



Document No.: NMS 532/5 Rev A

NCAMP Material Specification

Low Initial Temperature Vacuum-Bag-Only Cure, Medium Toughness Epoxy
Prepregs, Type 33, Class 1, Grade 145
(Solvay Cytec Cycom 5320-1 T650 Tape)

FOR TEST USE ONLY
Because this version does not contain all the
specifications limits

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Distribution Statement A. Approved for public release; distribution is unlimited.

1. SCOPE:**1.1 Form:**

This detail specification along with the base specification NMS 532 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.

1.3 Classification: All products qualified to this detail specification have the following classification: Type 33, Class 1, Grade 145

3. TECHNICAL REQUIREMENTS:

Table 1 – Prepreg Physical and Chemical Properties

Property	Test Method ⁽¹⁾	Number of Replicates	Requirements ⁽³⁾
Resin Content	ASTM D3529	Every roll ⁽²⁾	33±2% avg 33±3% ind
Fiber Areal Weight	SACMA SRM 23R-94	Every roll ⁽²⁾	145±7 gsm ind 145±5 gsm avg
Volatile Content	ASTM D3530	First and last rolls of every batch ⁽²⁾	2% max, avg
Flow	ASTM D3531	First and last rolls of every batch ⁽²⁾	4 to 12% avg
Gel Time	ASTM D3532	Optional	N/A, 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	See QPL
IR	ASTM E168 ASTM E1252	Optional	See QPL
Differential Scanning Calorimetry (DSC) exotherm peak temperature total heat of reaction	SACMA SRM 25R-94	Optional	See QPL

⁽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 of measurements per roll. Limits computed at $\alpha=0.01$ and modified CV.

3.2 Constituent Material Requirements:

3.2.2 Reinforcement: the carbon fiber tow shall be qualified to Solvay Cytec T650-35 6K NT PRS 60658479 (GP2) and PRS 61658479 (RH) carbon fiber material specifications.

3.5 Laminate (Cured Prepreg) Requirements:

3.5.2 Cured Laminate Physical Properties:

TABLE 3 - Cured Laminate Physical Properties

Property	Test Method	Requirements ⁽²⁾
Cured Ply Thickness ⁽³⁾	SACMA SRM 10R-94	0.0050 – 0.0058 inch, avg
Dry Glass Transition Temperature, Tg by DMA	by flexural loading per ASTM D7028 ⁽¹⁾	Between 188.30 and 208.30 °C, ind Between 370.95 and 406.95 °F, ind

⁽¹⁾ Optional to use either method. 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. Limits computed at $\alpha=0.01$ and modified CV.

⁽³⁾ Computed from actual qualification panel thicknesses.

3.5.3 Cured Laminate Mechanical Properties:

TABLE 4 - Required Cured Laminate Tests for Mechanical Properties (Class 1)

Property	Test Method ⁽¹⁾	Requirements
0° Tension Strength and Modulus, Room Temperature Layup: [0] ₈	ASTM D3039	Strength ⁽²⁾ : Min. Ind. \geq 238.05 ksi Strength ⁽²⁾ : Average \geq 276.39 ksi Modulus ⁽²⁾ : Between 18.39 and 21.77 msi
90/0° Compression Strength, Room Temperature Layup: [90/0/90] ₇	ASTM D6641	Strength ⁽²⁾ : Min. Ind. \geq 72.74 ksi Strength ⁽²⁾ : Average \geq 84.77 ksi
0° Short Beam Strength, Room Temperature Layup: [0] ₄₅	ASTM D2344	Strength: Min. Ind. \geq 12.76 ksi Strength: Average \geq 14.57 ksi

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

⁽²⁾ Normalize the properties to a cured ply thickness value of 0.0055 inch, based on actual qualification panel thicknesses. $\text{Normalized_Value} = \text{Measured_Value} \times \text{Measured_CPT} / \text{Nominal_CPT}$

⁽³⁾ "ind." refers to individual measurements. "avg" refers to the average of 5 replicates. Limits computed at $\alpha=0.01$ and modified CV.

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout ⁽¹⁾
CYCOM 5320-1/T650/35 6K 145/33	Supplier Name: Cytec Engineered Materials Inc. Production Location: 4300 Jackson St, Greeneville, TX 75402	1/27/2017	NMS 532/5 Classification callout is optional because Type 33, Class 1, Grade 145 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 532/5.” This specification was 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.