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NCAMP Material Specification

This specification is generated and maintained in accordance with NCAMP Standard Operating Procedures, NSP 100

350ºF Autoclave Cure, Low Flow Toughened Epoxy Prepregs, Type 38, Class 2, Grade 193, Style 3K-70-PW (Hexcel 8552S AS4 Plain Weave Fabric)

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1. SCOPE:

1.1 Form:

This detail specification along with the base material specification NMS 128 establishes the requirements for carbon fiber fabric impregnated with a modified B-staged epoxy resin ("fabric prepreg"). The prepreg is produced using a solution coat process.

This detail specification follows the section and table numbering scheme of the base specification. It contains additional or superseding requirements. The base specification shall govern where no additional requirement is specified; in such cases, the applicable sections are omitted from this detail specification.

1.3 Classification: All products qualified to this detail specification have the following classification: Type 38, Class 2, Grade 193, Style 3K-70-PW

3. TECHNICAL REQUIREMENTS:

Table 1 – Prepreg Physical and Chemical Properties

Property	Test Method(1)	Number of Replicates	Requirements(3)
Resin Content	ASTM D 3529	Every roll(2)	38±3% ind 38±2% avg
Fiber Areal Weight	ASTM D 3776 or SACMA SRM 23R-94	Every roll(2)	193±9 gsm ind 193±8 gsm avg
Volatile Content	ASTM D 3530	First and last rolls of every batch(2)	2% max, avg
Flow	ASTM D 3531 At 50 psi	First and last rolls of every batch(2)	16±4% avg
Gel Time	ASTM D 3532	Optional	10±5 minutes, ind
Tack	See 4.6.1	First and last rolls of every batch	Level IV
Drape	See 4.6.2	First and last rolls of every batch	Pass
HPLC	SACMA SRM 20R-94	First and last rolls of a batch	Specification limits are included in PCD and certificate of conformity
IR	ASTM E 168 ASTM E 1252	Optional	Specification limits are included in PCD and certificate of conformity
Differential Scanning Calorimetry (DSC) exotherm peak temperature	SACMA SRM 25R-94	Optional	227±6°C ind

(1) Specific procedures should be identical to those used in the original material qualification program
(2) Three specimens should be taken across the width of the prepreg; left, center, right.
(3) "ind." refers to individual measurements. "avg" refers to the average measurements per roll.

3.2 Constituent Material Requirements:

3.2.1 Epoxy Resin System: Up to 50% resin blending is allowed.

3.2.2 Reinforcement: The carbon fiber tow shall be qualified to NMS 818/9. The fabric weaving is controlled through prepreg PCD and NRP 101.This product does not contain tracer yarn. Tracer yarn may be included only if it is specifically requested by the purchaser. The inclusion of tracer yarn might alter the material properties.

3.5 Laminate (Cured Prepreg) Requirements:

3.5.2 Cured Laminate Physical Properties:

TABLE 3 - Cured Laminate Physical Properties

Property	Test Method(1)	Requirements(2)
Cured Ply Thickness of Laminates in Table 5	SACMA SRM 10R-94	Between 0.0073 and 0.0081 inch, avg
Dry Glass Transition Temperature, Tg	SACMA SRM 18R-94 or HSP-T2 (by TMA)	Between 191.9 and 213.4 ºC, ind or Between 189 and 238 ºC, ind

(1) Specific procedures should be identical to those used in the original material qualification program
(2) "ind" refers to individual measurements. "avg" refers to the average measurements per panel.

3.5.3 Cured Laminate Mechanical Properties:

TABLE 5 - Required Cured Laminate Tests for Mechanical Properties (Class 2)

Property	Test Method(1)	Requirements(3)

0° (warp) Tension Strength and Modulus Layup: $[0]_{15}$	ASTM D3039	Strength[(2)]: Min. Ind. $\geq$ 89 ksi Strength[(2)]: Average $\geq$ 102 ksi Modulus[(2)]: Between 8.6 and 10.1 msi avg
90° (fill) Compression Strength and Modulus Layup: $[90]_{15}$	ASTM D6641	Strength[(2)]: Min. Ind. $\geq$ 78.0 ksi Strength[(2)]: Average $\geq$ 97.6 ksi Modulus[(2,4)]: Between 7.8 and 9.3 msi avg
0° (warp) Short Beam Strength Layup: $[0]_{32}$	ASTM D2344	Strength: Min. Ind. $\geq$ 9.9 ksi Strength: Average $\geq$ 12.1 ksi

(1) Specific procedures should be identical to those used in the original material qualification program

(2) Normalize the properties to a nominal cured ply thickness (CPT) value of 0.0078 inch using the following equation:
Normalized_Value = Measured_Value x Measured_CPT / Nominal_CPT

(3) "ind." refers to individual measurements. "avg" refers to the average of 5 replicates. Unless otherwise noted, the specification limits are derived using the statistical methods in CMH-17 Rev G, Volume 1, section 8.4.1 with α=1% and n=5 along with modified coefficient of variation approach in section 8.4.4.[(4)] Acceptable to use a minimum of one specimen with strain gage

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout[1]
Hexply 8552S/AS4GP Plain Weave Fabric	Supplier Name: Hexcel Corporation Production Location: Hexcel Salt Lake City Plant 6700 West 5400 South West Valley City, UT 84118 USA	4/14/2011	NMS 128/3 Classification callout is optional because Type 38, Class 2, Grade 193, Style 3K-70-PW is the only classification allowed in this QPL.

[1]In accordance with NCAMP Standard Operating Procedures, NSP 100, this QPL shall not contain alternate materials/products. Additional production location may be included in the QPL only after successful equivalency demonstration and approval per NCAMP Prepreg Process Control Document (PCD) Preparation and Maintenance Guide, NRP 101.

[1]The proper specification callout for material procurement purpose is “NMS 128/3.” This specification is developed based on the material properties that are available publicly. The purchaser may specify additional requirements beyond those specified in this specification, especially when the purchaser has generated additional material properties beyond those available publicly or when the application requires additional requirements. The additional requirements are subject to supplier review and approval.