2-100 **SCOPE**

Part 2 defines the materials comprising the glass fiber reinforced thermoset polyester and vinyl ester resin laminates, and the types of laminates used to fabricate the RTP corrosion-resistant equipment. See Mandatory Appendix M-12 for thermoplastic lining materials used in dual laminate vessels.

2-200 **LAMINATE COMPOSITIONS**

The composition of the allowable RTP laminates is limited to the specific materials in Part 2 and Mandatory Appendices M-1 and M-2. Subpart 2A covers predefined standard laminates as representative flat laminates. Subpart 2B covers laminates developed using the Lamination Analysis Method, by which the modulus properties of laminates are obtained. Subpart 2C covers permissible tolerances for laminate thickness variation.

Construction and testing for properties of design basis laminates are required in Subpart 2A. Calculation of laminate properties by the Lamination Analysis Method (Mandatory Appendix M-3) is addressed in Subpart 2B.

Minimum inspections and tests to be performed on reinforcements, prior to their use, are described in Mandatory Appendix M-1.

Minimum inspections and tests to be performed on resins, curing agents, and common additives, prior to their use, are described in Mandatory Appendix M-2.

2-210 **Resin and Reinforcement Substitution**

The Fabricator shall use the same resins and reinforcements during fabrication as used in the design basis laminates and Lamination Analysis Method, with the exception of the surfacing veil, which may be changed as required for corrosion resistance.

2-300 **MATERIALS**

(17) **2-310 Resin Matrix**

The resin shall be that polyester or vinyl ester specified by the User’s Basic Requirements Specification. Only resins with a heat deflection temperature (HDT) of at least 180°F (82°C) per ASTM D648 with a 264 psi loading and a 1/8-in. specimen, as published by the resin manufacturer, shall be used. Properties established through testing at ambient temperature are valid up to 180°F (82°C) or up to 35°F (19°C) below the resin’s HDT, whichever is lower. When a maximum flame retardancy is specified by the UBRS, the flame spread rating shall be determined by the resin manufacturer according to ASTM E84 using all mat laminates greater than 0.1 in. thick. Verification of the flame spread rating is not required as a part of laminate qualification. Since flame spread can be determined only on flat laminate panels, verification is not required on fabricated equipment. Prior to use in laminate fabrications, the resin shall be inspected, tested, and found acceptable by the inspections and tests specified in Mandatory Appendix M-2.

(a) The catalyst/promoter/accelerator system shall be as recommended by the resin manufacturer and specified in the Fabricator’s written procedures.

(b) The resin shall not contain any pigment, dyes, colorants, or filler, except as follows:

1. A thixotropic agent that does not interfere with visual inspection of laminate quality, or with the required corrosion resistance of the laminate, may be added for viscosity control.

NOTE: The addition of a thixotropic agent may reduce the resistance of a laminate to some corrosive chemical environments. It is the responsibility of the Fabricator to obtain approval from the selector of the resin prior to using a thixotropic agent in the inner surface (para. 2A-221) or the interior layer (para. 2A-222).

2. Resin pastes used to fill crevices before overlay shall not be subject to these limitations.

3. Pigments, dyes, or colorants may be added to the exterior surface when specified by the UBRS.

NOTE: The addition of pigment, dyes, or colorants may interfere with visual inspection of laminate quality.

4. Flame retardant synergists shall be used only when required in the UBRS. If fire retardant synergists were used to obtain the specified ASTM E84 flame spread rating, the same type and amount must be used in the laminate.

NOTE: The addition of fire retardant synergists may interfere with visual inspection of laminate quality.

5. Common additives, as described in Mandatory Appendix M-2, Article G, may be added without requalifying the standard laminate.

6. Fillers or additives for abrasion resistance, thermal shock resistance, and electrical conductivity are allowed. A requalification of the design basis laminate is required if these fillers or additives are added to the structural laminate. All fillers or additives shall be
**ARTICLE E
RESIN AND CURING AGENTS LOG SHEETS**

See Tables M2E-1 and M2E-2 for the Resin and Curing Agents Log Sheets.

**ARTICLE F
COMMON ADDITIVES**

**M2F-100 INTRODUCTION**

This Article specifies the minimum inspections by the Fabricator that must be performed prior to the acceptance and use of any of the common additives in the resin.

**M2F-200 DEFINITION AND LIMITS**

**M2F-210 Thixotropic Agents**

Thixotropic agents are flame-processed silicon dioxides that are used to adjust the resin flow characteristics. The laminating resin shall contain not more than 1.5 parts per 100 parts resin by weight.

**M2F-220 Flame Retardant Synergists**

Flame retardant synergists are antimony oxides that are added to halogenated resins to enhance their measured flame retardant characteristics when measured per ASTM E84. The laminating resin shall not contain more than 5 parts antimony oxide per 100 parts resin by weight. When predispersed concentrates are used, the laminating resin shall contain not more than 5 parts active antimony oxide by weight. No more than 10 parts of the predispersed concentrate per 100 parts resin by weight is permissible.

**M2F-230 Ultraviolet Light Absorbers**

Ultraviolet light absorbers are organic compounds that, by converting photochemical energy to thermal energy, effectively stabilize resin binders against the deteriorating effects of ultraviolet light. Only the outer surface resin-rich layer may contain the ultraviolet light absorber.

**M2F-240 Pigments**

Pigments are compounds that provide coloration and/or opacity. Only the outer surface resin-rich layer may contain pigment.

**M2F-300 ACCEPTANCE INSPECTION**

(a) The package for each of the common additives shall be inspected at the time of delivery. Acceptance requirements are defined in para. M2F-400.

(b) The form shown in Table M2F-1, or a similar form that contains the provisions to record the results of these required inspections, shall be used by the Fabricator and shall be retained in the inspection records.

**M2F-400 ACCEPTANCE CRITERIA**

(a) The primary package shall be clearly labeled by the additive manufacturer to identify the contained product by manufacturer, name, and lot number. The primary container shall be free from damage (breakage, tear, or puncture). There shall be no visible sign that any part of the primary container wall has at any time been saturated with a liquid such as water.

(b) For additives found to be acceptable, the Fabricator must list the manufacturer’s name, product name, product lot number, and purpose of additive on the inspection form. In the space next to “As Received,” the inspector will sign his/her name and record the date.

**M2F-500 INSPECTION IN USE**

At the time of use, additives shall be visually inspected for contamination. Solid contaminants may be removed and discarded. Any portion of a product that has been agglomerated by exposure to a liquid contaminant must be removed and discarded before the remainder can be added to a resin.

When contamination is found, the Fabricator must enter the date, describe the condition, and initial the entry on the original Common Additives Log Sheet (see Table M2F-1).
(b) The Fabricator shall position and ensure that the vessel is in suitable condition to permit reasonable and safe access for inspection.

(c) The Fabricator shall provide reasonable and safe means, such as ladders and/or platforms, to permit the Inspector to safely inspect accessible inner and outer surfaces of the vessel.

(d) The User’s inspector should be familiar with the possible hazards and safety requirements associated with the use of all RTP materials and fabrication methods. The User’s inspector should observe safety requirements set up by the Fabricator and should be alert to fabricating shop hazards that might be associated with hydrostatic testing of equipment.

6-500 EQUIPMENT DESIGN

The Inspector shall examine the Fabricator’s design records and reports and verify that the vessel conforms to the latest revision of approved drawings and the UBRS, and that the Fabricator’s Design Report has been certified by a registered Professional Engineer.

6-600 MATERIALS

The Inspector shall verify that materials used in fabrication of a vessel comply with the requirements of this Standard and the UBRS.

6-700 FABRICATION

The Inspector shall establish hold points and make periodic inspections and measurements of the vessel as are required by this Standard to verify that fabrication is in accordance with the requirements of this Standard and the UBRS.

At the completion of each hold point inspection, the Inspector shall report results on forms provided in the Fabricator’s Quality Control Program, and highlight any discrepancies requiring corrective action.

6-800 FABRICATOR’S QUALITY ASSURANCE PROGRAM

The Inspector shall make such checks as are necessary to verify that the Fabricator’s Quality Assurance Program is in effective operation. In addition, the Certified Individual shall perform an annual audit of the Fabricator’s Quality Assurance Program.

Any discrepancies shall be promptly brought to the Fabricator’s attention for discussion and resolution.

6-900 FINAL INSPECTION

(a) At the time of final inspection, the Fabricator shall provide to the Inspector the final revision of all of the following documents:

(1) design drawings

(2) UBRS

(3) completed and signed copies of all forms from the Fabricator’s Quality Control Manual that were used during fabrication to check and verify compliance with this Standard and the design

(4) any copies of Fabricator’s Partial Data Reports, with signed Certificates of Compliance, applicable to the finished fabrication (see Table 1-3)

(5) copies of all inspection reports made by any inspector/Inspector during the course of fabrication

(6) the nameplate that is to be applied to the vessel, so that the Inspector may verify that the nameplate meets the requirements of the UBRS and para. 1-540

(b) Design drawings shall show design thicknesses and the laminate reinforcing sequence for every section or member. If, during the course of fabrication, it was necessary to add repeatable units to the laminate [see para. 6-920(f)(4)], this change shall be noted and highlighted on the drawings provided to the Inspector.

(c) The Fabricator shall also make available to the Inspector all nozzle and manway cutouts, each identified clearly as to its point of origin on the vessel.

(d) Upon completion of final inspection, the Inspector shall prepare a brief report summarizing his/her inspection activities and findings, and submit the report to the Fabricator as an attachment to the Certificate of Compliance.

(e) When the Inspector has completed the inspections and found the results to be within required tolerances, the Inspector shall present his/her inspection report along with any findings to the Certified Individual. The Certified Individual shall sign and date the Certificate of Compliance prior to returning it to the Fabricator with the inspection report.

(f) Paragraphs 6-910 through 6-960 describe the minimum basic tests that shall be made, witnessed, or verified by the Inspector prior to or at the time of final inspection.

6-910 Resin Cure

(a) During the course of fabrication, the Fabricator shall make all such checks necessary to ensure that resin additives, promotion, catalyzation, dilution, and curing are controlled and are within the requirements of this Standard. The Fabricator’s Quality Control Program shall include procedures and forms, to be used throughout fabrication, to control the ongoing process of resin handling and curing so as to ensure that cure is within required tolerance prior to the final inspection.
(although 6-month intervals are recommended). The first audit shall occur no more than 1 yr from the date of issuance of the Certificate of Authorization.

(h) assurance that the RTP-1 nameplate information meets the requirements of the UBRS and para. 1-540.

M4-500 EXAMPLE OF A FABRICATOR’S QUALITY CONTROL PROGRAM

An example of a Fabricator’s Quality Control Program is included in Nonmandatory Appendix NM-6.
ASME RTP-1–2017
SUMMARY OF CHANGES

Following approval by the RTP Committee and ASME, and after public review, ASME RTP-1–2017 was approved by the American National Standards Institute on August 3, 2017.

ASME RTP-1–2017 includes the following changes identified by a margin note, (17).

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<td>Second paragraph of subpara. (c) revised</td>
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<td>In first paragraph, second sentence revised</td>
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<td>1-220</td>
<td>Subparagraph (a)(3) revised</td>
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<td>Fabricator’s Partial Data Report revised</td>
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8-580 Withdrawal of Certification

The requirements of ASME CA-1, para. 2.8 shall apply.

8-600 DESIGNATED OVERSIGHT

The requirements of ASME CA-1, Section 3 shall apply.

8-700 DATA REPORTS

The requirements of paras. 1-520 and 8-410(d) shall apply.

8-800 ASME RTP CERTIFIED MARK AND CERTIFIED DESIGNATOR

8-810 Marking Items With the ASME Certification Mark and the RTP Certification Designator

(a) The official ASME Certification Mark with RTP Designator (as shown in Fig. 8-1) shall be applied to a vessel built according to all provisions of this Standard and ASME CA-1, para. 5.1.

(b) The Fabricator who completes a vessel, and has held throughout its design and fabrication a valid Certificate of Authorization, and having the acceptance of the Certified Individual [see para. 6-300(i)], may then apply the ASME Certification Mark with RTP Designator, which together with the Fabricator’s Data Report shall certify all requirements of this Standard have been met. The ASME Certification Mark with RTP Designator shall be applied after the successful completion of all tests required by paras. 6-910 through 6-960.

(c) RTP subassemblies or components of a vessel for which Partial Data Reports are required in Part 6 shall be marked by the component Fabricator with the following:

(1) the official ASME Certification Mark with RTP Designator shown in Fig. 8-1 above the word “COMPONENT”

(2) name of the Fabricator of the part of the vessel, and certificate number, preceded by the words “Certified By”

8-820 Authorization and Time of Marking

The requirements of ASME CA-1, para. 5.2 shall apply.

8-830 Control

The requirements of ASME CA-1, para. 5.3 shall apply.

8-840 RTP Requirements for Nameplate Construction and Attachment

(a) The method for identifying a vessel built to this Standard shall be a nameplate not less than 4 in. × 6 in. in size. The nameplate shall be permanently attached to the vessel or to a corrosion-resistant bracket permanently attached to the vessel as follows:

(1) Paper nameplates shall be laminated to the vessel surface or to an RTP bracket using resin-wetted layers of fiberglass surfacing veil.

(2) Cast, etched, embossed, engraved, or stamped nameplates shall be permanently attached to a metal or RTP bracket. Easily removable fasteners such as screws, bolts, and drive pins are not acceptable attachment methods.

(3) In the case of an insulated vessel, the bracket shall have a standoff height of at least 1 in. more than the insulation thickness.

(b) The nameplate shall be marked with all information as required by para. 8-850.

(c) After attachment to the vessel or bracket, all data shall be visible and legible.

(d) Nameplates shall be located in such a position as to be easily visible after a vessel is installed. Users should designate required nameplate location prior to the time that drawings are approved for fabrication. Locations near manways, which after vessel installation would be near ground level or just above an operating platform, are recommended.

(e) In addition to the nameplate, Fabricators may affix or attach any such proprietary or User logos, or data plates, as desired, with no limitation on design, method of attachment, data content, or location, provided the structural integrity of the vessel or its usefulness is not compromised.

8-850 Requirements for RTP Nameplate Information and Marking

(a) Each nameplate shall be marked with the following:

(1) the official ASME Certification Mark with RTP Designator shown in Fig. 8-1

(2) name of the Fabricator of the vessel and certificate number

(3) Fabricator’s serial number for the vessel

(4) year stamped

(5) User’s identification number (if specified in the UBRs)

(6) Manufacturer’s Specific Product Identification for resin
(7) appropriate Visual Inspection Level (Level 1 or Level 2)
(8) for vessels defined as “Atmospheric” in the UBRS (see also para. 3-300), the words
   (a) “Design Pressure — Atmospheric”
   (b) “Maximum Temperature”
(9) for other vessels
   (a) “Maximum Allowable Working Pressure at Maximum Temperature”
   (b) “Maximum Allowable External Working Pressure at Maximum Temperature”
(10) design basis specific gravity of contents
(11) the designation “Critical Service” if applicable

Specified pressures shall be gage pressures given in units as specified in the UBRS. Temperatures shall be in units specified in the UBRS.

(b) If the vessel is optionally registered, the National Board Mark and Registration Number shall be stamped on the nameplate. The legend “National Board Registration Number” is optional.

(c) Letters and figures indicating specific vessel design data shall be at least 5⁄16 in. high. Preprinted legend letters and figures shall be at least 3⁄8 in. high.

8-860 Requirements for RTP Nameplate Design

(a) Paper Nameplates
   (1) Paper shall be at least 0.004 in. thick and of high quality, white bond or linen base.
   (2) All markings shall be black, highly visible and readable, on a white background.
   (3) Markings, including the ASME Certification Mark with RTP Designator, shall be made in indelible ink of such nature as not to be water or resin soluble.

(b) Cast, Etched, Embossed, Engraved, or Stamped Nameplates
   (1) Material shall be 300 series stainless steel or other suitable corrosion-resistant material.
   (2) Thickness shall be sufficient to resist distortion due to the application of the marking, but in no case shall be less than 0.020 in.
   (3) Markings including the RTP Designator may be produced by casting, etching, embossing, stamping, or engraving. The ASME Certification Mark shall be stamped. All stamps for applying the ASME Certification shall be obtained from ASME.