

SECTION V

2021

ASME Boiler and
Pressure Vessel Code
An International Code

**Nondestructive
Examination**

Currently in preview, click buy full version

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME,” ASME logos, or the ASME Single Certification Mark shall not be used on any item that is not constructed in accordance with all of the applicable requirements of the Code or Standard. Use of the ASME Single Certification Mark requires formal ASME certification; if no certification program is available, such ASME markings may not be used. (For Certification and Accreditation Programs, see <https://www.asme.org/certification-accreditation>.)

Items produced by parties not formally possessing an ASME Certificate may not be described, either explicitly or implicitly, as ASME certified or approved in any code forms or other document.

AN INTERNATIONAL CODE

2021 ASME Boiler & Pressure Vessel Code

2021 Edition

July 1, 2021

NONDESTRUCTIVE EXAMINATION

ASME Boiler and Pressure Vessel Committee
on Nondestructive Examination



The American Society of
Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: July 1, 2021

This international code or standard was developed under procedures accredited as meeting the criteria for American National Standards and it is an American National Standard. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

The endnotes and preamble in this document (if any) are part of this American National Standard.



ASME Collective Membership Mark



ASME Single Certification Mark

"ASME" and the above ASME symbols are registered trademarks of The American Society of Mechanical Engineers.

The Specifications published and copyrighted by the American Society for Testing and Materials are reproduced with the Society's permission.

No part of this document may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Library of Congress Catalog Card Number: 56-3934
Printed in the United States of America

Adopted by the Council of The American Society of Mechanical Engineers, 1914; latest edition 2021.

The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

Copyright © 2021 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved

TABLE OF CONTENTS

| | |
|--|--------|
| List of Sections | xxv |
| Foreword | xxviii |
| Statement of Policy on the Use of the ASME Single Certification Mark and Code Authorization in Advertising | xxviii |
| Statement of Policy on the Use of ASME Marking to Identify Manufactured Items | xxx |
| Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees | xxxii |
| Personnel | xxxiv |
| ASTM Personnel | lv |
| Summary of Changes | lvi |
| List of Changes in Record Number Order | lx |
| Cross-Referencing and Stylistic Changes in the Boiler and Pressure Vessel Code | lxi |
| Subsection A | |
| Article 1 | |
| T-110 | 1 |
| T-120 | 1 |
| T-130 | 2 |
| T-150 | 2 |
| T-160 | 3 |
| T-170 | 3 |
| T-180 | 3 |
| T-190 | 4 |
| Mandatory Appendix I | |
| I-110 | 5 |
| I-120 | 5 |
| I-130 | 26 |
| Mandatory Appendix II | |
| II-110 | 27 |
| II-120 | 27 |
| Mandatory Appendix III | |
| III-110 | 30 |
| Mandatory Appendix IV | |
| IV-110 | 31 |
| IV-120 | 31 |
| Mandatory Appendix A | |
| A-110 | 39 |
| Article 2 | |
| T-210 | 41 |
| T-220 | 41 |
| T-230 | 42 |

| | | |
|-------------------------------|---|----|
| T-260 | Calibration | 43 |
| T-270 | Examination | 43 |
| T-280 | Evaluation | 48 |
| T-290 | Documentation | 49 |
| Mandatory Appendix I | In-Motion Radiography | 50 |
| I-210 | Scope | 50 |
| I-220 | General Requirements | 50 |
| I-260 | Calibration | 50 |
| I-270 | Examination | 50 |
| Mandatory Appendix II | Real-Time Radioscopic Examination | 52 |
| II-210 | Scope | 52 |
| II-220 | General Requirements | 52 |
| II-230 | Equipment and Materials | 52 |
| II-260 | Calibration | 52 |
| II-270 | Examination | 53 |
| II-280 | Evaluation | 53 |
| II-290 | Documentation | 53 |
| Mandatory Appendix III | Digital Image Acquisition, Display, and Storage for Radiography and Radioscopy | 54 |
| III-210 | Scope | 54 |
| III-220 | General Requirements | 54 |
| III-230 | Equipment and Materials | 54 |
| III-250 | Image Acquisition and Storage | 54 |
| III-260 | Calibration | 54 |
| III-280 | Evaluation | 54 |
| III-290 | Documentation | 55 |
| Mandatory Appendix IV | Interpretation, Evaluation, and Disposition of Radiographic and Radioscopic Examination Test Results Produced by the Digital Image Acquisition and Display Process | 56 |
| IV-210 | Scope | 56 |
| IV-220 | General Requirements | 56 |
| IV-230 | Equipment and Materials | 56 |
| IV-250 | Image Acquisition, Storage, and Interpretation | 57 |
| IV-260 | Calibration | 57 |
| IV-280 | Evaluation | 57 |
| IV-290 | Documentation | 57 |
| Mandatory Appendix V | Acquisition, Display, Interpretation, and Storage of Digital Images of Radiographic Film for Nuclear Applications | 58 |
| VI-210 | Scope | 58 |
| VI-220 | General Requirements | 58 |
| VI-230 | Equipment and Materials | 58 |
| VI-240 | System Performance Requirements | 59 |
| VI-250 | Technique | 59 |
| VI-260 | Demonstration of System Performance | 59 |
| VI-270 | Examination | 60 |
| VI-280 | Evaluation | 60 |
| VI-290 | Documentation | 60 |
| Mandatory Appendix VI | Supplement A | 61 |
| VI-A-210 | Scope | 61 |
| VI-A-220 | General | 61 |
| VI-A-230 | Equipment and Materials | 61 |
| VI-A-240 | Miscellaneous Requirements | 61 |

| | | |
|--------------------------------|---|-----|
| Mandatory Appendix VII | Radiographic Examination of Metallic Castings | 64 |
| VII-210 | Scope | 64 |
| VII-220 | General Requirements | 64 |
| VII-270 | Examination | 64 |
| VII-280 | Evaluation | 64 |
| VII-290 | Documentation | 64 |
| Mandatory Appendix VIII | Radiography Using Phosphor Imaging Plate | 65 |
| VIII-210 | Scope | 65 |
| VIII-220 | General Requirements | 65 |
| VIII-230 | Equipment and Materials | 65 |
| VIII-260 | Calibration | 65 |
| VIII-270 | Examination | 65 |
| VIII-280 | Evaluation | 66 |
| VIII-290 | Documentation | 67 |
| Mandatory Appendix VIII | Supplement A | 68 |
| VIII-A-210 | Scope | 68 |
| VIII-A-220 | General | 68 |
| VIII-A-230 | Equipment and Materials | 68 |
| VIII-A-240 | Miscellaneous Requirements | 68 |
| Mandatory Appendix IX | Radiography Using Digital Detector Systems | 70 |
| IX-210 | Scope | 70 |
| IX-220 | General Requirements | 70 |
| IX-230 | Equipment and Materials | 70 |
| IX-260 | Detector Pixel Correction | 70 |
| IX-270 | Examination | 71 |
| IX-280 | Evaluation | 72 |
| IX-290 | Documentation | 73 |
| Mandatory Appendix IX | Supplement A | 74 |
| IX-A-210 | Scope | 74 |
| IX-A-220 | General | 74 |
| IX-A-230 | Equipment and Materials | 74 |
| IX-A-240 | Miscellaneous Requirements | 74 |
| Nonmandatory Appendix A | Recommended Radiographic Technique Sketches for Pipe or Tube Welds | 75 |
| A-210 | Scope | 75 |
| Nonmandatory Appendix C | Hole-Type IQI Placement Sketches for Welds | 78 |
| C-210 | Scope | 78 |
| Nonmandatory Appendix D | Number of IQIs (Special Cases) | 83 |
| D-210 | Scope | 83 |
| Article 4 | Ultrasonic Examination Methods for Welds | 86 |
| T-410 | Scope | 86 |
| T-420 | General | 86 |
| T-430 | Equipment | 86 |
| T-440 | Miscellaneous Requirements | 98 |
| T-450 | Techniques | 98 |
| T-460 | Calibration | 98 |
| T-470 | Examination | 101 |
| T-480 | Evaluation | 103 |
| T-490 | Documentation | 103 |

| | | |
|--------------------------------|---|-----|
| Mandatory Appendix I | Screen Height Linearity | 105 |
| I-410 | Scope | 105 |
| I-440 | Miscellaneous Requirements | 105 |
| Mandatory Appendix II | Amplitude Control Linearity | 106 |
| II-410 | Scope | 106 |
| II-440 | Miscellaneous Requirements | 106 |
| Mandatory Appendix III | Time of Flight Diffraction (TOFD) Technique | 107 |
| III-410 | Scope | 107 |
| III-420 | General | 107 |
| III-430 | Equipment | 107 |
| III-460 | Calibration | 109 |
| III-470 | Examination | 110 |
| III-480 | Evaluation | 111 |
| III-490 | Documentation | 111 |
| Mandatory Appendix IV | Phased Array Manual Raster Examination Techniques Using Linear Arrays | 112 |
| IV-410 | Scope | 112 |
| IV-420 | General | 112 |
| IV-460 | Calibration | 112 |
| IV-490 | Documentation | 112 |
| Mandatory Appendix V | Phased Array E-Scan and S-Scan Linear Scanning Examination Techniques | 114 |
| V-410 | Scope | 114 |
| V-420 | General | 114 |
| V-460 | Calibration | 114 |
| V-470 | Examination | 114 |
| V-490 | Documentation | 116 |
| Mandatory Appendix VII | Ultrasonic Examination Requirements for Workmanship-Based Acceptance Criteria | 117 |
| VII-410 | Scope | 117 |
| VII-420 | General | 117 |
| VII-430 | Equipment | 117 |
| VII-440 | Miscellaneous Requirements | 117 |
| VII-460 | Calibration | 118 |
| VII-470 | Examination | 118 |
| VII-480 | Evaluation | 118 |
| VII-490 | Documentation | 118 |
| Mandatory Appendix VIII | Ultrasonic Examination Requirements for Fracture-Mechanics-Based Acceptance Criteria | 119 |
| VIII-410 | Scope | 119 |
| VIII-420 | General | 119 |
| VIII-430 | Equipment | 119 |
| VIII-440 | Miscellaneous Requirements | 120 |
| VIII-460 | Calibration | 120 |
| VIII-470 | Examination | 120 |
| VIII-480 | Evaluation | 120 |
| VIII-490 | Documentation | 121 |
| Mandatory Appendix IX | Procedure Qualification Requirements for Flaw Sizing and Categorization | 122 |
| IX-410 | Scope | 122 |
| IX-420 | General | 122 |
| IX-430 | Equipment | 122 |

| | | |
|--------------------------------|--|-----|
| IX-440 | Miscellaneous Requirements | 122 |
| IX-480 | Evaluation | 123 |
| IX-490 | Documentation | 123 |
| Mandatory Appendix X | Ultrasonic Examination of High Density Polyethylene | 124 |
| X-410 | Scope | 124 |
| X-420 | General | 124 |
| X-430 | Equipment | 124 |
| X-460 | Calibration | 126 |
| X-470 | Examination | 126 |
| X-490 | Documentation | 126 |
| Mandatory Appendix XI | Full Matrix Capture | 127 |
| XI-410 | Scope | 127 |
| XI-420 | General | 127 |
| XI-430 | Equipment | 127 |
| XI-450 | Techniques | 128 |
| XI-460 | Calibration | 130 |
| XI-470 | Examination | 131 |
| XI-480 | Evaluation | 131 |
| XI-490 | Documentation | 132 |
| Nonmandatory Appendix A | Layout of Vessel Reference Points | 134 |
| A-410 | Scope | 134 |
| A-440 | Miscellaneous Requirements | 134 |
| Nonmandatory Appendix B | General Techniques for Angle Beam Calibrations | 135 |
| B-410 | Scope | 135 |
| B-460 | Calibration | 135 |
| Nonmandatory Appendix C | General Techniques for Straight Beam Calibrations | 141 |
| C-410 | Scope | 141 |
| C-460 | Calibration | 141 |
| Nonmandatory Appendix D | Examples of Recording Angle Beam Examination Data | 143 |
| D-410 | Scope | 143 |
| D-420 | General | 143 |
| D-470 | Examination Requirements | 143 |
| D-490 | Documentation | 143 |
| Nonmandatory Appendix E | Computerized Imaging Techniques | 146 |
| E-410 | Scope | 146 |
| E-420 | General | 146 |
| E-460 | Calibration | 146 |
| E-470 | Examination | 146 |
| Nonmandatory Appendix F | Examination of Welds Using Full Matrix Capture | 152 |
| F-410 | Scope | 152 |
| F-420 | General | 152 |
| F-430 | Equipment | 152 |
| F-440 | Miscellaneous | 153 |
| F-450 | Techniques | 153 |
| F-460 | Calibration | 154 |
| F-470 | Examination | 156 |
| F-480 | Evaluation | 157 |
| Nonmandatory Appendix G | Alternate Calibration Block Configuration | 160 |
| G-410 | Scope | 160 |
| G-460 | Calibration | 160 |

| | | |
|--------------------------------|---|-----|
| Nonmandatory Appendix I | Examination of Welds Using Angle Beam Search Units | 163 |
| I-410 | Scope | 163 |
| I-470 | Examination | 163 |
| Nonmandatory Appendix J | Alternative Basic Calibration Block | 164 |
| J-410 | Scope | 164 |
| J-430 | Equipment | 164 |
| Nonmandatory Appendix K | Recording Straight Beam Examination Data for Planar Reflectors | 167 |
| K-410 | Scope | 167 |
| K-470 | Examination | 167 |
| K-490 | Records/Documentation | 167 |
| Nonmandatory Appendix L | TOFD Sizing Demonstration/Dual Probe — Computer Imaging Technique | 168 |
| L-410 | Scope | 168 |
| L-420 | General | 168 |
| L-430 | Equipment | 168 |
| L-460 | Calibration | 168 |
| L-470 | Examination | 168 |
| L-480 | Evaluation | 168 |
| L-490 | Documentation | 170 |
| Nonmandatory Appendix M | General Techniques for Angle Beam Longitudinal Wave Calibrations | 171 |
| M-410 | Scope | 171 |
| M-460 | Calibration | 171 |
| Nonmandatory Appendix N | Time of Flight Diffraction (TOFD) Interpretation | 174 |
| N-410 | Scope | 174 |
| N-420 | General | 174 |
| N-450 | Procedure | 176 |
| N-480 | Evaluation | 180 |
| Nonmandatory Appendix O | Time of Flight Diffraction (TOFD) Technique — General Examination Configurations | 194 |
| O-410 | Scope | 194 |
| O-430 | Equipment | 194 |
| O-470 | Examination | 194 |
| Nonmandatory Appendix P | Phased Array (PAUT) Interpretation | 197 |
| P-410 | Scope | 197 |
| P-420 | General | 197 |
| P-450 | Procedure | 197 |
| P-480 | Evaluation | 197 |
| Nonmandatory Appendix Q | Example of a Split DAC Curve | 206 |
| Q-410 | Scope | 206 |
| Q-420 | General | 206 |
| Nonmandatory Appendix R | Straight Beam Calibration Blocks for Restricted Access Weld Examinations | 208 |
| R-410 | Scope | 208 |
| R-420 | General | 208 |
| R-430 | Equipment | 208 |
| Nonmandatory Appendix S | General Techniques for Straight-Beam Transfer Correction | 211 |
| S-410 | Scope | 211 |
| S-420 | Calibration | 211 |
| S-430 | Signal Adjustment | 211 |
| S-440 | Distance–Amplitude Correction (DAC) | 211 |

| | | |
|--------------------------------|--|------------|
| S-450 | Test Material Adjustment | 211 |
| S-460 | Calculate the Transfer Correction | 211 |
| Nonmandatory Appendix U | General Techniques for Angle-Beam Transfer Correction | 214 |
| U-410 | Scope | 214 |
| U-420 | Calibration | 214 |
| U-430 | Signal Adjustment | 214 |
| U-440 | Distance-Amplitude Correction (DAC) | 214 |
| U-450 | Test Material Adjustment | 214 |
| U-460 | Calculate the Transfer Correction | 214 |
| Article 5 | Ultrasonic Examination Methods for Materials | 217 |
| T-510 | Scope | 217 |
| T-520 | General | 217 |
| T-530 | Equipment | 217 |
| T-560 | Calibration | 218 |
| T-570 | Examination | 220 |
| T-580 | Evaluation | 221 |
| T-590 | Documentation | 221 |
| Mandatory Appendix I | Ultrasonic Examination of Pumps and Valves | 223 |
| I-510 | Scope | 223 |
| I-530 | Equipment | 223 |
| I-560 | Calibration | 223 |
| I-570 | Examination | 223 |
| Mandatory Appendix II | Inservice Examination of Nozzle Inside Corner Radius and Inner Corner Regions | 224 |
| II-510 | Scope | 224 |
| II-530 | Equipment | 224 |
| II-560 | Calibration | 224 |
| II-570 | Examination | 224 |
| Mandatory Appendix IV | Inservice Examination of Bolts | 225 |
| IV-510 | Scope | 225 |
| IV-530 | Equipment | 225 |
| IV-560 | Calibration | 225 |
| IV-570 | Examination | 225 |
| Article 6 | Liquid Penetrant Examination | 226 |
| T-610 | Scope | 226 |
| T-620 | General | 226 |
| T-630 | Equipment | 226 |
| T-640 | Miscellaneous Requirements | 226 |
| T-650 | Technique | 227 |
| T-660 | Calibration | 228 |
| T-670 | Examination | 228 |
| T-680 | Evaluation | 230 |
| T-690 | Documentation | 230 |
| Mandatory Appendix II | Control of Contaminants for Liquid Penetrant Examination | 231 |
| II-610 | Scope | 231 |
| II-640 | Requirements | 231 |
| II-690 | Documentation | 231 |
| Mandatory Appendix III | Qualification Techniques for Examinations at Nonstandard Temperatures | 232 |
| III-610 | Scope | 232 |
| III-630 | Materials | 232 |
| III-640 | Requirements | 232 |

| | | |
|--------------------------------|---|-----|
| Article 7 | Magnetic Particle Examination | 234 |
| T-710 | Scope | 234 |
| T-720 | General | 234 |
| T-730 | Equipment | 234 |
| T-740 | Miscellaneous Requirements | 235 |
| T-750 | Technique | 235 |
| T-760 | Calibration | 238 |
| T-770 | Examination | 241 |
| T-780 | Evaluation | 244 |
| T-790 | Documentation | 244 |
| Mandatory Appendix I | Magnetic Particle Examination Using the AC Yoke Technique on Ferromagnetic Materials Coated With Nonferromagnetic Coatings | 245 |
| I-710 | Scope | 245 |
| I-720 | General | 245 |
| I-730 | Equipment | 246 |
| I-740 | Miscellaneous Requirements | 246 |
| I-750 | Technique | 246 |
| I-760 | Calibration | 246 |
| I-770 | Examination | 247 |
| I-780 | Evaluation | 247 |
| I-790 | Documentation | 247 |
| Mandatory Appendix III | Magnetic Particle Examination Using the Yoke Technique With Fluorescent Particles in an Undarkened Area | 248 |
| III-710 | Scope | 248 |
| III-720 | General | 248 |
| III-750 | Technique | 248 |
| III-760 | Calibration | 248 |
| III-770 | Examination | 248 |
| III-790 | Documentation | 249 |
| Mandatory Appendix IV | Qualification of Alternate Wavelength Light Sources for Excitation of Fluorescent Particles | 250 |
| IV-710 | Scope | 250 |
| IV-720 | General | 250 |
| IV-750 | Technique | 250 |
| IV-770 | Qualification Examinations | 250 |
| IV-790 | Documentation | 251 |
| Mandatory Appendix V | Requirements for the Use of Magnetic Rubber Techniques | 252 |
| V-710 | Scope | 252 |
| V-720 | General Requirements | 252 |
| V-730 | Equipment | 252 |
| V-740 | Miscellaneous Requirements | 252 |
| V-750 | Techniques | 253 |
| V-760 | Calibration | 254 |
| V-770 | Examination | 254 |
| V-780 | Evaluation | 254 |
| V-790 | Documentation | 254 |
| Nonmandatory Appendix A | Measurement of Tangential Field Strength With Gaussmeters ... | 255 |
| A-710 | Scope | 255 |
| A-720 | General Requirements | 255 |
| A-730 | Equipment | 255 |
| A-750 | Procedure | 255 |
| A-790 | Documentation/Records | 255 |

| | | |
|-------------------------------|--|-----|
| Article 8 | Eddy Current Examination | 256 |
| T-810 | Scope | 256 |
| Mandatory Appendix II | Eddy Current Examination of Nonferromagnetic Heat Exchanger Tubing | 257 |
| II-810 | Scope | 257 |
| II-820 | General | 257 |
| II-830 | Equipment | 257 |
| II-840 | Requirements | 259 |
| II-860 | Calibration | 259 |
| II-870 | Examination | 261 |
| II-880 | Evaluation | 261 |
| II-890 | Documentation | 262 |
| Mandatory Appendix III | Eddy Current Examination on Coated Ferromagnetic Materials .. | 264 |
| III-810 | Scope | 264 |
| III-820 | General | 264 |
| III-830 | Equipment | 264 |
| III-850 | Technique | 264 |
| III-860 | Calibration | 264 |
| III-870 | Examination | 265 |
| III-890 | Documentation | 265 |
| Mandatory Appendix IV | External Coil Eddy Current Examination of Tubular Products | 266 |
| IV-810 | Scope | 266 |
| IV-820 | General | 266 |
| IV-830 | Equipment | 266 |
| IV-850 | Technique | 267 |
| IV-860 | Calibration | 267 |
| IV-870 | Examination | 267 |
| IV-880 | Evaluation | 267 |
| IV-890 | Documentation | 267 |
| Mandatory Appendix V | Eddy Current Measurement of Nonconductive-Nonferromagnetic Coating Thickness on a Nonferromagnetic Metallic Material ... | 268 |
| V-810 | Scope | 268 |
| V-820 | General | 268 |
| V-830 | Equipment | 268 |
| V-850 | Technique | 269 |
| V-860 | Calibration | 269 |
| V-870 | Examination | 269 |
| V-880 | Evaluation | 269 |
| V-890 | Documentation | 269 |
| Mandatory Appendix VI | Eddy Current Detection and Measurement of Depth of Surface Discontinuities in Nonferromagnetic Metals With Surface Probes | 271 |
| VI-810 | Scope | 271 |
| VI-820 | General | 271 |
| VI-830 | Equipment | 272 |
| VI-850 | Technique | 272 |
| VI-860 | Calibration | 272 |
| VI-870 | Examination | 272 |
| VI-880 | Evaluation | 272 |
| VI-890 | Documentation | 273 |

| | | |
|--------------------------------|---|-----|
| Mandatory Appendix VII | Eddy Current Examination of Ferromagnetic and Nonferromagnetic Conductive Metals to Determine If Flaws Are Surface Connected | 274 |
| VII-810 | Scope | 274 |
| VII-820 | General | 274 |
| VII-830 | Equipment | 274 |
| VII-850 | Technique | 275 |
| VII-860 | Calibration | 275 |
| VII-870 | Examination | 275 |
| VII-880 | Evaluation | 275 |
| VII-890 | Documentation | 275 |
| Mandatory Appendix VIII | Alternative Technique for Eddy Current Examination of Nonferromagnetic Heat Exchanger Tubing, Excluding Nuclear Steam Generator Tubing | 278 |
| VIII-810 | Scope | 278 |
| VIII-820 | General | 278 |
| VIII-830 | Equipment | 278 |
| VIII-850 | Technique | 280 |
| VIII-860 | Calibration | 280 |
| VIII-870 | Examination | 282 |
| VIII-880 | Evaluation | 282 |
| VIII-890 | Documentation | 282 |
| Mandatory Appendix IX | Eddy Current Array Examination of Ferromagnetic and Nonferromagnetic Materials for the Detection of Surface-Breaking Flaws | 284 |
| IX-810 | Scope | 284 |
| IX-820 | General Requirements | 284 |
| IX-830 | Equipment | 285 |
| IX-840 | Application Requirements | 286 |
| IX-850 | Technique | 286 |
| IX-860 | Calibration | 287 |
| IX-870 | Examination | 287 |
| IX-880 | Evaluation | 287 |
| IX-890 | Documentation | 287 |
| Mandatory Appendix X | Eddy Current Array Examination of Ferromagnetic and Nonferromagnetic Welds for the Detection of Surface-Breaking Flaws .. | 289 |
| X-810 | Scope | 289 |
| X-820 | General Requirements | 289 |
| X-830 | Equipment | 289 |
| X-840 | Application Requirements | 291 |
| X-850 | Technique | 291 |
| X-860 | Calibration | 291 |
| X-870 | Examination | 292 |
| X-880 | Evaluation | 292 |
| X-890 | Documentation | 292 |
| Article 9 | Visual Examination | 293 |
| T-910 | Scope | 293 |
| T-920 | General | 293 |
| T-930 | Equipment | 294 |
| T-950 | Technique | 294 |
| T-980 | Evaluation | 294 |
| T-990 | Documentation | 294 |
| Article 10 | Leak Testing | 295 |
| T-1010 | Scope | 295 |

| | | |
|--------------------------------|---|------------|
| T-1020 | General | 295 |
| T-1030 | Equipment | 296 |
| T-1040 | Miscellaneous Requirements | 296 |
| T-1050 | Procedure | 296 |
| T-1060 | Calibration | 296 |
| T-1070 | Test | 297 |
| T-1080 | Evaluation | 297 |
| T-1090 | Documentation | 297 |
| Mandatory Appendix I | Bubble Test — Direct Pressure Technique | 298 |
| I-1010 | Scope | 298 |
| I-1020 | General | 298 |
| I-1030 | Equipment | 298 |
| I-1070 | Test | 298 |
| I-1080 | Evaluation | 299 |
| Mandatory Appendix II | Bubble Test — Vacuum Box Technique | 300 |
| II-1010 | Scope | 300 |
| II-1020 | General | 300 |
| II-1030 | Equipment | 300 |
| II-1070 | Test | 301 |
| II-1080 | Evaluation | 301 |
| Mandatory Appendix III | Halogen Diode Detector Probe Test | 302 |
| III-1010 | Introduction and Scope | 302 |
| III-1020 | General | 302 |
| III-1030 | Equipment | 302 |
| III-1060 | Calibration | 302 |
| III-1070 | Test | 303 |
| III-1080 | Evaluation | 304 |
| Mandatory Appendix IV | Helium Mass Spectrometer Test — Detector Probe Technique ... | 305 |
| IV-1010 | Scope | 305 |
| IV-1020 | General | 305 |
| IV-1030 | Equipment | 305 |
| IV-1060 | Calibration | 305 |
| IV-1070 | Test | 306 |
| IV-1080 | Evaluation | 307 |
| Mandatory Appendix V | Helium Mass Spectrometer Test — Tracer Probe Technique | 308 |
| V-1010 | Scope | 308 |
| V-1020 | General | 308 |
| V-1030 | Equipment | 308 |
| V-1060 | Calibration | 308 |
| V-1070 | Test | 309 |
| V-1080 | Evaluation | 309 |
| Mandatory Appendix VI | Pressure Change Test | 311 |
| VI-1010 | Scope | 311 |
| VI-1020 | General | 311 |
| VI-1030 | Equipment | 311 |
| VI-1060 | Calibration | 312 |
| VI-1070 | Test | 312 |
| VI-1080 | Evaluation | 312 |
| Mandatory Appendix VIII | Thermal Conductivity Detector Probe Test | 313 |
| VIII-1010 | Introduction and Scope | 313 |
| VIII-1020 | General | 313 |
| VIII-1030 | Equipment | 313 |
| VIII-1060 | Calibration | 313 |

| | | |
|--------------------------------|---|-----|
| VIII-1070 | Test | 314 |
| VIII-1080 | Evaluation | 315 |
| Mandatory Appendix IX | Helium Mass Spectrometer Test — Hood Technique | 316 |
| IX-1010 | Scope | 316 |
| IX-1020 | General | 316 |
| IX-1030 | Equipment | 316 |
| IX-1050 | Technique | 317 |
| IX-1060 | Calibration | 317 |
| IX-1070 | Test | 318 |
| IX-1080 | Evaluation | 319 |
| Mandatory Appendix X | Ultrasonic Leak Detector Test | 320 |
| X-1010 | Introduction | 320 |
| X-1020 | General | 320 |
| X-1030 | Equipment | 320 |
| X-1060 | Calibration | 321 |
| X-1070 | Test | 321 |
| X-1080 | Evaluation | 321 |
| Mandatory Appendix XI | Helium Mass Spectrometer — Helium-Filled-Container Leakage Rate Test | 322 |
| XI-1010 | Scope | 322 |
| XI-1020 | General | 322 |
| XI-1030 | Equipment | 322 |
| XI-1050 | Technique | 323 |
| XI-1060 | Calibration | 323 |
| XI-1070 | Calculation of Test Reliability and Corrected Leakage Rate | 325 |
| XI-1080 | Evaluation | 325 |
| Nonmandatory Appendix A | Supplementary Leak Testing Equation Symbols | 326 |
| A-1010 | Applicability of the Formulas | 326 |
| Article 11 | Acoustic Emission Examination of Fiber-Reinforced Plastic Vessels | 327 |
| T-1110 | Scope | 327 |
| T-1120 | General | 327 |
| T-1130 | Equipment | 328 |
| T-1160 | Calibration | 329 |
| T-1170 | Examination | 329 |
| T-1180 | Evaluation | 330 |
| T-1190 | Documentation | 330 |
| Mandatory Appendix I | Instrumentation Performance Requirements | 338 |
| I-1110 | AE Sensors | 338 |
| I-1120 | Signal Cable | 338 |
| I-1130 | Couplant | 338 |
| I-1140 | Preamplifier | 338 |
| I-1150 | Filters | 338 |
| I-1160 | Power-Signal Cable | 338 |
| I-1170 | Main Amplifier | 339 |
| I-1180 | Main Processor | 339 |
| Mandatory Appendix II | Instrument Calibration | 341 |
| II-1110 | General | 341 |
| II-1120 | Threshold | 341 |
| II-1130 | Reference Amplitude Threshold | 341 |
| II-1140 | Count Criterion N_c and A_M Value | 341 |
| II-1160 | Field Performance | 341 |

| | | |
|--------------------------------|--|-----|
| Nonmandatory Appendix A | Sensor Placement Guidelines | 342 |
| Article 12 | Acoustic Emission Examination of Metallic Vessels During Pressure Testing | 348 |
| T-1210 | Scope | 348 |
| T-1220 | General | 348 |
| T-1230 | Equipment | 349 |
| T-1260 | Calibration | 349 |
| T-1270 | Examination | 350 |
| T-1280 | Evaluation | 351 |
| T-1290 | Documentation | 351 |
| Mandatory Appendix I | Instrumentation Performance Requirements | 355 |
| I-1210 | Acoustic Emission Sensors | 355 |
| I-1220 | Signal Cable | 355 |
| I-1230 | Couplant | 355 |
| I-1240 | Preamplifier | 355 |
| I-1250 | Filter | 355 |
| I-1260 | Power-Signal Cable | 355 |
| I-1270 | Power Supply | 355 |
| I-1280 | Main Amplifier | 355 |
| I-1290 | Main Processor | 355 |
| Mandatory Appendix II | Instrument Calibration and Cross-Referencing | 357 |
| II-1210 | Manufacturer's Calibration | 357 |
| II-1220 | Instrument Cross-Referencing | 357 |
| Nonmandatory Appendix A | Sensor Placement Guidelines | 358 |
| Nonmandatory Appendix B | Supplemental Information for Conducting Acoustic Emission Examinations | 363 |
| B-1210 | Frequency Selection | 363 |
| B-1220 | Combining More Than One Sensor in a Single Channel | 363 |
| B-1230 | Attenuative Welds | 363 |
| B-1240 | Production Line Testing of Identical Vessels | 363 |
| Article 13 | Continuous Acoustic Emission Monitoring of Pressure Boundary Components | 364 |
| T-1310 | Scope | 364 |
| T-1320 | General | 364 |
| T-1330 | Equipment | 365 |
| T-1340 | Miscellaneous Requirements | 367 |
| T-1350 | Technique/Procedure Requirements | 368 |
| T-1360 | Calibration | 370 |
| T-1370 | Examination | 370 |
| T-1380 | Evaluation/Results | 371 |
| T-1390 | Reports/Records | 371 |
| Mandatory Appendix I | Nuclear Components | 373 |
| I-1310 | Scope | 373 |
| I-1330 | Equipment | 373 |
| I-1340 | Miscellaneous Requirements | 373 |
| I-1360 | Calibration | 373 |
| I-1380 | Evaluation | 373 |
| Mandatory Appendix II | Non-Nuclear Metal Components | 375 |
| II-1310 | Scope | 375 |
| II-1330 | Equipment | 375 |
| II-1360 | Calibration | 376 |
| II-1380 | Evaluation | 376 |

| | | |
|-------------------------------|---|-----|
| Mandatory Appendix III | Nonmetallic Components | 377 |
| III-1310 | Scope | 377 |
| III-1320 | General | 377 |
| III-1330 | Equipment | 377 |
| III-1360 | Calibration | 377 |
| III-1380 | Evaluation | 378 |
| Mandatory Appendix IV | Limited Zone Monitoring | 379 |
| IV-1310 | Scope | 379 |
| IV-1320 | General | 379 |
| IV-1340 | Miscellaneous Requirements | 379 |
| IV-1350 | Technique | 379 |
| IV-1360 | Calibration | 379 |
| IV-1380 | Evaluation | 379 |
| IV-1390 | Documentation | 380 |
| Mandatory Appendix V | Hostile Environment Applications | 381 |
| V-1310 | Scope | 381 |
| V-1330 | Equipment | 381 |
| V-1340 | Miscellaneous Requirements | 381 |
| Mandatory Appendix VI | Leak Detection Applications | 384 |
| VI-1310 | Scope | 384 |
| VI-1320 | General | 384 |
| VI-1330 | Equipment | 384 |
| VI-1350 | Technique | 385 |
| VI-1360 | Calibration | 385 |
| VI-1370 | Examination | 385 |
| VI-1380 | Evaluation | 385 |
| Article 14 | Examination System Qualification | 386 |
| T-1410 | Scope | 386 |
| T-1420 | General Requirements | 386 |
| T-1430 | Equipment | 387 |
| T-1440 | Application Requirements | 387 |
| T-1450 | Conduct of Qualification Demonstration | 389 |
| T-1460 | Calibration | 390 |
| T-1470 | Examination | 390 |
| T-1480 | Evaluation | 392 |
| T-1490 | Documentation and Records | 392 |
| Mandatory Appendix II | UT Performance Demonstration Criteria | 393 |
| II-1410 | Scope | 393 |
| II-1420 | General | 393 |
| II-1430 | Equipment | 393 |
| II-1440 | Application Requirements | 393 |
| II-1450 | Conduct of Qualification Demonstration | 394 |
| II-1460 | Calibration | 395 |
| II-1470 | Examination | 395 |
| II-1480 | Evaluation | 395 |
| II-1490 | Documentation | 395 |
| Article 15 | Alternating Current Field Measurement Technique (ACFMT) | 396 |
| T-1510 | Scope | 396 |
| T-1520 | General | 396 |
| T-1530 | Equipment | 396 |
| T-1540 | Miscellaneous Requirements | 397 |
| T-1560 | Calibration | 397 |
| T-1570 | Examination | 399 |

| | | |
|--------------------------------|---|-----|
| T-1580 | Evaluation | 399 |
| T-1590 | Documentation | 399 |
| Article 16 | Magnetic Flux Leakage (MFL) Examination | 400 |
| T-1610 | Scope | 400 |
| T-1620 | General | 400 |
| T-1630 | Equipment | 401 |
| T-1640 | Requirements | 401 |
| T-1650 | Calibration | 401 |
| T-1660 | Examination | 401 |
| T-1670 | Evaluation | 402 |
| T-1680 | Documentation | 402 |
| Article 17 | Remote Field Testing (RFT) Examination Method | 404 |
| T-1710 | Scope | 404 |
| T-1720 | General | 404 |
| T-1730 | Equipment | 404 |
| T-1750 | Technique | 404 |
| T-1760 | Calibration | 405 |
| T-1770 | Examination | 407 |
| T-1780 | Evaluation | 407 |
| T-1790 | Documentation | 407 |
| Article 18 | Acoustic Pulse Reflectometry (APR) Examination | 409 |
| T-1810 | Scope | 409 |
| T-1820 | General | 409 |
| T-1830 | Equipment | 409 |
| T-1840 | Miscellaneous Requirements | 411 |
| T-1850 | Prior to the Examination | 411 |
| T-1860 | Calibration | 411 |
| T-1870 | Examination | 412 |
| T-1880 | Evaluation | 412 |
| T-1890 | Documentation | 412 |
| Article 19 | Guided Wave Examination Method for Piping | 415 |
| T-1910 | Scope | 415 |
| T-1920 | General | 415 |
| T-1930 | Equipment | 415 |
| T-1950 | Wave Modes | 415 |
| T-1960 | Calibration | 416 |
| T-1970 | Examination | 417 |
| T-1980 | Evaluation | 417 |
| T-1990 | Documentation | 417 |
| Nonmandatory Appendix A | Operation of GWT Systems | 419 |
| A-1910 | Scope | 419 |
| A-1920 | General | 419 |
| Article 20 | Computed Tomography Examination | 422 |
| T-2010 | Scope | 422 |
| T-2020 | General | 422 |
| T-2030 | Equipment | 422 |
| T-2060 | Detector Pixel Correction | 423 |
| T-2070 | Examination | 423 |
| T-2080 | Evaluation | 423 |
| T-2090 | Documentation | 424 |
| Article 21 | Pulsed Eddy Current (PEC) Technique for Corrosion Screening .. | 426 |
| T-2110 | Scope | 426 |
| T-2120 | General | 426 |

| | | |
|--------------------------------|--|-----|
| T-2130 | Equipment | 427 |
| T-2150 | Techniques | 427 |
| T-2160 | Calibration | 427 |
| T-2170 | Examination | 428 |
| T-2180 | Evaluation | 428 |
| T-2190 | Documentation | 428 |
| Nonmandatory Appendix A | Applications of Pulsed Eddy Current Examination | 430 |
| A-2110 | Scope | 430 |
| A-2120 | General | 430 |
| A-2150 | Process Used With PEC Equipment | 434 |
| A-2160 | Reference Measurement | 435 |
| A-2170 | Examination | 436 |
| Nonmandatory Appendix B | Training Outline for Pulsed Eddy Current Examination | 437 |
| B-2110 | Scope | 437 |
| B-2120 | Training Outline for Level II Personnel | 437 |
| Subsection B | Documents Adopted by Section V | 439 |
| Article 22 | Radiographic Standards | 440 |
| SE-94/SE-94M | Standard Guide for Radiographic Examination Using Industrial Radiographic Film | 441 |
| SE-747 | Standard Practice for Design, Manufacture and Material Grouping Classification of Wire Image Quality Indicators (IQI) Used for Radiology | 455 |
| SE-999 | Standard Guide for Controlling the Quality of Industrial Radiographic Film Processing | 469 |
| SE-1025 | Standard Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiography | 475 |
| SE-1030/SE-1030M | Standard Practice for Radiographic Examination of Metallic Castings .. | 483 |
| SE-1114 | Standard Test Method for Determining the Size of Iridium-192 Industrial Radiographic Sources | 495 |
| SE-1165 | Standard Test Method for Measurement of Focal Spots of Industrial X-Ray Tubes by Pinhole Imaging | 501 |
| SE-1255 | Standard Practice for Radioscopy | 515 |
| SE-1416 | Standard Practice for Radioscopic Examination of Weldments | 525 |
| SE-1475 | Standard Guide for Data Fields for Computerized Transfer of Digital Radiological Examination Data | 533 |
| SE-1647 | Standard Practice for Determining Contrast Sensitivity in Radiology .. | 541 |
| SE-2597/SE-2597M | Standard Practice for Manufacturing Characterization of Digital Detector Arrays | 547 |
| Article 23 | Ultrasonic Standards | 566 |
| SA-388/SA-388M | Standard Practice for Ultrasonic Examination of Steel Forgings | 567 |
| SA-435/SA-435M | Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates | 577 |
| SA-577/SA-577M | Standard Specification for Ultrasonic Angle-Beam Examination of Steel Plate | 581 |
| SA-578/SA-578M | Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications | 585 |
| SA-609/SA-609M | Standard Practice for Castings, Carbon, Low-Alloy and Martensitic Stainless Steel, Ultrasonic Examination Thereof | 591 |
| SA-745/SA-745M | Standard Practice for Ultrasonic Examination of Austenitic Steel Forgings | 601 |
| SB-548 | Standard Test Method for Ultrasonic Inspection of Aluminum-Alloy Plate for Pressure Vessels | 607 |

| | | |
|-------------------|--|-----|
| SD-7091 | Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals | 613 |
| SE-213 | Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing | 621 |
| SE-273 | Standard Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing | 633 |
| SE-317 | Standard Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Instruments and Systems Without the Use of Electronic Measurement Instruments | 639 |
| SE-797/SE-797M | Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method | 653 |
| SE-2491 | Standard Guide for Evaluating Performance Characteristics of Phased-Array Ultrasonic Testing Instruments and Systems | 661 |
| SE-2700 | Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays | 681 |
| Article 24 | Liquid Penetrant Standards | 690 |
| SD-129 | Standard Test Method for Sulfur in Petroleum Products (General High Pressure Decomposition Device Method) | 691 |
| SD-516 | Standard Test Method for Sulfate Ion in Water | 697 |
| SD-808 | Standard Test Method for Chlorine in New and Used Petroleum Products (High Pressure Decomposition Device Method) | 703 |
| SE-165/SE-165M | Standard Practice for Liquid Penetrant Examination for General Industry | 709 |
| SE-2297 | Standard Guide for Use of UV-A and Visible Light Sources and Meters Used in the Liquid Penetrant and Magnetic Particle Methods | 729 |
| SE-3022 | Standard Practice for Measurement of Emission Characteristics and Requirements for LED UV-A Lamps Used in Fluorescent Penetrant and Magnetic Particle Testing | 735 |
| Article 25 | Magnetic Particle Standards | 744 |
| SD-1186 | Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base | 745 |
| SE-709 | Standard Guide for Magnetic Particle Testing | 751 |
| Article 26 | Eddy Current Standard | 799 |
| SE-243 | Standard Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper-Alloy Tubes | 801 |
| Article 29 | Acoustic Emission Standards | 807 |
| SE-650/SE-650M | Standard Guide for Mounting Piezoelectric Acoustic Emission Sensors | 809 |
| SE-750 | Standard Practice for Characterizing Acoustic Emission Instrumentation | 813 |
| SE-976 | Standard Guide for Determining the Reproducibility of Acoustic Emission Sensor Response | 825 |
| SE-1067/SE-1067M | Standard Practice for Acoustic Emission Examination of Fiberglass Reinforced Plastic Resin (FRP) Tanks/Vessels | 833 |
| SE-1118/SE-1118M | Standard Practice for Acoustic Emission Examination of Reinforced Thermosetting Resin Pipe (RTRP) | 849 |
| SE-1139/SE-1139M | Standard Practice for Continuous Monitoring of Acoustic Emission From Metal Pressure Boundaries | 863 |
| SE-1211/SE-1211M | Standard Practice for Leak Detection and Location Using Surface-Mounted Acoustic Emission Sensors | 871 |
| SE-1419/SE-1419M | Standard Practice for Examination of Seamless, Gas-Filled, Pressure Vessels Using Acoustic Emission | 877 |
| SE-2075/SE-2075M | Standard Practice for Verifying the Consistency of AE-Sensor Response Using an Acrylic Rod | 887 |

| | | |
|--------------------------------|---|-----|
| Article 31 | Alternating Current Field Measurement Standard | 892 |
| SE-2261/SE-2261M | Standard Practice for Examination of Welds Using the Alternating Current Field Measurement Technique | 893 |
| Article 32 | Remote Field Testing Standard | 908 |
| SE-2096/SE-2096M | Standard Practice for In Situ Examination of Ferromagnetic Heat-Exchanger Tubes Using Remote Field Testing | 909 |
| Article 33 | Guided Wave Standards | 919 |
| SE-2775 | Standard Practice for Guided Wave Testing of Above Ground Steel Pipework Using Piezoelectric Effect Transduction | 921 |
| SE-2929 | Standard Practice for Guided Wave Testing of Above Ground Steel Piping With Magnetostrictive Transduction | 933 |
| Mandatory Appendix II | Standard Units for Use in Equations | 944 |
| Nonmandatory Appendix A | Guidance for the Use of U.S. Customary and SI Units in the ASME Boiler and Pressure Vessel Code | 945 |
| A-1 | Use of Units in Equations | 945 |
| A-2 | Guidelines Used to Develop SI Equivalents | 945 |
| A-3 | Soft Conversion Factors | 947 |
| FIGURES | | |
| T-275 | Location Marker Sketches | 45 |
| I-263 | Beam Width Determination | 51 |
| VI-A-1 | Reference Film | 62 |
| VIII-A-221-1 | Procedure Demonstration Block | 69 |
| IX-263 | Beam Width Determination | 72 |
| A-210-1 | Single-Wall Radiographic Techniques | 76 |
| C-210-1 | Side and Top Views of Hole-Type IQI Placements | 79 |
| C-210-2 | Side and Top Views of Hole-Type IQI Placements | 80 |
| C-210-3 | Side and Top Views of Hole-Type IQI Placements | 81 |
| C-210-4 | Side and Top Views of Hole-Type IQI Placements | 82 |
| D-210-1 | Complete Circumference Cylindrical Component | 83 |
| D-210-2 | Section of Circumference 240 deg or More Cylindrical Component (Example is Alternate Intervals) | 83 |
| D-210-3 | Section(s) of Circumference Less Than 240 deg Cylindrical Component | 83 |
| D-210-4 | Section(s) of Circumference Equal to or More Than 120 deg and Less Than 240 deg Cylindrical Component Option | 84 |
| D-210-5 | Complete Circumferential Welds Spherical Component | 84 |
| D-210-6 | Welds in Segments of Spherical Component | 84 |
| D-210-7 | Plan View A-A | 84 |
| D-210-8 | Array of Objects in a Circle | 85 |
| T-434.1.7.2 | Ratio Limits for Curved Surfaces | 90 |
| T-434.2.1 | Nonpiping Calibration Blocks | 91 |
| T-434.3-1 | Calibration Block for Piping | 92 |
| T-434.3-2 | Alternate Calibration Block for Piping | 93 |
| T-434.4.1 | Calibration Block for Technique One | 94 |
| T-434.4.2.1 | Alternate Calibration Block for Technique One | 95 |
| T-434.4.2.2 | Alternate Calibration Block for Technique One | 96 |
| T-434.4.3 | Calibration Block for Technique Two | 96 |
| T-434.5.1 | Calibration Block for Straight Beam Examination of Nozzle Side Weld Fusion Zone and/or Adjacent Nozzle Parent Metal | 97 |
| I-440 | Linearity | 105 |
| III-434.2.1(a) | TOFD Reference Block | 108 |
| III-434.2.1(b) | Two-Zone Reference Block Example | 109 |
| III-463.5 | Offset Scans | 110 |
| X-471.1 | Fusion Pipe Joint Examination Volume | 126 |

| | | |
|------------|--|-----|
| XI-434.1-1 | Calibration Block | 129 |
| B-461.1 | Sweep Range (Side-Drilled Holes) | 135 |
| B-461.2 | Sweep Range (IIW Block) | 136 |
| B-461.3 | Sweep Range (Notches) | 136 |
| B-462.1 | Sensitivity and Distance–Amplitude Correction (Side-Drilled Holes) | 137 |
| B-462.3 | Sensitivity and Distance–Amplitude Correction (Notches) | 138 |
| B-464 | Position Depth and Beam Path | 139 |
| B-465 | Planar Reflections | 139 |
| B-466 | Beam Spread | 140 |
| C-461 | Sweep Range | 141 |
| C-462 | Sensitivity and Distance–Amplitude Correction | 142 |
| D-490 | Search Unit Location, Position, and Beam Direction | 144 |
| E-460.1 | Lateral Resolution and Depth Discrimination Block for 45 deg and 60 deg Applications .. | 148 |
| E-460.2 | Lateral and Depth Resolution Block for 0 deg Applications | 150 |
| F-451.1-1 | FMC/TFM Generic Workflow | 154 |
| F-451.1-2 | Active Focusing Workflow | 155 |
| F-451.1-3 | Active Focusing Workflow With FMC Data Acquisition | 155 |
| F-451.1-4 | Example of an Iterative FMC/TFM Workflow as an Adaptation of That Shown in Figure F-451.1-1 | 156 |
| F-471-1 | Examples of Ultrasonic Imaging Modes | 159 |
| G-461(a) | Critical Radius, R_c , for Transducer/Couplant Combinations | 161 |
| G-461(b) | Correction Factor (Gain) for Various Ultrasonic Examination Parameters | 162 |
| J-431 | Basic Calibration Block | 165 |
| L-432 | Example of a Flat Demonstration Block Containing Three Notches | 169 |
| M-461.1 | Sweep Range (Side-Drilled Holes) | 171 |
| M-461.2 | Sweep Range (Cylindrical Surfaces) | 172 |
| M-461.3 | Sweep Range (Straight Beam Search Unit) | 172 |
| M-462 | Sensitivity and Distance–Amplitude Correction | 173 |
| N-421(a) | Schematic Showing Waveform Transformation Into Grayscale | 174 |
| N-421(b) | Schematic Showing Generation of Grayscale Image From Multiple A-Scans | 175 |
| N-421(c) | Schematic Showing Standard TOFD Setup and Display With Waveform and Signal Phases | 175 |
| N-421(d) | TOFD Display With Flaws and Displayed A-Scan | 176 |
| N-451 | Measurement Tools for Flaw Heights | 177 |
| N-452(a) | Schematic Showing the Detection of Off-Axis Flaws | 177 |
| N-452(b) | Measurement Errors From Flaw Position Uncertainty | 178 |
| N-453 | TOFD Image Showing Hyperbolic “Tails” From the Ends of a Flaw Image Used to Measure Flaw Length | 178 |
| N-454(a) | TOFD Image Showing Top and Bottom Diffracted Signals From Midwall Flaw and A-Scan Interpretation | 179 |
| N-454(b) | TOFD Image Showing Top and Bottom Diffracted Signals From Centerline Crack and A-Scan Interpretation | 179 |
| N-481(a) | Schematics of Image Generation, Scan Pattern, Waveform, and TOFD Display Showing the Image of the Point Flaw | 180 |
| N-481(b) | Schematics of Image Generation, Flaw Location, and TOFD Display Showing the Image of the Inside (ID) Surface-Breaking Flaw | 181 |
| N-481(c) | Schematics of Image Generation, Flaw Location, and TOFD Display Showing the Image of the Outside (OD) Surface-Breaking Flaw | 181 |
| N-481(d) | Schematics of Flaw Location, Signals, and TOFD Display Showing the Image of the Midwall Flaw | 182 |
| N-481(e) | Flaw Location and TOFD Display Showing the Image of the Lack of Root Penetration | 183 |
| N-481(f) | Flaw Location and TOFD Display Showing the Image of the Concave Root Flaw | 183 |
| N-481(g) | Flaw Location, TOFD Display Showing the Image of the Midwall Lack of Fusion Flaw, and the A-Scan | 184 |
| N-481(h) | Flaw Location and TOFD Display Showing the Image of the Porosity | 184 |
| N-481(i) | Flaw Location and TOFD Display Showing the Image of the Transverse Crack | 185 |

| | | |
|-------------|---|-----|
| N-481(j) | Schematics of Image Generation, Flaw Location, and TOFD Display Showing the Image of the Interpass Lack of Fusion | 185 |
| N-482(a) | Schematic of Flaw Locations and TOFD Image Showing the Lateral Wave, Backwall, and Three of the Four Flaws | 186 |
| N-482(b) | Schematic of Flaw Locations and TOFD Display Showing the Lateral Wave, Backwall, and Four Flaws | 187 |
| N-483(a) | Acceptable Noise Levels, Flaws, Lateral Wave, and Longitudinal Wave Backwall | 188 |
| N-483(b) | TOFD Image With Gain Too Low | 189 |
| N-483(c) | TOFD Image With Gain Set Too High | 190 |
| N-483(d)(1) | TOFD Image With the Gate Set Too Early | 190 |
| N-483(d)(2) | TOFD Image With the Gate Set Too Late | 191 |
| N-483(d)(3) | TOFD Image With the Gate Set Too Long | 191 |
| N-483(e) | TOFD Image With Transducers Set Too Far Apart | 192 |
| N-483(f) | TOFD Image With Transducers Set Too Close Together | 192 |
| N-483(g) | TOFD Image With Transducers Not Centered on the Weld Axis | 193 |
| N-483(h) | TOFD Image Showing Electrical Noise Interference | 193 |
| O-470(a) | Example of a Single Zone TOFD Setup | 195 |
| O-470(b) | Example of a Two Zone TOFD Setup (Equal Zone Heights) | 195 |
| O-470(c) | Example of a Three Zone TOFD Setup (Unequal Zone Heights With Zone 3 Addressed by Two Offset Scans) | 195 |
| O-470(d) | Example of a Four Zone TOFD Setup (Equal Zone Heights) | 196 |
| P-421-1 | Black and White (B&W) Version of Color Palette | 199 |
| P-421-2 | Scan Pattern Format | 199 |
| P-421-3 | Example of an E-Scan Image Display | 200 |
| P-421-4 | Example of an S-Scan Image Display | 201 |
| P-452.1 | Flaw Length Sizing Using Amplitude Drop Technique and the Vertical Cursors on the C-Scan Display | 201 |
| P-452.2-1 | Scan Showing Flaw Height Sizing Using Amplitude Drop Technique and the Horizontal Cursors on the B-Scan Display | 202 |
| P-452.2-2 | Flaw Height Sizing Using Top Diffraction Technique and the Horizontal Cursors on the S-Scan Display | 202 |
| P-481 | S-Scan of I.D. Connected Crack | 203 |
| P-481.1 | E-Scan of LOF in Midwall | 203 |
| P-481.2 | S-Scan of Porosity, Showing Multiple Reflectors | 204 |
| P-481.3 | O.D. Toe Crack Detected Using S-Scan | 204 |
| P-481.4 | IP Signal on S-Scan, Positioned on Root | 205 |
| P-481.5 | Slag Displayed as a Midwall Defect on S-Scan | 205 |
| Q-410 | Distance–Amplitude Correction | 206 |
| Q-421 | First DAC Curve | 207 |
| Q-422 | Second DAC Curve | 207 |
| R-434-1 | Corner Weld Example | 209 |
| R-434-2 | Tee Weld Example | 210 |
| S-430-1 | Signal Adjustment (Back Wall) | 211 |
| S-440-1 | DAC Curve for Straight Beam Transfer Correction | 212 |
| S-460-1 | Example 1 (Straight-Beam Transfer Correction) | 212 |
| S-460-2 | Example 2 (Straight-Beam Transfer Correction) | 213 |
| U-430-1 | Signal Adjustment (Angle Beam) | 215 |
| U-440-1 | DAC Curve | 215 |
| U-450-1 | Signal Adjustment (Angle Beam) | 215 |
| U-460-1 | Example 1 (Angle-Beam Transfer Correction) | 216 |
| U-460-2 | Example 2 (Angle-Beam Transfer Correction) | 216 |
| T-534.3 | Straight Beam Calibration Blocks for Bolting | 219 |
| III-630 | Liquid Penetrant Comparator | 232 |
| T-754.2.1 | Single-Pass and Two-Pass Central Conductor Technique | 237 |
| T-754.2.2 | The Effective Region of Examination When Using an Offset Central Conductor | 237 |
| T-764.2(a) | Pie-Shaped Magnetic Particle Field Indicator | 239 |

| | | |
|---------------|--|-----|
| T-764.2(b)(1) | Artificial Flaw Shims | 239 |
| T-764.2(b)(2) | Artificial Flaw Shims | 240 |
| T-766.1 | Ketos (Betz) Test Ring | 242 |
| II-863.1 | Differential Technique Response From Calibration Reference Standard | 261 |
| II-863.2 | Absolute Technique Response From Calibration Reference Standard | 261 |
| II-880 | Flaw Depth as a Function of Phase Angle at 400 kHz [Ni-Cr-Fe 0.050 in. (1.24 mm) Wall Tube] | 262 |
| V-860 | Typical Lift-off Calibration Curve for Coating Thickness Showing Thickness Calibration Points Along the Curve | 270 |
| VI-832 | Reference Specimen | 273 |
| VI-850 | Impedance Plane Representations of Indications From Figure VI-832 | 273 |
| VII-835 | Eddy Current Reference Specimen | 276 |
| VII-862 | Impedance Plane Responses for Stainless Steel and Carbon Steel Reference Specimens ... | 277 |
| VIII-864.1 | Differential Technique Response From Calibration Reference | 281 |
| VIII-864.2 | Absolute Technique From Calibration Reference Standard | 281 |
| IX-821-1 | ECA Technique Compared to Raster Scan | 284 |
| IX-832-1 | Array Coil Sensitivity Variance | 285 |
| IX-833-1 | Example Reference Standard | 286 |
| IX-872-1 | Scanning Overlap | 288 |
| X-833-1 | Example Reference Standard | 291 |
| T-1173(a)(1) | Atmospheric Vessels Loading Sequence | 332 |
| T-1173(a)(2) | Vacuum Vessels Loading Sequence | 333 |
| T-1173(a)(3) | Test Algorithm — Flowchart for Atmospheric Vessels | 334 |
| T-1173(b)(1) | Pressure Vessel Loading Sequence | 335 |
| T-1173(b)(2) | Algorithm — Flowchart for Pressure Vessels | 336 |
| I-1183 | Sample of Schematic of AE Instrumentation for Vessel Examination | 340 |
| A-1110 | Case 1 — Atmospheric Vertical Vessel | 342 |
| A-1120 | Case 2 — Atmospheric Vertical Vessel | 343 |
| A-1130 | Case 3 — Atmospheric/Pressure Vessel | 344 |
| A-1140 | Case 4 — Atmospheric/Pressure Vertical Vessel | 345 |
| A-1150 | Case 5 — Atmospheric/Vacuum Vertical Vessel | 346 |
| A-1160 | Case 6 — Atmospheric/Pressure Horizontal Tank | 347 |
| T-1273.2.1 | An Example of Pressure Vessel Test Stressing Sequence | 352 |
| T-1273.2.2 | An Example of In-Service, Pressure Vessel, Test Loading Sequence | 353 |
| A-1210 | Case 1 — Vertical Pressure Vessel Dished Heads, Lug or Leg Supported | 358 |
| A-1220 | Case 2 — Vertical Pressure Vessel Dished Heads, Agitated, Baffled Lug, or Leg Support .. | 359 |
| A-1230 | Case 3 — Horizontal Pressure Vessel Dished Heads, Saddle Supported | 360 |
| A-1240 | Case 4 — Vertical Pressure Vessel Packed or Trayed Column Dished Heads, Lug or Skirt Supported | 361 |
| A-1250 | Case 5 — Spherical Pressure Vessel, Leg Supported | 362 |
| T-1331 | Functional Flow Diagram — Continuous AE Monitoring System | 365 |
| T-1332.2 | Response of a Waveguide AE Sensor Inductively Tuned to 500 kHz | 366 |
| V-1333 | Metal Waveguide AE Sensor Construction | 382 |
| V-1341 | Mounting Fixture for Steel Waveguide AE Sensor | 383 |
| II-1434 | Flaw Characterization for Tables II-1434-1 and II-1434-2 | 394 |
| T-1533 | ACFMT Calibration Block | 398 |
| T-1622.1.1 | Reference Plate Dimensions | 401 |
| T-1622.1.2 | Reference Pipe or Tube Dimensions | 402 |
| T-1762 | Pit Reference Tube (Typical) | 405 |
| T-1763.1(a) | Voltage Plane Display of Differential Channel Response for Through-Wall Hole (Through-Hole Signal) and 20% Groove Showing Preferred Angular Relationship | 406 |
| T-1763.1(b) | Voltage Plane Display of Differential Channel Response for the Tube Support Plate (TSP), 20% Groove, and Through-Wall Hole (Through-Hole Signal) | 406 |
| T-1763.2 | Reference Curve and the Absolute Channel Signal Response From Two Circumferential Grooves and a Tube Support Plate | 407 |
| T-1832 | Reference Specimens | 410 |

| | | |
|------------|---|-----|
| T-1865.1 | Signal Analysis From Various Types of Discontinuities | 413 |
| T-1865.2 | Reflection From a Through-Wall Hole | 414 |
| A-1920 | Illustration of the Guided Wave Examination Procedure | 420 |
| A-2121-1 | Basic Decay Curve in a Log-Linear Graph | 430 |
| A-2121-2 | Basic Decay Curve in a Log-Log Graph | 431 |
| A-2123.1-1 | Impact of Aluminum Jacketing With a Thickness of 0.04 in. (1 mm) on the Decay Curve in a Log-Linear Graph | 431 |
| A-2123.1-2 | Impact of Aluminum Jacketing With a Thickness of 0.04 in. (1 mm) on the Decay Curve in a Log-Log Graph | 432 |
| A-2152-1 | Image of Reference Plate With Two Thicknesses | 435 |
| A-2152.1-1 | Image of Trajectory A-B on Which Measurements Are Performed to Determine the Footprint | 435 |
| A-2152.1-2 | Wall Thickness Response of the Measurement of Trajectory A-B | 435 |
| A-2152.1-3 | Derivative of the Wall Thickness Response of the Measurement of Trajectory A-B | 436 |
| A-2152.2-1 | Wall Thickness Response of the Measurement of Trajectory A-B With a Plotted Line | 436 |

TABLES

| | | |
|------------|--|-----|
| II-121-1 | Initial Training and Experience Requirements for CR and DR Techniques | 28 |
| II-121-2 | Additional Training and Experience Requirements for PAUT, TOFD, and FMC Ultrasonic Techniques | 29 |
| II-122.1 | Minimum CR and DR Examination Questions | 29 |
| II-122.2 | Minimum Ultrasonic Technique Examination Questions | 29 |
| A-110 | Imperfection vs. Type of NDE Method | 39 |
| T-233.1 | Hole-Type IQI Designation, Thickness, and Hole Diameters | 42 |
| T-233.2 | Wire IQI Designation, Wire Diameter, and Wire Identity | 42 |
| T-276 | IQI Selection | 47 |
| T-283 | Equivalent Hole-Type IQI Sensitivity | 49 |
| A-210-2 | Double-Wall Radiographic Techniques | 77 |
| T-421 | Requirements of an Ultrasonic Examination Procedure | 87 |
| III-421 | Requirements of a TOFD Examination Procedure | 107 |
| IV-421 | Requirements of a Manual Linear Phased Array Raster Scanning Examination Procedure | 113 |
| V-421 | Requirements of Phased Array Linear Scanning Examination Procedures | 115 |
| X-421 | Requirements of an Ultrasonic Examination Procedure for HDPE Techniques | 124 |
| XI-421.1-1 | Requirements of an FMC Examination Procedure | 128 |
| D-490 | Example Data Record | 144 |
| F-441-1 | An Illustrated Elementary Transmit/Receive Matrix | 153 |
| F-471-1 | Ultrasonic Imaging Paths/Modes | 158 |
| G-461 | Transducer Factor, F_1 , for Various Ultrasonic Transducer Diameters and Frequencies | 160 |
| O-432(a) | Search Unit Parameters for Single Zone Examinations Up to 3 in. (75 mm) | 194 |
| O-432(b) | Search Unit Parameters for Multiple Zone Examinations Up to 12 in. (300 mm) Thick | 194 |
| O-470 | Recommended TOFD Zones for Butt Welds Up to 12 in. (300 mm) Thick | 194 |
| T-522 | Variables of an Ultrasonic Examination Procedure | 218 |
| T-621.1 | Requirements of a Liquid Penetrant Examination Procedure | 227 |
| T-621.3 | Minimum and Maximum Time Limits for Steps in Penetrant Examination Procedures | 227 |
| T-672 | Minimum Dwell Times | 229 |
| T-721 | Requirements of a Magnetic Particle Examination Procedure | 235 |
| I-721 | Requirements of AC Yoke Technique on Coated Ferritic Component | 245 |
| III-721 | Requirements for an AC or HWDC Yoke Technique With Fluorescent Particles in an Undarkened Area | 248 |
| IV-721 | Requirements for Qualifying Alternate Wavelength Light Sources for Excitation of Specific Fluorescent Particles | 250 |
| V-721 | Requirements of a Magnetic Rubber Examination Procedure | 253 |
| II-821 | Requirements of an Eddy Current Examination Procedure | 258 |
| IV-823 | Requirements of an External Coil Eddy Current Examination Procedure | 266 |
| V-821 | Requirements of an Eddy Current Examination Procedure for the Measurement of Nonconductive-Nonferromagnetic Coating Thickness on a Metallic Material | 268 |

| | | |
|-----------------|---|-----|
| VI-821 | Requirements of an Eddy Current Examination Procedure for the Detection and Measurement of Depth for Surface Discontinuities in Nonferromagnetic Metallic Materials | 271 |
| VII-823 | Requirements of an Eddy Current Surface Examination Procedure | 274 |
| VIII-821 | Requirements of an Eddy Current Examination Procedure | 279 |
| IX-822-1 | Written Procedure Requirements for an ECA Examination | 285 |
| X-822-1 | Written Procedure Requirements for an ECA Examination | 290 |
| T-921 | Requirements of a Visual Examination Procedure | 293 |
| I-1021 | Requirements of a Direct Pressure Bubble Leak Testing Procedure | 298 |
| II-1021 | Requirements of a Vacuum Box Leak Testing Procedure | 300 |
| III-1021 | Requirements of a Halogen Diode Detector Probe Testing Procedure | 303 |
| III-1031 | Tracer Gases | 303 |
| IV-1021 | Requirements of a Helium Mass Spectrometer Detector Probe Testing Procedure | 306 |
| V-1021 | Requirements of a Helium Mass Spectrometer Tracer Probe Testing Procedure | 309 |
| VI-1021 | Requirements of a Pressure Change Testing Procedure | 311 |
| VIII-1021 | Requirements of a Thermal Conductivity Detector Probe Testing Procedure | 314 |
| VIII-1031 | Tracer Gases | 314 |
| IX-1021 | Requirements of a Helium Mass Spectrometer Hood Testing Procedure | 316 |
| X-1021 | Requirements of an Ultrasonic Leak Testing Procedure | 320 |
| XI-1021.1-1 | Requirements of a Helium Mass Spectrometer Sealed-Object Leakage Rate Test | 323 |
| T-1121 | Requirements for Reduced Operating Level Immediately Prior to Examination | 327 |
| T-1181 | Evaluation Criteria | 337 |
| T-1281 | An Example of Evaluation Criteria for Zone Location | 354 |
| II-1381 | An Example of Evaluation Criteria for Zone Location | 376 |
| II-1382 | An Example of Evaluation Criteria for Multisource Location | 376 |
| T-1472.1 | Total Number of Samples for a Given Number of Misses at a Specified Confidence Level and POD | 391 |
| T-1472.2 | Required Number of First Stage Examiners vs. Target Pass Rate | 392 |
| II-1434-1 | Flaw Acceptance Criteria for 4-in. to 12-in. Thick Weld | 394 |
| II-1434-2 | Flaw Acceptance Criteria for Larger Than 12-in. Thick Weld | 394 |
| T-1522 | Requirements of an ACFMT Examination Procedure | 397 |
| T-1623 | Requirements of an MFL Examination Procedure | 403 |
| T-1721 | Requirements of an RFT Examination Procedure | 404 |
| T-1821 | Requirements of an Acoustic Pulse Reflectometry Examination Procedure | 409 |
| T-1921.1 | Requirements of a GWT Examination Procedure | 416 |
| T-2021.1-1 | Requirements of a Computed Tomography Examination Procedure | 425 |
| T-2121.1-1 | Requirements of a PEC Examination Procedure | 429 |
| II-1 | Standard Units for Use in Equations | 944 |
| ENDNOTES | | 949 |

(21)

LIST OF SECTIONS

SECTIONS

- I Rules for Construction of Power Boilers

- II Materials
 - Part A — Ferrous Material Specifications
 - Part B — Nonferrous Material Specifications
 - Part C — Specifications for Welding Rods, Electrodes, and Filler Metals
 - Part D — Properties (Customary)
 - Part D — Properties (Metric)

- III Rules for Construction of Nuclear Facility Components
 - Subsection NCA — General Requirements for Division 1 and Division 2
 - Appendices
 - Division 1
 - Subsection NB — Class 1 Components
 - Subsection NCD — Class 2 and Class 3 Components*
 - Subsection NE — Class MC Components
 - Subsection NF — Supports
 - Subsection NG — Core Support Structures
 - Division 2 — Code for Concrete Containments
 - Division 3 — Containment Systems for Transportation and Storage of Spent Nuclear Fuel and High-Level Radioactive Material
 - Division 5 — High Temperature Reactors

- IV Rules for Construction of Heating Boilers

- V Nondestructive Examination

- VI Recommended Rules for the Care and Operation of Heating Boilers

- VII Recommended Guidelines for the Care of Power Boilers

- VIII Rules for Construction of Pressure Vessels
 - Division 1
 - Division 2 — Alternative Rules
 - Division 3 — Alternative Rules for Construction of High Pressure Vessels

- IX Welding, Brazing, and Fusing Qualifications

- X Fiber-Reinforced Plastic Pressure Vessels

- XI Rules for Inservice Inspection of Nuclear Power Plant Components
 - Division 1 — Rules for Inspection and Testing of Components of Light-Water-Cooled Plants
 - Division 2 — Requirements for Reliability and Integrity Management (RIM) Programs for Nuclear Power Plants

- XII Rules for Construction and Continued Service of Transport Tanks

- XIII Rules for Overpressure Protection

* In the 2021 Edition, Subsections NC and ND have been incorporated into one publication, Subsection NCD (BPVC.III.1.NCD), Class 2 and Class 3 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 2021 Code Cases book: "Boilers and Pressure Vessels" or "Nuclear Components." Each Code Cases book is updated with seven Supplements. Supplements will be sent or made available automatically to the purchasers of the Code Cases books up to the publication of the 2023 Code. Annulments of Code Cases become effective six months after the first announcement of the annulment in a Code Case Supplement or Edition of the appropriate Code Case book. Code Case users can check the current status of any Code Case at <http://go.asme.org/BPVCCDatabase>. Code Case users can also view an index of the complete list of Boiler and Pressure Vessel Code Cases and Nuclear Code Cases at <http://go.asme.org/BPVCC>.

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) Committee on Overpressure Protection (XIII)
- (l) 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

* 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 overpressure protection.

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 the ASME Single 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.

The words "shall," "should," and "may" are used in this Standard as follows:

- *Shall* is used to denote a requirement.
- *Should* is used to denote a recommendation.
- *May* is used to denote permission, neither a requirement nor a recommendation.

STATEMENT OF POLICY ON THE USE OF THE ASME SINGLE 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 ASME Single 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 ASME Single Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the ASME Single 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 ASME Single 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 ASME Single 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 ASME Single 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 ASME Single Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the ASME Single Certification Mark.

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 ASME Single Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the ASME Single 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 (21)

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) Interpretations will be issued only if existing Code text is ambiguous or conveys conflicting requirements. If a 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. This information should include a statement indicating why the included paragraphs, figures, or tables are ambiguous or convey conflicting requirements. 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 ASME Single 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 include a statement indicating why the included paragraphs, figures, or tables are ambiguous or convey conflicting requirements. 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, 2021

TECHNICAL OVERSIGHT MANAGEMENT COMMITTEE (TOMC)

| | |
|-------------------------------------|---|
| R. E. McLaughlin, <i>Chair</i> | J. F. Henry |
| N. A. Finney, <i>Vice Chair</i> | R. B. Keating |
| S. J. Rossi, <i>Staff Secretary</i> | B. Linnemann |
| G. Aurioles, Sr. | W. M. Lundy |
| R. W. Barnes | D. I. Morris |
| T. L. Bedeaux | T. P. Pastor |
| D. A. Bowers | M. D. Rana |
| C. Brown | S. C. Roberts |
| D. B. DeMichael | F. J. Schaaf, Jr. |
| R. P. Deubler | G. Scribner |
| P. D. Edwards | W. J. Sperko |
| J. G. Feldstein | D. Srnic |
| G. W. Galanes | R. W. Swayne |
| J. A. Hall | M. Wadkinson |
| T. E. Hansen | J. E. Batey, <i>Contributing Member</i> |
| G. W. Hembree | |

Subgroup on Research and Development (TOMC)

| | |
|-------------------------------------|---------------------------------------|
| S. C. Roberts, <i>Chair</i> | B. Hrubala |
| S. J. Rossi, <i>Staff Secretary</i> | R. B. Keating |
| R. W. Barnes | R. E. McLaughlin |
| N. A. Finney | T. P. Pastor |
| J. F. Henry | D. Andrei, <i>Contributing Member</i> |
| W. Hoffelner | |

Subgroup on Strategic Initiatives (TOMC)

| | |
|-------------------------------------|------------------|
| N. A. Finney, <i>Chair</i> | M. H. Jawad |
| S. J. Rossi, <i>Staff Secretary</i> | R. B. Keating |
| R. W. Barnes | R. E. McLaughlin |
| T. L. Bedeaux | T. P. Pastor |
| G. W. Hembree | S. C. Roberts |
| J. F. Henry | |

Task Group on Remote Inspection and Examination (SI-TOMC)

| | |
|-----------------------------|---|
| S. C. Roberts, <i>Chair</i> | M. Tannenbaum |
| P. J. Coco | J. Cameron, <i>Alternate</i> |
| N. A. Finney | P. Lang, <i>Contributing Member</i> |
| S. A. Marks | J. Pang, <i>Contributing Member</i> |
| R. Rockwood | S. J. Rossi, <i>Contributing Member</i> |
| C. Stevens | C. A. Sanna, <i>Contributing Member</i> |

Special Working Group on High Temperature Technology (TOMC)

| | |
|-------------------------|--------------|
| D. Dewees, <i>Chair</i> | B. F. Hantz |
| F. W. Brust | J. F. Henry |
| T. D. Burchell | R. I. Jetter |
| P. R. Donavin | P. Smith |

ADMINISTRATIVE COMMITTEE

| | |
|-------------------------------------|-----------------|
| R. E. McLaughlin, <i>Chair</i> | R. B. Keating |
| N. A. Finney, <i>Vice Chair</i> | B. Linnemann |
| S. J. Rossi, <i>Staff Secretary</i> | M. D. Rana |
| D. A. Bowers | S. C. Roberts |
| J. Cameron | R. R. Stevenson |
| D. B. DeMichael | R. W. Swayne |
| J. A. Hall | |

MARINE CONFERENCE GROUP

| | |
|-----------------------------------|----------------|
| E. Lawson, <i>Staff Secretary</i> | H. N. Patel |
| J. G. Hungerbuhler, Jr. | N. Prokopuk |
| G. Nair | J. D. Reynolds |

CONFERENCE COMMITTEE

| | |
|--|---|
| C. B. Cantrell — Nebraska, <i>Chair</i> | A. M. Lorimor — South Dakota |
| J. T. Amato — Ohio, <i>Secretary</i> | M. Mailman — Northwest Territories, Canada |
| W. Anderson — Mississippi | W. McGivney — City of New York, New York |
| P. Bearden — Minnesota | S. F. Noonan — Maryland |
| R. Becker — Colorado | A. K. Oda — Washington |
| T. D. Boggs — Missouri | B. S. Oliver — New Hampshire |
| R. A. Boillard — Indiana | J. L. Oliver — Nevada |
| R. J. Bunte — Iowa | M. Poehlmann — Alberta, Canada |
| J. H. Burpee — Maine | P. B. Polick — Illinois |
| S. Chapman — Tennessee | J. F. Porcella — West Virginia |
| T. G. Clark — Oregon | C. F. Reyes — California |
| B. J. Crawford — Georgia | W. J. Ross — Pennsylvania |
| E. L. Creaser — New Brunswick, Canada | M. J. Ryan — City of Chicago, Illinois |
| J. J. Dacanay — Hawaii | M. H. Sansone — New York |
| R. DeLury — Manitoba, Canada | T. S. Seime — North Dakota |
| C. Dinic — Ontario, Canada | C. S. Selinger — Saskatchewan, Canada |
| D. Eastman — Newfoundland and Labrador, Canada | J. E. Sharier — Ohio |
| D. A. Ehler — Nova Scotia, Canada | R. Spiker — North Carolina |
| S. D. Frazier — Washington | D. J. Stenrose — Michigan |
| T. J. Granneman II — Oklahoma | R. J. Stimson II — Kansas |
| S. Harder — Arizona | R. K. Sturm — Utah |
| E. G. Hilton — Virginia | D. K. Sullivan — Arkansas |
| M. L. Jordan — Kentucky | J. Taveras — Rhode Island |
| R. Kamboj — British Columbia, Canada | G. Teel — California |
| E. Kawa, Jr. — Massachusetts | S. R. Townsend — Prince Edward Island, Canada |
| A. Khssassi — Quebec, Canada | R. D. Troutt — Texas |
| D. Kinney — North Carolina | D. M. Warburton — Florida |
| J. Klug — City of Milwaukee, Wisconsin | M. Washington — New Jersey |
| K. S. Lane — Alaska | E. Wiggins — Alabama |
| J. LeSage, Jr. — Louisiana | |

INTERNATIONAL INTEREST REVIEW GROUP

V. Felix
 Y.-G. Kim
 S. H. Leong
 W. Lin
 O. F. Manafa

C. Minu
 Y.-W. Park
 A. R. Reynaga Nogales
 P. Williamson

COMMITTEE ON POWER BOILERS (BPV I)

R. E. McLaughlin, *Chair*
 E. M. Ortman, *Vice Chair*
 U. D'Urso, *Staff Secretary*
 D. I. Anderson
 J. L. Arnold
 K. K. Coleman
 P. D. Edwards
 J. G. Feldstein
 S. Fincher
 G. W. Galanes
 T. E. Hansen
 J. F. Henry
 J. S. Hunter
 M. Ishikawa
 G. B. Komora
 F. Massi
 L. Moedinger
 P. A. Molvie
 Y. Oishi
 D. E. Tompkins

D. E. Tuttle
 J. Vattappilly
 M. Wadkinson
 R. V. Wielgoszinski
 F. Zeller
 H. Michael, *Delegate*
 D. L. Berger, *Honorary Member*
 D. N. French, *Honorary Member*
 J. Hainsworth, *Honorary Member*
 W. L. Lowry, *Honorary Member*
 J. R. MacKay, *Honorary Member*
 T. C. McGough, *Honorary Member*
 J. T. Pillow, *Honorary Member*
 B. W. Roberts, *Honorary Member*
 R. D. Schueler, Jr., *Honorary Member*
 J. M. Tanzosh, *Honorary Member*
 R. L. Williams, *Honorary Member*
 L. W. Yoder, *Honorary Member*

Executive Committee (BPV I)

E. M. Ortman, *Chair*
 R. E. McLaughlin, *Vice Chair*
 D. I. Anderson
 J. L. Arnold
 J. R. Braun
 K. K. Coleman
 H. Dalal

T. Dhanraj
 U. D'Urso
 P. F. Gilston
 K. Hayes
 P. Jennings
 A. Spangenberg
 D. E. Tompkins

Subgroup on Design (BPV I)

D. I. Anderson, *Chair*
 L. S. Tsai, *Secretary*
 P. Becker
 D. Dewees
 G. B. Komora
 L. Krupp

P. A. Molvie
 N. Ranck
 J. Vattappilly
 M. Wadkinson
 J. P. Glaspie, *Contributing Member*

Subgroup on Fabrication and Examination (BPV I)

J. L. Arnold, *Chair*
 P. F. Gilston, *Vice Chair*
 P. Becker, *Secretary*
 A. Biesecker
 K. K. Coleman
 S. Fincher
 G. W. Galanes
 T. E. Hansen

P. Jennings
 M. Lewis
 C. T. McDaris
 R. E. McLaughlin
 R. J. Newell
 Y. Oishi
 R. V. Wielgoszinski

Subgroup on General Requirements and Piping (BPV I)

E. M. Ortman, *Chair*
 D. E. Tompkins, *Vice Chair*
 F. Massi, *Secretary*
 P. D. Edwards
 T. E. Hansen
 M. Ishikawa
 M. Lemmons
 R. E. McLaughlin

L. Moedinger
 B. J. Mollitor
 Y. Oishi
 D. E. Tuttle
 M. Wadkinson
 R. V. Wielgoszinski
 W. L. Lowry, *Contributing Member*

Subgroup on Locomotive Boilers (BPV I)

J. R. Braun, *Chair*
 S. M. Butler, *Secretary*
 A. Biesecker
 C. Cross
 G. W. Galanes
 D. W. Griner

M. A. Janssen
 S. A. Lee
 L. Moedinger
 G. M. Ray
 M. W. Westland

Subgroup on Materials (BPV I)

K. K. Coleman, *Chair*
 K. Hayes, *Vice Chair*
 M. Lewis, *Secretary*
 S. H. Bowes
 G. W. Galanes
 P. F. Gilston
 J. F. Henry
 J. S. Hunter
 E. Liebl

F. Masuyama
 M. Ortolani
 D. W. Rahoi
 J. Vattappilly
 F. Zeller
 B. W. Roberts, *Contributing Member*
 J. M. Tanzosh, *Contributing Member*

Subgroup on Solar Boilers (BPV I)

P. Jennings, *Chair*
 R. E. Hearne, *Secretary*
 S. Fincher

J. S. Hunter
 F. Massi
 P. Swarnkar

Task Group on Modernization (BPV I)

D. I. Anderson, *Chair*
 U. D'Urso, *Staff Secretary*
 J. L. Arnold
 D. Dewees
 G. W. Galanes
 J. P. Glaspie
 T. E. Hansen

J. F. Henry
 R. E. McLaughlin
 P. A. Molvie
 E. M. Ortman
 D. E. Tuttle
 J. Vattappilly

Germany International Working Group (BPV I)

A. Spangenberg, *Chair*
 P. Chavdarov, *Secretary*
 B. Daume
 J. Fleischfresser
 R. Kauer
 D. Koelbl
 S. Krebs
 T. Ludwig
 R. A. Meyers
 H. Michael

F. Miunske
 M. Sykora
 R. Helmholtz, *Contributing Member*
 J. Henrichsmeyer, *Contributing Member*
 B. Müller, *Contributing Member*
 P. Paluszkiewicz, *Contributing Member*
 R. Uebel, *Contributing Member*

India International Working Group (BPV I)

| | |
|----------------------------------|-------------------|
| H. Dalal, <i>Chair</i> | S. Purkait |
| T. Dhanraj, <i>Vice Chair</i> | M. G. Rao |
| K. Thanupillai, <i>Secretary</i> | U. Revisankaran |
| P. Brahma | G. U. Shanker |
| S. Chakrabarti | D. K. Shrivastava |
| A. Hantodkar | K. Singha |
| S. A. Kumar | R. Sundararaj |
| A. J. Patil | S. Venkataramana |
| A. R. Patil | |

Subgroup on Ferrous Specifications (BPV II)

| | |
|---------------------------------|---|
| A. Appleton, <i>Chair</i> | J. Gundlach |
| K. M. Hottle, <i>Vice Chair</i> | D. S. Janikowski |
| C. Hyde, <i>Secretary</i> | S. G. Lee |
| B. M. Dingman | W. C. Mack |
| M. J. Dossourian | K. E. Orié |
| O. Elkadim | D. Poweleit |
| D. Fialkowski | E. Uptis |
| J. F. Grubb | J. D. Fritz, <i>Contributing Member</i> |

COMMITTEE ON MATERIALS (BPV II)

| | |
|--|--|
| J. Cameron, <i>Chair</i> | J. D. Fritz, <i>Contributing Member</i> |
| J. F. Grubb, <i>Vice Chair</i> | W. Hoffelner, <i>Contributing Member</i> |
| C. E. O'Brien, <i>Staff Secretary</i> | M. Katcher, <i>Contributing Member</i> |
| A. Appleton | R. K. Nanstad, <i>Contributing Member</i> |
| P. Chavdarov | M. L. Nayyar, <i>Contributing Member</i> |
| J. R. Foulds | D. T. Peters, <i>Contributing Member</i> |
| D. W. Gandy | B. W. Roberts, <i>Contributing Member</i> |
| J. A. Hall | J. J. Sanchez-Hanton, <i>Contributing Member</i> |
| J. F. Henry | R. W. Swindeman, <i>Contributing Member</i> |
| K. M. Hottle | J. W. Tanzosh, <i>Contributing Member</i> |
| M. Ishikawa | E. Uptis, <i>Contributing Member</i> |
| K. Kimura | R. G. Young, <i>Contributing Member</i> |
| F. Masuyama | T. M. Cullen, <i>Honorary Member</i> |
| K. E. Orié | W. D. Edsall, <i>Honorary Member</i> |
| D. W. Rahoí | G. C. Hsu, <i>Honorary Member</i> |
| W. Ren | C. E. Spaeder, Jr., <i>Honorary Member</i> |
| E. Shapiro | A. W. Zeuthen, <i>Honorary Member</i> |
| R. C. Sutherland | |
| F. Zeller | |
| O. Oldani, <i>Delegate</i> | |
| F. Abe, <i>Contributing Member</i> | |
| A. Chaudouet, <i>Contributing Member</i> | |
| D. B. Denis, <i>Contributing Member</i> | |

Subgroup on International Material Specifications (BPV II)

| | |
|-----------------------------------|---|
| M. Ishikawa, <i>Chair</i> | W. M. Lundy |
| A. R. Nywening, <i>Vice Chair</i> | F. Zeller |
| B. Mruk, <i>Secretary</i> | C. Zhou |
| A. Chaudouet | O. Oldani, <i>Delegate</i> |
| P. Chavdarov | H. Lorenz, <i>Contributing Member</i> |
| H. Chen | T. F. Miskell, <i>Contributing Member</i> |
| A. F. Garbolevsky | E. Uptis, <i>Contributing Member</i> |
| D. O. Henry | |

Subgroup on Nonferrous Alloys (BPV II)

| | |
|--------------------------------|--|
| E. Shapiro, <i>Chair</i> | D. W. Rahoí |
| S. Yem, <i>Vice Chair</i> | W. Ren |
| J. Robertson, <i>Secretary</i> | R. C. Sutherland |
| R. M. Beldyk | J. Weritz |
| J. M. Downs | A. Williams |
| J. F. Grubb | R. Wright |
| W. MacDonald | D. B. Denis, <i>Contributing Member</i> |
| D. Maitra | M. Katcher, <i>Contributing Member</i> |
| J. A. McMaster | D. T. Peters, <i>Contributing Member</i> |

Executive Committee (BPV II)

| | |
|---------------------------------------|------------------|
| J. Cameron, <i>Chair</i> | M. Ishikawa |
| C. E. O'Brien, <i>Staff Secretary</i> | D. L. Kurlé |
| A. Appleton | R. W. Mikitka |
| G. W. Galanes | E. Shapiro |
| J. F. Grubb | R. C. Sutherland |
| J. F. Henry | |

Subgroup on Physical Properties (BPV II)

| | |
|------------------------------|---|
| J. F. Grubb, <i>Chair</i> | P. K. Lam |
| P. K. Rai, <i>Vice Chair</i> | S. Neilsen |
| G. Aurióles, Sr. | D. W. Rahoí |
| D. Chandiramani | E. Shapiro |
| P. Chavdarov | D. K. Verma |
| H. Eshraghi | S. Yem |
| B. F. Hantz | D. B. Denis, <i>Contributing Member</i> |
| R. D. Jones | |

Subgroup on External Pressure (BPV II)

| | |
|-----------------------------------|--|
| D. L. Kurlé, <i>Chair</i> | J. F. Grubb |
| S. Guzey, <i>Vice Chair</i> | M. H. Jawad |
| J. A. A. Morrow, <i>Secretary</i> | S. Krishnamurthy |
| E. Alexis | R. W. Mikitka |
| L. F. Campbell | P. K. Rai |
| H. Chen | M. Wadkinson |
| D. S. Griffin | M. Katcher, <i>Contributing Member</i> |

Subgroup on Strength, Ferrous Alloys (BPV II)

| | |
|----------------------------------|--|
| S. W. Knowles, <i>Vice Chair</i> | M. Osterfoss |
| L. S. Nicol, <i>Secretary</i> | D. W. Rahoí |
| J. R. Foulds | S. Rosinski |
| G. W. Galanes | M. Ueyama |
| J. A. Hall | F. Zeller |
| J. F. Henry | F. Abe, <i>Contributing Member</i> |
| M. Ishikawa | A. Di Rienzo, <i>Contributing Member</i> |
| F. Masuyama | M. Nair, <i>Contributing Member</i> |
| M. Ortolani | R. G. Young, <i>Contributing Member</i> |

Subgroup on Strength of Weldments (BPV II & BPV IX)

| | |
|--------------------------------|--|
| G. W. Galanes, <i>Chair</i> | J. Penso |
| K. L. Hayes, <i>Vice Chair</i> | D. W. Rahoi |
| S. H. Bowes, <i>Secretary</i> | B. W. Roberts |
| K. K. Coleman | W. J. Sperko |
| M. Denault | J. P. Swezy, Jr. |
| J. R. Foulds | M. Ueyama |
| D. W. Gandy | P. D. Flenner, <i>Contributing Member</i> |
| M. Ghahremani | J. J. Sanchez-Hanton, <i>Contributing Member</i> |
| J. F. Henry | |
| W. F. Newell, Jr. | |

Working Group on Materials Database (BPV II)

| | |
|---------------------------------------|---|
| W. Hoffelner, <i>Vice Chair</i> | J. L. Arnold, <i>Contributing Member</i> |
| C. E. O'Brien, <i>Staff Secretary</i> | D. T. Peters, <i>Contributing Member</i> |
| F. Abe | W. Ren, <i>Contributing Member</i> |
| J. R. Foulds | B. W. Roberts, <i>Contributing Member</i> |
| J. F. Henry | R. W. Swindeman, <i>Contributing Member</i> |
| R. C. Sutherland | |
| D. Andrei, <i>Contributing Member</i> | |

Working Group on Creep Strength Enhanced Ferritic Steels (BPV II)

| | |
|----------------------------------|---|
| M. Ortolani, <i>Chair</i> | J. J. Sanchez-Hanton |
| G. W. Galanes, <i>Vice Chair</i> | J. A. Siefert |
| S. H. Bowes | W. J. Sperko |
| K. K. Coleman | F. Zeller |
| J. R. Foulds | F. Abe, <i>Contributing Member</i> |
| J. F. Henry | G. Cumino, <i>Contributing Member</i> |
| M. Lang | P. D. Flenner, <i>Contributing Member</i> |
| S. Luke | R. W. Swindeman, <i>Contributing Member</i> |
| F. Masuyama | J. M. Tanzosh, <i>Contributing Member</i> |
| T. Melfi | |
| W. F. Newell, Jr. | |

Working Group on Data Analysis (BPV II)

| | |
|---------------------------------|---|
| J. F. Grubb, <i>Chair</i> | F. Abe, <i>Contributing Member</i> |
| J. R. Foulds, <i>Vice Chair</i> | W. Hoffelner, <i>Contributing Member</i> |
| J. F. Henry | M. Katcher, <i>Contributing Member</i> |
| F. Masuyama | D. T. Peters, <i>Contributing Member</i> |
| M. Ortolani | B. W. Roberts, <i>Contributing Member</i> |
| W. Ren | R. W. Swindeman, <i>Contributing Member</i> |
| M. Subanovic | |
| M. J. Swindeman | |

China International Working Group (BPV II)

| | |
|-------------------------------|---------------|
| S. Liu, <i>Chair</i> | Q.-J. Wang |
| Yong Zhang, <i>Vice Chair</i> | X. Wang |
| A. T. Xu, <i>Secretary</i> | F. Yang |
| W. Fang | G. Yang |
| Q. C. Feng | H.-C. Yang |
| S. Huo | J. Yang |
| F. Kong | R. Ye |
| H. Li | L. Yin |
| J. Li | H. Zhang |
| S. Li | X.-H. Zhang |
| Z. Rongcan | Yingkai Zhang |
| S. Tan | Q. Zhao |
| C. Wang | S. Zhao |
| J. Wang | |

COMMITTEE ON CONSTRUCTION OF NUCLEAR FACILITY COMPONENTS (BPV III)

| | |
|--------------------------------------|---|
| R. B. Keating, <i>Chair</i> | M. A. Lockwood |
| T. M. Adams, <i>Vice Chair</i> | K. A. Manoly |
| D. E. Matthews, <i>Vice Chair</i> | K. Matsunaga |
| K. Verderber, <i>Staff Secretary</i> | B. McGlone |
| A. Appleton | S. McKillop |
| S. Asada | J. C. Minichiello |
| R. W. Barnes | M. N. Mitchell |
| W. H. Borter | T. Nagata |
| M. E. Cohen | J. B. Ossmann |
| R. P. Deubler | S. Pellet |
| P. R. Donavin | E. L. Pleins |
| A. C. Eberhardt | S. Sham |
| J. V. Gardiner | W. J. Sperko |
| J. Grimm | C. T. Smith, <i>Contributing Member</i> |
| S. Hunter | W. K. Sowder, Jr., <i>Contributing Member</i> |
| R. M. Jessee | M. Zhou, <i>Contributing Member</i> |
| R. I. Jetter | D. K. Morton, <i>Honorary Member</i> |
| C. C. Kim | R. F. Reedy, Sr., <i>Honorary Member</i> |
| G. H. Koo | |
| V. Kostarev | |

Executive Committee (BPV III)

| | |
|--------------------------------------|-------------------|
| R. B. Keating, <i>Chair</i> | D. E. Matthews |
| K. Verderber, <i>Staff Secretary</i> | S. McKillop |
| T. M. Adams | J. A. Munshi |
| P. R. Donavin | S. Sham |
| J. V. Gardiner | W. K. Sowder, Jr. |
| J. Grimm | |

Subcommittee on Design (BPV III)

| | |
|-----------------------------|--|
| P. R. Donavin, <i>Chair</i> | S. Sham |
| R. P. Deubler | W. F. Weitze |
| M. A. Gray | G. L. Hollinger, <i>Contributing Member</i> |
| R. I. Jetter | M. H. Jawad, <i>Contributing Member</i> |
| R. B. Keating | W. J. O'Donnell, Sr., <i>Contributing Member</i> |
| K. A. Manoly | K. Wright, <i>Contributing Member</i> |
| D. E. Matthews | |
| S. McKillop | |
| M. N. Mitchell | |

Subgroup on Component Design (SC-D) (BPV III)

| | |
|------------------------------|--|
| D. E. Matthews, <i>Chair</i> | K. A. Manoly |
| P. Vock, <i>Vice Chair</i> | R. J. Masterson |
| S. Pellet, <i>Secretary</i> | J. C. Minichiello |
| T. M. Adams | T. Mitsushashi |
| D. J. Ammerman | D. Murphy |
| G. A. Antaki | T. M. Musto |
| S. Asada | T. Nagata |
| J. F. Ball | J. R. Stinson |
| C. Basavaraju | G. Z. Tokarski |
| D. Chowdhury | J. P. Tucker |
| R. P. Deubler | S. Willoughby-Braun |
| P. Hirschberg | C. Wilson |
| M. Kassir | A. A. Dermenjian, <i>Contributing Member</i> |
| R. B. Keating | I. Saito, <i>Contributing Member</i> |
| D. Keck | K. R. Wichman, <i>Honorary Member</i> |
| O.-S. Kim | |
| T. R. Liszkai | |

Working Group on Core Support Structures (SG-CD) (BPV III)

| | |
|----------------------------------|---|
| D. Keck, <i>Chair</i> | M. D. Snyder |
| R. Z. Ziegler, <i>Vice Chair</i> | R. Vollmer |
| R. Martin, <i>Secretary</i> | T. M. Wiger |
| G. W. Delpont | C. Wilson |
| L. C. Hartless | Y. Wong |
| T. R. Liszkai | A. Tsirigotis, <i>Alternate</i> |
| H. S. Mehta | J. F. Kielb, <i>Contributing Member</i> |
| M. Nakajima | |

Working Group on Pumps (SG-CD) (BPV III)

| | |
|------------------------------------|---|
| D. Chowdhury, <i>Chair</i> | J. Sulley |
| J. V. Gregg, Jr., <i>Secretary</i> | A. G. Washburn |
| M. D. Eftychiou | Y. Wong |
| R. A. Fleming | I. H. Tseng, <i>Alternate</i> |
| S. Hughes | X. Di, <i>Contributing Member</i> |
| J. Kikushima | C. Gabhart, <i>Contributing Member</i> |
| K. J. Noel | R. Ladefian, <i>Contributing Member</i> |

Working Group on Design of Division 3 Containment Systems (SG-CD) (BPV III)

| | |
|------------------------------|---|
| D. J. Ammerman, <i>Chair</i> | D. Siromani |
| S. Klein, <i>Secretary</i> | X. Zhai |
| V. Broz | X. Zhang |
| D. W. Lewis | J. C. Minichiello, <i>Contributing Member</i> |
| A. Rigato | |

Working Group on Supports (SG-CD) (BPV III)

| | |
|---------------------------------------|---|
| J. R. Stinson, <i>Chair</i> | S. Pellet |
| U. S. Bandyopadhyay, <i>Secretary</i> | G. Z. Tokarski |
| K. Avrithi | A. Tsirigotis |
| F. J. Birch | L. Vandersip |
| N. M. Bisceglia | P. Wiseman |
| R. P. Deubler | J. Huang, <i>Alternate</i> |
| N. M. Graham | R. J. Masterson, <i>Contributing Member</i> |
| Y. Matsubara | |

Working Group on HDPE Design of Components (SG-CD) (BPV III)

| | |
|---------------------------------|---|
| T. M. Musto, <i>Chair</i> | D. P. Munson |
| J. B. Ossmann, <i>Secretary</i> | F. J. Schaaf, Jr. |
| M. Brandes | R. Stakenborghs |
| S. Choi | J. Wright |
| J. R. Hebeisen | M. T. Audrain, <i>Alternate</i> |
| P. Krishnaswamy | D. Burwell, <i>Contributing Member</i> |
| M. Kuntz | J. C. Minichiello, <i>Contributing Member</i> |
| K. A. Manoly | |
| M. Martin | |

Working Group on Valves (SG-CD) (BPV III)

| | |
|----------------------------|---------------------------------|
| P. Vock, <i>Chair</i> | C. A. Mizer |
| S. Jones, <i>Secretary</i> | H. O'Brien |
| M. C. Buckley | J. O'Callaghan |
| A. Cardillo | K. E. Reid II |
| R. Farrell | J. Sulley |
| G. A. Jolly | I. H. Tseng |
| J. Lambin | J. P. Tucker |
| T. Lippucci | N. J. Hansing, <i>Alternate</i> |

Working Group on Piping (SG-CD) (BPV III)

| | |
|----------------------------------|---|
| G. A. Antaki, <i>Chair</i> | J. F. McCabe |
| G. Z. Tokarski, <i>Secretary</i> | I.-K. Nam |
| C. Basavaraju | J. O'Callaghan |
| J. Catalano | K. E. Reid II |
| F. Claeys | N. C. Sutherland |
| C. M. Faigy | D. Vlaicu |
| R. Farrell | S. Weindorf |
| R. G. Gilada | C.-I. Wu |
| N. M. Graham | T. M. Adams, <i>Contributing Member</i> |
| M. A. Gray | R. J. Gurdal, <i>Contributing Member</i> |
| R. W. Haupt | R. B. Keating, <i>Contributing Member</i> |
| A. Hirano | Y. Liu, <i>Contributing Member</i> |
| P. Hirschberg | J. C. Minichiello, <i>Contributing Member</i> |
| M. Kassar | |
| J. Kawahata | A. N. Nguyen, <i>Contributing Member</i> |
| V. Kostarev | M. S. Sils, <i>Contributing Member</i> |
| D. Lieb | E. A. Wais, <i>Contributing Member</i> |
| T. B. Littleton | |

Working Group on Vessels (SG-CD) (BPV III)

| | |
|---------------------------------------|---|
| D. Murphy, <i>Chair</i> | M. C. Scott |
| S. Willoughby-Braun, <i>Secretary</i> | P. K. Shah |
| J. Arthur | C. Turylo |
| C. Basavaraju | D. Vlaicu |
| D. Keck | C. Wilson |
| J. I. Kim | T. Yamazaki |
| O.-S. Kim | R. Z. Ziegler |
| D. E. Matthews | B. Basu, <i>Contributing Member</i> |
| T. Mitsuhashi | R. B. Keating, <i>Contributing Member</i> |
| T. J. Schriefer | W. F. Weitz, <i>Contributing Member</i> |

Working Group on Pressure Relief (SG-CD) (BPV III)

| | |
|----------------------------------|---|
| J. F. Ball, <i>Chair</i> | I. H. Tseng |
| K. R. May, <i>Vice Chair</i> | J. Yu |
| R. Krithivasan, <i>Secretary</i> | N. J. Hansing, <i>Alternate</i> |
| J. W. Dickson | J. M. Levy, <i>Alternate</i> |
| S. Jones | B. J. Yonsky, <i>Alternate</i> |
| R. Lack | S. T. French, <i>Contributing Member</i> |
| D. Miller | D. B. Ross, <i>Contributing Member</i> |
| T. Patel | S. Ruesenberg, <i>Contributing Member</i> |
| K. Shores | |

Subgroup on Design Methods (SC-D) (BPV III)

| | |
|----------------------------------|--|
| S. McKillop, <i>Chair</i> | J. I. Kim |
| P. R. Donavin, <i>Vice Chair</i> | W. J. O'Donnell, Sr. |
| J. Wen, <i>Secretary</i> | W. D. Reinhardt |
| K. Avrithi | P. Smith |
| L. Davies | S. D. Snow |
| R. Farrell | R. Vollmer |
| S. R. Gosselin | W. F. Weitz |
| M. A. Gray | T. M. Adams, <i>Contributing Member</i> |
| J. V. Gregg, Jr. | C. W. Bruny, <i>Contributing Member</i> |
| K. Hsu | H. T. Harrison III, <i>Contributing Member</i> |
| R. Kalnas | |
| D. Keck | K. Wright, <i>Contributing Member</i> |

Working Group on Design Methodology (SG-DM) (BPV III)

| | |
|------------------------------|--|
| R. Farrell, <i>Chair</i> | J. Wen |
| R. Vollmer, <i>Secretary</i> | T. M. Wiger |
| K. Avrithi | G. Banyay, <i>Contributing Member</i> |
| C. Basavaraju | D. S. S. Bartran, <i>Contributing Member</i> |
| C. M. Faidy | R. D. Blevins, <i>Contributing Member</i> |
| C. F. Heberling II | M. R. Breach, <i>Contributing Member</i> |
| M. Kassab | C. W. Bruny, <i>Contributing Member</i> |
| J. I. Kim | D. L. Caldwell, <i>Contributing Member</i> |
| T. R. Liszkai | H. T. Harrison III, <i>Contributing Member</i> |
| K. Matsunaga | P. Hirschberg, <i>Contributing Member</i> |
| S. McKillop | R. B. Keating, <i>Contributing Member</i> |
| B. Pellereau | A. Walker, <i>Contributing Member</i> |
| S. Ranganath | K. Wright, <i>Contributing Member</i> |
| W. D. Reinhardt | |
| P. K. Shah | |
| S. D. Snow | |
| S. Wang | |
| W. F. Weitze | |

Working Group on Environmental Fatigue Evaluation Methods (SG-DM) (BPV III)

| | |
|--------------------------------|--|
| M. A. Gray, <i>Chair</i> | P. Hirschberg |
| W. F. Weitze, <i>Secretary</i> | H. S. Mehta |
| S. Asada | J.-S. Park |
| K. Avrithi | B. Pellereau |
| R. C. Cipolla | G. L. Stevens |
| T. M. Damiani | D. Vlaicu |
| C. M. Faidy | K. Wang |
| T. D. Gilman | R. Z. Ziegler |
| S. R. Gosselin | S. Cuvilliez, <i>Contributing Member</i> |
| Y. He | K. Wright, <i>Contributing Member</i> |
| A. Hirano | |

Working Group on Fatigue Strength (SG-DM) (BPV III)

| | |
|---------------------------------|--|
| P. R. Donavin, <i>Chair</i> | S. H. Kleinsmith |
| M. S. Shelton, <i>Secretary</i> | H. S. Mehta |
| T. M. Damiani | B. Pellereau |
| D. W. DeJohn | S. Ranganath |
| C. M. Faidy | G. L. Stevens |
| P. Gill | Y. Wang |
| S. R. Gosselin | W. F. Weitze |
| R. J. Gurdal | Y. Zou |
| C. F. Heberling II | D. Dewees, <i>Contributing Member</i> |
| C. E. Hinnant | S. Majumdar, <i>Contributing Member</i> |
| P. Hirschberg | W. J. O'Donnell, Sr., <i>Contributing Member</i> |
| K. Hsu | K. Wright, <i>Contributing Member</i> |
| J. I. Kim | |

Working Group on Probabilistic Methods in Design (SG-DM) (BPV III)

| | |
|------------------------------|--|
| M. Golliet, <i>Chair</i> | D. O. Henry |
| R. Kalnas, <i>Vice Chair</i> | A. Hirano |
| T. Asayama | A. Martin |
| K. Avrithi | P. J. O'Regan |
| G. Brouette | B. Pellereau |
| J. Hakii | R. S. Hill III, <i>Contributing Member</i> |

Special Working Group on Computational Modeling for Explicit Dynamics (SG-DM) (BPV III)

| | |
|-----------------------------------|---------------|
| D. J. Ammerman, <i>Vice Chair</i> | P. Y.-K. Shih |
| V. Broz, <i>Secretary</i> | S. D. Snow |
| J. M. Jordan | C.-F. Tso |
| S. Kuehner | M. C. Yaksh |
| D. Molitoris | U. Zencker |
| W. D. Reinhardt | |

Working Group on Allowable Stress Criteria (SG-HTR) (BPV III)

| | |
|--------------------------------|---|
| R. Wright, <i>Chair</i> | R. Rupp |
| M. McMurtrey, <i>Secretary</i> | S. Sham |
| K. Kimura | Y. Wang |
| D. Maitra | X. Wei |
| R. J. McReynolds | J. R. Foulds, <i>Contributing Member</i> |
| M. C. Messner | R. W. Swindeman, <i>Contributing Member</i> |
| W. Ren | |

Working Group on Analysis Methods (SG-HTR) (BPV III)

| | |
|-----------------------------|--|
| M. C. Messner, <i>Chair</i> | S. Sham |
| R. W. Barnes | X. Wei |
| J. A. Blanco | S. X. Xu |
| P. Carter | T. Hassan, <i>Contributing Member</i> |
| M. E. Cohen | S. Krishnamurthy, <i>Contributing Member</i> |
| R. I. Jetter | M. J. Swindeman, <i>Contributing Member</i> |
| G. H. Koo | |
| H. Qian | |

Working Group on Creep-Fatigue and Negligible Creep (SG-HTR) (BPV III)

| | |
|---------------------------|---------------|
| S. Sham, <i>Chair</i> | G. H. Koo |
| Y. Wang, <i>Secretary</i> | M. McMurtrey |
| M. Ando | M. C. Messner |
| F. W. Brust | J. C. Poehler |
| P. Carter | H. Qian |
| M. E. Cohen | X. Wei |
| R. I. Jetter | |

Working Group on High Temperature Flaw Evaluation (SG-HTR) (BPV III)

| | |
|---------------------------|------------------|
| F. W. Brust, <i>Chair</i> | H. Qian |
| P. Carter | P. J. Rush |
| S. Kalyanam | C. J. Sallaberry |
| B.-L. Lyow | D. J. Shim |
| M. C. Messner | X. Wei |
| J. C. Poehler | S. X. Xu |

Subgroup on General Requirements (BPV III)

| | |
|-------------------------------|---|
| J. V. Gardiner, <i>Chair</i> | E. C. Renaud |
| N. DeSantis, <i>Secretary</i> | T. N. Rezk |
| V. Apostolescu | J. Rogers |
| A. Appleton | D. J. Roszman |
| S. Bell | R. Spuhl |
| J. R. Berry | G. E. Szabatura |
| G. Brouette | D. M. Vickery |
| G. C. Deleanu | J. DeKleine, <i>Contributing Member</i> |
| J. W. Highlands | H. Michael, <i>Contributing Member</i> |
| E. V. Imbro | C. T. Smith, <i>Contributing Member</i> |
| K. A. Kavanagh | W. K. Sowder, Jr., <i>Contributing Member</i> |
| Y.-S. Kim | |
| B. McGlone | |

Working Group on General Requirements (SG-GR) (BPV III)

| | |
|----------------------------|---|
| B. McGlone, <i>Chair</i> | K. A. Kavanagh |
| J. Grimm, <i>Secretary</i> | Y.-S. Kim |
| V. Apostolescu | D. T. Meisch |
| A. Appleton | R. B. Patel |
| S. Bell | E. C. Renaud |
| J. R. Berry | T. N. Rezk |
| G. Brouette | J. Rogers |
| J. Carter | D. J. Roszman |
| P. J. Coco | B. S. Sandhu |
| N. DeSantis | R. Spuhl |
| Y. Diaz-Castillo | J. F. Strunk |
| O. Elkadim | G. E. Szabatura |
| J. V. Gardiner | D. M. Vickery |
| S. M. Goodwin | J. L. Williams |
| J. Harris | J. DeKleine, <i>Contributing Member</i> |
| J. W. Highlands | S. F. Harrison, Jr., <i>Contributing Member</i> |
| E. V. Imbro | |

Joint ACI-ASME Committee on Concrete Components for Nuclear Service (BPV III)

| | |
|---|---|
| J. A. Munshi, <i>Chair</i> | N. Orbovic |
| J. McLean, <i>Vice Chair</i> | J. F. Strunk |
| J. Cassamassino, <i>Staff Secretary</i> | G. Thomas |
| C. J. Bang | S. Wang |
| L. J. Colarusso | A. Adediran, <i>Contributing Member</i> |
| A. C. Eberhardt | J. F. Artuso, <i>Contributing Member</i> |
| F. Farzam | S. Bae, <i>Contributing Member</i> |
| P. S. Ghosal | J.-B. Domage, <i>Contributing Member</i> |
| B. D. Hovis | B. B. Scott, <i>Contributing Member</i> |
| T. C. Inman | M. R. Senecal, <i>Contributing Member</i> |
| C. Jones | |
| O. Jovall | Z. Shang, <i>Contributing Member</i> |
| T. Kang | M. Sircar, <i>Contributing Member</i> |
| N.-H. Lee | C. T. Smith, <i>Contributing Member</i> |
| T. Muraki | |

Special Working Group on General Requirements Consolidation (SG-GR) (BPV III)

| | |
|--------------------------------|----------------|
| J. V. Gardiner, <i>Chair</i> | R. B. Patel |
| J. Grimm, <i>Vice Chair</i> | E. C. Renaud |
| C. T. Smith, <i>Vice Chair</i> | R. Spuhl |
| Y. Diaz-Castillo | J. L. Williams |

Working Group on General Requirements for Graphite and Ceramic Composite Core Components and Assemblies (SG-GR) (BPV III)

| | |
|----------------------------------|----------------|
| A. Appleton, <i>Chair</i> | M. N. Mitchell |
| W. J. Geringer, <i>Secretary</i> | E. C. Renaud |
| J. R. Berry | W. Windes |
| Y. Diaz-Castillo | |

Subgroup on Materials, Fabrication, and Examination (BPV III)

| | |
|-----------------------------|--|
| J. Grimm, <i>Chair</i> | M. Lashley |
| S. Hunter, <i>Secretary</i> | D. W. Mann |
| W. H. Borter | T. Melfi |
| G. R. Cannell | I.-K. Nam |
| S. Cho | J. B. Ossmann |
| P. J. Coco | J. E. O'Sullivan |
| R. H. Davis | M. C. Scott |
| B. D. Frew | W. J. Sperko |
| D. W. Gandy | J. R. Stinson |
| S. E. Gingrich | J. F. Strunk |
| M. Golliet | W. Windes |
| L. S. Harbison | R. Wright |
| R. M. Jessee | S. Yee |
| J. Johnston, Jr. | H. Michael, <i>Delegate</i> |
| C. C. Kim | R. W. Barnes, <i>Contributing Member</i> |
| M. Kris | D. B. Denis, <i>Contributing Member</i> |

Working Group on HDPE Materials (SG-MFE) (BPV III)

| | |
|--------------------------------|---------------------------------------|
| G. Brouette, <i>Chair</i> | D. P. Munson |
| M. A. Martin, <i>Secretary</i> | T. M. Musto |
| M. C. Buckley | S. Patterson |
| M. Golliet | S. Schuessler |
| J. Johnston, Jr. | R. Stakenborghs |
| P. Krishnaswamy | M. Troughton |
| M. Kuntz | J. Wright |
| B. Lin | B. Hauger, <i>Contributing Member</i> |

Working Group on Design (BPV III-2)

| | |
|----------------------------|---|
| N.-H. Lee, <i>Chair</i> | J. A. Munshi |
| S. Wang, <i>Vice Chair</i> | T. Muraki |
| M. Allam | N. Orbovic |
| S. Bae | J. S. Saini |
| L. J. Colarusso | G. Thomas |
| A. C. Eberhardt | A. Istar, <i>Contributing Member</i> |
| F. Farzam | S.-Y. Kim, <i>Contributing Member</i> |
| P. S. Ghosal | J. Kwon, <i>Contributing Member</i> |
| B. D. Hovis | B. B. Scott, <i>Contributing Member</i> |
| T. C. Inman | Z. Shang, <i>Contributing Member</i> |
| C. Jones | M. Shin, <i>Contributing Member</i> |
| O. Jovall | M. Sircar, <i>Contributing Member</i> |

Working Group on Materials, Fabrication, and Examination (BPV III-2)

| | |
|---------------------------------|---|
| C. Jones, <i>Chair</i> | N.-H. Lee |
| A. Eberhardt, <i>Vice Chair</i> | Z. Shang |
| M. Allam | J. F. Strunk |
| C. J. Bang | I. Zivanovic |
| B. Birch | A. A. Aboelmagd, <i>Contributing Member</i> |
| J.-B. Domage | |
| P. S. Ghosal | J. F. Artuso, <i>Contributing Member</i> |
| T. Kang | B. B. Scott, <i>Contributing Member</i> |

Special Working Group on Modernization (BPV III-2)

| | |
|------------------------------|--|
| N. Orbovic, <i>Chair</i> | S. Wang |
| J. McLean, <i>Vice Chair</i> | I. Zivanovic |
| A. Adediran | J.-B. Domage, <i>Contributing Member</i> |
| O. Jovall | F. Lin, <i>Contributing Member</i> |
| N. Stoeva | M. A. Ugalde, <i>Contributing Member</i> |
| A. Varma | |

Subgroup on Containment Systems for Spent Nuclear Fuel and High-Level Radioactive Material (BPV III)

| | |
|-----------------------------------|---|
| G. J. Solovey, <i>Chair</i> | D. Siromani |
| D. J. Ammerman, <i>Vice Chair</i> | D. B. Spencer |
| S. Klein, <i>Secretary</i> | J. Wellwood |
| G. Bjorkman | X. J. Zhai |
| V. Broz | X. Zhang |
| D. W. Lewis | D. Dunn, <i>Alternate</i> |
| E. L. Pleins | W. H. Borter, <i>Contributing Member</i> |
| A. Rigato | N. M. Simpson, <i>Contributing Member</i> |
| P. Sakalaukus, Jr. | |

Subgroup on Fusion Energy Devices (BPV III)

| | |
|-----------------------------------|--|
| W. K. Sowder, Jr., <i>Chair</i> | S. Lee |
| D. Andrei, <i>Staff Secretary</i> | G. Li |
| D. J. Roszman, <i>Secretary</i> | X. Li |
| M. Bashir | P. Mokaria |
| J. P. Blanchard | T. R. Muldoon |
| L. C. Cadwallader | M. Porton |
| T. P. Davis | F. J. Schaaf, Jr. |
| B. R. Doshi | P. Smith |
| L. El-Guebaly | Y. Song |
| G. Holtmeier | M. Trosen |
| D. Johnson | C. Waldon |
| K. A. Kavanagh | I. J. Zatz |
| K. Kim | R. W. Barnes, <i>Contributing Member</i> |
| I. Kimihiro | |

Working Group on General Requirements (BPV III-4)

| | |
|-----------------------------|-------------------|
| D. J. Roszman, <i>Chair</i> | P. Mokaria |
| M. Ellis | W. K. Sowder, Jr. |

Working Group on In-Vessel Components (BPV III-4)

| | |
|-------------------------|----------------|
| M. Bashir, <i>Chair</i> | M. Kalsey |
| Y. Carin | S. T. Madabusi |
| T. P. Davis | |

Working Group on Magnets (BPV III-4)

| | |
|----------------------|---------------------------|
| S. Lee, <i>Chair</i> | K. Kim, <i>Vice Chair</i> |
|----------------------|---------------------------|

Working Group on Materials (BPV III-4)

| | |
|-------------------------|------------|
| M. Porton, <i>Chair</i> | P. Mummery |
| T. P. Davis | |

Working Group on Vacuum Vessels (BPV III-4)

| | |
|---------------------------|------------|
| I. Kimihiro, <i>Chair</i> | D. Johnson |
| L. C. Cadwallader | Q. Shijun |
| B. R. Doshi | Y. Song |

Subgroup on High Temperature Reactors (BPV III)

| | |
|-----------------------|---|
| S. Sham, <i>Chair</i> | R. Wright |
| M. Ando | A. Yeshnik |
| N. Broom | G. L. Zeng |
| F. W. Brust | A. Tsirigotis, <i>Alternate</i> |
| P. Carter | D. S. Griffin, <i>Contributing Member</i> |
| M. E. Cohen | X. Li, <i>Contributing Member</i> |
| W. J. Geringer | S. Majumdar, <i>Contributing Member</i> |
| B. F. Hantz | D. L. Marriott, <i>Contributing Member</i> |
| M. H. Jawad | M. Morishita, <i>Contributing Member</i> |
| R. I. Jetter | W. O'Donnell, Sr., <i>Contributing Member</i> |
| K. Kimura | L. Shi, <i>Contributing Member</i> |
| G. H. Koo | R. W. Swindeman, <i>Contributing Member</i> |
| A. Mann | |
| M. C. Messner | |
| X. Wei | |
| W. Windes | |

Working Group on Nonmetallic Design and Materials (SG-HTR) (BPV III)

| | |
|-----------------------------------|----------------|
| W. Windes, <i>Chair</i> | M. G. Jenkins |
| W. J. Geringer, <i>Vice Chair</i> | Y. Katoh |
| A. Appleton | J. Lang |
| T. D. Burchell | M. N. Mitchell |
| S.-H. Chi | J. B. Ossmann |
| V. Chugh | A. Yeshnik |
| S. T. Gonczyk | G. L. Zeng |
| K. Harris | |

Special Working Group on High Temperature Reactor Stakeholders (SG-HTR) (BPV III)

| | |
|---------------------------|--|
| M. E. Cohen, <i>Chair</i> | S. Sham |
| M. Arcaro | B. Song |
| R. W. Barnes | X. Wei |
| N. Broom | A. Yeshnik |
| V. Chugh | G. L. Zeng |
| R. A. Fleming | T. Asayama, <i>Contributing Member</i> |
| K. Harris | X. Li, <i>Contributing Member</i> |
| R. I. Jetter | M. Morishita, <i>Contributing Member</i> |
| Y. W. Kim | L. Shi, <i>Contributing Member</i> |
| G. H. Koo | G. Wu, <i>Contributing Member</i> |
| K. J. Noel | |

Seismic Design Steering Committee (BPV III)

| | |
|-------------------------------|--------------|
| T. M. Adams, <i>Chair</i> | G. H. Koo |
| F. G. Abatt, <i>Secretary</i> | V. Kostarev |
| G. A. Antaki | A. Maekawa |
| C. Basavaraju | K. Matsunaga |
| A. Berkovsky | R. M. Pace |
| D. Chowdhury | D. Watkins |
| R. Döring | |

Argentina International Working Group (BPV III)

| | |
|-------------------------------------|------------------|
| J. Fernández, <i>Chair</i> | S. A. Echeverria |
| A. Politi, <i>Vice Chair</i> | E. P. Fresquet |
| O. Martinez, <i>Staff Secretary</i> | M. M. Gamizo |
| A. Gomez, <i>Secretary</i> | I. M. Guerreiro |
| A. Acrogliano | I. A. Knorr |
| W. Agrelo | M. F. Liendo |
| G. O. Anteri | D. E. Matthews |
| M. Anticoli | L. R. Miño |
| C. A. Araya | J. Monte |
| J. P. Balbiani | R. L. Morard |
| A. A. Betervide | A. E. Pastor |
| D. O. Bordato | E. Pizzichini |
| G. Bourguigne | J. L. Racamato |
| M. L. Cappella | H. C. Sanzi |
| A. Claus | G. J. Scian |
| R. G. Cocco | G. G. Sebastian |
| A. Coleff | M. E. Szarko |
| A. J. Dall'Osto | P. N. Torano |
| L. M. De Barberis | A. Turrin |
| D. P. Delfino | O. A. Verastegui |
| D. N. Dell'Erba | M. D. Vigliano |
| F. G. Diez | P. Yamamoto |
| A. Dominguez | M. Zunino |

China International Working Group (BPV III)

| | |
|----------------------------|-------------|
| J. Yan, <i>Chair</i> | C. Peiyin |
| W. Tang, <i>Vice Chair</i> | Z. Sun |
| Y. He, <i>Secretary</i> | G. Tang |
| L. Guo | L. Ting |
| Y. Jing | Y. Tu |
| D. Kang | Y. Wang |
| Y. Li | H. Wu |
| B. Liang | S. Xue |
| H. Lin | Z. Yin |
| S. Liu | D. Yuangang |
| W. Liu | G. Zhang |
| J. Ma | W. Zhang |
| K. Mao | Y. Zhong |
| D. E. Matthews | Z. Zhong |
| W. Pei | |

Germany International Working Group (BPV III)

| | |
|--------------------------------|--------------|
| J. Wendt, <i>Chair</i> | H.-W. Lange |
| D. Koelbl, <i>Vice Chair</i> | T. Ludwig |
| R. Gersinska, <i>Secretary</i> | X. Pitoiset |
| P. R. Donavin | M. Reichert |
| R. Döring | G. Roos |
| C. G. Frantescu | J. Rudolph |
| A. Huber | L. Sybert |
| R. E. Hueggenberg | I. Tewes |
| C. Huttner | R. Tiete |
| E. Iacopetta | R. Trieglaff |
| M. H. Koeppen | F. Wille |
| C. Kuschke | S. Zickler |

India International Working Group (BPV III)

| | |
|----------------------------------|----------------|
| R. N. Sen, <i>Chair</i> | A. Johori |
| S. B. Parkash, <i>Vice Chair</i> | D. Kulkarni |
| A. D. Bagdare, <i>Secretary</i> | R. Kumar |
| S. Aithal | D. Narain |
| S. Benhur | E. L. Pleins |
| N. M. Borwankar | V. Sehgal |
| M. Brijlani | S. Singh |
| H. Dalal | B. K. Sreedhar |
| S. K. Goyal | |

Korea International Working Group (BPV III)

| | |
|-----------------------------|--------------|
| G. H. Koo, <i>Chair</i> | D. Kwon |
| O.-S. Kim, <i>Secretary</i> | B. Lee |
| H. Ahn | D. Lee |
| S. Cho | S. Lee |
| G.-S. Choi | S.-G. Lee |
| S. Choi | H. Lim |
| J. Y. Hong | I.-K. Nam |
| N.-S. Huh | C.-K. Oh |
| J.-K. Hwang | C.-Y. Oh |
| S. S. Hwang | E.-J. Oh |
| C. Jang | C. Park |
| I. I. Jeong | H. Park |
| S. H. Kang | J.-S. Park |
| J.-I. Kim | Y. S. Pyun |
| J.-S. Kim | T. Shin |
| M.-W. Kim | S. Song |
| S.-S. Kim | W. J. Sperko |
| Y.-B. Kim | J. S. Yang |
| Y.-S. Kim | O. Yoo |

United Kingdom International Working Group (BPV III)

| | |
|-----------------------------------|---------------------|
| C. D. Bell, <i>Chair</i> | G. Innes |
| P. M. James, <i>Vice Chair</i> | S. A. Jones |
| C. B. Carpenter, <i>Secretary</i> | B. Pellereau |
| T. Bann | C. R. Schneider |
| M. J. Chevalier | J. W. Stairmand |
| M. Consonni | J. Sulley |
| M. J. Crathorne | J. Talamantes-Silva |

Special Working Group on Editing and Review (BPV III)

| | |
|------------------------------|-------------------|
| D. E. Matthews, <i>Chair</i> | S. Hunter |
| R. P. Deubler | J. C. Minichiello |
| A. C. Eberhardt | J. F. Strunk |
| J. V. Gardiner | C. Wilson |

Special Working Group on HDPE Stakeholders (BPV III)

| | |
|--------------------------------|--|
| M. Brandes, <i>Chair</i> | D. P. Munson |
| S. Patterson, <i>Secretary</i> | T. M. Musto |
| S. Choi | J. E. O'Sullivan |
| C. M. Faidy | V. Rohatgi |
| M. Golliet | F. J. Schaaf, Jr. |
| R. M. Jessee | R. Stakenborghs |
| J. Johnston, Jr. | M. Troughton |
| M. Kuntz | J. Wright |
| M. Lashley | C. Lin, <i>Alternate</i> |
| K. A. Manoly | D. Burwell, <i>Contributing Member</i> |

Special Working Group on Honors and Awards (BPV III)

| | |
|---------------------------------|----------------|
| J. C. Minichiello, <i>Chair</i> | R. M. Jessee |
| A. Appleton | D. E. Matthews |
| R. W. Barnes | |

Special Working Group on Industry Experience for New Plants (BPV III & BPV XI)

| | |
|---------------------------------|---------------------------------|
| J. T. Lindberg, <i>Chair</i> | O.-S. Kim |
| J. B. Ossmann, <i>Chair</i> | K. Matsunaga |
| M. C. Buckley, <i>Secretary</i> | D. E. Matthews |
| A. Cardillo | R. E. McLaughlin |
| T. L. Chan | D. W. Sandusky |
| P. J. Hennessey | R. M. Wilson |
| D. O. Henry | S. M. Yee |
| J. Honcharik | A. Tsirigotis, <i>Alternate</i> |
| C. G. Kim | |

Special Working Group on International Meetings and IWG Liaisons (BPV III)

| | |
|--------------------------------------|---------------|
| D. E. Matthews, <i>Chair</i> | R. L. Crane |
| K. Verderber, <i>Staff Secretary</i> | P. R. Donavin |
| T. M. Adams | E. L. Pleins |
| R. W. Barnes | W. J. Sperko |
| T. D. Burchell | |

Special Working Group on New Plant Construction Issues (BPV III)

| | |
|-------------------------------|---|
| E. L. Pleins, <i>Chair</i> | M. L. Wilson |
| M. C. Scott, <i>Secretary</i> | H. Xu |
| A. Cardillo | J. Yan |
| P. J. Coco | N. J. Hansing, <i>Alternate</i> |
| J. Honcharik | J. C. Minichiello, <i>Contributing Member</i> |
| O.-S. Kim | K. Verderber, <i>Contributing Member</i> |
| M. Kris | |
| D. W. Sandusky | |
| R. R. Stevenson | |

COMMITTEE ON HEATING BOILERS (BPV IV)

| | |
|--|--|
| J. A. Hall, <i>Chair</i> | P. A. Molvie |
| T. L. Bedeaux, <i>Vice Chair</i> | R. D. Troutt |
| C. R. Ramcharran, <i>Staff Secretary</i> | M. Wadkinson |
| L. Badziagowski | R. V. Wielgoszinski |
| B. Calderon | H. Michael, <i>Delegate</i> |
| J. P. Chicoine | D. Picart, <i>Delegate</i> |
| J. M. Downs | D. Nelson, <i>Alternate</i> |
| J. L. Kleiss | S. V. Voorhees, <i>Contributing Member</i> |
| J. Klug | |
| M. Mengon | |

Subgroup on Care and Operation of Heating Boilers (BPV IV)

| | |
|--|--------------|
| R. D. Troutt, <i>Chair</i> | J. A. Hall |
| C. R. Ramcharran, <i>Staff Secretary</i> | J. L. Kleiss |
| B. Ahee | P. A. Molvie |
| T. L. Bedeaux | M. Wadkinson |
| J. M. Downs | |

Subgroup on Cast Boilers (BPV IV)

| | |
|--|--------------|
| J. P. Chicoine, <i>Chair</i> | J. A. Hall |
| J. M. Downs, <i>Vice Chair</i> | J. L. Kleiss |
| C. R. Ramcharran, <i>Staff Secretary</i> | M. Mengon |
| T. L. Bedeaux | |

Subgroup on Materials (BPV IV)

| | |
|--|-----------------|
| M. Wadkinson, <i>Chair</i> | L. Badziagowski |
| J. M. Downs, <i>Vice Chair</i> | T. L. Bedeaux |
| C. R. Ramcharran, <i>Staff Secretary</i> | J. A. Hall |

Subgroup on Water Heaters (BPV IV)

| | |
|--|--------------|
| L. Badziagowski, <i>Chair</i> | C. Dinic |
| J. L. Kleiss, <i>Vice Chair</i> | B. J. Iske |
| C. R. Ramcharran, <i>Staff Secretary</i> | P. A. Molvie |
| B. Ahee | T. E. Trant |
| J. P. Chicoine | R. D. Troutt |

Subgroup on Welded Boilers (BPV IV)

| | |
|--|-----------------------------|
| T. L. Bedeaux, <i>Chair</i> | M. Mengon |
| J. L. Kleiss, <i>Vice Chair</i> | P. A. Molvie |
| C. R. Ramcharran, <i>Staff Secretary</i> | R. D. Troutt |
| B. Ahee | M. Wadkinson |
| L. Badziagowski | R. V. Wielgoszinski |
| B. Calderon | D. Nelson, <i>Alternate</i> |
| C. Dinic | |

COMMITTEE ON NONDESTRUCTIVE EXAMINATION (BPV V)

| | |
|--|--|
| N. A. Finney, <i>Chair</i> | L. E. Mullins |
| C. May, <i>Vice Chair</i> | T. L. Plasek |
| C. R. Ramcharran, <i>Staff Secretary</i> | P. B. Shaw |
| D. Bajula | C. Vorwald |
| J. Bennett | G. M. Gatti, <i>Delegate</i> |
| P. L. Brown | S. J. Akryn, <i>Contributing Member</i> |
| M. A. Burns | J. E. Batey, <i>Contributing Member</i> |
| N. Carter | A. S. Birks, <i>Contributing Member</i> |
| T. Clausing | N. Y. Faransso, <i>Contributing Member</i> |
| C. Emslander | R. W. Kruzic, <i>Contributing Member</i> |
| A. F. Garbolevsky | F. J. Sattler, <i>Contributing Member</i> |
| J. F. Halley | H. C. Graber, <i>Honorary Member</i> |
| P. T. Hayes | O. F. Hedden, <i>Honorary Member</i> |
| G. W. Hembree | J. R. MacKay, <i>Honorary Member</i> |
| F. B. Kovacs | T. G. McCarty, <i>Honorary Member</i> |
| K. Krueger | |
| B. D. Laite | |

Executive Committee (BPV V)

| | |
|--|---------------|
| C. May, <i>Chair</i> | J. F. Halley |
| N. A. Finney, <i>Vice Chair</i> | P. T. Hayes |
| C. R. Ramcharran, <i>Staff Secretary</i> | G. W. Hembree |
| N. Carter | F. B. Kovacs |
| C. Emslander | C. Vorwald |
| V. F. Godinez-Azcuaga | |

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

| | |
|---------------------------------|--|
| C. Emslander, <i>Chair</i> | K. Krueger |
| D. I. Morris, <i>Vice Chair</i> | C. May |
| J. Bennett | C. Vorwald |
| N. Carter | S. J. Akryn, <i>Contributing Member</i> |
| T. Clausing | J. E. Batey, <i>Contributing Member</i> |
| N. A. Finney | N. Y. Faransso, <i>Contributing Member</i> |
| J. F. Halley | J. P. Swezy, Jr., <i>Contributing Member</i> |
| G. W. Hembree | |
| F. B. Kovacs | |

Subgroup on Surface Examination Methods (BPV V)

| | |
|--------------------------------|--|
| N. Carter, <i>Chair</i> | P. B. Shaw |
| B. D. Laite, <i>Vice Chair</i> | C. Vorwald |
| P. L. Brown | C. Wassink |
| T. Clausing | D. M. Woodward |
| C. Emslander | G. M. Gatti, <i>Delegate</i> |
| N. Farenbaugh | S. J. Akryn, <i>Contributing Member</i> |
| N. A. Finney | J. E. Batey, <i>Contributing Member</i> |
| J. F. Halley | N. Y. Faransso, <i>Contributing Member</i> |
| K. Hayes | R. W. Kruzic, <i>Contributing Member</i> |
| G. W. Hembree | F. J. Sattler, <i>Contributing Member</i> |
| C. May | |
| L. E. Mullins | |

Subgroup on Volumetric Methods (BPV V)

| | |
|---------------------------------|--|
| C. May, <i>Chair</i> | L. E. Mullins |
| J. F. Halley, <i>Vice Chair</i> | E. Peloquin |
| D. Adkins | T. L. Plasek |
| P. L. Brown | C. Vorwald |
| N. A. Finney | G. M. Gatti, <i>Delegate</i> |
| A. F. Garbolevsky | S. J. Akrin, <i>Contributing Member</i> |
| R. W. Hardy | J. E. Batey, <i>Contributing Member</i> |
| P. T. Hayes | N. Y. Faransso, <i>Contributing Member</i> |
| G. W. Hembree | |
| F. B. Kovacs | R. W. Kruzic, <i>Contributing Member</i> |
| K. Krueger | F. J. Sattler, <i>Contributing Member</i> |

Special Working Group on Advanced Ultrasonic Testing Techniques (BPV V)

| | |
|-------------------------------|-------------|
| L. E. Mullins, <i>Chair</i> | P. T. Hayes |
| K. Krueger, <i>Vice Chair</i> | M. Lozev |
| D. Adkins | E. Peloquin |
| D. Bajula | M. Sens |
| N. A. Finney | D. Tompkins |
| J. L. Garner | C. Wassink |
| J. F. Halley | |

Working Group on Full Matrix Capture (FMC) (BPV V)

| | |
|--------------------------------|---------------|
| P. T. Hayes, <i>Chair</i> | K. Hayes |
| E. Peloquin, <i>Vice Chair</i> | G. W. Hembree |
| D. Adkins | K. Krueger |
| D. Bajula | M. Lozev |
| D. Bellistri | L. E. Mullins |
| J. Catty | D. Richard |
| N. A. Finney | M. Sens |
| J. L. Garner | D. Tompkins |
| V. F. Godinez-Azcuaga | O. Volf |
| R. T. Grotenhuis | C. Wassink |
| J. F. Halley | |

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

| | |
|-------------------------------------|--|
| V. F. Godinez-Azcuaga, <i>Chair</i> | L. Zhang |
| S. R. Doctor, <i>Vice Chair</i> | J. E. Batey, <i>Contributing Member</i> |
| J. Catty | N. Y. Faransso, <i>Contributing Member</i> |
| N. F. Douglas, Jr. | |
| R. K. Miller | |

Working Group on Computed Tomography (BPV V)

| | |
|----------------------|---|
| C. May, <i>Chair</i> | R. J. Mills |
| T. L. Clifford | T. L. Plasek |
| R. W. Hardy | C. Vorwald |
| G. W. Hembree | B. White |
| F. B. Kovacs | L. E. Mullins, <i>Contributing Member</i> |

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

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

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

| | |
|-------------------------------|--|
| J. F. Halley, <i>Chair</i> | D. Tompkins |
| K. Krueger, <i>Vice Chair</i> | D. Van Allen |
| D. Adkins | J. Vinyard |
| D. Bajula | C. Vorwald |
| C. Brown | C. Wassink |
| C. Emslander | D. Alleyne, <i>Contributing Member</i> |
| N. A. Finney | J. E. Batey, <i>Contributing Member</i> |
| P. T. Hayes | N. Y. Faransso, <i>Contributing Member</i> |
| G. W. Hembree | |
| B. D. Laite | R. W. Kruzic, <i>Contributing Member</i> |
| C. May | G. M. Light, <i>Contributing Member</i> |
| L. E. Mullins | P. Mudge, <i>Contributing Member</i> |
| E. Peloquin | F. J. Sattler, <i>Contributing Member</i> |
| M. J. Quarry | J. Vanvelsor, <i>Contributing Member</i> |

Italy International Working Group (BPV V)

| | |
|-----------------------------------|--|
| P. L. Dinelli, <i>Chair</i> | M. A. Grimoldi |
| D. D. Raimander, <i>Secretary</i> | G. Luoni |
| M. Agostini | O. Oldani |
| T. Aldo | U. Papponetti |
| F. Bresciani | P. Pedersoli |
| G. Campos | A. Veroni |
| N. Caputo | M. Zambon |
| M. Colombo | V. Calo, <i>Contributing Member</i> |
| F. Ferrarese | G. Gobbi, <i>Contributing Member</i> |
| E. Ferrari | G. Pontiggia, <i>Contributing Member</i> |

COMMITTEE ON PRESSURE VESSELS (BPV VIII)

| | |
|-------------------------------------|---|
| S. C. Roberts, <i>Chair</i> | D. Srnic |
| M. D. Lower, <i>Vice Chair</i> | D. B. Stewart |
| J. Oh, <i>Staff Secretary</i> | P. L. Sturgill |
| S. J. Rossi, <i>Staff Secretary</i> | K. Subramanian |
| G. Auriolles, Sr. | D. A. Swanson |
| S. R. Babka | J. P. Swezy, Jr. |
| R. J. Basile | S. Terada |
| P. Chavdarov | E. Uptis |
| D. B. DeMichael | A. Viet |
| J. F. Grubb | K. Xu |
| B. F. Hantz | P. A. McGowan, <i>Delegate</i> |
| M. Kowalczyk | H. Michael, <i>Delegate</i> |
| D. L. Kurle | K. Oyamada, <i>Delegate</i> |
| R. Mahadeen | M. E. Papponetti, <i>Delegate</i> |
| S. A. Marks | X. Tang, <i>Delegate</i> |
| P. Matkovic | A. Chaudouet, <i>Contributing Member</i> |
| R. W. Mikitka | |
| B. R. Morelock | J. P. Glaspie, <i>Contributing Member</i> |
| T. P. Pastor | W. S. Jacobs, <i>Contributing Member</i> |
| D. T. Peters | K. T. Lau, <i>Contributing Member</i> |
| M. J. Pischke | U. R. Miller, <i>Contributing Member</i> |
| M. D. Rana | K. Mokhtarian, <i>Contributing Member</i> |
| G. B. Rawls, Jr. | |
| F. L. Richter | G. G. Karcher, <i>Honorary Member</i> |
| C. D. Rodery | K. K. Tam, <i>Honorary Member</i> |
| J. C. Sowinski | |

Executive Committee (BPV VIII)

| | |
|-------------------------------------|----------------|
| M. D. Lower, <i>Chair</i> | F. L. Richter |
| S. J. Rossi, <i>Staff Secretary</i> | S. C. Roberts |
| G. Auriolles, Sr. | J. C. Sowinski |
| M. Kowalczyk | K. Subramanian |
| S. A. Marks | A. Viet |
| P. Matkovic | K. Xu |

Subgroup on Design (BPV VIII)

J. C. Sowinski, *Chair*
 C. S. Hinson, *Vice Chair*
 G. Aurioles, Sr.
 S. R. Babka
 O. A. Barsky
 R. J. Basile
 D. Chandiramani
 M. Faulkner
 B. F. Hantz
 C. E. Hinnant
 M. H. Jawad
 S. Krishnamurthy
 D. L. Kurle
 K. Kuscus
 M. D. Lower
 R. W. Mikitka
 B. Millet
 M. D. Rana
 G. B. Rawls, Jr.

S. C. Roberts
 C. D. Rodery
 T. G. Seipp
 D. Srnic
 D. A. Swanson
 S. Terada
 J. Vattappilly
 K. Xu
 K. Oyamada, *Delegate*
 M. E. Papponetti, *Delegate*
 W. S. Jacobs, *Contributing Member*
 P. K. Lam, *Contributing Member*
 K. Mokhtarian, *Contributing Member*
 T. P. Pastor, *Contributing Member*
 S. C. Shah, *Contributing Member*
 K. K. Tam, *Contributing Member*
 E. Uptis, *Contributing Member*
 Z. Wang, *Contributing Member*

Subgroup on General Requirements (BPV VIII)

F. L. Richter, *Chair*
 M. Faulkner, *Vice Chair*
 J. Hoskinson, *Secretary*
 N. Barkley
 R. J. Basile
 T. P. Beirne
 D. T. Davis
 D. B. DeMichael
 M. D. Lower
 T. P. Pastor
 D. K. Peetz

G. B. Rawls, Jr.
 S. C. Roberts
 J. C. Sowinski
 P. Speranza
 D. Srnic
 D. B. Stewart
 D. A. Swanson
 R. Uebel
 J. P. Gaspie, *Contributing Member*
 Z. Wang, *Contributing Member*
 Y. Yang, *Contributing Member*

Task Group on Fired Heater Pressure Vessels (BPV VIII)

J. Hoskinson, *Chair*
 J. Bradley
 W. Kim
 S. Kirk
 D. Nelson
 T. P. Pastor

R. Robles
 J. Rust
 P. Shanks
 E. Smith
 D. Srnic
 J. P. Swezy, Jr.

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

B. F. Hantz, *Chair*
 T. W. Norton, *Secretary*
 D. A. Arnett
 J. Bedoya
 S. Guzey
 C. F. Heberling II
 C. E. Hinnant
 M. H. Jawad
 S. Kataoka
 S. Kilambi
 K. D. Kirkpatrick

S. Krishnamurthy
 A. Mann
 C. Nadarajah
 P. Pruetter
 T. G. Seipp
 M. A. Shah
 S. Terada
 R. G. Brown, *Contributing Member*
 D. Dewees, *Contributing Member*
 K. Saboda, *Contributing Member*

Task Group on Subsea Applications (BPV VIII)

M. Sarzynski, *Chair*
 A. J. Grohmann, *Vice Chair*
 L. P. Antalffy
 R. C. Biel
 J. Ellens
 J. Hademenos
 J. Kaculi
 K. Karpanan
 F. Kirkemo
 C. Lan

P. Lutkiewicz
 N. McKie
 S. K. Parimi
 R. H. Patil
 J. R. Sims
 M. P. Vaclavik
 R. Cordes, *Contributing Member*
 S. Krishna, *Contributing Member*
 D. T. Peters, *Contributing Member*

Working Group on Elevated Temperature Design (BPV I and VIII)

A. Mann, *Chair*
 C. Nadarajah, *Secretary*
 D. Anderson
 D. Dewees
 B. F. Hantz
 M. H. Jawad
 R. I. Jetter
 S. Krishnamurthy
 T. Le
 M. C. Messner

M. N. Mitchell
 P. Pruetter
 M. J. Swindeman
 J. P. Gaspie, *Contributing Member*
 D. L. Marriott, *Contributing Member*
 N. McMurray, *Contributing Member*
 B. J. Mollitor, *Contributing Member*

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

S. Krishnamurthy, *Chair*
 T. L. Anderson
 K. E. Bagnoli
 R. P. Deubler
 B. F. Hantz

B. R. Macejko
 J. Penso
 M. Prager
 M. D. Rana

Subgroup on Heat Transfer Equipment (BPV VIII)

P. Matkovichs, *Chair*
 M. D. Clark, *Vice Chair*
 L. Bower, *Secretary*
 G. Aurioles, Sr.
 S. R. Babka
 J. H. Barbee
 O. A. Barsky
 T. Bunyarattaphantu
 A. Chaudouet
 D. L. Kurle
 R. Mahadeen
 S. Mayeux

S. Neilsen
 E. Smith
 A. M. Voytko
 R. P. Wiberg
 I. G. Campbell, *Contributing Member*
 G. G. Karcher, *Contributing Member*
 J. Pasek, *Contributing Member*
 D. Srnic, *Contributing Member*
 Z. Tong, *Contributing Member*

Subgroup on Fabrication and Examination (BPV VIII)

S. A. Marks, *Chair*
 D. I. Morris, *Vice Chair*
 T. Halligan, *Secretary*
 N. Carter
 J. Lu
 B. R. Morelock
 O. Mulet
 M. J. Pischke
 M. J. Rice
 J. Roberts
 C. D. Rodery
 B. F. Shelley
 D. Smith
 P. L. Sturgill

J. P. Swezy, Jr.
 E. Uptis
 C. Violand
 E. A. Whittle
 K. Oyamada, *Delegate*
 W. J. Bees, *Contributing Member*
 L. F. Campbell, *Contributing Member*
 J. Lee, *Contributing Member*
 J. Si, *Contributing Member*
 R. Uebel, *Contributing Member*
 X. Xue, *Contributing Member*
 B. Yang, *Contributing Member*

Working Group on Plate Heat Exchangers (BPV VIII)

P. Matkovichs, *Chair*
 S. R. Babka
 J. F. Grubb
 V. Gudge
 R. Mahadeen
 S. A. Marks

D. I. Morris
 M. J. Pischke
 E. Smith
 D. Srnic
 S. Sullivan

Subgroup on High Pressure Vessels (BPV VIII)

K. Subramanian, *Chair*
 M. Sarzynski, *Vice Chair*
 A. P. Maslowski, *Staff Secretary*
 L. P. Antalffy
 R. C. Biel
 P. N. Chaku
 L. Fridlund
 R. T. Hallman
 K. Karpanan
 J. Keltjens
 A. K. Khare
 G. M. Mital
 G. T. Nelson
 M. Parr
 D. T. Peters
 E. A. Rodriguez
 E. D. Roll
 J. R. Sims
 E. Smith
 F. W. Tatar
 S. Terada
 C. Tipple

R. Wink
 Y. Xu
 A. M. Clayton, *Contributing Member*
 R. Cordes, *Contributing Member*
 R. D. Dixon, *Contributing Member*
 Q. Dong, *Contributing Member*
 T. A. Duffey, *Contributing Member*
 D. Fuenmayor, *Contributing Member*
 R. M. Hoshman, *Contributing Member*
 Y. Huang, *Contributing Member*
 F. Kirkemo, *Contributing Member*
 R. A. Leishear, *Contributing Member*
 C. Romero, *Contributing Member*
 K.-J. Young, *Contributing Member*
 D. J. Burns, *Honorary Member*
 D. M. Fryer, *Honorary Member*
 G. J. Mraz, *Honorary Member*
 E. H. Perez, *Honorary Member*

Subgroup on Materials (BPV VIII)

M. Kowalczyk, *Chair*
 J. Cameron, *Vice Chair*
 S. Kilambi, *Secretary*
 P. Chavdarov
 J. F. Grubb
 D. Maitra
 D. W. Raho
 J. Robertson
 R. C. Sutherlin
 E. Uptis
 K. Xu
 S. Yem

A. Di Rienzo, *Contributing Member*
 J. D. Fritz, *Contributing Member*
 M. Katcher, *Contributing Member*
 W. M. Lundy, *Contributing Member*
 J. A. McMaster, *Contributing Member*
 J. Penso, *Contributing Member*
 B. Pletcher, *Contributing Member*
 P. G. Wittenbach, *Contributing Member*
 X. Wu, *Contributing Member*

Subgroup on Toughness (BPV VIII)

K. Xu, *Chair*
 T. Halligan, *Vice Chair*
 N. Carter
 C. S. Hinson
 W. S. Jacobs
 S. Kilambi
 D. L. Kurlle
 M. D. Rana
 F. L. Richter
 K. Subramanian

D. A. Swanson
 J. P. Swezy, Jr.
 S. Terada
 E. Uptis
 J. Vattappilly
 K. Oyamada, *Delegate*
 S. Krishnamurthy, *Contributing Member*
 K. Mokhtarian, *Contributing Member*

Subgroup on Graphite Pressure Equipment (BPV VIII)

A. Viet, *Chair*
 C. W. Cary, *Vice Chair*
 G. C. Becherer
 F. L. Brown
 R. J. Bulgin

J. D. Clements
 H. Lee, Jr.
 T. Rudy
 A. A. Stupica

Argentina International Working Group (BPV VIII)

A. Dominguez, *Chair*
 F. P. Larrosa, *Secretary*
 M. M. Acosta
 R. A. Barey
 C. Alderetes
 F. A. Andres
 L. F. Boccanera
 O. S. Bretones
 A. Burgueno
 G. Casanas
 D. H. Da Rold
 J. I. Duo
 M. Favareto

M. D. Kuhn
 L. M. Leccese
 C. Meinl
 M. A. Mendez
 J. J. Monaco
 M. A. A. Pipponzi
 D. Rizzo
 R. Robles
 J. C. Rubeo
 S. Schamun
 G. Telleria
 M. M. C. Tocco

China International Working Group (BPV VIII)

X. Chen, *Chair*
 B. Shou, *Vice Chair*
 Z. Fan, *Secretary*
 Y. Chen
 Z. Chen
 J. Cui
 R. Duan
 W. Guo
 B. Han
 J. Hu
 Q. Hu
 H. Hui
 D. Luo
 Y. Luo

C. Miao
 X. Qian
 L. Sun
 B. Wang
 C. Wu
 F. Xu
 F.-Z. Xuan
 Y. Yang
 K. Zhang
 Yanfeng Zhang
 Yijun Zhang
 S. Zhao
 J. Zheng
 G. Zhu

Germany International Working Group (BPV VIII)

P. Chavdarov, *Chair*
 M. Sykora, *Vice Chair*
 B. Daume
 A. Emrich
 J. Fleischfresser
 R. Helmholdt
 R. Kauer
 D. Koelbl
 S. Krebs

T. Ludwig
 R. A. Meyers
 H. Michael
 S. Reich
 A. Spangenberg
 G. Naumann, *Contributing Member*
 P. Paluszkiwicz, *Contributing Member*
 R. Uebel, *Contributing Member*

India International Working Group (BPV VIII)

D. Chandiramani, *Chair*
 D. Kulkarni, *Vice Chair*
 A. D. Dalal, *Secretary*
 P. Arulkumar
 B. Basu
 P. Gandhi
 S. K. Goyal
 V. Jayabalan
 A. Kakumanu
 V. V. P. Kumar

T. Mukherjee
 P. C. Pathak
 S. B. Patil
 D. Prabhu
 A. Sadasivam
 M. P. Shah
 R. Tiru
 V. T. Valavan
 M. Sharma, *Contributing Member*

Italy International Working Group (BPV VIII)

| | |
|-----------------------------------|--------------------------------------|
| A. Teli, <i>Chair</i> | M. Guglielmetti |
| D. D. Raimander, <i>Secretary</i> | A. F. Magri |
| B. G. Alborali | P. Mantovani |
| P. Aliprandi | M. Millefanti |
| A. Avogadri | L. Moracchioli |
| A. Camanni | P. Pacor |
| M. Colombo | G. Pontiggia |
| P. Conti | S. Sarti |
| D. Cortassa | A. Veroni |
| P. L. Dinelli | G. Gobbi, <i>Contributing Member</i> |
| F. Finco | |

Special Working Group on Bolted Flanged Joints (BPV VIII)

| | |
|-----------------------------|------------------|
| R. W. Mikitka, <i>Chair</i> | W. McDaniel |
| G. Auriolles, Sr. | M. Osterfoss |
| D. Bankston, Jr. | J. R. Payne |
| W. Brown | G. B. Rawls, Jr. |
| H. Chen | R. Wacker |
| A. Mann | |

Subgroup on Interpretations (BPV VIII)

| | |
|---------------------------------|---|
| G. Auriolles, Sr., <i>Chair</i> | C. D. Rodery |
| J. Oh, <i>Staff Secretary</i> | T. G. Seipp |
| S. R. Babka | J. C. Sowinski |
| J. Cameron | D. B. Stewart |
| N. Carter | D. A. Swanson |
| C. W. Cary | J. P. Swezy, Jr. |
| B. F. Hantz | J. Vattappilly |
| M. Kowalczyk | A. Viet |
| D. L. Kurle | K. Xu |
| M. D. Lower | R. J. Basile, <i>Contributing Member</i> |
| A. Mann | D. B. DeMichael, <i>Contributing Member</i> |
| S. A. Marks | R. D. Dixon, <i>Contributing Member</i> |
| P. Matkovics | S. Kilambi, <i>Contributing Member</i> |
| G. M. Mital | R. Mahadeen, <i>Contributing Member</i> |
| D. I. Morris | T. P. Pastor, <i>Contributing Member</i> |
| D. T. Peters | P. L. Sturgill, <i>Contributing Member</i> |
| F. L. Richter | |
| S. C. Roberts | |

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

| | |
|-----------------------------------|--|
| D. A. Bowers, <i>Chair</i> | W. J. Sperko |
| M. J. Pischke, <i>Vice Chair</i> | P. L. Sturgill |
| E. Lawson, <i>Staff Secretary</i> | J. P. Swezy, Jr. |
| M. Bernasek | E. W. Woelfel |
| M. A. Boring | D. Pojatar, <i>Delegate</i> |
| J. G. Feldstein | A. Roza, <i>Delegate</i> |
| P. D. Flenner | M. Consonni, <i>Contributing Member</i> |
| S. E. Gingrich | S. A. Jones, <i>Contributing Member</i> |
| K. L. Hayes | S. Raghunathan, <i>Contributing Member</i> |
| R. M. Jessee | M. J. Stanko, <i>Contributing Member</i> |
| J. S. Lee | P. L. Van Fosson, <i>Contributing Member</i> |
| W. M. Lundy | R. K. Brown, Jr., <i>Honorary Member</i> |
| S. A. Marks | M. L. Carpenter, <i>Honorary Member</i> |
| T. Melfi | B. R. Newmark, <i>Honorary Member</i> |
| W. F. Newell, Jr. | S. D. Reynolds, Jr., <i>Honorary Member</i> |
| D. K. Peetz | |
| E. G. Reichelt | |
| M. J. Rice | |
| M. B. Sims | |

Subgroup on Brazing (BPV IX)

| | |
|---------------------------|------------------|
| S. A. Marks, <i>Chair</i> | A. R. Nywening |
| E. W. Beckman | M. J. Pischke |
| A. F. Garbolevsky | J. P. Swezy, Jr. |
| N. Mohr | |

Subgroup on General Requirements (BPV IX)

| | |
|-------------------------------|---|
| P. L. Sturgill, <i>Chair</i> | D. K. Peetz |
| N. Carter, <i>Vice Chair</i> | H. B. Porter |
| S. A. Marks, <i>Secretary</i> | J. P. Swezy, Jr. |
| J. P. Bell | E. W. Woelfel |
| D. A. Bowers | E. Molina, <i>Delegate</i> |
| P. Gilston | E. W. Beckman, <i>Contributing Member</i> |
| M. Heinrichs | B. R. Newmark, <i>Honorary Member</i> |
| A. Howard | |
| R. M. Jessee | |

Subgroup on Materials (BPV IX)

| | |
|---------------------------|---|
| M. Bernasek, <i>Chair</i> | M. J. Pischke |
| T. Anderson | A. Roza |
| E. Cutlip | C. E. Sainz |
| M. Denault | P. L. Sturgill |
| S. E. Gingrich | C. Zafir |
| L. S. Harbison | V. G. V. Giunto, <i>Delegate</i> |
| M. James | D. J. Kotecki, <i>Contributing Member</i> |
| R. M. Jessee | B. Krueger, <i>Contributing Member</i> |
| T. Melfi | W. J. Sperko, <i>Contributing Member</i> |
| S. D. Nelson | M. J. Stanko, <i>Contributing Member</i> |

Subgroup on Plastic Fusing (BPV IX)

| | |
|-----------------------------|----------------|
| E. W. Woelfel, <i>Chair</i> | E. G. Reichelt |
| D. Burwell | M. J. Rice |
| K. L. Hayes | S. Schuessler |
| R. M. Jessee | M. Troughton |
| J. Johnston, Jr. | C. Violand |
| J. E. O'Sullivan | J. Wright |

Subgroup on Strength of Weldments (BPV II and IX)

| | |
|--------------------------------|--|
| G. W. Galanes, <i>Chair</i> | J. Penso |
| K. L. Hayes, <i>Vice Chair</i> | D. W. Rahoi |
| S. H. Bowes, <i>Secretary</i> | B. Roberts |
| K. K. Coleman | W. J. Sperko |
| M. Denault | J. P. Swezy, Jr. |
| J. R. Foulds | M. Ueyama |
| D. W. Gandy | A. A. Amiri, <i>Contributing Member</i> |
| M. Ghahremani | P. D. Flenner, <i>Contributing Member</i> |
| J. Henry | J. J. Sanchez-Hanton, <i>Contributing Member</i> |
| W. F. Newell, Jr. | |

Subgroup on Welding Qualifications (BPV IX)

| | |
|-------------------------------|---|
| M. J. Rice, <i>Chair</i> | B. R. Newton |
| J. S. Lee, <i>Vice Chair</i> | E. G. Reichelt |
| K. L. Hayes, <i>Secretary</i> | M. B. Sims |
| M. Bernasek | W. J. Sperko |
| M. A. Boring | S. A. Sprague |
| D. A. Bowers | P. L. Sturgill |
| R. Campbell | J. P. Swezy, Jr. |
| R. B. Corbit | C. Violand |
| P. D. Flenner | A. D. Wilson |
| L. S. Harbison | D. Chandiramani, <i>Contributing Member</i> |
| M. Heinrichs | M. Consonni, <i>Contributing Member</i> |
| W. M. Lundy | M. Dehghan, <i>Contributing Member</i> |
| D. W. Mann | T. C. Wiesner, <i>Contributing Member</i> |
| T. Melfi | |
| W. F. Newell, Jr. | |

Argentina International Working Group (BPV IX)

| | |
|-----------------------------------|----------------|
| A. Burgueno, <i>Chair</i> | J. A. Herrera |
| E. Lawson, <i>Staff Secretary</i> | M. D. Kuhn |
| B. Bardott | M. A. Mendez |
| L. F. Boccanera | A. E. Pastor |
| M. Favareto | G. Telleria |
| C. A. Garibotti | M. M. C. Tocco |

Germany International Working Group (BPV IX)

| | |
|-----------------------------------|--------------|
| P. Chavdarov, <i>Chair</i> | S. Krebs |
| A. Spangenberg, <i>Vice Chair</i> | T. Ludwig |
| E. Lawson, <i>Staff Secretary</i> | G. Naumann |
| P. Thiebo, <i>Secretary</i> | A. Roza |
| J. Daldrup | K.-G. Toelle |
| B. Daume | S. Wegener |
| J. Fleischfresser | F. Wodke |
| E. Floer | R. Helmholdt |

Italy International Working Group (BPV IX)

| | |
|-------------------------------|--------------------------------------|
| D. D. Raimander, <i>Chair</i> | L. Moracchioli |
| M. Bernasek | P. Pacor |
| A. Camanni | G. Pontiggia |
| P. L. Dinelli | P. Siboni |
| F. Ferrarese | A. Volpi |
| M. Mandina | V. Calo, <i>Contributing Member</i> |
| A. S. Monastra | G. Gobbi, <i>Contributing Member</i> |

Spain International Working Group (BPV IX)

| | |
|--------------------------------------|--------------------------------------|
| F. J. Q. Pandelo, <i>Chair</i> | F. Manas |
| F. L. Villabrille, <i>Vice Chair</i> | B. B. Miguel |
| E. Lawson, <i>Staff Secretary</i> | A. D. G. Munoz |
| F. R. Hermida, <i>Secretary</i> | A. B. Pascual |
| C. A. Celimendiz | S. Sevil |
| M. A. F. Garcia | G. Gobbi, <i>Contributing Member</i> |
| R. G. Garcia | |

COMMITTEE ON FIBER-REINFORCED PLASTIC PRESSURE VESSELS (BPV X)

| | |
|--------------------------------------|--|
| B. Linnemann, <i>Chair</i> | L. E. Hunt |
| B. F. Shelley, <i>Vice Chair</i> | D. L. Keeler |
| P. D. Stumpf, <i>Staff Secretary</i> | D. H. McCauley |
| A. L. Beckwith | N. L. Newhouse |
| F. L. Brown | G. Ramirez |
| J. L. Bustillos | J. R. Richter |
| B. R. Colley | S. L. Wagner |
| T. W. Cowley | D. O. Yancey, Jr. |
| I. L. Dinovo | P. H. Ziehl |
| D. Eisberg | D. H. Hodgkinson, <i>Contributing Member</i> |
| M. R. Gorman | |
| B. Hebb | |

COMMITTEE ON NUCLEAR INSERVICE INSPECTION (BPV XI)

| | |
|---|---|
| R. W. Swayne, <i>Chair</i> | N. A. Palm |
| S. D. Kulat, <i>Vice Chair</i> | G. C. Park |
| D. W. Lamond, <i>Vice Chair</i> | A. T. Roberts III |
| D. Miro-Quesada, <i>Staff Secretary</i> | D. A. Scarth |
| J. F. Ball | F. J. Schaaf, Jr. |
| W. H. Bamford | S. Takaya |
| J. M. Boughman | D. Vetter |
| C. Brown | T. V. Vo |
| S. B. Brown | D. E. Waskey |
| T. L. Chan | J. G. Weicks |
| R. C. Cipolla | M. Weis |
| D. R. Cordes | Y.-K. Chung, <i>Delegate</i> |
| H. Do | C. Ye, <i>Delegate</i> |
| E. V. Farrell, Jr. | M. L. Benson, <i>Alternate</i> |
| M. J. Ferlisi | J. K. Loy, <i>Alternate</i> |
| P. D. Fisher | R. O. McGill, <i>Alternate</i> |
| T. J. Griesbach | D. J. Shim, <i>Alternate</i> |
| J. Hakii | A. Udyawar, <i>Alternate</i> |
| M. L. Hall | E. B. Gerlach, <i>Contributing Member</i> |
| D. O. Henry | B. R. Newton, <i>Contributing Member</i> |
| W. C. Holston | C. D. Cowfer, <i>Honorary Member</i> |
| J. T. Lindberg | D. D. Davis, <i>Honorary Member</i> |
| G. A. Lofthus | R. E. Gimple, <i>Honorary Member</i> |
| H. Malikowski | F. E. Gregor, <i>Honorary Member</i> |
| S. L. McCracken | O. F. Hedden, <i>Honorary Member</i> |
| S. A. Norman | R. D. Kerr, <i>Honorary Member</i> |
| C. A. Nove | P. C. Riccardella, <i>Honorary Member</i> |
| T. Nuoffer | R. A. West, <i>Honorary Member</i> |
| J. Nygaard | C. J. Wirtz, <i>Honorary Member</i> |
| J. E. O'Sullivan | R. A. Yonekawa, <i>Honorary Member</i> |

Executive Committee (BPV XI)

| | |
|---|--------------------------------|
| S. D. Kulat, <i>Chair</i> | S. L. McCracken |
| R. W. Swayne, <i>Vice Chair</i> | C. A. Nove |
| D. Miro-Quesada, <i>Staff Secretary</i> | T. Nuoffer |
| W. H. Bamford | N. A. Palm |
| M. J. Ferlisi | G. C. Park |
| D. W. Lamond | A. T. Roberts III |
| J. T. Lindberg | M. L. Benson, <i>Alternate</i> |

Argentina International Working Group (BPV XI)

| | |
|-------------------------------------|-------------------|
| F. M. Schroeter, <i>Chair</i> | R. J. Lopez |
| O. Martinez, <i>Staff Secretary</i> | M. Magliocchi |
| D. A. Cipolla | L. R. Miño |
| A. Claus | J. Monte |
| D. Costa | M. D. Pereda |
| D. P. Delfino | A. Politi |
| D. N. Dell'Erba | C. G. Real |
| A. Dominguez | F. J. Schaaf, Jr. |
| S. A. Echeverria | G. J. Scian |
| E. P. Fresquet | M. J. Solari |
| M. M. Gamizo | P. N. Torano |
| I. M. Guerreiro | P. Yamamoto |
| F. Llorente | |

Task Group on Inspectability (BPV XI)

| | |
|------------------------------|----------------|
| J. T. Lindberg, <i>Chair</i> | G. A. Lofthus |
| E. Henry, <i>Secretary</i> | S. Matsumoto |
| A. Cardillo | D. E. Matthews |
| D. R. Cordes | P. J. O'Regan |
| M. J. Ferlisi | J. B. Ossmann |
| P. Gionta | S. A. Sabo |
| D. O. Henry | P. Sullivan |
| J. Honcharik | C. Thomas |
| R. Klein | J. Tucker |
| C. Latiolais | |

China International Working Group (BPV XI)

| | |
|------------------------------|-------------|
| J. H. Liu, <i>Chair</i> | S. Shuo |
| Y. Nie, <i>Vice Chair</i> | Y. Sixin |
| C. Ye, <i>Vice Chair</i> | Y. X. Sun |
| M. W. Zhou, <i>Secretary</i> | G. X. Tang |
| J. F. Cai | Q. Wang |
| H. Chen | Q. W. Wang |
| H. D. Chen | Z. S. Wang |
| Y. Cheng | L. Xing |
| Y. B. Guo | F. Xu |
| Y. Hongqi | S. X. Xu |
| D. R. Horn | Q. Yin |
| Y. Hou | K. Zhang |
| S. X. Lin | Y. Zhe |
| W. N. Pei | Z. M. Zhong |
| L. Shiwei | |

Task Group on ISI of Spent Nuclear Fuel Storage and Transportation Containment Systems (BPV XI)

| | |
|-------------------------------|--------------------------------------|
| K. Hunter, <i>Chair</i> | M. Liu |
| M. Orihuela, <i>Secretary</i> | K. Mauskar |
| D. J. Ammerman | R. M. Meyer |
| W. H. Borter | B. L. Montgomery |
| J. Broussard | R. M. Pace |
| S. Brown | E. L. Pleins |
| C. R. Bryan | M. A. Richter |
| T. Carraher | B. Sarno |
| S. Corcoran | R. Sindelar |
| D. Dunn | M. Staley |
| N. Fales | J. Wellwood |
| R. C. Folley | X. J. Zhai |
| G. Grant | P.-S. Lam, <i>Alternate</i> |
| B. Gutherman | G. White, <i>Alternate</i> |
| M. W. Joseph | J. Wise, <i>Alternate</i> |
| M. Keene | H. Smith, <i>Contributing Member</i> |

German International Working Group (BPV XI)

| | |
|---------------------------------|-------------|
| R. Döring, <i>Chair</i> | N. Legl |
| R. Trieglaff, <i>Vice Chair</i> | T. Ludwig |
| R. Piel, <i>Secretary</i> | X. Pitoiset |
| A. Casse | M. Reichert |
| S. Dugan | L. Sybertz |
| C. G. Frantescu | I. Tewes |
| M. Hagenbruch | R. Tiete |
| E. Iacopetta | J. Wendt |
| S. D. Kulat | S. Zickler |
| H.-W. Lange | |

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

| | |
|------------------------------|--------------------------------|
| W. H. Bamford, <i>Chair</i> | R. O. McGill |
| N. A. Palm, <i>Secretary</i> | H. S. Mehta |
| M. Brumovsky | K. Miyazaki |
| H. D. Chung | R. M. Pace |
| R. C. Cipolla | J. C. Poehler |
| C. M. Faidy | S. Ranganath |
| M. M. Farooq | D. A. Scarth |
| B. R. Ganta | D. J. Shim |
| T. J. Griesbach | G. L. Stevens |
| K. Hasegawa | A. Udyawar |
| K. Hojo | T. V. Vo |
| D. N. Hopkins | G. M. Wilkowski |
| D. R. Lee | S. X. Xu |
| Y. S. Li | M. L. Benson, <i>Alternate</i> |

India International Working Group (BPV XI)

| | |
|------------------------------|--------------|
| S. B. Parkash, <i>Chair</i> | N. Palm |
| D. Narain, <i>Vice Chair</i> | D. Rawal |
| K. K. Rai, <i>Secretary</i> | R. Sahai |
| Z. M. Mansuri | R. K. Sharma |
| M. R. Nadgouda | |

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

| | |
|----------------------------|---------------------------------------|
| R. M. Pace, <i>Chair</i> | M. Hayashi |
| S. X. Xu, <i>Secretary</i> | K. Hojo |
| F. G. Abatt | S. A. Kleinsmith |
| G. A. Antaki | H. S. Mehta |
| P. R. Donavin | T. V. Vo |
| R. G. Gilada | G. M. Wilkowski |
| T. J. Griesbach | T. Weaver, <i>Contributing Member</i> |

Special Working Group on Editing and Review (BPV XI)

| | |
|----------------------------|-----------|
| R. W. Swayne, <i>Chair</i> | K. R. Rao |
| M. Orihuela | |

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

| | |
|-----------------------------|-----------------|
| R. C. Cipolla, <i>Chair</i> | C. Liu |
| S. X. Xu, <i>Secretary</i> | M. Liu |
| W. H. Bamford | H. S. Mehta |
| M. L. Benson | G. A. A. Miessi |
| M. Brumovsky | K. Miyazaki |
| H. D. Chung | S. Noronha |
| M. A. Erickson | R. K. Qashu |
| C. M. Faidy | S. Ranganath |
| M. M. Farooq | P. J. Rush |
| B. R. Ganta | D. A. Scarth |
| R. G. Gilada | W. L. Server |
| F. D. Hayes | D. J. Shim |
| P. H. Hoang | S. Smith |
| K. Hojo | M. Uddin |
| D. N. Hopkins | A. Udyawar |
| S. Kalyanam | T. V. Vo |
| Y. Kim | K. Wang |
| V. Lacroix | B. Wasiluk |
| D. R. Lee | G. M. Wilkowski |
| Y. S. Li | |

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

| | |
|-----------------------------------|------------------|
| D. A. Scarth, <i>Chair</i> | S. Kalyanam |
| G. M. Wilkowski, <i>Secretary</i> | K. Kashima |
| K. Azuma | V. Lacroix |
| M. L. Benson | Y. S. Li |
| M. Brumovsky | R. O. McGill |
| F. W. Brust | H. S. Mehta |
| H. D. Chung | G. A. A. Miessi |
| R. C. Cipolla | K. Miyazaki |
| N. G. Cofie | S. H. Pellet |
| C. M. Faidy | P. J. Rush |
| M. M. Farooq | C. J. Sallaberry |
| B. R. Ganta | W. L. Server |
| S. R. Gosselin | D. J. Shim |
| C. E. Guzman-Leong | S. Smith |
| K. Hasegawa | M. F. Uddin |
| P. H. Hoang | A. Udyawar |
| K. Hojo | T. V. Vo |
| D. N. Hopkins | K. Wang |
| E. J. Houston | B. Wasiluk |
| R. Janowiak | S. X. Xu |

Working Group on Flaw Evaluation Reference Curves (BPV XI)

| | |
|------------------------------|--------------|
| G. L. Stevens, <i>Chair</i> | A. Jenks |
| A. Udyawar, <i>Secretary</i> | V. Lacroix |
| W. H. Bamford | H. S. Mehta |
| M. L. Benson | K. Miyazaki |
| F. W. Brust | B. Pellereau |
| R. C. Cipolla | S. Ranganath |
| M. M. Farooq | D. A. Scarth |
| A. E. Freed | D. J. Shim |
| P. Gill | S. Smith |
| K. Hasegawa | T. V. Vo |
| K. Hojo | S. X. Xu |
| R. Janowiak | |

Task Group on Code Case N-513 (WG-PFE) (BPV XI)

| | |
|---------------------------------|--------------|
| R. O. McGill, <i>Chair</i> | S. M. Parker |
| E. J. Houston, <i>Secretary</i> | D. Rudland |
| G. A. Antaki | P. J. Rush |
| R. C. Cipolla | D. A. Scarth |
| M. M. Farooq | S. X. Xu |
| R. Janowiak | |

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

| | |
|----------------------------|--------------|
| R. O. McGill, <i>Chair</i> | M. Kassab |
| S. X. Xu, <i>Secretary</i> | M. Moenssens |
| F. G. Abatt | D. P. Munson |
| G. A. Antaki | R. M. Pace |
| R. C. Cipolla | S. H. Pellet |
| R. G. Gilada | D. Rudland |
| K. Hasegawa | P. J. Rush |
| K. M. Hoffman | D. A. Scarth |
| R. Janowiak | |

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

| | |
|-------------------------------|---------------|
| N. A. Palm, <i>Chair</i> | H. Kobayashi |
| A. E. Freed, <i>Secretary</i> | H. S. Mehta |
| K. R. Baker | A. D. Odell |
| W. H. Bamford | R. M. Pace |
| M. Brumovsky | J. C. Poehler |
| M. A. Erickson | S. Ranganath |
| T. J. Griesbach | W. L. Server |
| M. Hayashi | C. A. Tomes |
| R. Janowiak | A. Udyawar |
| M. Kirk | T. V. Vo |
| S. A. Kleinsmith | H. Q. Xu |

Task Group on Flaw Evaluation for HDPE Pipe (WG-PFE) (BPV XI)

| | |
|--------------------------|--------------|
| P. J. Rush, <i>Chair</i> | D. J. Shim |
| P. Krishnaswamy | M. Troughton |
| M. Moenssens | J. Wright |
| D. P. Munson | S. X. Xu |
| D. A. Scarth | |

Task Group on Appendix L (WG-OPC) (BPV XI)

| | |
|------------------------------|---------------|
| N. Glunt, <i>Chair</i> | C.-S. Oh |
| R. M. Pace, <i>Secretary</i> | H. Park |
| A. E. Freed | S. Ranganath |
| M. A. Gray | D. J. Shim |
| T. J. Griesbach | S. Smith |
| H. Nam | G. L. Stevens |
| A. Nana | A. Udyawar |
| A. D. Odell | |

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

| | |
|--------------------------------|------------------------------|
| J. T. Lindberg, <i>Chair</i> | J. Harrison |
| D. R. Cordes, <i>Secretary</i> | D. O. Henry |
| M. Briley | G. A. Lofthus |
| C. Brown | S. A. Sabo |
| T. L. Chan | F. J. Schaaf, Jr. |
| T. Cinson | R. V. Swain |
| S. E. Cumblidge | C. A. Nove, <i>Alternate</i> |
| K. J. Hacker | |

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

| | |
|-----------------------------|----------------|
| C. Brown, <i>Chair</i> | D. O. Henry |
| T. Cinson, <i>Secretary</i> | J. T. Lindberg |
| J. E. Aycock | C. Shinsky |
| J. Bennett | R. Tedder |
| S. E. Cumblidge | T. Thulien |
| A. Diaz | J. T. Timm |
| N. Farenbaugh | |

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

| | |
|-------------------------------|--------------------------|
| G. A. Lofthus, <i>Chair</i> | D. A. Kull |
| J. Harrison, <i>Secretary</i> | C. Latiolais |
| M. Briley | C. A. Nove |
| A. Bushmire | S. A. Sabo |
| D. R. Cordes | R. V. Swain |
| S. R. Doctor | D. Van Allen |
| K. J. Hacker | D. K. Zimmerman |
| W. A. Jensen | B. Lin, <i>Alternate</i> |

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

| | |
|--------------------------------------|-----------------------------|
| S. L. McCracken, <i>Chair</i> | B. R. Newton |
| E. V. Farrell, Jr., <i>Secretary</i> | S. A. Norman |
| J. F. Ball | J. E. O'Sullivan |
| M. Brandes | G. C. Park |
| S. B. Brown | R. R. Stevenson |
| R. Clow | R. W. Swayne |
| P. D. Fisher | D. J. Tilly |
| M. L. Hall | D. E. Waskey |
| W. C. Holston | J. G. Weicks |
| J. Honcharik | B. Lin, <i>Alternate</i> |
| A. B. Meichler | J. K. Loy, <i>Alternate</i> |

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

| | |
|----------------------------|-----------------------------|
| J. G. Weicks, <i>Chair</i> | M. Kris |
| D. Barborak | S. E. Marlette |
| S. J. Findlan | S. L. McCracken |
| P. D. Fisher | B. R. Newton |
| R. C. Folley | J. E. O'Sullivan |
| M. L. Hall | D. J. Tilly |
| W. C. Holston | D. E. Waskey |
| J. Honcharik | J. K. Loy, <i>Alternate</i> |
| C. C. Kim | |

Task Group on Temper Bead Welding (BPV XI)

| | |
|-----------------------------|------------------|
| S. J. Findlan, <i>Chair</i> | J. E. O'Sullivan |
| D. Barborak | A. Patel |
| M. L. Hall | J. Tatman |
| S. L. McCracken | D. J. Tilly |
| N. Mohr | D. E. Waskey |
| B. R. Newton | J. G. Weicks |
| G. Olson | |

Task Group on Weld Overlay (BPV XI)

| | |
|-------------------------------|----------------|
| S. L. McCracken, <i>Chair</i> | B. R. Newton |
| D. Barborak | G. Olson |
| S. J. Findlan | A. Patel |
| M. L. Hall | P. Raynaud |
| W. C. Holston | D. W. Sandusky |
| S. Hunter | D. E. Waskey |
| C. Lohse | J. G. Weicks |
| S. E. Marlette | |

Working Group on Non-Metals Repair/Replacement Activities (SG-RRR) (BPV XI)

| | |
|---------------------------------|-------------------|
| J. E. O'Sullivan, <i>Chair</i> | M. P. Marohl |
| S. Schuessler, <i>Secretary</i> | T. M. Musto |
| M. Brandes | S. Patterson |
| D. R. Dechene | A. Pridmore |
| J. Johnston, Jr. | F. J. Schaaf, Jr. |
| B. Lin | R. Stakenborghs |

Task Group on HDPE Piping for Low Safety Significance Systems (WG-NMRRR) (BPV XI)

| | |
|------------------------------------|-------------------|
| M. Brandes, <i>Chair</i> | T. M. Musto |
| J. E. O'Sullivan, <i>Secretary</i> | F. J. Schaaf, Jr. |
| M. Golliet | S. Schuessler |
| B. Lin | R. Stakenborghs |

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

| | |
|--------------------------------|--------------------------------|
| J. E. O'Sullivan, <i>Chair</i> | R. P. Ojdrovic |
| S. F. Arnold | A. Pridmore |
| S. W. Choi | P. Raynaud |
| D. R. Dechene | S. Rios |
| M. Golliet | C. W. Rowley |
| L. S. Gordon | J. Sealey |
| M. Kuntz | R. Stakenborghs |
| H. Lu | N. Stoeva |
| M. P. Marohl | M. F. Uddin |
| L. Nadeau | J. Wen |
| C. A. Nove | B. Davenport, <i>Alternate</i> |

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

| | |
|----------------------------------|-----------------|
| S. B. Brown, <i>Chair</i> | B. Lin |
| A. B. Meichler, <i>Secretary</i> | H. Malikowski |
| O. Bhatti | G. C. Park |
| R. Clow | M. A. Pyne |
| R. R. Croft | R. R. Stevenson |
| E. V. Farrell, Jr. | R. W. Swayne |

Task Group on Repair and Replacement Optimization (WG-D&P) (BPV XI)

| | |
|-------------------------------|-----------------|
| S. L. McCracken, <i>Chair</i> | D. Jacobs |
| T. Basso | H. Malikowski |
| R. Clow | T. Nuoffer |
| K. Dietrich | G. C. Park |
| E. V. Farrell, Jr. | A. Patel |
| R. C. Folley | R. R. Stevenson |
| M. L. Hall | R. G. Weicks |
| W. C. Holston | |

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

| | |
|------------------------------|---------------------------------|
| M. J. Ferlisi, <i>Chair</i> | S. D. Kulat |
| J. Nygaard, <i>Secretary</i> | D. W. Lamond |
| J. M. Boughman | T. Nomura |
| S. B. Brown | T. Nuoffer |
| S. T. Chesworth | M. A. Pyne |
| H. Q. Do | H. M. Stephens, Jr. |
| K. W. Hall | R. Thames |
| P. J. Hennessey | M. Weis |
| K. M. Hoffman | M. J. Homiack, <i>Alternate</i> |
| A. E. Keyser | |

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

| | |
|-------------------------------|------------------|
| H. Malikowski, <i>Chair</i> | S. E. Marlette |
| K. Dietrich, <i>Secretary</i> | B. L. Montgomery |
| W. H. Bamford | G. C. Park |
| T. Cinson | W. Sims |
| P. R. Donavin | D. E. Waskey |
| K. M. Hoffman | C. Wax |
| H. Kobayashi | K. A. Whitney |
| C. Lohse | |

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

| | |
|-----------------------------|-------------------------------|
| M. J. Ferlisi, <i>Chair</i> | J. A. Munshi |
| R. Thames, <i>Secretary</i> | M. Sircar |
| P. S. Ghosal | P. C. Smith |
| H. T. Hill | S. Walden |
| A. E. Keyser | M. Weis |
| B. Lehman | S. G. Brown, <i>Alternate</i> |
| P. Leininger | |

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

| | |
|---------------------------|---------------|
| H. Q. Do, <i>Chair</i> | J. Howard |
| M. Weis, <i>Secretary</i> | A. Keller |
| R. W. Blyde | S. D. Kulat |
| K. Caver | E. Lantz |
| C. Cueto-Felgueroso | A. Maekawa |
| M. J. Ferlisi | T. Nomura |
| M. L. Garcia Heras | J. C. Nygaard |
| K. W. Hall | S. Orita |
| K. M. Hoffman | |

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

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

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

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

Working Group on General Requirements (BPV XI)

| | |
|---------------------------|---------------------------------|
| T. Nuoffer, <i>Chair</i> | A. T. Roberts III |
| J. Mayo, <i>Secretary</i> | S. R. Scott |
| J. F. Ball | D. Vetter |
| T. L. Chan | S. E. Woolf |
| P. J. Hennessey | M. T. Audrain, <i>Alternate</i> |
| K. A. Kavanagh | R. S. Spencer, <i>Alternate</i> |
| T. N. Rezk | |

Subgroup on Reliability and Integrity Management Program (SG-RIM) (BPV XI)

| | |
|---------------------------------|---------------------|
| A. T. Roberts III, <i>Chair</i> | P. J. Hennessey |
| D. Vetter, <i>Secretary</i> | D. M. Jones |
| T. Anselmi | D. R. Lee |
| N. Broom | T. Lupold |
| V. Chugh | M. Orihuela |
| S. R. Doctor | F. J. Schaaf, Jr. |
| J. D. Fletcher | H. M. Stephens, Jr. |
| J. T. Fong | R. W. Swayne |
| J. Grimm | S. Takaya |
| K. Harris | R. Vayda |

Working Group on MANDE (BPV XI)

| | |
|-----------------------------------|---------------|
| H. M. Stephens, Jr., <i>Chair</i> | J. T. Fong |
| S. R. Doctor, <i>Vice Chair</i> | D. O. Henry |
| M. Turnbow, <i>Secretary</i> | T. Lupold |
| T. Anselmi | L. E. Mullins |
| N. A. Finney | M. Orihuela |

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

| | |
|-------------------------|--|
| S. Takaya, <i>Chair</i> | D. R. Lee |
| T. Asayama | H. Machida |
| S. R. Doctor | T. Muraki |
| K. Dozaki | A. T. Roberts III |
| J. T. Fong | F. J. Schaaf, Jr. |
| J. Hakii | R. Vayda |
| K. Harris | D. Watanabe |
| M. Hayashi | M. Morishita, <i>Contributing Member</i> |
| Y. Kamishima | |

COMMITTEE ON TRANSPORT TANKS (BPV XII)

| | |
|-------------------------------|--|
| N. J. Paulick, <i>Chair</i> | T. A. Rogers |
| M. D. Rana, <i>Vice Chair</i> | R. C. Sallash |
| J. Oh, <i>Staff Secretary</i> | M. Shah |
| A. N. Antoniou | S. Staniszewski |
| P. Chilukuri | A. P. Varghese |
| W. L. Garfield | Y. Doron, <i>Contributing Member</i> |
| M. Pitts | R. Meyers, <i>Contributing Member</i> |
| J. Roberts | M. R. Ward, <i>Contributing Member</i> |

Executive Committee (BPV XII)

| | |
|----------------------------------|-----------------|
| M. D. Rana, <i>Chair</i> | T. A. Rogers |
| N. J. Paulick, <i>Vice Chair</i> | R. C. Sallash |
| J. Oh, <i>Staff Secretary</i> | S. Staniszewski |
| M. Pitts | A. P. Varghese |

Subgroup on Design and Materials (BPV XII)

| | |
|-----------------------------|--|
| R. C. Sallash, <i>Chair</i> | K. Xu |
| D. K. Chandiramani | A. T. Duggleby, <i>Contributing Member</i> |
| P. Chilukuri | R. D. Hayworth, <i>Contributing Member</i> |
| Y. Doron | G. G. Karcher, <i>Contributing Member</i> |
| S. L. McWilliams | B. E. Spencer, <i>Contributing Member</i> |
| N. J. Paulick | M. R. Ward, <i>Contributing Member</i> |
| M. D. Rana | J. Zheng, <i>Contributing Member</i> |
| T. A. Rogers | |
| M. Shah | |
| S. Staniszewski | |
| A. P. Varghese | |

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

| | |
|------------------------|--------------------------------------|
| M. Pitts, <i>Chair</i> | T. A. Rogers |
| P. Chilukuri | R. C. Sallash |
| Y. Doron | L. Selensky |
| M. Koprivnak | S. Staniszewski |
| P. Miller | R. D. Hayworth |
| O. Mulet | G. McRae, <i>Contributing Member</i> |
| J. Roberts | |

Subgroup on General Requirements (BPV XII)

| | |
|--------------------------------|--|
| S. Staniszewski, <i>Chair</i> | L. Selensky |
| B. F. Pittel, <i>Secretary</i> | P. Chilukuri, <i>Contributing Member</i> |
| A. N. Antoniou | T. J. Hitchcock, <i>Contributing Member</i> |
| Y. Doron | S. L. McWilliams, <i>Contributing Member</i> |
| H. Ebben III | T. A. Rogers, <i>Contributing Member</i> |
| J. L. Freiler | D. G. Shelton, <i>Contributing Member</i> |
| W. L. Garfield | M. R. Ward, <i>Contributing Member</i> |
| O. Mulet | |
| M. Pitts | |
| R. C. Sallash | |

Subgroup on Nonmandatory Appendices (BPV XII)

| | |
|-----------------------------------|--------------------------------------|
| T. A. Rogers, <i>Chair</i> | M. Pitts |
| S. Staniszewski, <i>Secretary</i> | R. C. Sallash |
| P. Chilukuri | D. G. Shelton |
| N. J. Paulick | Y. Doron, <i>Contributing Member</i> |

COMMITTEE ON OVERPRESSURE PROTECTION (BPV XIII)

| | |
|--|---|
| D. B. DeMichael, <i>Chair</i> | R. D. Danzy, <i>Contributing Member</i> |
| D. Miller, <i>Vice Chair</i> | M. Elias, <i>Contributing Member</i> |
| C. E. O'Brien, <i>Staff Secretary</i> | D. Felix, <i>Contributing Member</i> |
| J. F. Ball | A. Frigerio, <i>Contributing Member</i> |
| J. Burgess | J. P. Glaspie, <i>Contributing Member</i> |
| B. Calderon | A. Hassan, <i>Contributing Member</i> |
| J. W. Dickson | P. K. Lam, <i>Contributing Member</i> |
| A. Donaldson | J. M. Levy, <i>Contributing Member</i> |
| S. F. Harrison, Jr. | M. Mengon, <i>Contributing Member</i> |
| B. K. Nutter | J. Mize, <i>Contributing Member</i> |
| T. Patel | M. Mullavey, <i>Contributing Member</i> |
| M. Poehlmann | S. K. Parimi, <i>Contributing Member</i> |
| T. R. Tarbay | R. Raman, <i>Contributing Member</i> |
| D. E. Tompkins | M. Reddy, <i>Contributing Member</i> |
| Z. Wang | S. Ruesenberg, <i>Contributing Member</i> |
| J. A. West | K. Shores, <i>Contributing Member</i> |
| A. Wilson | D. E. Tezzo, <i>Contributing Member</i> |
| H. Aguilar, <i>Contributing Member</i> | |
| R. W. Barnes, <i>Contributing Member</i> | |

Executive Committee (BPV XIII)

| | |
|---------------------------------------|--------------|
| D. Miller, <i>Chair</i> | A. Donaldson |
| D. B. DeMichael, <i>Vice Chair</i> | B. K. Nutter |
| C. E. O'Brien, <i>Staff Secretary</i> | J. A. West |
| J. F. Ball | |

Subgroup on Design and Materials (BPV XIII)

| | |
|-----------------------------|--|
| D. Miller, <i>Chair</i> | T. R. Tarbay |
| T. Patel, <i>Vice Chair</i> | J. A. West |
| B. Mruk, <i>Secretary</i> | A. Williams |
| C. E. Bear | D. J. Azukas, <i>Contributing Member</i> |
| A. Biesecker | R. D. Danzy, <i>Contributing Member</i> |
| W. E. Chapin | A. Hassan, <i>Contributing Member</i> |
| J. L. Freiler | R. Miyata, <i>Contributing Member</i> |
| B. Joergensen | M. Mullavey, <i>Contributing Member</i> |
| V. Kalyanasundaram | S. K. Parimi, <i>Contributing Member</i> |
| B. J. Mollitor | G. Ramirez, <i>Contributing Member</i> |
| A. Swearingin | K. Shores, <i>Contributing Member</i> |

Subgroup on General Requirements (BPV XIII)

| | |
|--|--|
| A. Donaldson, <i>Chair</i> | T. M. Fabiani, <i>Contributing Member</i> |
| B. F. Pittel, <i>Vice Chair</i> | J. L. Freiler, <i>Contributing Member</i> |
| J. M. Levy, <i>Secretary</i> | J. P. Glaspie, <i>Contributing Member</i> |
| D. J. Azukas | G. D. Goodson, <i>Contributing Member</i> |
| J. F. Ball | C. Haldiman, <i>Contributing Member</i> |
| M. Z. Brown | J. Horne, <i>Contributing Member</i> |
| J. Burgess | B. Joergensen, <i>Contributing Member</i> |
| D. B. DeMichael | C. Lasarte, <i>Contributing Member</i> |
| M. Elias | D. Mainiero-Cessna, <i>Contributing Member</i> |
| S. T. French | M. Mengon, <i>Contributing Member</i> |
| J. Gillham | D. E. Miller, <i>Contributing Member</i> |
| R. Klimas, Jr. | R. Miyata, <i>Contributing Member</i> |
| Z. E. Kumana | B. Mruk, <i>Contributing Member</i> |
| P. K. Lam | R. Raman, <i>Contributing Member</i> |
| K. R. May | M. Reddy, <i>Contributing Member</i> |
| J. Mize | S. Ruesenberg, <i>Contributing Member</i> |
| L. Moedinger | R. Sadowski, <i>Contributing Member</i> |
| M. Mullavey | A. Swearingin, <i>Contributing Member</i> |
| M. Poehlmann | A. P. Varghese, <i>Contributing Member</i> |
| K. Shores | |
| D. E. Tezzo | |
| D. E. Tompkins | |
| J. F. White | |
| B. Calderon, <i>Contributing Member</i> | |
| P. Chavdarov, <i>Contributing Member</i> | |

Subgroup on Nuclear (BPV XIII)

| | |
|----------------------------------|--|
| J. F. Ball, <i>Chair</i> | K. Shores |
| K. R. May, <i>Vice Chair</i> | I. H. Tseng |
| R. Krithivasan, <i>Secretary</i> | J. Yu |
| J. W. Dickson | N. J. Hansing, <i>Alternate</i> |
| S. Jones | J. M. Levy, <i>Alternate</i> |
| R. Lack | B. J. Yonsky, <i>Alternate</i> |
| D. Miller | S. T. French, <i>Contributing Member</i> |
| T. Patel | D. B. Ross, <i>Contributing Member</i> |

Subgroup on Testing (BPV XIII)

| | |
|---------------------------------|---|
| B. K. Nutter, <i>Chair</i> | J. R. Thomas, Jr. |
| T. P. Beirne, <i>Vice Chair</i> | Z. Wang |
| J. W. Dickson, <i>Secretary</i> | A. Wilson |
| B. Calderon | D. Nelson, <i>Alternate</i> |
| V. Chicola III | J. Cockerham, <i>Contributing Member</i> |
| B. Engman | J. Mize, <i>Contributing Member</i> |
| R. J. Garnett | M. Mullavey, <i>Contributing Member</i> |
| R. Houk | R. Raman, <i>Contributing Member</i> |
| R. Lack | S. Ruesenberg, <i>Contributing Member</i> |
| M. Mengon | K. Shores, <i>Contributing Member</i> |
| C. Sharpe | |
| A. Strecker | |

US TAG to ISO TC 185 Safety Devices for Protection Against Excessive Pressure (BPV XIII)

| | |
|---------------------------------------|-------------------|
| D. Miller, <i>Chair</i> | B. K. Nutter |
| C. E. O'Brien, <i>Staff Secretary</i> | T. Patel |
| J. F. Ball | J. R. Thomas, Jr. |
| T. J. Bevilacqua | J. A. West |
| D. B. DeMichael | J. F. White |
| J. W. Dickson | |

COMMITTEE ON BOILER AND PRESSURE VESSEL CONFORMITY ASSESSMENT (CBPVCA)

| | |
|-----------------------------------|---|
| R. V. Wielgoszinski, <i>Chair</i> | T. P. Beirne, <i>Alternate</i> |
| G. Scribner, <i>Vice Chair</i> | M. Blankinship, <i>Alternate</i> |
| P. Murray, <i>Staff Secretary</i> | J. W. Dickson, <i>Alternate</i> |
| J. P. Chicoine | J. M. Downs, <i>Alternate</i> |
| P. D. Edwards | B. J. Hackett, <i>Alternate</i> |
| T. E. Hansen | W. Hibdon, <i>Alternate</i> |
| B. L. Krasiun | Y.-S. Kim, <i>Alternate</i> |
| P. F. Martin | B. Morelock, <i>Alternate</i> |
| L. E. McDonald | M. Poehlmann, <i>Alternate</i> |
| D. Miller | R. Rockwood, <i>Alternate</i> |
| I. Powell | B. C. Turczynski, <i>Alternate</i> |
| L. Skarin | D. E. Tuttle, <i>Alternate</i> |
| R. Uebel | S. V. Voorhees, <i>Alternate</i> |
| E. A. Whittle | D. Cheetham, <i>Contributing Member</i> |
| P. Williams | A. J. Spencer, <i>Honorary Member</i> |

COMMITTEE ON NUCLEAR CERTIFICATION (CNC)

| | |
|------------------------------------|---|
| R. R. Stevenson, <i>Chair</i> | E. A. Whittle |
| J. DeKleine, <i>Vice Chair</i> | T. Aldo, <i>Alternate</i> |
| Z. McLucas, <i>Staff Secretary</i> | M. Blankinship, <i>Alternate</i> |
| J. F. Ball | P. J. Coco, <i>Alternate</i> |
| G. Claffey | N. DeSantis, <i>Alternate</i> |
| G. Gobbi | C. Dinic, <i>Alternate</i> |
| S. M. Goodwin | P. D. Edwards, <i>Alternate</i> |
| J. W. Highlands | T. B. Franchuk, <i>Alternate</i> |
| K. A. Kavanagh | K. M. Hottle, <i>Alternate</i> |
| J. C. Krane | P. Krane, <i>Alternate</i> |
| M. A. Lockwood | D. Nenstiel, <i>Alternate</i> |
| T. McGee | L. Ponce, <i>Alternate</i> |
| E. L. Pleins | P. F. Prescott, <i>Alternate</i> |
| T. E. Quaka | S. V. Voorhees, <i>Alternate</i> |
| T. N. Rezk | M. Wilson, <i>Alternate</i> |
| G. E. Szabatura | S. Yang, <i>Alternate</i> |
| C. Turylo | S. F. Harrison, Jr., <i>Contributing Member</i> |
| D. M. Vickery | |

ASTM PERSONNEL

(21)

(Cooperating in the Development of the Specifications Herein)
As of January 1, 2021

E07 ON NONDESTRUCTIVE TESTING

T. Clausing, *Chair*
T. Gordon, *Vice Chair*

R. S. Gostautas, *Recording Secretary*
B. White, *Membership Secretary*

SUMMARY OF CHANGES

Errata to the BPV Code may be posted on the ASME website 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, **(21)**, placed next to the affected area.

| <i>Page</i> | <i>Location</i> | <i>Change</i> |
|-------------|---|--|
| xxvi | List of Sections | (1) Listing for Section III updated (2) Section XIII added (3) Code Case information updated |
| xxviii | Foreword | (1) Subparagraph (k) added and subsequent subparagraph redesignated (2) Second footnote revised (3) Last paragraph added |
| xxxi | Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees | Paragraphs 1(a)(3)(-b), 2(b), and 5(a)(3) revised |
| xxxiv | Personnel | Updated |
| lv | ASTM Personnel | Updated |
| 1 | T-120 | (1) Former endnotes (1) and (2) added as in-text notes to subparas. (c) and (d), respectively, and deleted from Endnotes (2) Subparagraphs (e)(2) and (f) and endnote 1 (formerly endnote 3) revised |
| 3 | T-160 | In subpara. (b), cross-reference revised |
| 6 | I-121.1 | (1) Definitions of <i>automated examination technique</i> , <i>bad pixel map</i> , <i>bit depth</i> , <i>corrected image</i> , <i>gain correction</i> , <i>image format</i> , <i>offset correction</i> , <i>pixel correction</i> , <i>window level</i> , and <i>window width</i> added (2) Definition of <i>bad pixel</i> revised |
| 10 | I-121.2 | Definitions of <i>automated scanner</i> , <i>even imaging path</i> , <i>manual scanning</i> , <i>nonautomated scanner</i> , <i>odd imaging path</i> , <i>semiautomated scanner</i> , and <i>time-of-flight diffraction (TOFD)</i> added |
| 25 | I-121.12 | Added |
| 25 | I-121.13 | Added |
| 26 | I-130 | Deleted; definitions moved to I-121.2 |
| 27 | II-124 | In II-124.1, II-124.2, II-124.3, II-124.4, and II-124.5, cross-references revised |
| 30 | Mandatory Appendix II, Supplement A (Article 1) | Deleted |

| <i>Page</i> | <i>Location</i> | <i>Change</i> |
|-------------|---------------------------------------|--|
| 31 | Mandatory Appendix III (Article 1) | Revised in its entirety |
| 37 | Mandatory Appendix IV (Article 1) | Revised in its entirety |
| 41 | T-224 | Revised |
| 42 | T-231.2 | Revised |
| 43 | T-262.3 | In subpara. (a), spelling of <i>calibration</i> corrected by errata |
| 44 | T-274.1 | Note revised |
| 44 | T-275 | Revised |
| 47 | Table T-276 | First column editorially revised |
| 46 | T-276.2 | In introductory paragraph, last sentence added |
| 46 | T-277.1 | In subpara. (a), second paragraph revised |
| 48 | T-283.1 | First paragraph revised |
| 49 | T-291 | Subparagraph (d) revised |
| 52 | II-221 | In introductory paragraph, cross-reference revised |
| 53 | II-286 | In first paragraph, cross-reference revised |
| 64 | VII-293 | Former endnote 7 added as an in-text note and deleted from Endnotes |
| 65 | VIII-277.1 | In subpara. (a), penultimate sentence revised |
| 66 | VIII-277.3 | In first paragraph, penultimate sentence revised |
| 66 | VIII-282 | Revised |
| 67 | VIII-293 | Last paragraph of VIII-291 revised and redesignated as VIII-293 |
| 69 | Figure VIII-A-221-1 | In General Note (c), definition of <i>width</i> revised |
| 70 | Mandatory Appendix IX (Article 2) | “Direct radiography” revised to “digital radiography” throughout |
| 70 | IX-260 | Revised in its entirety |
| 70 | IX-261 | Added |
| 71 | IX-263 | First sentence revised |
| 71 | IX-274 | Title revised |
| 71 | IX-274.2 | Title and definition of U_M revised |
| 71 | IX-275 | In subpara. (a), first sentence revised |
| 71 | IX-277.1 | Subparagraphs (a) through (d) revised |
| 72 | IX-277.3 | In first paragraph, penultimate sentence revised |
| 72 | IX-281 | Revised in its entirety |
| 72 | IX-282 | Revised |
| 73 | IX-291 | Subparagraph (q) revised |
| 73 | IX-293 | Last paragraph of IX-291 revised and redesignated as IX-293 |
| 74 | IX-A-221 | Paragraph following subpara. (c) revised |

| <i>Page</i> | <i>Location</i> | <i>Change</i> |
|-------------|-------------------------------------|---|
| 86 | T-410 | First paragraph added and last paragraph deleted |
| 86 | T-420 | Introductory paragraph revised |
| 88 | T-434.1.2 | Subparagraph (c) revised |
| 91 | Figure T-434.2.1 | First column of table editorially revised |
| 97 | Figure T-434.5.1 | First column of table editorially revised |
| 108 | Figure III-434.2.1(a) | First column of table editorially revised |
| 108 | III-434.2.2 | Revised |
| 109 | III-463.2 | Revised in its entirety |
| 109 | III-463.5 | First sentence revised |
| 110 | Figure III-463.5 | Revised |
| 110 | III-467 | Spelling of <i>actual</i> corrected by errata |
| 113 | Table IV-421 | Title revised |
| 119 | VIII-421.1 | First sentence added by errata |
| 123 | IX-495 | Former IX-492 revised and redesignated as IX-495 |
| 127 | XI-421.2.1 | Added |
| 127 | XI-432.4 | Revised |
| 128 | XI-434.1.1 | Added |
| 129 | Figure XI-434.1-1 | First column of table editorially revised |
| 130 | XI-461 | Revised in its entirety |
| 130 | XI-462.1 | Added |
| 130 | XI-462.7 | Added |
| 130 | XI-462.8.2 | Revised in its entirety |
| 131 | XI-467.1 | Second cross-reference revised |
| 131 | XI-471.2 | Cross-reference revised |
| 131 | XI-471.3 | Subparagraph (c) revised |
| 131 | XI-481.1 | Cross-reference revised |
| 131 | XI-481.1.2 | Cross-reference revised |
| 137 | B-462.1 | Subparagraph (g) editorially revised |
| 137 | B-462.3 | Subparagraph (g) editorially revised |
| 154 | F-462 | (1) Designator and title editorially added (2) Former F-461 redesignated as F-462.1, and cross-reference in note revised |
| 165 | Figure J-431 | First column of table editorially revised |
| 211 | Nonmandatory Appendix S (Article 4) | Added |
| 214 | Nonmandatory Appendix U (Article 4) | Added |
| 218 | T-534.4 | Added |

| <i>Page</i> | <i>Location</i> | <i>Change</i> |
|-------------|------------------|---|
| 219 | Figure T-534.3 | First column of table editorially revised |
| 226 | T-610 | First paragraph deleted |
| 227 | T-651 | Introductory paragraph revised and last paragraph deleted |
| 246 | I-741 | Revised |
| 253 | Table V-721 | Title revised |
| 258 | Table II-821 | Title revised |
| 264 | III-810 | Subparagraph (c) revised |
| 264 | III-850 | Third sentence revised |
| 279 | Table VIII-821 | Title revised |
| 318 | IX-1071.5 | Revised in its entirety |
| 319 | IX-1072.2 | In subpara. (d), "0.77 < PSCF/FSCF" corrected by errata to "0.77 ≤ PSCF/FSCF" |
| 319 | IX-1080 | Revised in its entirety |
| 422 | Article 20 | Added |
| 426 | Article 21 | Added |
| 439 | Subsection B | Boxed explanatory note added to title page of each specification |
| 441 | SE-94/SE-94M | Revised in its entirety |
| 455 | SE-747 | Revised in its entirety |
| 475 | SE-1025 | Revised in its entirety |
| 501 | SE-1165 | Reapproved |
| 515 | SE-1255 | Revised in its entirety |
| 533 | SE-1475 | Added |
| 541 | SE-1647 | Revised in its entirety |
| 567 | SA-388/SA-388M | Revised in its entirety |
| 591 | SA-609/SA-609M | (1) Reapproved (2) In Table 4, Note B, "18 mm" corrected by errata to "13 mm" (3) In Table S1.1, third column head, "1.002" corrected by errata to "±0.002" |
| 691 | SD-129 | Revised in its entirety |
| 709 | SE-165/SE-165M | Revised in its entirety |
| 735 | SE-3022 | Revised in its entirety |
| 813 | SE-750 | Revised in its entirety |
| 825 | SE-976 | Revised in its entirety |
| 877 | SE-1419/SE-1419M | Revised in its entirety |
| 921 | SE-2775 | Revised in its entirety |
| 933 | SE-2929 | Revised in its entirety |

LIST OF CHANGES IN RECORD NUMBER ORDER

DELETED

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).

INTENTIONALLY LEFT BLANK

SUBSECTION A NONDESTRUCTIVE METHODS OF EXAMINATION

ARTICLE 1 GENERAL REQUIREMENTS

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

(21)

(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 not mandatory unless specifically referenced in whole or in part in [Subsection A](#) or as indicated in other Code Sections or referencing documents. Where there is a conflict between [Subsection A](#) and [Subsection B](#), the requirements of [Subsection A](#) take precedence.

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

NOTE: For example, a reference to [T-270](#) includes all of the rules contained in [T-271](#) through [T-277.3](#).

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

NOTE: For example, [T-233](#) requires that Image Quality Indicators be manufactured and identified in accordance with the requirements or alternatives allowed in SE-747 or SE-1025, and Appendices, as appropriate for the style of IQI to be used. These are the only parts of either SE-747 or SE-1025 that are mandatory in Article 2. In many cases, Subsection B documents are not mandatory and are intended only for guidance or reference use.

(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 (2016 Edition),¹ Personnel Qualification and Certification in Nondestructive Testing, as amended by Mandatory Appendix III; or