

**ASME RTP-1-2023**

(Revision of ASME RTP-1-2021)

# **Reinforced Thermoset Plastic Corrosion-Resistant Equipment**

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: February 29, 2024

The next edition of this Standard is scheduled for publication in 2025. This Standard will become effective 6 months after the Date of Issuance.

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# CONTENTS

Foreword .....	x
Statement of Policy on the Use of the ASME Single Certification Mark and Code Authorization in Advertising .....	xi
Statement of Policy on the Use of ASME Marking to Identify Manufactured Items .....	xii
Committee Roster .....	xiii
Correspondence With the RTP Committee .....	xv
Introduction .....	xvii
Summary of Changes .....	xviii
<b>Part 1</b>	<b>General Requirements</b>
1-100	Introduction .....
1-200	User's Basic Requirements Specification .....
1-300	Fabricator's Design Report .....
1-400	Inspection .....
1-500	Fabricator's Quality Control Program .....
<b>Part 2</b>	<b>Materials</b>
2-100	Scope .....
2-200	Laminate Compositions .....
2-300	Materials .....
<b>Subpart 2A</b>	<b>Requirements for Representative Flat Laminates</b>
2A-100	Introduction .....
2A-200	Laminate Requirements .....
2A-300	Requirements for Physical and Mechanical Properties .....
2A-400	Test Methods .....
2A-500	Records .....
2A-600	Additional Standard Laminate Compositions for Subpart 2A .....
<b>Subpart 2B</b>	<b>Requirements for Laminates Developed Using the Lamination Analysis Method (Type 1)</b>
2B-100	Laminate Composition .....
2B-200	Requirements for Physical and Mechanical Properties .....
2B-300	Test Methods .....
2B-400	Records .....
<b>Subpart 2C</b>	<b>Permissible Tolerances for Laminate Thickness Variation</b>
2C-100	Tolerance for Average Spot Thickness .....
2C-200	Tolerance for Thickness of a Major Part .....
2C-300	Exceptions and Adjustments .....
<b>Part 3</b>	<b>Design</b>
3-100	Scope .....
3-200	General .....
3-300	Definitions and Related Requirements .....

<b>Subpart 3A</b>	<b>Design by Rules</b> .....	21
3A-100	Loadings .....	21
3A-200	Pressure and Axial Loads Design .....	23
3A-300	External Pressure Design .....	27
3A-400	Intermittent Load Design .....	31
3A-500	Large Diameter RTP Equipment Body Flanges .....	32
3A-600	Vessels Supported by Shell Attachments .....	32
3A-700	Reinforcement of Circular Openings .....	32
3A-800	Secondary Bond Shear Stress .....	33
<b>Subpart 3B</b>	<b>Design by Stress Analysis</b> .....	33
3B-100	Introduction .....	33
3B-200	Design Acceptability .....	33
3B-300	Loading .....	34
3B-400	Design .....	35
3B-500	Stress Criteria .....	35
3B-600	External Pressure .....	35
3B-700	Attachments .....	36
<b>Part 4</b>	<b>Fabrication</b> .....	37
4-100	Scope .....	37
4-200	Large Diameter Body Flanges .....	37
4-300	Shell Joints .....	37
4-400	Flanged Nozzles .....	39
4-500	Manways .....	53
4-600	Reinforcement of Cutouts .....	53
4-700	Tolerances .....	53
4-800	Balsa Wood Cored Plates .....	53
<b>Part 5</b>	<b>Overpressure Protection</b> .....	55
5-100	Basis for Design .....	55
5-200	Protection Against Overpressure .....	55
5-300	Type of Overpressure Protection .....	55
5-400	Location of Overpressure Protection Devices .....	55
5-500	Installation Practices .....	55
5-600	Overpressure Device Set Pressure .....	55
5-700	Relief Device Sizing .....	55
5-800	Discharge Lines From Pressure Relief Devices .....	55
5-900	Responsibility for Design and Selection .....	56
<b>Part 6</b>	<b>Inspection and Tests</b> .....	57
6-100	Scope .....	57
6-200	Inspector .....	57
6-300	Inspection and Responsibility .....	57
6-400	Conditions for Inspection .....	58
6-500	Equipment Design .....	58
6-600	Materials .....	58
6-700	Fabrication .....	58
6-800	Fabricator's Quality Assurance Program .....	58

6-900	Final Inspection .....	58
<b>Part 7</b>	<b>Shop Qualification .....</b>	<b>66</b>
7-100	Scope .....	66
7-200	General .....	66
7-300	Fabricator's Facilities and Equipment .....	66
7-400	Personnel .....	66
7-500	Quality Control Program, Document Handling, and Record System .....	66
7-600	Demonstration of Capability (Demonstration Laminates) .....	66
7-700	Minimum Test Values From Demonstration Laminates .....	66
7-800	Demonstration Vessel .....	69
7-900	Identifying Demonstration Laminates .....	69
7-1000	Laboratory Test and Test Report Requirements for Demonstration Laminates .....	69
<b>Part 8</b>	<b>Certification .....</b>	<b>72</b>
8-100	Scope .....	72
8-200	General .....	72
8-300	Certification Process .....	72
8-400	ASME RTP-1 Certificate of Authorization Holder .....	72
8-500	Issuance of Certification .....	72
8-600	Designated Oversight .....	73
8-700	Data Reports .....	73
8-800	ASME RTP Certified Mark and Certified Designation .....	73
<b>Mandatory Appendices</b>		
M-1	Reinforcement Materials Receiving Procedures .....	75
M-2	Matrix Materials Receiving Procedures .....	85
M-3	Calculations Using the Classical Lamination Theory (CLT) Analysis Method .....	92
M-4	Quality Control Program .....	120
M-5	Qualification of Laminates and Secondary Bonders .....	122
M-6	Demonstration Vessel .....	129
M-7	Repair Procedures .....	138
M-8	Acoustic Emission Examination .....	143
M-9	Glossary .....	144
M-10	Reference Documents .....	148
M-11	Submission of Technical Inquiries to the Reinforced Thermoset Plastic Corrosion-Resistant Equipment Committee .....	151
M-12	Dual Laminate Vessels .....	152
M-13	Balsa Wood Receiving and Inspection Procedures .....	189
<b>Non-mandatory Appendices</b>		
NM-1	Design Examples .....	191
NM-2	Design of Integral Body Flanges .....	210
NM-3	Seismic, Wind, and Snow Loadings .....	231
NM-4	Hold-Down Lug Design .....	238
NM-5	Ring Support of Vessels .....	249
NM-6	Example of a Fabricator's Quality Control Program .....	262

NM-7	Acceptance Inspection by User's Inspector . . . . .	276
NM-8	Handling and Shipping . . . . .	285
NM-9	Installation of RTP Vessels . . . . .	288
NM-10	Requirements and Responsibilities of User (or User's Agent), Fabricator, Inspector, and Certified Individual . . . . .	291
NM-11	Design for 250-lb Concentrated Load on a Torispherical Head . . . . .	295
NM-12	RTP Flange Design . . . . .	297
NM-13	Stress Analysis Methods . . . . .	301
NM-15	Flat Cored Plate Design . . . . .	326
NM-16	External Pressure Design Example for Cylindrical Shells . . . . .	329
NM-17	Stiffener Design Calculations . . . . .	332
<b>Figures</b>		
3-1	Torispherical Heads . . . . .	25
3-2	Toriconical Head Dimensions . . . . .	26
3-3	Stiffener Details for Half-Round, Trapezoidal, and Filament Wound Band Configurations . . . . .	30
4-1	Fabrication Tolerances . . . . .	38
4-2	Joint Arrangement . . . . .	40
4-3	Flat-Bottom Tank Knuckle Detail . . . . .	41
4-4	Support Skirt Attachment Detail . . . . .	43
4-5(a)	Nozzle Flange Dimensions for Class 150 Bolting (U.S. Customary Units) . . . . .	44
4-5(b)	Nozzle Flange Dimensions for Class 150 Bolting (SI Units) . . . . .	45
4-6	Flanged Nozzle Lay-Up Method . . . . .	46
4-7	Flush Nozzle Installation . . . . .	47
4-8	Penetrating Nozzle Installation . . . . .	48
4-9	Bottom Drain Detail . . . . .	49
4-10	Nozzle Installation and Cutout Reinforcement Location Alternate . . . . .	50
4-11	Nozzle Gussets . . . . .	51
4-12	Flange Tolerances . . . . .	53
4-13	Flat Cored Bottom Knuckle Detail . . . . .	54
7-1	Dimensions for Tensile Test Specimen . . . . .	71
8-1	Official ASME Certification Mark With RTP Designator . . . . .	73
M3-1	Moment Results . . . . .	92
M3-2	Force Results . . . . .	93
M3-3	Geometry and Notation of an <i>n</i> -Layered Laminate . . . . .	93
M3-4	Coordinate Systems . . . . .	94
M5-1	Flare Test Piece . . . . .	125
M5-2	Secondary Bond Test Assembly . . . . .	125
M5-3	Secondary Bond Test Specimen . . . . .	127
M6-1	ASME RTP-1 Demonstration Vessel . . . . .	135
M6-2	Post-Test Sectioning of Vessel for Final Inspection and Display . . . . .	136
M6-3	Witness of Hydrotest of ASME RTP-1 Demonstration Vessel (Attachment No. 3) . . . . .	137
M12C-1	Support Ledges Showing Recommended Weld Locations Away From Thermoformed Bends . . . . .	166
M12D-1	Maximum Offset Allowed for Joints Between Sheets With Different Thicknesses . . . . .	168
M12D-2	Visual Features of Hot Gas Welds . . . . .	170

M12D-3	Illustrations of Flow Lines . . . . .	170
M12D-4	Heat-Affected Zone Patterns . . . . .	171
M12D-5	Butt Fusion Welds Showing Melt Flow Lines . . . . .	171
M12D-6	Nozzle Construction for Penetrating Nozzle . . . . .	173
M12D-7	Nozzle and Manway Construction and Installation . . . . .	174
M12D-8	Bottom Nozzle Construction and Installation . . . . .	176
M12G-1	Dual Laminate Demonstration Vessel . . . . .	18
M12G-2	Post-Test Sectioning of Dual Laminate Demonstration Vessel for Final Inspection and Display . . . . .	175
NM1-1	Toriconical Head . . . . .	192
NM1-2	Stress Intensity in a Toriconical Head . . . . .	194
NM1-3	Horizontal Tank . . . . .	196
NM1-4	Pressure Distribution . . . . .	197
NM1-5	Saddle Reaction . . . . .	198
NM1-6	Stress Along Top Meridian, Initial Try . . . . .	199
NM1-7	Stress Along 45-deg Meridian, Initial Try . . . . .	200
NM1-8	Stress Along 90-deg Meridian, Initial Try . . . . .	201
NM1-9	Stress Along 135-deg Meridian, Initial Try . . . . .	202
NM1-10	Stress Along Bottom Meridian, Initial Try . . . . .	203
NM1-11	Stress Along Top Meridian, Final Try . . . . .	205
NM1-12	Stress Along 45-deg Meridian, Final Try . . . . .	206
NM1-13	Stress Along 90-deg Meridian, Final Try . . . . .	207
NM1-14	Stress Along 135-deg Meridian, Final Try . . . . .	208
NM1-15	Stress Along Bottom Meridian, Final Try . . . . .	209
NM2-1	Values of $F$ (Integral Flange Factors) . . . . .	219
NM2-2	Values of $f$ (Hub Stress Correction Factors) . . . . .	220
NM2-3	Values of $T$ , $U$ , $Y$ , and $Z$ (Terms Involving $K$ ) . . . . .	221
NM2-4	Values of $V$ (Integral Flange Factors) . . . . .	222
NM2-5	Design of Flat-Face Integral Body Flanges With Full-Face Gaskets (Example Calculation — 72-in. Flange at 300 psi) . . . . .	223
NM4-1	Wound-On Hold-Down Lug . . . . .	239
NM4-2A	Secondary Bolted Hold-Down Lug, Type A . . . . .	240
NM4-2B	Secondary Bolted Hold-Down Lug, Type B . . . . .	241
NM4-3	Moment Coefficient, $M_L$ . . . . .	242
NM4-4	Uplift Coefficient, $P_G$ . . . . .	242
NM4-5	Anchor Clips . . . . .	244
NM4-6	Shear Ledge . . . . .	246
NM5-1	Lugs on Band . . . . .	250
NM5-2	Moment Coefficient, $M_L$ . . . . .	251
NM5-3	Split-Ring Flange . . . . .	252
NM5-4	Ring Support of Vessels . . . . .	254
NM5-5	Geometric Quantities . . . . .	255
NM5-6	Ring Design Chart for Three Lugs . . . . .	256
NM5-7	Ring Design Chart for Four Lugs . . . . .	257
NM5-8	Ring Design Chart for Eight Lugs . . . . .	258
NM5-9	Example Cross Section . . . . .	259

NM5-10	Lug . . . . .	260
NM6-1	Organization Chart . . . . .	264
NM7-1	Recommended Fabrication Tolerances . . . . .	283
NM8-1	Lifting Vessel With Spreader Bar . . . . .	285
NM8-2	Strongback for Lifting . . . . .	286
NM8-3	Use of Strongbacks . . . . .	287
NM9-1	Flat-Face Valve Flange to Flat-Face RTP Nozzle Flange and Full-Face Gasket . . . . .	288
NM9-2	Raised-Face Valve Flange to Flat-Face RTP Nozzle Flange With Filler Ring and Full-Face Gasket . . . . .	289
NM9-3	Flange Bolt Tightening . . . . .	289
NM10-1	ASME RTP-1 Flowchart . . . . .	294
NM11-1	Stress Function . . . . .	296
NM12-1	Flange Dimensioning Details . . . . .	297
NM12-2	Flange Loading Conditions . . . . .	298
NM13A-1	Sign Conventions for Cylindrical Segments . . . . .	303
NM13B-1	Sign Conventions for Spherical Segments . . . . .	308
NM13C-1	Sign Conventions for Flat Plates . . . . .	313
NM13C-2	Simply Supported Flat Plate . . . . .	313
NM13C-3	Edge Loads on Flat Plates . . . . .	314
NM13C-4	Flat Plate Vessel Head . . . . .	314
NM13C-5	Flat Plate to Cylinder Joint . . . . .	315
NM13D-1	Example Pressure Vessel . . . . .	318
NM13D-2	Forces and Moments in Pressure Vessel Example . . . . .	318
NM13D-3	Hemispherical Head . . . . .	320
NM13D-4	Cylindrical Shell . . . . .	320
NM13D-5	Flat Plate Head . . . . .	321
NM15-1	Equivalent Solid and Cored Plates . . . . .	327
NM17-1	Stiffener Moment of Inertia for a Half-Round . . . . .	332
NM17-2	Stiffener Moment of Inertia for a Trapezoidal Stiffener . . . . .	334
NM17-3	Stiffener Moment of Inertia for a Filament Wound Band . . . . .	336
<b>Tables</b>		
2A-1	Standard Laminate Composition Type I . . . . .	15
2A-2	Standard Laminate Composition Type II . . . . .	16
2A-3	Minimum Values of Flat Laminates . . . . .	16
4-1	Flange Flatness Tolerance . . . . .	39
4-2	Typical Dimensions of Manways . . . . .	52
4-3	Shear Bond Length . . . . .	52
6-1	RTP Visual Inspection Acceptance Criteria . . . . .	62
7-1	Required Resins and Acceptable Fabrication Processes for Demonstration Laminates . . . . .	67
7-2	Dimensional Requirements for Hand Lay-Up and Spray-Up Demonstration Laminates . . . . .	68
7-3	Reinforcement Requirements for Hand Lay-Up and Spray-Up Demonstration Laminates . . . . .	68
M3-1	Properties for Materials in the Design Example . . . . .	110
M3-2	Lamina Input for CLT Calculations . . . . .	112
M3-3	Strains, Stresses, and Strength Ratios . . . . .	117

M3-4	Woven Roving Layer Modeled as a Balanced and Symmetric Three-Ply Laminate . . . .	118
M6-1	User's Basic Requirements Specification (UBRS) (As Required by the Provisions of ASME RTP-1) . . . . .	131
M8-1	Acceptance Criteria per Channel . . . . .	143
M12B-1	ASTM Specifications for Thermoplastic Polymers . . . . .	153
M12B-2	Typical Thermoplastic Polymer Properties . . . . .	154
M12B-3	Thermoplastic Sheet Visual Inspection Acceptance Criteria . . . . .	157
M12D-1	Visual Weld Defects . . . . .	169
M12E-1	Lining Visual Inspection Acceptance Criteria . . . . .	173
M12G-1	User's Basic Requirements Specification (UBRS) (As Required by the Provisions of ASME RTP-1) . . . . .	181
M12H-1	Weld Strength Requirements . . . . .	186
NM1-1	Example 1, Vessel With a Toriconical Lower Head . . . . .	195
NM1-2	Wall Thickness in a Horizontal Tank . . . . .	204
NM2-1	Typical Body Flange Dimensions and Recommended Bolt Torque Values for RTP Body Flanges . . . . .	213
NM2-2	Body Flange Design Using Full-Face Gaskets, Maximum Stress Less Than 1,000 psi — Type II Laminates . . . . .	214
NM2-3	Body Flange Design Using Full-Face Gaskets, Maximum Stress Less Than 1,800 psi — Type I Laminates . . . . .	216
NM2-4	Values of <i>T</i> , <i>Z</i> , <i>Y</i> , and <i>U</i> (Factors Involving <i>K</i> ) . . . . .	224
NM13C-1	Multiplying Factors . . . . .	311
	List of SI Units for Use With ASME RTP-1 . . . . .	339
	Commonly Used Conversion Factors . . . . .	340
 <b>Forms</b>		
1-1	User's Basic Requirements Specification (UBRS) (As Required by the Provisions of ASME RTP-1) . . . . .	2
1-2	Fabricator's Data Report (As Required by the Provisions of ASME RTP-1) . . . . .	10
1-3	Fabricator's Partial Data Report . . . . .	12
M1A-1	Veil and Mat Reinforcement Log Sheet . . . . .	76
M1B-1	Roving Reinforcement Log Sheet . . . . .	78
M1C-1	Fabric Reinforcement Log Sheet . . . . .	80
M1D-1	Milled Fiber Reinforcement Log Sheet . . . . .	83
M2E-1	Resin Log Sheet . . . . .	89
M2E-2	Spring Agents Log Sheet . . . . .	90
M2F-1	Common Additives Log Sheet . . . . .	91
M5-1	Laminator Qualification Report . . . . .	123
M5-2	Secondary Bonder Qualification Report . . . . .	124
M12L-1	Thermoplastic Sheet or Roll Receiving Log . . . . .	156
M12B-2	Welding Material Receiving Log . . . . .	159
M12B-3	Bonding Resin Receiving Log . . . . .	160
M12B-4	Conductive Material Receiving Log . . . . .	162
M12B-5	Thermoplastic Shape Receiving Log . . . . .	164
M13-1	Balsa Wood Core Inspection Sheet . . . . .	190
NM2-1	Design of Flat-Face Integral Body Flanges With Full-Face Gaskets . . . . .	218

NM6-1	Mixing Data Sheet .....	268
NM6-2	Component Data Sheet .....	269
NM6-3	Document Control Sheet .....	270
NM6-4	Document Distribution List .....	271
NM6-5	Document Preparation and Distribution Responsibility .....	272
NM6-6	Nonconformity Correction Report .....	273
NM6-7	QC Manual Master Revision List .....	275
NM7-1	RTP Equipment Inspection Requirements .....	277
NM7-2	Inspection Checklist for RTP Equipment .....	278
NM7-3	Inspection and Test Plan .....	281
<b>SI Units</b>	.....	<b>338</b>

# FOREWORD

The function of the Reinforced Thermoset Plastic (RTP) Corrosion-Resistant Equipment Committee is to establish rules of safety governing the design, fabrication, and inspection during construction of such equipment, and to interpret these rules when questions arise regarding their intent. In formulating the rules, the Committee considers the needs of users, material manufacturers, fabricators, and inspectors of this equipment. The objective of the rules is to afford protection of life and property, and to provide a margin for deterioration in service so as to give a reasonably long safe period of usefulness. Advancements in design and material and the evidence of experience are recognized.

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 Fabricator's freedom to choose any method of design or any form of construction that conforms to the rules of this Standard.

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

The first edition of this Standard was issued on December 31, 1989.

Following approval by the ASME RTP Committee, ASME RTP-1-2023 was approved by the American National Standards Institute as an American National Standard on November 9, 2023.

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

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The ASME Single Certification Mark shall be used only for stamping and nameplates as specifically provided in the Code or Standard. 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.

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ASME’s certification related to products means that the capability by the supplier to fulfill requirements in the applicable standard has been reviewed and accepted by ASME. The supplier is responsible for ensuring that products meet, and if applicable continue to meet, the requirements on which the certification is based. This shall be made clear on stampings, labels, or nameplate markings by inclusion of the words:

Certified by

\_\_\_\_\_  
(Manufacturer)

# ASME RTP COMMITTEE

## Reinforced Thermoset Plastic Corrosion-Resistant Equipment

(The following is the roster of the committee at the time of approval of this Standard.)

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(23)

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**Revisions and Errata.** The committee processes revisions to this Standard on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

## Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases 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 Standard.

(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number

(4) the editions of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

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**Committee Meetings.** The RTP Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at <https://go.asme.org/RTPcommittee>.

# INTRODUCTION

## GENERAL

The use of reinforced thermoset plastic (RTP) vessels, with maximum allowable working pressure (MAWP) and maximum allowable external working pressure (MAEWP) not exceeding 15.0 psig (103 kPag) external and/or 15.0 psig (103 kPag) internal above any hydrostatic head, that contain corrosive and otherwise hazardous materials, dictates the need for rules and/or stress analysis concerning materials of construction, design, fabrication, quality control, and inspection of such equipment. In developing rules for RTP, the committee has adapted the principles of rules included in the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, wherever they are applicable.

Adaption of standard rules to RTP requires recognition of differences that exist between metallic materials and RTP. These differences are addressed in the remainder of this Introduction.

## MATERIALS AND ASSEMBLY

In the absence of ASTM standards, RTP laminate specifications ([Part 2](#)) have been developed for use with this ASME Standard. These specifications include laminate composition and properties. Laminates (composites) manufactured by contact molding and by filament winding are covered.

These materials of construction are not available in commerce as mill shapes such as sheet and plate for forming and joining by the Fabricator. They are produced in situ on a mandrel or mold by the Fabricator during fabrication of RTP equipment components. Each Fabricator, as part of the Fabricator's shop, must demonstrate capability to produce laminates meeting the requirements of the laminate specifications.

Assembly of components such as shells, heads, and nozzles requires joining by secondary bonding. This operation involves fit-up, surface preparation, and overwrapping with a laminate of composition equivalent to the laminates being joined. Secondary Bonders must be qualified individually by the procedures detailed in [Mandatory Appendix M-5](#).

## DESIGN

Design by formulas and by stress analysis are both included in this Standard. Consideration is given both to ultimate strength and to limiting strain. Time and temperature dependence of RTP laminate properties are recognized.

The ultimate stress consideration is required to ensure safety against catastrophic failure over a reasonably long term. The design factors of [Subparts 3A](#) and [3B](#) include consideration of variability of quality in the labor-intensive fabricating operation. The strain considerations are required to ensure long-term operation under cyclic stress (fatigue) without cracking the resin matrix of the composite laminate, thus maintaining maximum corrosion resistance. More than 20 years of successful experience, together with test data, have shown these considerations to be valid.

## INSPECTION

Reliance is placed on careful auditing of the Fabricator's Quality Control Program and close visual inspection of equipment during fabrication and of finished equipment.

## NONMANDATORY APPENDICES

Nonmandatory Appendices are provided in this Standard for reference only. The content of Nonmandatory Appendices is not a requirement even when referenced in mandatory parts of this Standard.

## UNITS

Either U.S. Customary units or SI units may be used to demonstrate compliance with the requirements of this Standard. It is not permissible to use a combination of both systems of units. Values are listed in the Standard with U.S. Customary units as the primary units and SI units shown parenthetically. The SI unit values have been converted from the U.S. Customary unit values. Conversion of units shall be performed to ensure that dimensional consistency is maintained. For either system of units, the Qualified Designer is responsible for ensuring that all units are consistent and correct.

A supplement to the Standard is included as a convenience to the user to provide typical SI units and commonly used conversion factors. Additional conversion factors are available in IEEE/ASTM SI 10.