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NCAMP Material Specification

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

350°F Autoclave Cure, Low Flow Toughened Epoxy Prepregs, Type 35, Class 1,
Grade 190
(Hexcel 8552 AS4 Unidirectional Tape)

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1. SCOPE:

1.1 Form:

This detail specification along with the base specification NMS 128 establishes the requirements for continuous unidirectional carbon fiber impregnated with a modified B-staged epoxy resin (“unidirectional tape prepreg”). The prepreg is produced using a hot-melt 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 35, Class 1, Grade 190

3. TECHNICAL REQUIREMENTS:

Table 1 – Prepreg Physical and Chemical Properties

Property	Test Method ⁽¹⁾	Number of Replicates	Requirements
Resin Content	ASTM D 3529	Every roll ⁽²⁾	35±3% ind 35±2% avg
Fiber Areal Weight	SACMA SRM 23R-94	Every roll ⁽²⁾	190±7 gsm ind 190±5 gsm avg
Volatile Content	ASTM D 3530	First and last rolls of every batch ⁽²⁾	1.4% max, avg
Flow	ASTM D 3531 At 50 psi	First and last rolls of every batch ⁽²⁾	12.5±4.0 % avg
Gel Time	ASTM D 3532	Optional	11.5±3.1 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 E1252	Optional	Specification limits are included in PCD and certificate of conformity
Differential Scanning Calorimetry (DSC) exotherm peak temperature	SACMA SRM 25R-94	Every batch	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 15% resin blending is allowed.
- 3.2.2 Reinforcement: The carbon fiber tow shall be qualified to NMS 818/7.

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 4	SACMA SRM 10	Between 0.0070 and 0.0078 inch, avg
Dry Glass Transition Temperature, Tg	SACMA SRM 18R-94 or HSP-T2 (by TMA)	Between 194.6 and 214.6 °C ind or Between 200 and 232°C 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 4 - Required Cured Laminate Tests for Mechanical Properties
(Class 1)

Property	Test Method ⁽¹⁾	Requirements ⁽³⁾
0° Tension Strength and Modulus, Room Temperature Layup: [0] ₆	ASTM D3039	Strength ⁽²⁾ : Min. Ind. ≥ 212 ksi Strength ⁽²⁾ : Average ≥ 261 ksi Modulus ⁽²⁾ : Between 17.0 and 19.9 msi, avg
90/0° Compression Strength, Room Temperature Layup: [90/0/90] ₅	ASTM D6641	Strength ⁽²⁾ : Min. Ind. ≥ 64.0 ksi Strength ⁽²⁾ : Average ≥ 73.7 ksi
0° Short Beam Strength, Room Temperature Layup: [0] ₃₄	ASTM D2344	Strength: Min. Ind. ≥ 13.6 ksi Strength: Average ≥ 15.5 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 0.0074 inch using the following equation:

$$\text{Normalized_Value} = \text{Measured_Value} \times \text{Measured_CPT} / \text{Nominal_CPT}$$

⁽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.

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout ⁽¹⁾
Hexply 8552/AS4 Tape	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 128/1 Classification callout is optional because Type 35, Class 1, Grade 190 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 128/1.” 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.