G. W. Hembree                           |
| J. Halley, <i>Vice Chair</i> | R. W. Kruzic                            |
| S. J. Akrin                  | B. D. Laite                             |
| J. E. Batey                  | C. May                                  |
| P. L. Brown                  | L. E. Mullins                           |
| B. Caccamise                 | A. B. Nagel                             |
| N. Carter                    | F. J. Sattler                           |
| N. Y. Faransso               | P. B. Shaw                              |
| N. Farenbaugh                | G. M. Gatti, <i>Delegate</i>            |
| N. A. Finney                 | A. S. Birks, <i>Contributing Member</i> |

**Subgroup on Volumetric Methods (BPV V)**

|                                 |                              |
|---------------------------------|------------------------------|
| A. B. Nagel, <i>Chair</i>       | G. W. Hembree                |
| N. A. Finney, <i>Vice Chair</i> | S. A. Johnson                |
| S. J. Akrin                     | F. B. Kovacs                 |
| J. E. Batey                     | R. W. Kruzic                 |
| P. L. Brown                     | C. May                       |
| B. Caccamise                    | L. E. Mullins                |
| J. M. Davis                     | T. L. Plasek                 |
| N. Y. Faransso                  | F. J. Sattler                |
| A. F. Garbolevsky               | C. Vorwald                   |
| J. F. Halley                    | G. M. Gatti, <i>Delegate</i> |
| R. W. Hardy                     |                              |

**Working Group on Acoustic Emissions (SG-VM) (BPV V)**

|                                |              |
|--------------------------------|--------------|
| N. Y. Faransso, <i>Chair</i>   | S. R. Doctor |
| J. E. Batey, <i>Vice Chair</i> | R. K. Miller |

**Working Group on Radiography (SG-VM) (BPV V)**

|                                 |               |
|---------------------------------|---------------|
| B. Caccamise, <i>Chair</i>      | G. W. Hembree |
| F. B. Kovacs, <i>Vice Chair</i> | S. A. Johnson |
| S. J. Akrin                     | R. W. Kruzic  |
| J. E. Batey                     | B. D. Laite   |
| P. L. Brown                     | C. May        |
| C. Emslander                    | R. J. Mills   |
| N. Y. Faransso                  | A. B. Nagel   |
| A. F. Garbolevsky               | T. L. Plasek  |
| R. W. Hardy                     | B. White      |

**Working Group on Ultrasonics (SG-VM) (BPV V)**

|                                 |               |
|---------------------------------|---------------|
| N. A. Finney, <i>Chair</i>      | R. W. Kruzic  |
| J. F. Halley, <i>Vice Chair</i> | B. D. Laite   |
| B. Caccamise                    | C. May        |
| J. M. Davis                     | L. E. Mullins |
| C. Emslander                    | A. B. Nagel   |
| N. Y. Faransso                  | F. J. Sattler |
| P. T. Hayes                     | C. Vorwald    |
| S. A. Johnson                   |               |

**Working Group on Guided Wave Ultrasonic Testing (SG-VM) (BPV V)**

|                                |               |
|--------------------------------|---------------|
| N. Y. Faransso, <i>Chair</i>   | S. A. Johnson |
| J. E. Batey, <i>Vice Chair</i> | G. M. Light   |
| D. Alleyne                     | P. Mudge      |
| N. Amir                        | M. J. Quarry  |
| J. F. Halley                   | J. Vanvelsor  |

**Italy International Working Group (BPV V)**

|                             |  |
|-----------------------------|--|
| P. L. Dinelli, <i>Chair</i> | M. A. Grimoldi                           |
| A. Veroni, <i>Secretary</i> | G. Luoni                                 |
| R. Bertolotti               | O. Oldani                                |
| F. Bresciani                | P. Pedersoli                             |
| G. Campos                   | A. Tintori                               |
| N. Caputo                   | M. Zambon                                |
| M. Colombo                  | G. Gobbi, <i>Contributing Member</i>     |
| F. Ferrarese                | G. Pontiggia, <i>Contributing Member</i> |
| E. Ferrari                  |  |

**COMMITTEE ON PRESSURE VESSELS (BPV VIII)**

|                                     |   |
|-------------------------------------|---|
| R. J. Basile, <i>Chair</i>          | G. B. Rawls, Jr.                          |
| S. C. Roberts, <i>Vice Chair</i>    | F. L. Richter                             |
| E. Lawson, <i>Staff Secretary</i>   | C. D. Rodery                              |
| S. J. Rossi, <i>Staff Secretary</i> | E. Soltow                                 |
| G. Auriolles, Sr.                   | J. C. Sowinski                            |
| J. Cameron                          | D. B. Stewart                             |
| A. Chaudouet                        | D. A. Swanson                             |
| D. B. DeMichael                     | J. P. Swezy, Jr.                          |
| J. P. Gaspie                        | S. Terada                                 |
| J. F. Grubb                         | E. Uptis                                  |
| L. E. Hayden, Jr.                   | R. Duan, <i>Delegate</i>                  |
| G. G. Karcher                       | P. A. McGowan, <i>Delegate</i>            |
| D. L. Kurle                         | H. Michael, <i>Delegate</i>               |
| K. T. Lau                           | K. Oyamada, <i>Delegate</i>               |
| M. D. Lower                         | M. E. Papponetti, <i>Delegate</i>         |
| R. Mahadeen                         | X. Tang, <i>Delegate</i>                  |
| R. W. Mikitka                       | M. Gold, <i>Contributing Member</i>       |
| U. R. Miller                        | W. S. Jacobs, <i>Contributing Member</i>  |
| B. R. Morelock                      | K. Mokhtarian, <i>Contributing Member</i> |
| T. P. Pastor                        |   |
| D. T. Peters                        |   |
| M. J. Pischke                       |   |
| M. D. Rana                          |   |

**Subgroup on Design (BPV VIII)**

|                                   |   |
|-----------------------------------|---|
| D. A. Swanson, <i>Chair</i>       | M. D. Rana                                |
| J. C. Sowinski, <i>Vice Chair</i> | G. B. Rawls, Jr.                          |
| M. Faulkner, <i>Secretary</i>     | S. C. Roberts                             |
| G. Auriolles, Sr.                 | C. D. Rodery                              |
| S. R. Babka                       | T. G. Seipp                               |
| O. A. Barsky                      | D. Srnica                                 |
| R. J. Basile                      | S. Terada                                 |
| M. R. Breach                      | J. Vattappilly                            |
| F. L. Brown                       | R. A. Whipple                             |
| D. Chandiramani                   | K. Xu                                     |
| B. F. Hantz                       | K. Oyamada, <i>Delegate</i>               |
| C. E. Hinnant                     | M. E. Papponetti, <i>Delegate</i>         |
| C. S. Hinson                      | W. S. Jacobs, <i>Contributing Member</i>  |
| M. H. Jawad                       | P. K. Lam, <i>Contributing Member</i>     |
| D. L. Kurle                       | K. Mokhtarian, <i>Contributing Member</i> |
| M. D. Lower                       |   |
| R. W. Mikitka                     |   |
| U. R. Miller                      |   |
| T. P. Pastor                      |   |

**Working Group on Design-By-Analysis (BPV VIII)**

|                                |                                       |
|--------------------------------|---------------------------------------|
| B. F. Hantz, <i>Chair</i>      | S. Krishnamurthy                      |
| T. W. Norton, <i>Secretary</i> | A. Mann                               |
| R. G. Brown                    | G. A. Miller                          |
| D. Dewees                      | C. Nadarajah                          |
| R. D. Dixon                    | P. Prueter                            |
| Z. Gu                          | M. D. Rana                            |
| C. F. Heberling II             | T. G. Seipp                           |
| C. E. Hinnant                  | M. A. Shah                            |
| R. Jain                        | S. Terada                             |
| M. H. Jawad                    | D. Arnett, <i>Contributing Member</i> |

**Task Group on U-2(g) (BPV VIII)**

|                    |                                       |
|--------------------|---------------------------------------|
| G. Aurioles, Sr.   | R. F. Reedy, Sr.                      |
| S. R. Babka        | S. C. Roberts                         |
| R. J. Basile       | M. A. Shah                            |
| D. K. Chandiramani | D. Srnic                              |
| R. Mahadeen        | D. A. Swanson                         |
| U. R. Miller       | J. P. Swezy, Jr.                      |
| T. W. Norton       | R. Uebel                              |
| T. P. Pastor       | K. K. Tam, <i>Contributing Member</i> |

**Subgroup on Fabrication and Examination (BPV VIII)**

|                                  |  |
|----------------------------------|--|
| J. P. Swezy, Jr., <i>Chair</i>   | B. F. Shelley                              |
| D. I. Morris, <i>Vice Chair</i>  | P. L. Sturgill                             |
| E. A. Whittle, <i>Vice Chair</i> | E. Uptis                                   |
| B. R. Morelock, <i>Secretary</i> | K. Oyamada, <i>Delegate</i>                |
| N. Carter                        | W. J. Bees, <i>Contributing Member</i>     |
| S. Flynn                         | L. F. Campbell, <i>Contributing Member</i> |
| S. Heater                        | W. S. Jacobs, <i>Contributing Member</i>   |
| O. Mulet                         | J. Lee, <i>Contributing Member</i>         |
| M. J. Pischke                    | R. Uebel, <i>Contributing Member</i>       |
| M. J. Rice                       |  |
| C. D. Rodery                     |  |

**Subgroup on Heat Transfer Equipment (BPV VIII)**

|                                 |  |
|---------------------------------|--|
| G. Aurioles, Sr., <i>Chair</i>  | U. R. Miller                               |
| S. R. Babka, <i>Vice Chair</i>  | D. Srnic                                   |
| P. Matkovichs, <i>Secretary</i> | A. M. Voytko                               |
| D. Angstadt                     | R. P. Wiberg                               |
| M. Bahadori                     | I. G. Campbell, <i>Contributing Member</i> |
| J. H. Barbee                    | I. Garcia, <i>Contributing Member</i>      |
| O. A. Barsky                    | J. Mauritz, <i>Contributing Member</i>     |
| L. Bower                        | T. W. Norton, <i>Contributing Member</i>   |
| A. Chaudouet                    | F. Osweiller, <i>Contributing Member</i>   |
| M. D. Clark                     | J. Pasek, <i>Contributing Member</i>       |
| S. Jeyakumar                    | R. Tiwari, <i>Contributing Member</i>      |
| G. G. Karcher                   | S. Yokell, <i>Contributing Member</i>      |
| D. L. Kurle                     | S. M. Caldwell, <i>Honorary Member</i>     |
| R. Mahadeen                     |  |
| S. Mayeux                       |  |

**Subgroup on General Requirements (BPV VIII)**

|                                  |   |
|----------------------------------|---|
| M. D. Lower, <i>Chair</i>        | K. T. Lau                               |
| J. P. Glaspie, <i>Vice Chair</i> | T. P. Pastor                            |
| F. L. Richter, <i>Secretary</i>  | S. C. Roberts                           |
| R. J. Basile                     | J. C. Sowinski                          |
| D. T. Davis                      | P. Speranza                             |
| D. B. DeMichael                  | D. B. Stewart                           |
| M. Faulkner                      | D. A. Swanson                           |
| F. Hamtak                        | R. Uebel                                |
| L. E. Hayden, Jr.                | C. C. Neely, <i>Contributing Member</i> |

**Task Group on Plate Heat Exchangers (BPV VIII)**

|                             |               |
|-----------------------------|---------------|
| P. Matkovichs, <i>Chair</i> | R. Mahadeen   |
| S. R. Babka                 | D. I. Morris  |
| K. Devlin                   | M. J. Pischke |
| S. Flynn                    | C. M. Romero  |
| J. F. Grubb                 | E. Soltow     |
| F. Hamtak                   | D. Srnic      |

**Task Group on Subsea Applications (BPV VIII)**

|                         |  |
|-------------------------|--|
| R. Cordes, <i>Chair</i> | F. Kirkemo                               |
| L. P. Antalffy          | C. Lan                                   |
| R. C. Biel              | N. McKie                                 |
| P. Bunch                | S. K. Parimi                             |
| J. Ellens               | M. Sarzynski                             |
| S. Harbert              | Y. Wada                                  |
| X. Kaculi               | D. T. Peters, <i>Contributing Member</i> |
| K. Karpanan             |  |

**Subgroup on High Pressure Vessels (BPV VIII)**

|   |   |
|---|---|
| D. T. Peters, <i>Chair</i>              | E. A. Rodriguez                           |
| G. M. Mital, <i>Vice Chair</i>          | E. D. Roll                                |
| A. P. Maslowski, <i>Staff Secretary</i> | K. C. Simpson, Jr.                        |
| L. P. Antalffy                          | J. R. Sims                                |
| R. C. Biel                              | D. L. Stang                               |
| P. N. Chaku                             | F. W. Tatar                               |
| R. Cordes                               | S. Terada                                 |
| R. D. Dixon                             | J. L. Traud                               |
| L. Fridlund                             | R. Wink                                   |
| R. T. Hallman                           | K.-J. Young                               |
| A. H. Honza                             | R. M. Hoshman, <i>Contributing Member</i> |
| J. A. Kapp                              | D. J. Burns, <i>Honorary Member</i>       |
| J. Keltjens                             | D. M. Fryer, <i>Honorary Member</i>       |
| A. K. Khare                             | G. J. Mraz, <i>Honorary Member</i>        |
| N. McKie                                | E. H. Perez, <i>Honorary Member</i>       |
| S. C. Mordre                            |   |
| G. T. Nelson                            |   |

**Task Group on UG-20(f) (BPV VIII)**

|                                |               |
|--------------------------------|---------------|
| S. Krishnamurthy, <i>Chair</i> | B. R. Macejko |
| T. Anderson                    | J. Penso      |
| K. Bagnoli                     | M. Prager     |
| R. P. Deubler                  | M. D. Rana    |
| B. F. Hantz                    |               |

**Subgroup on Materials (BPV VIII)**

|                                     |  |
|-------------------------------------|--|
| J. Cameron, <i>Chair</i>            | D. W. Rahoi                                |
| P. G. Wittenbach, <i>Vice Chair</i> | R. C. Sutherland                           |
| K. Xu, <i>Secretary</i>             | E. Uptis                                   |
| A. Di Rienzo                        | G. S. Dixit, <i>Contributing Member</i>    |
| J. D. Fritz                         | M. Gold, <i>Contributing Member</i>        |
| J. F. Grubb                         | M. Katcher, <i>Contributing Member</i>     |
| M. Kowalczyk                        | J. A. McMaster, <i>Contributing Member</i> |
| W. M. Lundy                         | E. G. Nisbett, <i>Contributing Member</i>  |
| J. Penso                            |  |

**Italy International Working Group (BPV VIII)**

|                             |                                      |
|-----------------------------|--------------------------------------|
| G. Pontiggia, <i>Chair</i>  | M. Guglielmetti                      |
| A. Veroni, <i>Secretary</i> | P. Mantovani                         |
| B. G. Alborali              | M. Massobrio                         |
| P. Angelini                 | L. Moracchioli                       |
| R. Boatti                   | C. Sangaletti                        |
| A. Camanni                  | S. Sarti                             |
| P. Conti                    | A. Teli                              |
| P. L. Dinelli               | I. Venier                            |
| F. Finco                    | G. Gobbi, <i>Contributing Member</i> |

**Subgroup on Toughness (BPV II & BPV VIII)**

|                           |   |
|---------------------------|---|
| D. L. Kurle, <i>Chair</i> | J. P. Swezy, Jr.                          |
| K. Xu, <i>Vice Chair</i>  | S. Terada                                 |
| N. Carter                 | E. Uptis                                  |
| W. S. Jacobs              | J. Vattappilly                            |
| K. E. Orié                | K. Oyamada, <i>Delegate</i>               |
| M. D. Rana                | K. Mokhtarian, <i>Contributing Member</i> |
| F. L. Richter             | C. C. Neely, <i>Contributing Member</i>   |
| K. Subramanian            |   |
| D. A. Swanson             |   |

**Special Working Group on Bolted Flanged Joints (BPV VIII)**

|                             |                  |
|-----------------------------|------------------|
| R. W. Mikitka, <i>Chair</i> | J. R. Payne      |
| W. Brown                    | G. B. Rawls, Jr. |
| H. Chen                     | M. S. Shelton    |
| W. J. Koves                 |                  |

**Subgroup on Graphite Pressure Equipment (BPV VIII)**

|                       |               |
|-----------------------|---------------|
| A. Viet, <i>Chair</i> | C. W. Cary    |
| G. C. Becherer        | E. Soltow     |
| F. L. Brown           | A. A. Stupica |

**Working Group on Design (BPV VIII Div. 3)**

|                          |  |
|--------------------------|--|
| E. D. Roll, <i>Chair</i> | K. C. Simpson                          |
| C. Becht V               | J. R. Sims                             |
| R. C. Biel               | D. L. Stang                            |
| R. Cordes                | K. Subramanian                         |
| R. D. Dixon              | S. Terada                              |
| L. Fridlund              | J. L. Traud                            |
| R. T. Hallman            | R. Wink                                |
| K. Karpanan              | Y. Xu                                  |
| J. Keltjens              | F. Kirkemo, <i>Contributing Member</i> |
| N. McKie                 | D. J. Burns, <i>Honorary Member</i>    |
| G. M. Mital              | D. M. Fryer, <i>Honorary Member</i>    |
| S. C. Mordre             | G. J. Mraz, <i>Honorary Member</i>     |
| G. T. Nelson             | E. H. Perez, <i>Honorary Member</i>    |
| D. T. Peters             |  |

**China International Working Group (BPV VIII)**

|                            |          |
|----------------------------|----------|
| X. Chen, <i>Chair</i>      | D. Luo   |
| B. Shou, <i>Vice Chair</i> | Y. Luo   |
| Z. Fan, <i>Secretary</i>   | C. Miao  |
| Y. Chen                    | X. Qian  |
| Z. Chen                    | B. Wang  |
| J. Cui                     | F. Xu    |
| R. Duan                    | F. Xuan  |
| W. Guo                     | K. Zhang |
| B. Han                     | Y. Zhang |
| J. Hu                      | S. Zhao  |
| Q. Hu                      | J. Zheng |
| H. Hui                     | G. Zhu   |

**Working Group on Materials (BPV VIII Div. 3)**

|                           |             |
|---------------------------|-------------|
| F. W. Tatar, <i>Chair</i> | J. A. Kapp  |
| L. P. Antalffy            | A. K. Khare |
| P. N. Chaku               |             |

**Germany International Working Group (BPV VIII)**

|                                   |                  |
|-----------------------------------|------------------|
| P. Chavdarov, <i>Chair</i>        | D. Koelbl        |
| A. Spangenberg, <i>Vice Chair</i> | S. Krebs         |
| H. P. Schmitz, <i>Secretary</i>   | T. Ludwig        |
| B. Daume                          | R. A. Meyers     |
| A. Emrich                         | H. Michael       |
| J. Fleischfresser                 | P. Paluszkiewicz |
| A. Gastberg                       | H. Schroeder     |
| R. Helmholdt                      | M. Sykora        |
| R. Kauer                          |                  |

**Task Group on Impulsively Loaded Vessels (BPV VIII)**

|                               |  |
|-------------------------------|--|
| E. A. Rodriguez, <i>Chair</i> | R. A. Leishear                               |
| G. A. Antaki                  | P. O. Leslie                                 |
| J. K. Asahina                 | F. Ohlson                                    |
| D. D. Barker                  | C. Romero                                    |
| A. M. Clayton                 | N. Rushton                                   |
| J. E. Didlake, Jr.            | J. H. Stofleth                               |
| T. A. Duffey                  | Q. Dong, <i>Contributing Member</i>          |
| B. L. Haroldsen               | H.-P. Schildberg, <i>Contributing Member</i> |
| K. Hayashi                    | J. E. Shepherd, <i>Contributing Member</i>   |
| D. Hilding                    | M. Yip, <i>Contributing Member</i>           |
| K. W. King                    |  |
| R. Kitamura                   |  |

**Subgroup on Interpretations (BPV VIII)**

|                                   |  |
|-----------------------------------|--|
| U. R. Miller, <i>Chair</i>        | D. I. Morris                             |
| E. Lawson, <i>Staff Secretary</i> | D. T. Peters                             |
| G. Auriolos, Sr.                  | S. C. Roberts                            |
| R. J. Basile                      | C. D. Rodery                             |
| J. Cameron                        | D. B. Stewart                            |
| R. D. Dixon                       | P. L. Sturgill                           |
| M. Kowalczyk                      | D. A. Swanson                            |
| D. L. Kurle                       | J. P. Swezy, Jr.                         |
| M. D. Lower                       | J. Vattappilly                           |
| R. Mahadeen                       | P. G. Wittenbach                         |
| G. M. Mital                       | T. P. Pastor, <i>Contributing Member</i> |

**Subgroup on Plastic Fusing (BPV IX)**

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| M. Ghahremani               | M. J. Rice       |
| K. L. Hayes                 | S. Schuessler    |
| R. M. Jessee                | M. Troughton     |
| J. Johnston, Jr.            | J. Wright        |

**COMMITTEE ON WELDING, BRAZING, AND FUSING (BPV IX)**

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| P. D. Flenner                       | A. Roza, <i>Delegate</i>                    |
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| K. L. Hayes                         | S. A. Jones, <i>Contributing Member</i>     |
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| J. S. Lee                           | S. Raghunathan, <i>Contributing Member</i>  |
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| T. Melfi                            | M. L. Carpenter, <i>Honorary Member</i>     |
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| M. B. Sims                          |   |

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| P. D. Flenner                | P. L. Van Fosson                            |
| L. S. Harbison               | T. C. Wiesner                               |
| K. L. Hayes                  | A. D. Wilson                                |
| W. M. Lundy                  | D. Chandiramani, <i>Contributing Member</i> |
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| S. Raghunathan               |   |

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| L. F. Campbell              | A. R. Nywening    |
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| P. Angelini                 | M. Massobrio                         |
| R. Boatti                   | L. Moracchioli                       |
| P. L. Dinelli               | G. Pontiggia                         |
| F. Ferrarese                | S. Verderame                         |
| A. Ghidini                  | A. Volpi                             |
| E. Lazzari                  | G. Gobbi, <i>Contributing Member</i> |
| L. Lotti                    |                                      |

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| J. P. Bell                   | D. K. Peetz                           |
| D. A. Bowers                 | J. Pillow                             |
| G. Chandler                  | H. B. Porter                          |
| P. R. Evans                  | J. P. Swezy, Jr.                      |
| S. Flynn                     | K. R. Willens                         |
| P. Gilston                   | E. W. Woelfel                         |
| F. Hamtak                    | E. Molina, <i>Delegate</i>            |
| A. Howard                    | B. R. Newmark, <i>Honorary Member</i> |

**Subgroup on Materials (BPV IX)**

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| J. L. Arnold              | C. E. Sainz    |
| E. Cutlip                 | W. J. Sperko   |
| S. S. Fiore               | M. J. Stanko   |
| S. E. Gingrich            | P. L. Sturgill |
| L. S. Harbison            | J. Warren      |
| R. M. Jessee              | C. Zanfir      |
| T. Melfi                  |                |

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| D. R. Cordes                      | H. D. Chung, <i>Delegate</i>               |
| D. D. Davis                       | C. Ye, <i>Delegate</i>                     |
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| E. B. Gerlach                     | R. A. Yonekawa, <i>Contributing Member</i> |
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| J. Hakii                          | M. L. Benson, <i>Alternate</i>             |
| D. O. Henry                       | J. T. Lindberg, <i>Alternate</i>           |
| W. C. Holston                     | R. O. McGill, <i>Alternate</i>             |
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| D. R. Lee                         | C. D. Cowfer, <i>Honorary Member</i>       |
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| H. Chen                      | Z. S. Wang  |
| H. D. Chen                   | L. Wei      |
| Y. B. Guo                    | F. Xu       |
| Y. Hou                       | Z. Y. Xu    |
| D. M. Kang                   | Q. Yin      |
| S. W. Li                     | K. Zhang    |
| X. Y. Liang                  | X. L. Zhang |
| S. X. Lin                    | Y. Zhang    |
| L. Q. Liu                    | Z. M. Zhong |

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| R. Doring     | H. Schau       |
| B. Erhard     | H.-J. Scholtka |
| M. Hagenbruch | X. Schuler     |
| B. Hoffmann   | J. Wendt       |
| E. Iacopetta  |                |

**Special Working Group on Editing and Review (BPV XI)**

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| L. Powers, <i>Staff Secretary</i> | J. T. Lindberg                 |
| W. H. Bamford                     | R. K. Rhyne                    |
| R. L. Dyle                        | J. C. Spanner, Jr.             |
| M. J. Ferlisi                     | R. W. Swayne                   |
| E. B. Gerlach                     | M. L. Benson, <i>Alternate</i> |

**Task Group on Inspectability (BPV XI)**

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| D. R. Cordes                    | J. Ossmann     |
| D. O. Henry                     | R. Rishel      |
| E. Henry                        | S. A. Sabo     |
| J. Honcharik                    | P. Sullivan    |
| J. Howard                       | C. Thomas      |
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**Task Group on ISI of Spent Nuclear Fuel Storage and Transportation Containment Systems (BPV XI)**

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| J. Broussard                     | M. Orihuela                 |
| S. Brown                         | R. Pace                     |
| C. R. Bryan                      | E. L. Pleins                |
| T. Carraher                      | R. Sindelar                 |
| D. Dunn                          | H. Smith                    |
| N. Fales                         | J. C. Spanner, Jr.          |
| R. C. Folley                     | C. J. Temus                 |
| B. Gutherman                     | G. White                    |
| S. Horowitz                      | X. J. Zhai                  |
| M. W. Joseph                     | P.-S. Lam, <i>Alternate</i> |
| H. Jung                          | J. Wise, <i>Alternate</i>   |
| M. Liu                           |                             |

**Argentina International Working Group (BPV XI)**

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| A. Claus                            | L. R. Miño       |
| D. Costa                            | J. Monte         |
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| D. N. Dell'Erba                     | A. Politi        |
| A. Dominguez                        | C. G. Real       |
| S. A. Echeverria                    | F. M. Schroeter  |
| E. P. Fresquet                      | G. J. Scian      |
| M. M. Gamizo                        | M. J. Solari     |
| I. M. Guerreiro                     | P. N. Torano     |
| M. F. Liendo                        | O. A. Verastegui |
| F. Llorente                         | P. Yamamoto      |

**Subgroup on Evaluation Standards (SG-ES) (BPV XI)**

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| H. D. Chung                  | H. S. Mehta                    |
| R. C. Cipolla                | K. Miyazaki                    |
| R. L. Dyle                   | R. Pace                        |
| C. M. Faidy                  | J. C. Poehler                  |
| B. R. Ganta                  | S. Ranganath                   |
| T. J. Griesbach              | D. A. Scarth                   |
| K. Hasegawa                  | T. V. Vo                       |
| K. Hojo                      | K. R. Wichman                  |
| D. N. Hopkins                | S. X. Xu                       |
| K. Koyama                    | M. L. Benson, <i>Alternate</i> |
| D. R. Lee                    | T. Hardin, <i>Alternate</i>    |

**Task Group on Evaluation of Beyond Design Basis Events (SG-ES) (BPV XI)**

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| P. R. Donavin                 | T. V. Vo                              |
| R. G. Gilada                  | K. R. Wichman                         |
| T. J. Griesbach               | G. M. Wilkowski                       |
| H. L. Gustin                  | S. X. Xu                              |
| M. Hayashi                    | T. Weaver, <i>Contributing Member</i> |
| K. Hojo                       |                                       |

**Working Group on Flaw Evaluation (SG-ES) (BPV XI)**

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| M. Brumovsky                | K. Miyazaki                     |
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| T. E. Demers                | S. Ranganath                    |
| C. M. Faidy                 | P. J. Rush                      |
| B. R. Ganta                 | D. A. Scarth                    |
| R. G. Gilada                | W. L. Server                    |
| H. L. Gustin                | D.-J. Shim                      |
| F. D. Hayes                 | A. Udyawar                      |
| P. H. Hoang                 | T. V. Vo                        |
| K. Hojo                     | B. Wasiluk                      |
| D. N. Hopkins               | K. R. Wichman                   |
| Y. Kim                      | G. M. Wilkowski                 |
| K. Koyama                   | D. L. Rudland, <i>Alternate</i> |
| V. Lacroix                  |                                 |

**Task Group on Crack Growth Reference Curves (BPV XI)**

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| M. L. Benson                   | D. R. Lee     |
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| R. C. Cipolla                  | K. Miyazaki   |
| R. L. Dyle                     | S. Ranganath  |
| K. Hasegawa                    | T. V. Vo      |

**Task Group on Evaluation Procedures for Degraded Buried Pipe (WG-PFE) (BPV XI)**

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| R. C. Cipolla              | R. Pace         |
| K. Hasegawa                | P. J. Rush      |
| K. M. Hoffman              | D. A. Scarth    |

**Working Group on Operating Plant Criteria (SG-ES) (BPV XI)**

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| M. Brumovsky                    | D. V. Sommerville           |
| T. L. Dickson                   | C. A. Tomes                 |
| R. L. Dyle                      | A. Udyawar                  |
| S. R. Gosselin                  | T. V. Vo                    |
| T. J. Griesbach                 | D. P. Weakland              |
| M. Hayashi                      | K. E. Woods                 |
| S. A. Kleinsmith                | H. Q. Xu                    |
| H. Kobayashi                    | T. Hardin, <i>Alternate</i> |
| H. S. Mehta                     |                             |

**Working Group on Pipe Flaw Evaluation (SG-ES) (BPV XI)**

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| M. Brumovsky                      | Y. S. Li                        |
| F. W. Brust                       | R. O. McGill                    |
| H. D. Chung                       | H. S. Mehta                     |
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| N. G. Cofie                       | K. Miyazaki                     |
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| T. E. Demers                      | H. Rathbun                      |
| C. M. Faidy                       | P. J. Rush                      |
| B. R. Ganta                       | D.-J. Shim                      |
| S. R. Gosselin                    | A. Udyawar                      |
| C. E. Guzman-Leong                | T. V. Vo                        |
| K. Hasegawa                       | B. Wasiluk                      |
| P. H. Hoang                       | S. X. Xu                        |
| K. Hojo                           | A. Alleswaram, <i>Alternate</i> |
| D. N. Hopkins                     |                                 |

**Subgroup on Nondestructive Examination (SG-NDE) (BPV XI)**

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| T. L. Chan                       | G. R. Perkins                |
| S. E. Cumblidge                  | S. A. Sabo                   |
| F. E. Dohmen                     | F. J. Schaaf, Jr.            |
| K. J. Hacker                     | R. V. Swain                  |
| J. Harrison                      | C. J. Wirtz                  |
| D. O. Henry                      | C. A. Nove, <i>Alternate</i> |

**Working Group on Personnel Qualification and Surface Visual and Eddy Current Examination (SG-NDE) (BPV XI)**

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| C. Brown, <i>Secretary</i>     | C. Shinsky         |
| S. E. Cumblidge                | J. C. Spanner, Jr. |
| A. Diaz                        | J. T. Timm         |
| N. Farenbaugh                  | C. J. Wirtz        |

**Task Group on Repair by Carbon Fiber Composites (WGN-MRR) (BPV XI)**

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| M. Golliet                     | V. Roy                        |
| L. S. Gordon                   | J. Sealey                     |
| M. P. Marohl                   | N. Stoeva                     |
| N. Meyer                       | M. F. Uddin                   |
| R. P. Ojdrovic                 | J. Wen                        |
| D. Peguero                     | T. Jimenez, <i>Alternate</i>  |
| A. Pridmore                    | G. M. Lupia, <i>Alternate</i> |

**Working Group on Procedure Qualification and Volumetric Examination (SG-NDE) (BPV XI)**

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| G. R. Perkins, <i>Secretary</i> | D. A. Kull      |
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| M. Briley                       | D. Nowakowski   |
| A. Bushmire                     | S. A. Sabo      |
| D. R. Cordes                    | R. V. Swain     |
| M. Dennis                       | S. J. Todd      |
| S. R. Doctor                    | D. K. Zimmerman |

**Working Group on Design and Programs (SG-RRA) (BPV XI)**

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| A. B. Meichler, <i>Secretary</i> | M. A. Pyne      |
| O. Bhatti                        | P. Raynaud      |
| R. Clow                          | R. R. Stevenson |
| R. R. Croft                      | R. W. Swayne    |
| E. V. Farrell, Jr.               | R. Turner       |
| E. B. Gerlach                    |                 |

**Subgroup on Repair/Replacement Activities (SG-RRA) (BPV XI)**

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| E. V. Farrell, Jr., <i>Secretary</i> | S. Schuessler                |
| J. F. Ball                           | R. R. Stevenson              |
| S. B. Brown                          | R. W. Swayne                 |
| R. Clow                              | D. J. Tilly                  |
| P. D. Fisher                         | D. E. Waskey                 |
| K. J. Karwoski                       | J. G. Weicks                 |
| S. L. McCracken                      | P. Raynaud, <i>Alternate</i> |
| B. R. Newton                         |                              |

**Subgroup on Water-Cooled Systems (SG-WCS) (BPV XI)**

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| J. M. Boughman                | T. Nomura                       |
| S. B. Brown                   | T. Nuoffer                      |
| S. T. Chesworth               | G. C. Park                      |
| D. D. Davis                   | H. M. Stephens, Jr.             |
| H. Q. Do                      | M. J. Homiack, <i>Alternate</i> |
| M. J. Ferlisi                 |                                 |

**Task Group on High Strength Nickel Alloys Issues (SG-WCS) (BPV XI)**

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| R. L. Dyle, <i>Chair</i>           | H. Malikowski      |
| B. L. Montgomery, <i>Secretary</i> | S. E. Marlette     |
| W. H. Bamford                      | G. C. Park         |
| P. R. Donavin                      | G. R. Poling       |
| K. Hoffman                         | J. M. Shuping      |
| K. Koyama                          | J. C. Spanner, Jr. |
| C. Lohse                           | D. P. Weakland     |

**Working Group on Welding and Special Repair Processes (SG-RRA) (BPV XI)**

|                               |                  |
|-------------------------------|------------------|
| D. E. Waskey, <i>Chair</i>    | M. Kris          |
| D. J. Tilly, <i>Secretary</i> | S. L. McCracken  |
| D. Barborak                   | D. B. Meredith   |
| S. J. Findlan                 | B. R. Newton     |
| P. D. Fisher                  | J. E. O'Sullivan |
| M. L. Hall                    | D. Segletes      |
| K. J. Karwoski                | J. G. Weicks     |
| C. C. Kim                     |                  |

**Working Group on Containment (SG-WCS) (BPV XI)**

|                                   |                                 |
|-----------------------------------|---------------------------------|
| H. M. Stephens, Jr., <i>Chair</i> | J. McIntyre                     |
| S. G. Brown, <i>Secretary</i>     | J. A. Munshi                    |
| P. S. Ghosal                      | M. Sircar                       |
| H. T. Hill                        | S. Walden, <i>Alternate</i>     |
| R. D. Hough                       | T. J. Herrity, <i>Alternate</i> |
| B. Lehman                         |                                 |

**Working Group on Nonmetals Repair/Replacement Activities (SG-RRA) (BPV XI)**

|                                 |                   |
|---------------------------------|-------------------|
| J. E. O'Sullivan, <i>Chair</i>  | T. M. Musto       |
| S. Schuessler, <i>Secretary</i> | S. Patterson      |
| J. Johnston, Jr.                | A. Pridmore       |
| M. Lashley                      | P. Raynaud        |
| M. P. Marohl                    | F. J. Schaaf, Jr. |

**Working Group on Inspection of Systems and Components (SG-WCS) (BPV XI)**

|                               |                |
|-------------------------------|----------------|
| M. J. Ferlisi, <i>Chair</i>   | S. D. Kulat    |
| N. Granback, <i>Secretary</i> | A. Lee         |
| J. M. Agold                   | G. J. Navratil |
| R. W. Blyde                   | T. Nomura      |
| C. Cueto-Felgueroso           | J. C. Nygaard  |
| H. Q. Do                      | R. Rishel      |
| K. W. Hall                    | J. C. Younger  |
| K. M. Hoffman                 |                |

**Working Group on Pressure Testing (SG-WCS) (BPV XI)**

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|--------------------------------|------------------|
| J. M. Boughman, <i>Chair</i>   | A. E. Keyser     |
| S. A. Norman, <i>Secretary</i> | D. W. Lamond     |
| T. Anselmi                     | J. K. McClanahan |
| Y.-K. Chung                    | B. L. Montgomery |
| M. J. Homiack                  | C. Thomas        |

**Task Group on Buried Components Inspection and Testing (WG-PT) (BPV XI)**

|                                  |              |
|----------------------------------|--------------|
| D. W. Lamond, <i>Chair</i>       | B. Davenport |
| J. M. Boughman, <i>Secretary</i> | A. Hiser     |
| M. Moenssens, <i>Secretary</i>   | J. Ossmann   |
| T. Anselmi                       |              |

**Working Group on Risk-Informed Activities (SG-WCS) (BPV XI)**

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|-----------------------------------|----------------|
| M. A. Pyne, <i>Chair</i>          | D. W. Lamond   |
| S. T. Chesworth, <i>Secretary</i> | R. K. Mattu    |
| J. M. Agold                       | A. McNeill III |
| C. Cueto-Felgueroso               | G. J. Navratil |
| R. Haessler                       | P. J. O'Regan  |
| J. Hakii                          | N. A. Palm     |
| K. W. Hall                        | D. Vetter      |
| M. J. Homiack                     | J. C. Younger  |
| S. D. Kulat                       |                |

**Working Group on General Requirements (BPV XI)**

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| R. K. Rhyne, <i>Chair</i>     | P. J. Hennessey |
| C. E. Moyer, <i>Secretary</i> | E. J. Maloney   |
| J. F. Ball                    | R. K. Mattu     |
| T. L. Chan                    | T. Nuoffer      |

**Special Working Group on Reliability and Integrity Management Program (BPV XI)**

|                                     |                |
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| A. T. Roberts III, <i>Secretary</i> | A. L. Krinzman |
| N. Broom                            | D. R. Lee      |
| S. R. Doctor                        | R. K. Miller   |
| S. Downey                           | M. N. Mitchell |
| J. D. Fletcher                      | R. Morrill     |
| J. T. Fong                          | T. Roney       |
| T. Graham                           | R. W. Swayne   |
| N. Granback                         | S. Takaya      |
| J. Grimm                            |                |

**JSME/ASME Joint Task Group for System-Based Code (SWG-RIM) (BPV XI)**

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| K. Dozaki                | M. Morishita      |
| S. R. Gosselin           | A. T. Roberts III |
| M. Hayashi               | F. J. Schaaf, Jr. |
| D. M. Jones              | S. Takaya         |
| Y. Kamishima             | D. Watanabe       |
| A. L. Krinzman           |                   |

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| P. Chilukuri                     | J. A. Byers, <i>Contributing Member</i> |
| W. L. Garfield                   | R. Meyers, <i>Contributing Member</i>   |
| G. G. Karcher                    | M. R. Ward, <i>Contributing Member</i>  |

**Executive Committee (BPV XII)**

|                                  |                 |
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| M. Pitts                         | A. P. Varghese  |

**Subgroup on Design and Materials (BPV XII)**

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| R. C. Sallash, <i>Secretary</i> | S. Staniszewski                             |
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| P. Chilukuri                    | A. T. Duggleby, <i>Contributing Member</i>  |
| Y. Doron                        | T. J. Hitchcock, <i>Contributing Member</i> |
| R. D. Hayworth                  | M. R. Ward, <i>Contributing Member</i>      |
| G. G. Karcher                   | J. Zheng, <i>Contributing Member</i>        |
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| N. J. Paulick                   |   |
| M. D. Rana                      |   |

**Subgroup on Fabrication, Inspection, and Continued Service (BPV XII)**

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| R. D. Hayworth                 | S. E. Benet, <i>Contributing Member</i>    |
| K. Mansker                     | J. A. Byers, <i>Contributing Member</i>    |
| G. McRae                       | A. S. Olivares, <i>Contributing Member</i> |
| O. Mulet                       | L. H. Strouse, <i>Contributing Member</i>  |
| T. A. Rogers                   | S. V. Voorhees, <i>Contributing Member</i> |
| M. Rudek                       |  |
| R. C. Sallash                  |  |

**Subgroup on General Requirements (BPV XII)**

|                                |  |
|--------------------------------|--|
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| Y. Doron                       | G. McRae, <i>Contributing Member</i>         |
| J. L. Freiler                  | S. L. McWilliams, <i>Contributing Member</i> |
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| O. Mulet                       | D. G. Shelton, <i>Contributing Member</i>    |
| M. Pitts                       | L. H. Strouse, <i>Contributing Member</i>    |
| T. Rummel                      | M. R. Ward, <i>Contributing Member</i>       |
| R. C. Sallash                  |  |
| L. Selensky                    |  |

**Subgroup on Nonmandatory Appendices (BPV XII)**

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| N. J. Paulick, <i>Chair</i>       | D. G. Shelton                               |
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| P. Chilukuri                      | D. D. Brusewitz, <i>Contributing Member</i> |
| R. D. Hayworth                    | T. J. Hitchcock, <i>Contributing Member</i> |
| K. Mansker                        | A. P. Varghese, <i>Contributing Member</i>  |
| S. L. McWilliams                  | M. R. Ward, <i>Contributing Member</i>      |
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| C. E. O'Brien, <i>Staff Secretary</i> | D. Miller                          |
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| J. Burgess                            | T. Patel                           |
| S. Cammeresi                          | M. Poehlmann                       |
| J. A. Cox                             | Z. Wang                            |
| R. D. Danzy                           | J. A. West                         |
| J. P. Glaspie                         | S. R. Irvin, Sr., <i>Alternate</i> |
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| J. Burgess                            | B. K. Nutter   |
| S. Cammeresi                          | T. Patel       |
| J. A. Cox                             | M. Poehlmann   |
| R. D. Danzy                           | Z. Wang        |
| J. P. Glaspie                         | J. A. West     |

**Subgroup on Design (SC-SVR)**

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| B. Joergensen           | R. D. Danzy, <i>Contributing Member</i> |
| B. J. Mollitor          |   |

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| D. Miller                           | P. F. Martin, <i>Alternate</i>          |
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| R. V. Wielgoszinski                 |   |

**Subgroup on General Requirements (SC-SVR)**

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| J. F. Ball, <i>Chair</i> | J. P. Glaspie |
| G. Brazier               | B. F. Pittel  |
| J. Burgess               | M. Poehlmann  |
| D. B. DeMichael          | D. E. Tuttle  |
| S. T. French             | J. White      |

**Subgroup on Testing (SC-SVR)**

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| W. F. Hart, <i>Chair</i> | A. Donaldson                       |
| T. P. Beirne             | G. D. Goodson                      |
| J. E. Britt              | B. K. Nutter                       |
| J. Buehrer               | C. Sharpe                          |
| S. Cammeresi             | Z. Wang                            |
| J. A. Cox                | A. Wilson                          |
| J. W. Dickson            | S. R. Irvin, Sr., <i>Alternate</i> |

**COMMITTEE ON NUCLEAR CERTIFICATION (CNC)**

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| D. M. Vickery                     | S. Yang, <i>Alternate</i>                  |
| E. A. Whittle                     |  |
| C. S. Withers                     |  |

**U.S. Technical Advisory Group ISO/TC 185 Safety Relief Valves**

|                                       |              |
|---------------------------------------|--------------|
| T. J. Bevilacqua, <i>Chair</i>        | D. Miller    |
| C. E. O'Brien, <i>Staff Secretary</i> | B. K. Nutter |
| J. F. Ball                            | T. Patel     |
| G. Brazier                            | J. A. West   |
| D. B. DeMichael                       |              |

# **ASTM PERSONNEL**

(17)

(Cooperating in the Development of the Specifications Herein)  
As of January 1, 2017

## **E07 ON NONDESTRUCTIVE TESTING**

A. P. Washabaugh, *Chair*

T. Clausing, *Recording Secretary*

W. C. Plumstead, Jr., *Vice Chair*

T. Gordon, *Membership Secretary*

## SUMMARY OF CHANGES

Errata to the BPV Code may be posted on the ASME Web site to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in the BPV Code. Such Errata shall be used on the date posted.

Information regarding Special Notices and Errata is published by ASME at <http://go.asme.org/BPVCerrata>.

Changes given below are identified on the pages by a margin note, **(17)**, placed next to the affected area.

The Record Numbers listed below are explained in more detail in “List of Changes in Record Number Order” following this Summary of Changes.

| <i>Page</i> | <i>Location</i>   | <i>Change (Record Number)</i>   |
|-------------|---|---|
| xxiv        | List of Sections  | Updated   |
| xxix        | Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees | Revised in its entirety (13-2222)   |
| xxxii       | Personnel   | Updated   |
| li          | ASTM Personnel  | Updated   |
| 1           | T-110   | (1) In subpara. (a), last line of first sentence editorially revised<br>(2) Subparagraph (b) editorially revised<br>(3) Subparagraphs (c) and (d) added (15-2834)   |
| 1           | T-120   | (1) In subpara. (b), last line editorially revised<br>(2) In subpara. (e)(1), “SNT-TC-1A” corrected by errata to “SNT-TC-1A (2006 Edition)” (15-1691)<br>(3) In subpara. (e)(2), “ANSI/ASNT CP-189” corrected by errata to “ANSI/ASNT CP-189 (2006 Edition)” (15-1691)<br>(4) In subpara. (g), “phased-array ultrasonic technology (PAUT)” corrected by errata to “phased-array ultrasonic (PAUT)” (15-1691)<br>(5) New subpara. (h) added and subsequent subparagraphs redesignated (16-1892)<br>(6) In former subpara. (i), penultimate sentence corrected by errata (15-1691)<br>(7) In former subpara. (k)(1), first sentence corrected by errata (15-1691) |
| 3           | T-170   | (1) In subpara. (a), last sentence revised (16-2768)<br>(2) Subparagraph (b) revised (16-2768)  |
| 5           | I-121   | (1) Definitions of <i>false indication</i> , <i>flaw characterization</i> , <i>nonrelevant indication</i> , and <i>relevant indication</i> revised (16-1068)<br>(2) Definition of <i>interpretation</i> revised (16-1184)   |
| 6           | I-121.1   | (1) Definitions of <i>bad pixel</i> , <i>cluster kernel pixel (CKP)</i> , <i>computed radiograph (CR) (photostimulated luminescence method)</i> , <i>digital detector array (DDA)</i> , <i>digital detector system (DDS)</i> , <i>digital radiography (DR)</i> , and <i>underperforming pixels</i> added (15-255)<br>(2) Definitions of <i>dynamic range</i> , <i>line pairs per millimeter</i> , and <i>spatial linearity</i> and equations in <i>film density</i> and <i>optical density</i> editorially revised  |

| <i>Page</i> | <i>Location</i> | <i>Change (Record Number)</i>  |
|-------------|-----------------|--|
| 9           | I-121.2         | (1) Definition of <i>compound S-scan</i> added (15-256)<br>(2) Definitions of <i>diffracted signals, diffraction, distance-amplitude response curve, scan plan, search unit, search unit mechanical fixturing device, and semiautomated ultrasonic examinations (SAUT)</i> editorially revised<br>(3) Definition of <i>piezoelectric element</i> revised (16-409)<br>(4) Definition of <i>transducer</i> revised (15-2832) |
| 14          | I-121.5         | (1) Definitions of <i>ferromagnetic material</i> and <i>nonferromagnetic material</i> added (15-267)<br>(2) Definition of <i>text information</i> editorially revised  |
| 16          | I-121.7         | (1) Definition of <i>halogen</i> editorially revised<br>(2) Definition of <i>leakage rate</i> revised (15-2832)  |
| 17          | I-121.8         | Notes in definitions of <i>emission, burst</i> and <i>emission, continuous</i> deleted (15-2832)   |
| 22          | I-121.10        | Definition of <i>reference tubes/reference specimens</i> revised (15-268)  |
| 23          | I-130           | Added (14-591)   |
| 24          | II-110          | "Phased Array Ultrasonic Technology (PAUT)" corrected by errata to "Phased Array Ultrasonic (PAUT)" (15-1691)  |
| 24          | II-124          | In II-124.1 through II-124.4, edition year for "ANSI/ASNT CP105" revised (16-695)  |
| 25          | Table II-121-1  | In last column head, "Todal" corrected by errata to "Total" (16-2245)  |
| 26          | Table II-121-2  | In last column head, "Todal" corrected by errata to "Total" (16-2245)  |
| 26          | Table II-122.2  | Corrected in its entirety by errata (15-1692)  |
| 29          | T-223           | Revised (15-1012)  |
| 31          | T-261.2         | Subparagraph (a) revised (13-1983)   |
| 32          | T-275           | First sentence revised (14-2471)   |
| 34          | T-276.1         | Revised (14-1538)  |
| 34          | T-276.2         | Subparagraphs (a) and (b) revised (16-1798) and subpara. (c) added (16-1798)   |
| 34          | T-277.1         | Subparagraph (d) revised (16-2220)   |
| 35          | T-277.2         | Subparagraph (b)(5) revised (15-1865)  |
| 37          | T-292           | First paragraph revised (16-2097)  |
| 38          | I-210           | Revised (15-1016)  |
| 38          | I-223           | Subparagraph (c) added (15-1012)   |
| 38          | I-277           | In subparas. (a) and (b), last sentence revised (16-2220)  |
| 40          | II-210          | Last paragraph added (15-1017)   |
| 53          | VII-271.2       | Revised (15-249)   |
| 53          | VII-282.1       | Revised (16-1188)  |
| 55          | VIII-287.1      | Subparagraph (a) revised (16-551)  |
| 55          | VIII-288        | Revised (16-1190)  |
| 55          | VIII-291        | Subparagraph (p) revised (15-1868)   |

| <i>Page</i> | <i>Location</i>                        | <i>Change (Record Number)</i>   |
|-------------|--|---|
| 57          | Mandatory Appendix IX<br>(Article 2)   | Revised in its entirety (15-1018)   |
| 63          | Figure A-210-2                         | Metric values under "O.D." revised (14-2313)  |
| 72          | T-432                                  | New T-432.2 added and former T-432.2 redesignated as T-432.3<br>(15-1861)   |
| 74          | T-434                                  | (1) In T-434.1.2, subparas. (c), (c)(1), and (c)(2) added (14-1755)<br>(2) T-434.2.3 deleted and T-434.2.4 redesignated as T-434.2.3<br>(12-1443)                                     |
| 83          | T-451                                  | Revised (14-2294)   |
| 83          | T-452                                  | Revised (14-591)  |
| 82          | Figure T-434.5.1                       | In the bottom illustration, "R" added by errata above diagonal arrow<br>(15-1025)   |
| 83          | T-453                                  | Added (14-591)  |
| 88          | T-492                                  | Revised (13-858)  |
| 92          | III-420                                | Revised in its entirety (15-252)  |
| 92          | Table III-421                          | Former Table III-422 redesignated (15-252)  |
| 93          | III-434.2                              | III-434.2.3 deleted and III-434.2.4 redesignated as III-434.2.3 and<br>revised (12-1443)  |
| 97          | IV-410                                 | Revised to delete endnote callouts (14-1536)  |
| 97          | IV-420                                 | Revised in its entirety (15-252)  |
| 97          | Table IV-421                           | Former Table IV-422 redesignated and revised (15-252, 16-1186)  |
| 97          | IV-462.7                               | Revised to delete endnote callout (14-1536)   |
| 99          | V-410                                  | Revised to delete endnote callouts (14-1536)  |
| 99          | V-421                                  | Designator (V-421) editorially added for proper hierarchy of<br>designated heads  |
| 99          | Table V-421                            | Revised (16-1186, 12-1990)  |
| 99          | V-462.7                                | Revised to delete endnote callout (14-1536)   |
| 101         | Mandatory Appendix VII<br>(Article 4)  | VII-410, VII-420, VII-430, and VII-460 revised (14-1536, 15-252,<br>16-2098)  |
| 103         | Mandatory Appendix VIII<br>(Article 4) | (1) Title corrected by errata by deleting "a" (16-1812)<br>(2) VIII-410, VIII-410, VIII-420, VIII-430, VIII-460, and VIII-490<br>revised (14-1719, 15-252, 15-1020, 15-2659, 16-2098) |
| 106         | IX-410                                 | Editorially revised   |
| 106         | IX-435.6                               | Revised (14-2407)   |
| 107         | IX-482                                 | (1) In title, "Acceptance" corrected by errata to "Acceptable"<br>(16-1813)<br>(2) Revised in its entirety (15-1021)  |
| 134         | Figure J-431                           | In first illustration, location of arrows corrected by errata (14-2166)   |
| 144         | Figure N-421(b)                        | Title revised (15-1024)   |
| 163         | Table O-470                            | Revised in its entirety (15-2879)   |

| <i>Page</i> | <i>Location</i>                       | <i>Change (Record Number)</i>   |
|-------------|---------------------------------------|---|
| 180         | T-534                                 | Revised (14-1587)   |
| 184         | T-592                                 | Revised (13-859)  |
| 192         | T-673.1                               | Revised (14-1841)   |
| 193         | T-673.3                               | Revised (14-1841)   |
| 196         | II-640                                | (1) II-641 and II-642 revised (15-1200)<br>(2) II-643 added (15-1200)                               |
| 197         | III-641.2                             | Second paragraph revised and third paragraph added (15-293)   |
| 201         | T-754                                 | (1) In T-754.1, subpara. (b)(2) revised (15-46)<br>(2) In T-754.2, subpara. (b) editorially revised |
| 204         | T-765                                 | (1) Corrected "10 min" to "30 min" by errata (17-351)<br>(2) Revised (14-1513)                      |
| 206         | T-766                                 | In subpara. (b), third sentence editorially revised   |
| 206         | T-771                                 | Revised (14-1514)   |
| 206         | T-773                                 | Subparagraph (b) revised (14-1515)  |
| 210         | Mandatory Appendix I<br>(Article 7)   | Title revised (15-1199)   |
| 210         | I-710                                 | Revised (15-1199)   |
| 211         | I-730.4                               | Revised (15-1199)   |
| 211         | I-741                                 | Revised (15-1199)   |
| 211         | I-751                                 | Subparagraph (a) revised (14-2408)  |
| 221         | A-720                                 | Last paragraph revised (15-2832)  |
| 222         | T-810                                 | Subparagraphs (a), (e), (g), and (h) revised (14-1615)  |
| 231         | Mandatory Appendix III<br>(Article 8) | Title revised (14-1615)   |
| 231         | III-810                               | Revised (14-1615)   |
| 231         | III-850                               | Revised (14-1615)   |
| 235         | Mandatory Appendix V<br>(Article 8)   | Title revised (14-1615)   |
| 235         | V-810                                 | Revised (14-1615)   |
| 235         | V-820                                 | Revised (14-1615)   |
| 235         | Table V-821                           | Title revised (14-1615)   |
| 236         | V-850                                 | Revised (14-1615)   |
| 238         | Mandatory Appendix VI<br>(Article 8)  | Title revised (14-1615)   |
| 238         | VI-810                                | Revised (14-1615)   |
| 238         | VI-820                                | Revised (14-1615)   |
| 238         | Table VI-821                          | Title revised (14-1615)   |
| 241         | Mandatory Appendix VII<br>(Article 8) | Title revised (14-1615)   |

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| 241         | VII-810             | Revised (14-1615)  |
| 241         | VII-821             | Editorially revised  |
| 242         | VII-830.5           | First paragraph editorially revised  |
| 243         | VII-862             | Revised (14-1615)  |
| 243         | VII-891             | Subparagraph (g) editorially revised   |
| 244         | Figure VII-862      | Editorially revised  |
| 255         | T-1063              | Revised in its entirety (15-266)   |
| 261         | III-1033            | Revised (15-266)   |
| 264         | IV-1033             | Revised in its entirety (15-266)   |
| 264         | IV-1061.2           | Revised (15-266)   |
| 267         | V-1033              | Title and text revised (15-266)  |
| 267         | V-1061.2            | Revised (15-266)   |
| 273         | VIII-1033           | Title and text revised (15-266)  |
| 277         | IX-1033             | Title and text revised (15-266)  |
| 277         | IX-1061             | (1) Title of para. IX-1061.1 editorially revised<br>(2) IX-1061.2 revised (15-266)                             |
| 277         | IX-1062             | (1) In IX-1062.5, last paragraph deleted (15-1877)<br>(2) IX-1062.6 added (15-1877)                            |
| 278         | IX-1072.2           | (1) In subpara. (b), last paragraph deleted (15-1877)<br>(2) Subparagraph (d) added (15-1877)                  |
| 279         | X-1032              | Revised (15-266)   |
| 282         | T-1110              | (1) Subparagraph (a) revised (15-259)<br>(2) Subparagraph (b) revised (16-1004)                                |
| 282         | T-1120              | Subparagraph (c) added (14-1867)   |
| 282         | T-1122              | (1) Title, first paragraph, and subparas. (a) and (b) revised (15-259)<br>(2) Subparagraph (c) added (15-2668) |
| 282         | Table T-1121        | General Note revised (15-2668)   |
| 283         | T-1123              | Second paragraph added (15-2665)   |
| 283         | T-1124              | Revised (16-1725)  |
| 283         | T-1127              | Subparagraphs (c) and (e) revised (16-1726)  |
| 283         | T-1130              | (1) Subparagraph (b) and last paragraph revised (15-2666)<br>(2) Subparagraph (b) revised (16-1726)            |
| 284         | T-1171              | First paragraph revised (15-259)   |
| 284         | T-1172              | Subparagraph (a) revised (15-259)  |
| 285         | T-1173              | Title and subparas. (a), (b), and (c) revised (15-259)   |
| 285         | T-1181              | Revised (16-1726)  |
| 285         | T-1183              | Subparagraphs (b)(1), (b)(2), and (b)(3) revised (15-259)  |
| 287         | Figure T-1173(a)(1) | Title revised (15-259)   |

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| 288         | Figure T-1173(a)(2) | Title revised (15-259)  |
| 290         | Figure T-1173(b)(1) | Title revised (15-259)  |
| 292         | Table T-1181        | (1) First and last rows and General Note (a) revised (16-1728)<br>(2) First row and Note (1) revised (15-2670)<br>(3) Fourth row and Note (5) deleted (16-1727)<br>(4) General Note (c) added (15-2669) |
| 294         | I-1181              | First paragraph revised (16-1726)   |
| 294         | I-1182              | Second sentence revised (16-1729)   |
| 296         | II-1120             | Second and third paragraphs added (16-1711)   |
| 296         | II-1130             | Last sentence added (15-2671)   |
| 297         | II-1150             | Deleted (16-1727)   |
| 299         | Figure A-1110       | Revised (15-2667)   |
| 300         | Figure A-1120       | Graphic revised (15-2667)   |
| 322         | T-1311              | Subparagraph (h) deleted (15-2832)  |
| 328         | T-1357              | Corrected "appendices" to "Mandatory Appendices" by errata (16-1527)  |
| 328         | T-1361              | In fifth sentence, open parenthesis following "40 dB <sub>AE</sub> " deleted by errata (16-1527)  |
| 329         | T-1378              | "Article 13" inserted by errata (16-1527)   |
| 329         | T-1381              | "Mandatory Appendices" corrected by errata to be in uppercase (16-1527)   |
| 331         | I-1380              | In subpara. (d) equation, subscript "0.53" corrected by errata to superscript "0.53" (16-1527)  |
| 339         | V-1332.2            | "95°C" corrected by errata to "93°C" (16-1527)  |
| 349         | T-1472.1            | First full paragraph after eq. (4) revised (15-329)   |
| 356         | T-1510              | Subparagraph (b) revised and subpara. (c) added (15-263)  |
| 413         | SE-999              | Revised in its entirety (15-2660)   |
| 439         | SE-1114             | Revised in its entirety (15-2661)   |
| 445         | SE-1165             | Revised in its entirety (15-2662)   |
| 483         | SA-388/SA-388M      | Revised in its entirety (15-2654)   |
| 509         | SA-609/SA-609M      | (1) In Table 4, Note B, "18 mm" corrected by errata to "13 mm" (16-1527)<br>(2) In Table S1.1, third column head, "1.002" corrected by errata to "±0.002" (16-1527) (16-1527)                           |
| 519         | SA-745/SA-745M      | Revised in its entirety (15-2655)   |
| 531         | SD-7091             | Added (14-2281)   |
| 539         | SE-213              | Revised in its entirety (15-2656)   |
| 551         | SE-273              | Revised in its entirety (15-2657)   |
| 557         | SE-797/SE-797M      | U.S. Customary values in Figure 2 corrected by errata (16-1527)   |
| 585         | SE-2700             | Revised in its entirety (15-2658)   |

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| 595         | SD-129           | Revised in its entirety (14-2276, 15-2600)                 |
| 633         | SE-2297          | Added (16-2143)  |
| 639         | SE-3022          | Added (16-2144)  |
| 655         | SE-709           | Revised in its entirety (15-2601)                          |
| 703         | Article 26       | SE-2096 editorially relocated to Article 32                |
| 705         | SE-243           | Revised in its entirety (14-2280, 15-2602)                 |
| 783         | SE-1419/SE-1419M | Revised in its entirety (15-2664)                          |
| 791         | SE-2075          | Added (16-1248)  |
| 797         | SE-1316          | Deleted (15-2832)  |
| 799         | SE-2261/SE-2261M | Revised in its entirety (15-2603)                          |
| 814         | Article 32       | Editorially added with SE-2096 (relocated from Article 26) |
| 825         | Article 33       | Added with SE-2775 and SE-2929 (16-499, 16-500)            |

## LIST OF CHANGES IN RECORD NUMBER ORDER

| Record Number | Change  |
|---------------|---|
| 12-1443       | Deleted T-434.2.3 to correct the conflict between T-434.2.3 and T-434.2.2. Redesignated T-434.2.4 to T-434.2.3 to update the paragraph numbers. Deleted III-434.2.3 to reflect the deletion of T-434.2.3. Redesignated III-434.2.4 to III-434.2.3 to update the paragraph numbers.  |
| 12-1990       | Revised Table IV-422 to require additional essential parameters related to wedges. Revised Table V-422 to require additional essential parameters related to wedges.  |
| 13-858        | Revised T-492 to remove Examination Record items that were redundant with Article 1, T-190.   |
| 13-859        | Revised T-592 to remove Examination Record items that were redundant with Article 1, T-190.   |
| 13-1983       | Updated SE-1165 from ASTM E1165-04(2010) to ASTM E1165-12. Revised T-261.2(a) to change voltage from 500 kV to 1 000 kV (sync with the ASTM document) and remove reference to Endnote 5. Deleted Endnote 5 (the referenced documents are out of print).   |
| 13-2222       | Revised the front guidance on interpretations in its entirety.  |
| 14-591        | Added scanner categories as T-453 such that a person(s) may select, as an option, a category of scanner mechanism for qualification, and subsequent exams in lieu of naming a specific manufacturer and model. Added the definitions of said mechanisms to Article 1, Mandatory Appendix I, I-130, UT — Ultrasonics. Updated current wording in T-452 for clarification.  |
| 14-1513       | Deleted reference to D96 and added reference to SE-709.   |
| 14-1514       | Revised “discontinuity surface” to “surface discontinuity” in Article 7, T-771.   |
| 14-1515       | Revised T-773(b) to read: “(b) <i>Wet Particles</i> . The magnetizing current shall be turned on after the particles have been applied. Flow of particles shall stop with the application of current. Wet particles applied from aerosol spray cans or pump sprayers may be applied before and/or during the application of magnetizing current. Wet particles may be applied during the application of magnetizing current if they are not applied directly to the examination area and are allowed to flow over the examination area or are applied directly to the examination area with low velocities insufficient to remove accumulated particles.” |
| 14-1536       | Deleted endnotes as definitions are now redundant as they have been incorporated into Article 1 Mandatory Appendix I, I-121.2 UT — Ultrasonics.   |
| 14-1538       | Revised para. T-276.1.  |
| 14-1587       | Revised T-534 to provide clarification of “product form” and to consider product form as “either wrought or cast.”  |
| 14-1615       | Revised Articles 8, 16, and 17 to change “magnetic” and “ferritic” to “ferromagnetic” and change “nonmagnetic” to “nonferromagnetic.”   |
| 14-1719       | Revised the references that incorrectly reference T-466 to reference T-467 in Mandatory Appendix VIII.  |
| 14-1755       | Revised para. T-434.1.2 to add subpara. (c), which contains the requirements for the use of a basic calibration block manufactured from a different product form material or has a different heat treatment from the component to be examined.  |
| 14-1841       | Revised T-673.1 to permit dry wiping followed by water-moistened wiping as an alternative to water spray for removing excess water-washable penetrant. Made an editorial change to T-673.3.   |
| 14-1867       | Added a reference in T-1120 to SE-1067, Standard Practice for Acoustic Emission Examination of Fiberglass Reinforced Plastic Resin (FRP) Tanks/Vessels.   |
| 14-2166       | Errata Correction. See Summary of Changes for details.  |
| 14-2276       | Updated SD-129 to ASTM D129-13.   |
| 14-2280       | Updated SE-243 to ASTM E243-13.   |
| 14-2281       | Adopted D7091-13 as SD-7091 in Article 23.  |
| 14-2294       | Delete “usually” and changed “may be necessary” to “required.”  |
| 14-2313       | Replaced “88 mm” with “89 mm” in Article 2, Figure A-210-2.   |
| 14-2407       | Revised Article 4, Mandatory Appendix IX, IX-435.6 to change the demonstration block’s required flaw size for material equal to or greater than 1 in. (25 mm) to address an <i>a/l</i> or <i>h/l</i> value.   |
| 14-2408       | Revised to change “surface crack” to “linear indication.”   |

| Record Number | Change   |
|---------------|--|
| 14-2471       | Revised the term “film” to “radiograph” and “are to” to “shall” in Article 2, T-275.   |
| 15-46         | Revised Article 7, T-754.1(b)(2) to improve clarity.   |
| 15-249        | Revised “88 mm” to “89 mm” in VII-271.2.   |
| 15-252        | Revised procedure and qualification requirements in Article 4 Mandatory Appendices III, IV, V, and VIII to be in the same format as Appendix V.  |
| 15-255        | Added the terms “bad pixels,” “cluster kernel pixel (CKP),” “computed radiography (CR) (photo-stimulated luminescence method),” “digital detector array (DDA),” “digital detector system (DDS),” “digital radiography (DR),” and “underperforming pixels” to Article 1, Mandatory Appendix I, I-121.1.   |
| 15-256        | Added definition for “compound S-scan” to Article 1, Mandatory Appendix I, I-121.2.  |
| 15-259        | Revised wording for the appropriate use of the words “stress,” “stressing,” “load,” and “loading.”   |
| 15-263        | Revised Alternating Current Field Measurement Technique (ACFMT) in Article 15, T-1510(b).  |
| 15-266        | Revised T-1063.1 and T-1063.2 to accommodate changes that have occurred in the technology for the design and manufacture of calibrated standard leaks. In this regard, discussion of the technology of the leak element (permeation vs. capillary) has been deleted from the text. Revised T-1063.1 and T-1063.2 to distinguish between two basic types of calibrated standard leaks, reservoir standard leaks that include an integral reservoir of tracer gas, and nonreservoir standard leaks that do not have an integral reservoir of tracer gas. Revised Article 10, Mandatory Appendices III, IV, V, VIII, IX, and X, paras. xxx-1033 to maintain alignment with the revised T-1063.1 and T-1063.2. Revised Article 10, Mandatory Appendices V and IX, V-1061.2 to maintain alignment with the revised T-1063.1 and T-1063.2. |
| 15-267        | Added the terms “ferromagnetic” and “nonferromagnetic” to the glossary.  |
| 15-268        | Moved definitions of terms from the glossary of the article on APR to the main glossary.   |
| 15-293        | Revised the lower temperature range in the example to 40°F (5°C). Added a new paragraph to III-641.2: “The temperature range can be any range desired by the user. If the penetrant has been previously qualified at temperatures at or below 125°F (52°C), the penetrant need only be qualified at the upper temperature range. The lowest temperature qualified previously will be the lower temperature limit.”   |
| 15-329        | Revised 33.8% to 49.3% and added a clarifying phrase in the fourth paragraph of T-1472.1.  |
| 15-1012       | Added a paragraph to Article 2, T-223 and Article 2, Mandatory Appendix I, I-223 to clarify placement of the backscatter check lead figure.  |
| 15-1016       | Revised Article 2, Mandatory Appendix I, I-210 to specify that the scope is applicable to film techniques only, and not to computed radiographic (CR) or digital radiographic (DR) techniques.   |
| 15-1017       | Revised Article 2, Mandatory Appendix II, II-210 to specify that the scope is not applicable to computed radiographic (CR) or digital radiographic (DR) techniques.  |
| 15-1018       | Revised the scope of Article 2, Mandatory Appendix IX to address the use of digital detector systems and the various dynamics currently available. Added requirements for in-motion as well as references to new ASTM documents that pertain to DDAs.  |
| 15-1020       | Revised Article 4, Mandatory Appendix VIII, VIII-423; “Personnel Qualification” as there is no definition or guideline to what constitutes actually participating in the qualification. Personnel collecting data should demonstrate their ability to do so and not just be there during the qualification.  |
| 15-1021       | Revised Article 4, Mandatory Appendix IX, IX-482 to propose placing a limit on oversizing flaws when qualifying an ultrasonic examination procedure.   |
| 15-1024       | Revised the title of Article 4, Nonmandatory Appendix N, Figure N-421(b) to remove grayscale image designation.  |
| 15-1025       | Errata correction. See Summary of Changes for details.   |
| 15-1199       | Replaced occurrences of “magnetic” or “ferritic” with “ferromagnetic.” Replaced “nonmagnetic” with “nonferromagnetic.”   |
| 15-1200       | Revised Article 6, Mandatory Appendix II, II-641 and II-642. Added new requirements for water in II-643.   |
| 15-1691       | Errata correction. See Summary of Changes for details.   |
| 15-1692       | Errata correction. See Summary of Changes for details.   |
| 15-1861       | Added wedge contouring requirements to Article 4, T-432.   |

| Record Number | Change  |
|---------------|---|
| 15-1865       | Revised T-277.2(b)(5) by deleting the first instance of the word “radiographed.”  |
| 15-1868       | Added the wording “to include” in Article 2, Mandatory Appendix VIII, VIII-291(p) to allow user discretion in documentation of additional parameters.   |
| 15-1877       | Deleted the second paragraph of Article 10, Mandatory Appendix IX, IX-1062.5 and replaced with a new subpara. IX-1062.6. The new IX-1062.6 requires that the final system sensitivity (S2) be within ±30% of the preliminary system sensitivity (S1). Paragraph IX-1062.6 includes an algebraic expression of this requirement. Deleted the second paragraph of Article 10, Mandatory Appendix IX, IX-1072.2(b) and replaced with a new subpara. IX-1072.2(d). The new IX-1072.2(d) requires that the final system correction factor (FSCF) be within ±30% of the preliminary system correction factor (PSCF). Paragraph IX-1072.2(d) includes an algebraic expression of this requirement. |
| 15-2600       | Adopted ASTM D129-13 in Article 24 to replace current SD-129.   |
| 15-2601       | Adopted ASTM E709-15 in Article 25 to replace current SE-709.   |
| 15-2602       | Adopted ASTM E243-13 in Article 26 to replace current SE-243.   |
| 15-2603       | Adopted ASTM E2261/E2261M-12 in Article 31 to replace current SE-2261/2261M.  |
| 15-2654       | Updated ASTM A388/A388M-11 to ASTM A388/A388M-15 document. Changes are: (1) added apparatus qualification Specification A788/A788M and S3 to Referenced Documents, and (2) revised 8.2 and S3 to reflect surface roughness requirements per Specification A788/A788M.   |
| 15-2655       | Adopted ASTM A745/A745M-15 in Article 23 to replace current SA-745/SA-745M.   |
| 15-2656       | Adopted ASTM E213-14e1 in Article 23 to replace current SE-213.   |
| 15-2657       | Adopted ASTM E273-15 in Article 23 to replace current SE-273.   |
| 15-2658       | Adopted ASTM E2700-14 in Article 23 to replace current SE-2700.   |
| 15-2659       | Revised Article 4, Mandatory Appendix VIII, VIII-492(c) to be consistent with fracture mechanics criteria as follows: indication data, that is position in weld, length, through-wall extent, and surface or subsurface characterization.   |
| 15-2660       | Adopted ASTM E999-15 in Article 22 to replace current SE-999.   |
| 15-2661       | Adopted ASTM E1114-09(R2014) in Article 22 to replace current SE-1114.  |
| 15-2662       | Adopted ASTM E1165-12 in Article 22 to replace current SE-1165.   |
| 15-2664       | Adopted ASTM E1419/E1419M-15 in Article 29 as SE-1419/SE-1419M.   |
| 15-2665       | Revised T-1123 to allow alternative vessel orientation.   |
| 15-2666       | Revised T-1130 to reference SE-1067.  |
| 15-2667       | Revised Figures A-1110 and A-1120 to correct sensor labels.   |
| 15-2668       | Revised T-1121 and T-1122 to include FRP pressure vessel testing.   |
| 15-2669       | Revised Table T-1181 for identifying defects and indications.   |
| 15-2670       | Revised Evaluation Criteria in Table T-1181 for Subsequent Loading.   |
| 15-2671       | Revised Article 11, Mandatory Appendix II, II-1120 and II-1130.   |
| 15-2832       | Deleted SE-1316, Standard Terminology for Nondestructive Examinations.  |
| 15-2834       | Added two new paragraphs to T-110. Paragraph T-110(c) addresses effective date of new Editions of Section V. Paragraph T-110(d) addresses the use of Code Cases.  |
| 15-2879       | Revised Nonmandatory Appendix O, Table O-470 to change the beam crossover depth for the upper zone of a two- and four-zone examination to $\frac{1}{3}t$ and $\frac{1}{6}t$ , respectively.   |
| 16-409        | Deleted the words “crystal or polycrystal” from the definition of piezoelectric element in Article 1, Mandatory Appendix I, I-121.3.  |
| 16-499        | Adopted ASTM E2775-11 in Article 33 as SE-2775. Revised T-1920 to reference SE-2775 instead of ASTM E2775.  |
| 16-500        | Adopted ASTM E2929-13 in Article 33 as SE-2929. Revised T-1920 to reference SE-2929 instead of ASTM E2929.  |
| 16-551        | Revised Article 2, Mandatory Appendix VIII, VIII-287.1(a) by replacing the word “on” with the phrase “in direct contact with.”  |
| 16-695        | Updated CP-105 references within Article 1, Mandatory Appendix II, II-124.1, 124.2, 124.3, and 124.4 to reflect reference to the 2016 Edition of CP-105.  |
| 16-1004       | Revised the maximum test pressure requirement.  |
| 16-1068       | Revised four occurrences of “NDT” to “NDE” in Article 1, Mandatory Appendix I.  |
| 16-1184       | Revised the definition of “interpretation” to include terms such as what is necessary when performing interpretations of surface methods and volumetric methods.  |

| Record Number | Change   |
|---------------|--|
| 16-1186       | Added a definition for compound S-scan to the Glossary of Terms found in Article 1, Mandatory Appendix I, I-121.2 UT — Ultrasonics. Revised the title of Article 4, Mandatory Appendix IV, Table IV-422 and added Table IV-422-2. Revised the title of Mandatory Appendix V, Table V-421 to V-421-1 and added Table V-421-2 for compound S-scan essential variables. Revised to include comments received during ballot 16-2197. |
| 16-1188       | Revised Article 2, Mandatory Appendix II, II-282.1 to be consistent with T-282.1.  |
| 16-1190       | Revised Article 2, Mandatory Appendix VIII, VIII-288 to describe the process for establishing the IQI sensitivity range, as well as its intended use. Revised subpara. (a) to describe the applicability of the IQI sensitivity range across multiple thicknesses.   |
| 16-1248       | Adopted ASTM E2075/E2075M-15 in Article 29 as SE-2075/SE-2075M.  |
| 16-1527       | Errata corrections. See Summary of Changes for details.  |
| 16-1711       | Revised Article 11, Mandatory Appendix II, II-1120 to provide an alternative to the lead sheet.  |
| 16-1725       | Added text regarding maximum temperature. Removed text regarding pressure compensation for testing at high temperatures.   |
| 16-1726       | Revised T-1127, T-1130, T-1181, and I-1181 to make low frequency sensors optional.   |
| 16-1727       | Revised Table T-1181. Deleted text from Article 11, Mandatory Appendix I, I-1181(e). Deleted Article 11, Mandatory Appendix II, II-1150.   |
| 16-1728       | In Table T-1181, revised evaluation criteria for emissions during hold, evaluation criteria for number of events greater than the amplitude threshold, and the General Notes.  |
| 16-1729       | Revised the resolution of amplitude measurement in Article 11, Mandatory Appendix I, I-1182.   |
| 16-1798       | Revised T-276.2(a) to clarify that IQI selection is based on the material thickness plus the estimated reinforcement thicknesses from both sides of the weld. Made editorial change to T-276.2(b). Added T-276.2(c) to address actual material/weld thickness.   |
| 16-1812       | Errata correction. See Summary of Changes for details.   |
| 16-1813       | Errata correction. See Summary of Changes for details.   |
| 16-1892       | Added use ANSI/ASME ANDE-1, ASME Nondestructive Examination and Quality Control Central Qualification and Certification Program, to T-120.   |
| 16-2097       | Revised T-292 to clarify that the Manufacturer is responsible for the radiographic review form.  |
| 16-2098       | Revised VII-434, VII-466, VIII-434, and VIII-466 to incorporate alternate methods of simulator check and search unit positioning.  |
| 16-2143       | Adopted ASTM E2297-15 as SE-2297 in Article 24.  |
| 16-2144       | Adopted ASTM E3022-15 as SE-3022 in Article 24.  |
| 16-2220       | Revised T-277.1(d) and Article 2, Mandatory Appendix I, I-277(a) and I-277(b) to replace “perpendicular to” with “across.”   |
| 16-2245       | Errata correction. See Summary of Changes for details.   |
| 16-2768       | Revised “Authorized Inspector” to “Inspector” in several places within T-170. Revised definition of “Inspector” to include “as defined and qualified as required by the referencing Code Section, or referencing document.”  |
| 17-351        | Errata correction. See Summary of Changes for details.   |

# CROSS-REFERENCING AND STYLISTIC CHANGES IN THE BOILER AND PRESSURE VESSEL CODE

There have been structural and stylistic changes to BPVC, starting with the 2011 Addenda, that should be noted to aid navigating the contents. The following is an overview of the changes:

## Subparagraph Breakdowns/Nested Lists Hierarchy

- First-level breakdowns are designated as (a), (b), (c), etc., as in the past.
- Second-level breakdowns are designated as (1), (2), (3), etc., as in the past.
- Third-level breakdowns are now designated as (-a), (-b), (-c), etc.
- Fourth-level breakdowns are now designated as (-1), (-2), (-3), etc.
- Fifth-level breakdowns are now designated as (+a), (+b), (+c), etc.
- Sixth-level breakdowns are now designated as (+1), (+2), etc.

## Footnotes

With the exception of those included in the front matter (roman-numbered pages), all footnotes are treated as endnotes. The endnotes are referenced in numeric order and appear at the end of each BPVC section/subsection.

## Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees

*Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees* has been moved to the front matter. This information now appears in all Boiler Code Sections (except for Code Case books).

## Cross-References

It is our intention to establish cross-reference link functionality in the current edition and moving forward. To facilitate this, cross-reference style has changed. Cross-references within a subsection or subarticle will not include the designator/identifier of that subsection/subarticle. Examples follow:

- *(Sub-)Paragraph Cross-References.* The cross-references to subparagraph breakdowns will follow the hierarchy of the designators under which the breakdown appears.
  - If subparagraph (-a) appears in X.1(c)(1) and is referenced in X.1(c)(1), it will be referenced as (-a).
  - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.1(c)(2), it will be referenced as (1)(-a).
  - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.1(e)(1), it will be referenced as (c)(1)(-a).
  - If subparagraph (-a) appears in X.1(c)(1) but is referenced in X.2(c)(2), it will be referenced as X.1(c)(1)(-a).
- *Equation Cross-References.* The cross-references to equations will follow the same logic. For example, if eq. (1) appears in X.1(a)(1) but is referenced in X.1(b), it will be referenced as eq. (a)(1)(1). If eq. (1) appears in X.1(a)(1) but is referenced in a different subsection/subarticle/paragraph, it will be referenced as eq. X.1(a)(1)(1).

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# SUBSECTION A NONDESTRUCTIVE METHODS OF EXAMINATION

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## ARTICLE 1 GENERAL REQUIREMENTS

### (17) T-110 SCOPE

(a) This Section of the Code contains requirements and methods for nondestructive examination (NDE), which are Code requirements to the extent they are specifically referenced and required by other Code Sections or referencing documents. These NDE methods are intended to detect surface and internal imperfections in materials, welds, fabricated parts, and components. They include radiographic examination, ultrasonic examination, liquid penetrant examination, magnetic particle examination, eddy current examination, visual examination, leak testing, and acoustic emission examination. See Nonmandatory Appendix A of this Article for a listing of common imperfections and damage mechanisms, and the NDE methods that are generally capable of detecting them.

(b) For general terms such as *inspection, flaw, discontinuity, evaluation, etc.*, refer to [Mandatory Appendix I](#).

(c) New editions of Section V may be used beginning with the date of issuance and become mandatory 6 months after the date of issuance unless modified by the referencing document.

(d) Code Cases are permissible and may be used, beginning with the date of approval by ASME. Only Code Cases that are specifically identified as being applicable to this Section may be used. At the time a Code Case is applied, only the latest revision may be used. Code Cases that have been incorporated into this Section or have been annulled shall not be used, unless permitted by the referencing Code. Qualifications using the provisions of a Code Case remain valid after the Code Case is annulled. The Code Case number shall be listed on the NDE Procedure or Personnel Certification, as applicable.

### T-120 GENERAL

(17)

(a) Subsection A describes the methods of nondestructive examination to be used if referenced by other Code Sections or referencing documents.

(b) [Subsection B](#) lists Standards covering nondestructive examination methods which have been accepted as standards. These standards are nonmandatory unless specifically referenced in whole or in part in [Subsection A](#) or as indicated in other Code Sections or referencing documents.

(c) Any reference to a paragraph of any Article in [Subsection A](#) of this Section includes all of the applicable rules in the paragraph.<sup>1</sup> In every case, reference to a paragraph includes all the subparagraphs and subdivisions under that paragraph.

(d) Reference to a standard contained in [Subsection B](#) is mandatory only to the extent specified.<sup>2</sup>

(e) For those documents that directly reference this Article for the qualification of NDE personnel, the qualification shall be in accordance with their employer's written practice which shall be in accordance with one of the following documents:

(1) SNT-TC-1A (2006 Edition),<sup>3</sup> Personnel Qualification and Certification in Nondestructive Testing; or

(2) ANSI/ASNT CP-189 (2006 Edition),<sup>3</sup> ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel

(f) National or international central certification programs, such as the ASNT Central Certification Program (ACCP) or ISO 9712:2012-based programs, may be alternatively used to fulfill the training, experience, and examination requirements of the documents listed in (e) as specified in the employer's written practice.

(g) In addition to the requirements described in (e) or (f) above, if the techniques of computed radiography (CR), digital radiography (DR), phased-array ultrasonic (PAUT), or ultrasonic time-of-flight diffraction (TOFD)