Document No.: NMS 532/6

NCAMP Material Specification

Low Initial Temperature Vacuum-Bag-Only Cure, Medium Toughness Epoxy Prepregs, Type 37, Class 2, Grade 193, Style 3K-PW (Cytec Cycom 5320-1 T650 PW)

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1. SCOPE:

1.1 Form:

This detail specification along with the base material specification NMS 532 establishes the requirements for carbon fiber fabric impregnated with a modified B-staged epoxy resin ("fabric 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 37, Class 2, Grade 193, Style 3K-PW

3. TECHNICAL REQUIREMENTS:

Table 1 – Prepreg Physical and Chemical Properties

Property	Test Method(1)	Number of Replicates	Requirements
Resin Content	ASTM D3529	Every roll(2)	37±3% ind 37±2% avg
Fiber Areal Weight	ASTM D3776 or SACMA SRM 23R-94	Every roll(2)	193±9 gsm ind 193±8 gsm avg
Volatile Content	ASTM D3530	First and last rolls of every batch(2)	2% max avg 1% max ind
Flow	ASTM D3531	First and last rolls of every batch(2)	3 to 15% avg(3)
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) Limits established based on variation observed in production

3.2 Constituent Material Requirements:

3.2.2 Reinforcement: the carbon fiber tow shall be qualified to Cytec T650-35 3K NT PRS 60658564 (GP2) and PRS 61658564 (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
Cured Ply Thickness	SACMA SRM 10R-94	0.0071 – 0.0083 inch
Dry Glass Transition Temperature, Tg by DMA	by flexural loading per ASTM D7028**(1)**	Between 180.08 and 200.08 °C(2)
		Between 356.14 and 392.14 °F(2)

(1) Specific procedures should be identical to those used in the original material qualification program.
(2) Limits generated from qualification and 2 additional production batch data.

3.5.3 Cured Laminate Mechanical Properties:

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

Property	Test Method(1)	Requirements
0° (warp) Tension Strength and Modulus Layup: $[0]_{15}$	ASTM D3039	Strength(2): Min. Ind. $\geq$ 98.69 ksi Strength(2): Average $\geq$ 113.23 ksi Modulus(2): Between 8.93 and 10.54 msi
90° (fill) Compression Strength and Modulus Layup: $[90]_{15}$	ASTM D6641	Strength(2): Min. Ind. $\geq$ 71.16 ksi Strength(2): Average $\geq$ 88.11 ksi Modulus(2,3): Between 7.96 and 9.41 msi
0° (warp) Short Beam Strength Layup: $[0]_{32}$	ASTM D2344	Strength: Min. Ind. $\geq$ 9.00 ksi Strength: Average $\geq$ 10.28 ksi

(1) Specific procedures should be identical to those used in the original material qualification program
(2) Normalize the properties to a measured cured ply thickness value of 0.0077 inch. Theoretically calculated cured ply thickness is 0.0076 inch.
Normalized_Value = Measured_Value x Measured_CPT / Nominal_CPT
(3) Permissible to use a minimum of two modulus specimens

QUALIFIED PRODUCTS LIST

Supplier Product Designation	Supplier Name and Production Location	Date Qualified	Specification Callout[1]
Cytec Cycom 5320-1 T650 3kPW	Supplier Name: Cytec Engineered Materials Inc. Production Location: 4300 Jackson St, Greeneville, TX 75402	June 2013	NMS 532/6 Classification callout is optional because Type 37, Class 2, Grade 193, Style 3kPW 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 532/6.” 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.