AEROSPACE MATERIAL SPECIFICATION

AMS3915™	REV. B
Issued 2013-02 Revised 2026-05 Superseding AMS3915A	

(R) Advanced Composites Prepreg - Nominal 250 °F (121 °C) Cure - Glass Fiber and Epoxy Resin, 7781 Weave Fabric

RATIONALE

This standard is being revised to the latest SAE format, which includes additional references, reorganizes sections and requirements (such as Material equivalency, SPC, etc.), removes the Five-Year Review cycle statement, updates the Out-time figure, removes the Resin Flow test as a recommended receiving test, adds an exception to the prepreg life extension testing requirements, updates the RC and FAW sample size tolerance, adds Wet DMA conditioning guidance, adds the UHPLC test method with a specification limit, makes Purchaser incoming material acceptance optional, and removes SACMA test methods when an alternate test method is available.

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1. SCOPE

The intent of this specification is for the procurement of 7781 glass fabric epoxy prepreg product with 250 °F (121 °C) cure for aerospace applications; therefore, no qualification or equivalency threshold values are provided. Users that intend to conduct a new material qualification or equivalency program must refer to the production quality assurance section (see 4.3).

1.1 Form

This specification establishes the requirements for a nominal 250 °F (121 °C) cure epoxy preimpregnated 7781 glass fabric product. The prepreg is 7781 glass fabric, a nominal fiber areal weight of 294 gsm, and nominal resin content of 38%.

1.2 Purpose

a. The purpose of this specification is to allow procurement of a defined material corresponding to the statistically derived material properties published in CMH-17 Volume II (formerly MIL-HDBK-17).

b. The materials qualified to this specification are designed specifically for vacuum-bag autoclave cure (see 4.4.11).

c. This specification is developed based on the material properties that are available publicly. The user may specify additional requirements beyond those defined in this specification, especially when the user has generated additional material properties beyond those available publicly or when the application has other requirements. The additional requirements are subject to supplier review and approval.

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d. The use of this specification does not guarantee material or structural performance. Users should be actively involved in evaluating material performance and quality including, but not limited to, performing regular user quality control tests, performing periodic equivalency/additional testing, participating in material change management activities, conducting statistical process control, and conducting regular supplier audits.

e. This material is intended for use in laminate applications with a service temperature of -65 to 180 °F (-54 to 82°C).

1.3 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address all the hazards that may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

1.4 Rounding of Values

The following applies to all specified limits or requirements in this specification. For purposes of determining conformance with this specification, an observed value or a calculated value must be rounded “to the nearest unit” in the last right-hand digit used in expressing the specification limit, in accordance with the rounding method of ASTM E29.

1.5 Conversion of Values Between Inch-Pound and SI Units

The following applies to all specified limits or requirements in this specification. For purposes of determining conformance with this specification, an observed value or a calculated value must be directly converted per ASTM SI10 to determine an appropriate equivalent value between inch-pound units and SI units.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada), www.sae.org.

AMS-C-9084 Cloth, Glass, Finished, for Resin Laminates

AS9100 Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

CMH-17 Composite Materials Handbook

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D792 Density and Specific Gravity (Relative Density) of Plastics by Displacement

ASTM D2344 Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

ASTM D2734 Void Content of Reinforced Plastics

ASTM D3039 Tensile Properties of Polymeric Matrix Composite Materials

ASTM D3171 Constituent Content of Composite Materials

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ASTM D3529 Matrix Solids Content and Matrix Content of Composite Prepreg

ASTM D3530 Volatiles Content of Composite Material Prepreg

ASTM D3531 Standard Test Method for Resin Flow of Carbon Fiber-Epoxy

ASTM D3532 Gel Time of Carbon Fiber-Epoxy Prepreg

ASTM D5379 Shear Properties of Composite Materials by the V-Notched Beam Method

ASTM D7028 Standard Test Method for Glass Transition Temperature (DMA Tg) of Polymer Matrix Composites by Dynamic Mechanical Analysis (DMA)

ASTM E4 Practices for Force Verification of Testing Machines

ASTM E29 Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

ASTM E168 Standard Practices for General Techniques of Infrared Quantitative Analysis

ASTM E1252 Standard Practice for Obtaining Infrared Spectra for Qualitative Analysis

ASTM E2160 Heat of Reaction of Thermally Reactive Materials by Differential Scanning Calorimetry

ASTM SI10 American National Standard for Metric Practice

2.3 ISO Publications

Copies of these documents are available online at www.iso.org/store.

ISO 14001:2015 Environmental Management System

2.4 SACMA Standards

Available from American Composites Manufacturers Association, 2000 N. 15th Street, Suite 250, Arlington, VA 22201, Tel: 703-525-0511, www.acmanet.org.

SACMA SRM 1R-94 Compressive Properties of Oriented Fiber-Resin Composites

SACMA SRM 20R-94 High Performance Liquid Chromatography of Thermoset Resins

2.5 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

DOT/FAA/AR-03/19 Material Qualification and Equivalency for Polymer Matrix Composite Material Systems

2.6 Code of Federal Regulations (CFR) Publications

Copies of these documents are available online at www.ecfr.gov.

14 CFR Part 23 Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes

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2.7 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.p-r-i.org.

PD2000 Governance and Administration of an Industry Managed Product Qualification Program

PD2001 Manufacturer Request for Product Approval and Qualification Process

2.8 Definitions

ACCEPTANCE TESTING: Tests to prove that the quality aspects of subsequent prepreg batches correspond to the quality characteristics of the “original” qualified prepreg product.

AMBIENT: The condition of the immediate surrounding environment.

AS MANUFACTURED: A condition that does not require additional conditioning steps prior to testing of a specimen.

BAG SIDE: The side of the panel that is cured against the vacuum bag.

BREATHER: A porous material that serves as a continuous air path over and/or around the part.

CREASE: A condition of the surface of the prepreg where the nominal thickness is not appreciably changed, but the material is permanently formed into a ridge.

FABRIC BATCH: Fabric woven from one warp loom setup with warp and fill yarns meeting the requirements of AMS-C-9084 with traceability to individual yarn lots and coated with the fiber finish that is specified.

FIBER FINISH: A coating material applied to the glass fiber in order to promote resin adhesion.

FIBER (YARN) LOT: Glass fiber produced in one continuous manufacturing operation under substantially identical conditions (except normal rest periods and daily shift changes).

FILL: The crosswise yarns running at 90 degrees to the warp of the fabric reinforcements; also known as weft or 90 degrees.

FOLD: A condition in which the prepreg is laid back over itself.

FOREIGN MATERIAL: All visually detectable material not characteristic of the prepreg, such as something other than carbon fiber or resin constituents.

FUZZ BALLS: The broken filaments and abraded particles that collect as loose filament bundles or balls that are occasionally incorporated onto the impregnated material.

MAJOR CHANGE: Changes that could affect the consistency, quality, fit, form, function, or performance of the final product. Refer to CMH-17 Vol. I, Section 2.7 for further guidance.

MASTER ROLL: A subunit of a prepreg batch that has been wound on a core until changed with another empty core that is further processed into product rolls.

MATERIAL QUALIFICATION AGENCY: Organization responsible for assuring that the qualification requirements of this specification have been fulfilled for a given material and for publication of that material’s designation in a QPL to control procurement.

MECHANICAL LIFE: The out-of-storage time over which the material remains capable of demonstrating mechanical properties in 3.3 if laid up and compacted within its handling life. See Figure 2 for mechanical life. Also known as open mold life or tool life.

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OUT-TIME: Out-time (also known as out-life) is defined by this document and Figure 2 as the sum of work (handling) and mechanical (staging) life.

PREPREG: In the context of this specification, prepreg is epoxy resin impregnated carbon fiber/fabric or glass fabric that, upon supply to composite parts fabricators, contains a certain amount of reactive resin mass and can be cured by heat and vacuum/pressure without further additives.

PREPREG BATCH: Prepreg product produced in one continuous manufacturing operation under substantially identical conditions (except normal rest periods and daily shift changes) using glass fiber fabric traceable to a specific lot and resin mixed in the mixer in one operation, or one homogenous mix, with traceability to individual component lots.

PRI: Performance Review Institute, represented by the Qualified Products Group (QPG) managing the Qualified Products List (QPL) attached to specifications related to the SAE P-17 committee.

PROCESS CONTROL DOCUMENT (PCD): A document that describes the raw materials, manufacturing processes, in-process testing, and alternate test methods used to document and to control variation of a supplier's product. The user should coordinate with the material supplier to establish that the PCD meets their requirements, such as content of the PCD, what PCD changes must be reported/approved, and who approves (in writing) the PCD.

PRODUCT ROLL: See "ROLL."

PUCKERS: Areas on prepreg product where the material has locally blistered or pulled away from the separator film or release material.

QUALIFYING AGENCY: The responsible agency for the Qualified Products List (QPL) or their designee.

RESIN BATCH: Resin mixed in one mixer in one operation or blended in one homogeneous mix with traceability to individual component lots.

RESIN-RICH AREA: Area of excess resin at the surface of the prepreg.

RESIN-STARVED AREA: Area of unwetted fibers at the surface of the prepreg.

ROLL: A subunit of a prepreg batch in the final configuration delivered to the user, which meets the size requirements in 5.2.

SELVAGE: The woven edge portion of a fabric parallel to the warp; usually has an increased number of ends/inch.

SMASH: A place in the fabric where a number of warp or filling yarns have been broken.

STORAGE LIFE: The time in storage at 10 °F (-12 °C) or below, while contained in sealed packaging, over which the prepreg material maintains its handling life, its mechanical life, as well as other requirements of this specification. See Figure 2.

STREAKS: Resin-rich or resin-starved areas on the prepreg surface.

SUPPLIER: The entity producing the material in this specification.

TOOL SIDE: The side of the panel that is cured against the tool surface.

USER: The entity utilizing the material in this specification. "Purchaser" or "processor" are types of users.

WARP: The roll length direction, continuous fibers from the warp loom set, etc. Also known as 0 degrees.

WRINKLE: A ridge or crease on a prepreg surface caused by crumpling or folding.

WORK LIFE: See Figure 1. The out-of-storage time over which the prepreg material maintains its tack and drape (at ≤65% relative humidity) prior to being incorporated into a part and remains capable of demonstrating the mechanical properties in this specification. Also known as application, assembly, or handling life.

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3. MATERIAL REQUIREMENTS

3.1 General Requirements

3.1.1 Process Control Document

The supplier must prepare and control a Process Control Document (PCD). The established PCD must be presented to the Qualifying Agency upon request. The Qualifying Agency must treat any information contained in the PCD as proprietary. Major changes to the PCD of a qualified material are subject to the written approval of the Qualifying Agency. Methods in the PCD may be used in place of methods in this specification when appropriate as an alternate means of compliance to this specification.

3.1.2 Product Qualification

All products must conform to the requirements of this procurement specification and must be approved in accordance with the requirements of PD2000 and PD2001 for listing in a PRI Qualified Products List (QPL).

3.2 Prepreg Requirements

3.2.1 Resin

The resin matrix used in the manufacture of prepreg to this specification must be 270 °F ± 10 °F (132 °C ± 5.6 °C) curing modified epoxy-based thermosetting resin, the components of which will be specified, tested, supplied, and processed in accordance with the PCD.

a. The resin must not produce any excessive health irritation/skin irritation when handled per the prepreg product Safety Data Sheet (SDS) and should not develop any emissions that require special environmental measurements during the processing of the prepreg product.

b. The resin composition, resin preparation, and processing of a product will be controlled by the PCD and evaluated during qualification.

c. Any major changes to the epoxy resin system after qualification must be reapproved by the Qualifying Agency.

3.2.2 Reinforcement

Reinforcement properties and corresponding test methods must be controlled by the PCD to include as a minimum the following: tensile strength and modulus, elongation at failure, yield, density, and sizing weight percent.

a. The reinforcement must be an approved constituent of the qualified prepreg material.

b. The fiber finish is considered an integral part of the reinforcement.

c. The product quality must be evaluated during materials qualification and must be controlled by the PCD.

d. The glass fiber must meet the requirements of AMS-C-9084, Type VIIIB, Class 2.

e. Any major changes to the reinforcement after qualification must be reapproved by the Qualifying Agency.

3.2.3 Visual Defect Limitations and Dimensional Requirement

The preimpregnated materials must be uniform in quality and condition, defined as:

a. It will not exhibit characteristics detrimental to handling, layup, or structural properties.

b. Material must be free of cut or broken fibers, resin-rich areas, resin-starved areas, dry or boardy areas, cured resin particles, and visible indications of moisture.

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c. Prepreg material must be free from all foreign material, except as follows:

1. Random, sparse flecks of carrier material inherent to the prepreg manufacturing process are acceptable.

2. Flecks no greater than 0.031 inch (0.79 mm) in any direction are acceptable.

3. Random, sparse flecks from the core and/or carrier deposited on the edge of the prepreg roll are acceptable.

d. Fuzz balls may be acceptable, provided:

1. The fuzz balls do not cause apparent fiber distortion. This must be determined without removing the fuzz balls.

2. Fuzz ball does not exceed 0.8 inch (20.3 mm) in any direction.

3. The accumulated area of fuzz balls must not exceed 3 square inches (0.076 m^2) in any 10 ft^2 (0.93 m^2) of one side of the prepreg material.

4. The overall thickness change due to fuzz ball is no more than 50% of the prepreg material nominal thickness.

e. Prepreg material width without selvage must be 38 inches ± 1 inch wide. Selvage edge must not exceed 1.5 inches. Selvage edge must not be thicker than the body of the fabric prepreg.

f. The fibers must be completely and uniformly coated with resin matrix.

g. The warp yarns must be parallel to the warp direction of the preimpregnated cloth within 1.5 inch (38 mm) in any 19 inches (483 mm).

h. The fill yarns must be perpendicular to the warp yarns of the preimpregnated cloth within 1.5 inch (38 mm) per 19 inches (483 mm) of the cloth width, or 3.0 inches (76 mm) over the full width (38 inches/965 mm) of the cloth.

i. The prepreg fabric must be free from wrinkles, smashes, fabric splices, hard spots, and curled or folded selvages that overlap non-selvage areas.

3.2.4 Materials Nonconforming to the Visible Defect Limitations and Dimensional Requirements

a. In cases where foreign material or resin-rich areas can be removed without causing any apparent deformation of the prepreg surface, it may be removed by a tool or adhesive tape. The tool or adhesive tape must not transfer any contaminants to the prepreg product.

b. Areas not conforming to 3.2.3 must be identified along the edge of the prepreg roll by markers unless removed and spliced. Markers must be single color, distinguishable from the prepreg and carrier release material, and removable without damaging the prepreg material. Splices are not required to be identified by markers.

1. For single-point defects, use a single marker.

2. Successive single-point defects 3 feet (0.91 m) or less apart are considered one continuous defect. For continuous defective areas, markers must be placed at the beginning, at 2-foot (0.6-m) (maximum) intervals, and at the end of the continuous defect

c. Each crease, cut, tear, smash, fabric splice, and weave separation must be marked. Fabric weaving defects must be re-marked after impregnation only if the fabric quality requirements of 3.2.3 are not met.

d. Prepreg may be cut and spliced to remove defects. Prepreg splicing must be in accordance with the splicing procedure documented in the PCD.

e. Prepreg material must have a roll maximum defect quantity of 15% by length or weight. Defect weight limit must be based on full-width material.

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f. Ninety percent of any roll must not contain two successive splices or defects closer than 50 feet (15 m). The remaining 10% must not contain two successive splices or defects closer than 15 feet (4.6 m).

g. The type, location, and length (for continuous defect) of each defect or splice must be indicated on a defect log accompanying each roll of prepreg material. Defect and splice locations must be identified to within 3 feet (0.91 m) relative to the outside end of the prepreg roll.

h. Defective areas, considered as the length of the defect multiplied by the width of the roll, must not be counted toward the amount purchased.

3.2.5 Storage and Handling Requirements

3.2.5.1 Release Paper/Poly Film

A non-contaminating separator paper or release/poly film with differential release can be used on the prepreg to permit easy removal of the preimpregnated material from the roll without loss of resin, tearing, shredding, fiber realignment, or other damage. The paper or film material must be capable of being cut cleanly without other visible damage and must not contaminate the prepreg.

3.2.5.2 Material Handling

All rolled material must be supported at all times by the ends of the core and kept horizontal. The material must not be allowed to rest against any surface nor in a vertical position except while being transferred to or from storage.

3.2.5.3 Thawed Rolled Materials

Preimpregnated materials must be allowed to warm at a temperature greater than 60 °F (16 °C) until moisture does not condense on the packaging (i.e., prepreg temperature is above dew point). The material out-of-storage time must be recorded.

NOTE 1: No form of applied or direct heat may be used to accelerate the thawing process.

NOTE 2: Rolls of prepreg material stored at lower than 60 °F (16 °C) must be contained in a sealed bag. The sealed bag must not be opened if condensation forms on the surface of the bag after being wiped dry.

3.2.6 Prepreg Life Requirements

The prepreg material, after the specified exposure times, must meet the following criteria:

- No detrimental effects on handling and layup.
- Compliance with supplier material acceptance testing per Tables 1, 2, and 3.
- Capable of meeting the qualification requirements.

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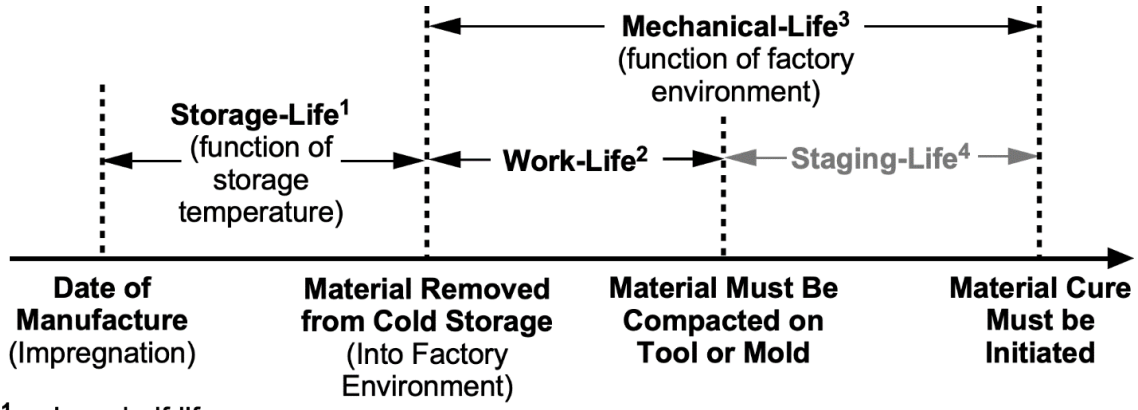
The heat history of the prepreg is controlled at the manufacturer to ensure the following material life requirements:



1 a.k.a. shelf-life
2 a.k.a. application-, assembly-, open-mold-, or handling-life
3 a.k.a. out-life
4 a.k.a. tool-life (not a minimum requirement; defined as mechanical-life - work-life)

Figure 1 - Definitions of storage, handling, and staging life and out-of-storage time

a. Storage life at ≤10 °F (-12 °C): 24 months from date of impregnation (manufacture) when stored at 10 °F (-12 °C) or below in a sealed container (see Figure 2). Temperature excursions for the user up to 40 °F (4 °C), such as during shipping and freezer defrost cycles, for a cumulative maximum of 7 days is permitted.

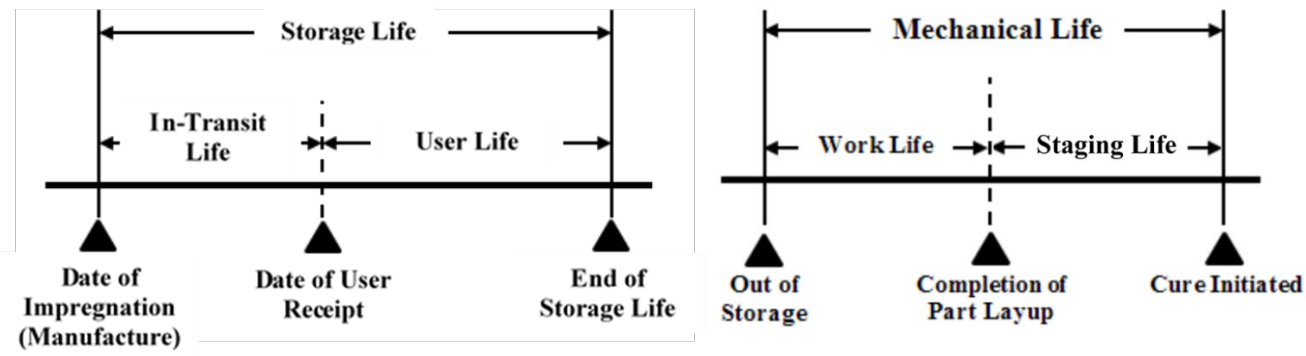


Figure 2 - Definition of storage, work, and mechanical life

b. Work life (handling life): 10 days when exposed at a temperature of 72 °F ± 5 °F (22.2 °C ± 2.8 °C) and 65% (maximum) relative humidity (see Figure 2).

c. Mechanical life: 28 days when exposed at a temperature 72 °F ± 5 °F (22.2 °C ± 2.8 °C) and 65% (maximum) relative humidity, unless sealed in a bag or vacuum bagged. Begins when the prepreg is removed from freezer storage and ends when the cure cycle begins (see Figure 2).

3.2.7 Prepreg Life Extension

The storage life at 10°F (-12 °C) or below may be extended for an additional 6 months from the end of the original storage life or test date, whichever is shorter, after successfully meeting the supplier material acceptance testing of Tables 1, 2, and 3 with the exception of Resin Content and Fiber Areal Weight.

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