



# CYCOM<sup>®</sup> 977-3 Epoxy Resin System

## DESCRIPTION

CYCOM<sup>®</sup> 977-3 is a 350°F (177°C) curing resin. It is a toughened epoxy resin with 350°F (177°C) dry and 270°F (132°C) wet service capability. CYCOM 977-3 is formulated for autoclave or press molding and can be cured at 350°F (177°C) for six hours. Unidirectional tape and woven fabric impregnated with CYCOM 977-3 resin will retain tack for 21 days at 72°F (22°C). It has a long mechanical out life suitable for fabrication of large structures.

## FEATURES & BENEFITS

- 350°F (177°C) cure
- Available on fabric and tape
- 350°F (177°C) dry service temperature
- 270°F (132°C) wet service temperature
- Laminate and sandwich panel usage
- Autoclave or press mold processing
- Toughened epoxy using Cytec Engineered Materials' proprietary "co-continuous" morphology
- Impact resistance
- Shelf life of 12 months at 0°F (-18°C), 21 days at 72°F (22°C)

## SUGGESTED APPLICATIONS

- Aircraft primary and secondary structure
- Applications where impact resistance is critical
- Applications where hot/wet performance is crucial

## CHARACTERISTICS & PROPERTIES

Figure 1 | Characteristic Viscosity Profile for CYCOM 977-3: Ramp Rate 2°C/minute

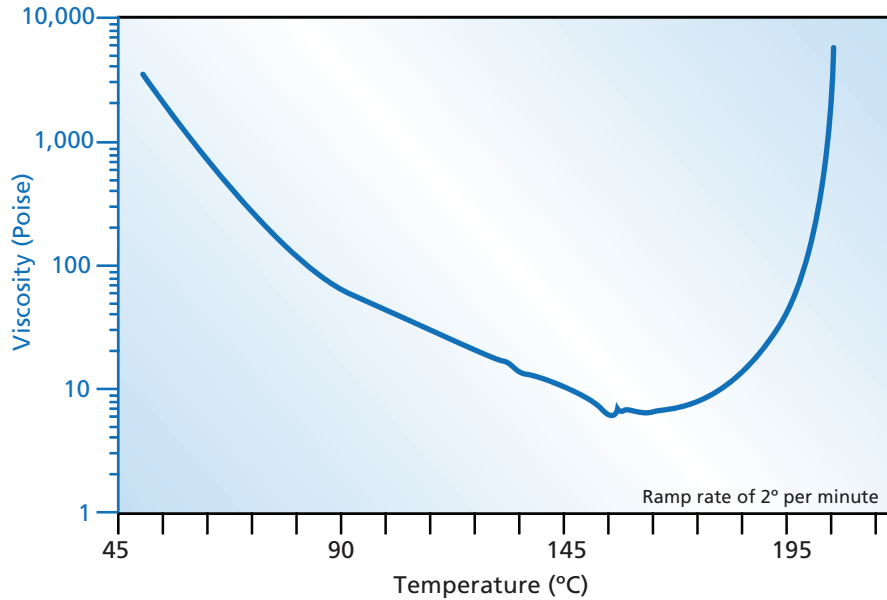


Table 1 | Typical Cured Neat Resin Properties<sup>2</sup>

Property	Test Temperature	
	Room Temperature	250°F (121°C)/Wet <sup>3</sup>
Compression Yield , ksi (MPa)	27 ± 0.3 (186 ± 2.1)	-
Flexural Strength <sup>4</sup> , ksi (MPa)	21 ± 4 (144 ± 30)	10 ± 0.4 (70 ± 3)
Flexural Modulus <sup>4</sup> , msi (GPa)	0.55 ± 0.01 (3.8 ± 0.07)	0.35 ± 0.3 (2.4 ± 2.1)
G <sub>1c</sub> <sup>5</sup> , J/m <sup>2</sup>	217 ± 24	-
K <sub>1c</sub> <sup>5</sup> , MPa·m <sup>1/2</sup>	0.9 ± 0.08	-
RDS DMA Tg <sup>1</sup> , °C *		
G'	-	178
G''	-	189
Tan Delta	-	190
Density, g/cc	1.29	-

<sup>1</sup> Tested at 5°C/minute

<sup>2</sup> Cured at 355°F (179°C) for 6 hours

<sup>3</sup> Wet = 7 days water immersion at 160°F (71°C)

<sup>4</sup> Flexural testing performed using a 3-point loading fixture at a 16:1 S/D ratio

<sup>5</sup> K<sub>1c</sub> and G<sub>1c</sub> tested using 3-point bending mode

\* **NOTE:** Tg data is not applicable for U.S. export control classification or licensing. For export-related information please contact us.

**Table 2 | Typical Prepreg Properties**

**5 Harness Satin (5HS) Standard Modulus Carbon Fiber [33 msi (228 GPa)]**

Typical Cytec Engineered Materials Product Codes: CYCOM 977-3/5HS AS4 6K

Mechanical Property	-65°F (-55°C)	Room Temperature	250°F (121°C)
<b>0° Tensile Properties</b>			
Strength, ksi (MPa)	-	126 ± 24 (869 ± 165)	-
Modulus, msi (GPa)	-	9.8 ± 0.6 (68 ± 4)	-
<b>0° Interlaminar Shear Properties</b>			
Strength, ksi (MPa)	-	13 ± 2 (90 ± 14)	-

**Table 3 | Typical Unidirectional Tape Properties**

**Intermediate Modulus Carbon Fiber [40 msi (276 GPa)]**

Typical Cytec Engineered Materials Product Codes: CYCOM 977-3/IM7 12K

Mechanical Property	-65°F (-55°C)	Room Temperature	250°F (121°C) Wet <sup>1</sup>
<b>0° Tensile Properties</b>			
Strength, ksi (MPa)	-	364 (2510)	-
Modulus, msi (GPa)	-	23.5 (162)	-
Failure Strain, %	-	1.46	-
<b>0° Compression Properties</b>			
Strength, ksi(MPa)	-	244 (1682)	195 (1344)
Modulus, msi (GPa)	-	22.3 (154)	21.2 (146)
<b>0° Flexural Properties</b>			
Strength, ksi (MPa)	-	256 (1765)	162 (1117)
Modulus, msi (GPa)	-	21.7 (150)	21.2 (146)
<b>0° Interlaminar Shear Properties</b>			
Strength, ksi (MPa)	-	18.5 (127.6)	11.4 (78.6)
<b>Compression After Impact<sup>2,3</sup>, ksi (MPa)</b>	-	28 (193.1)	-

<sup>1</sup> Wet = 1 week immersion in 160°F (71°C) water

<sup>2</sup> 25/50/25 orientation

<sup>3</sup> 270 in-lb impact levels

## APPLICATIONS NOTES

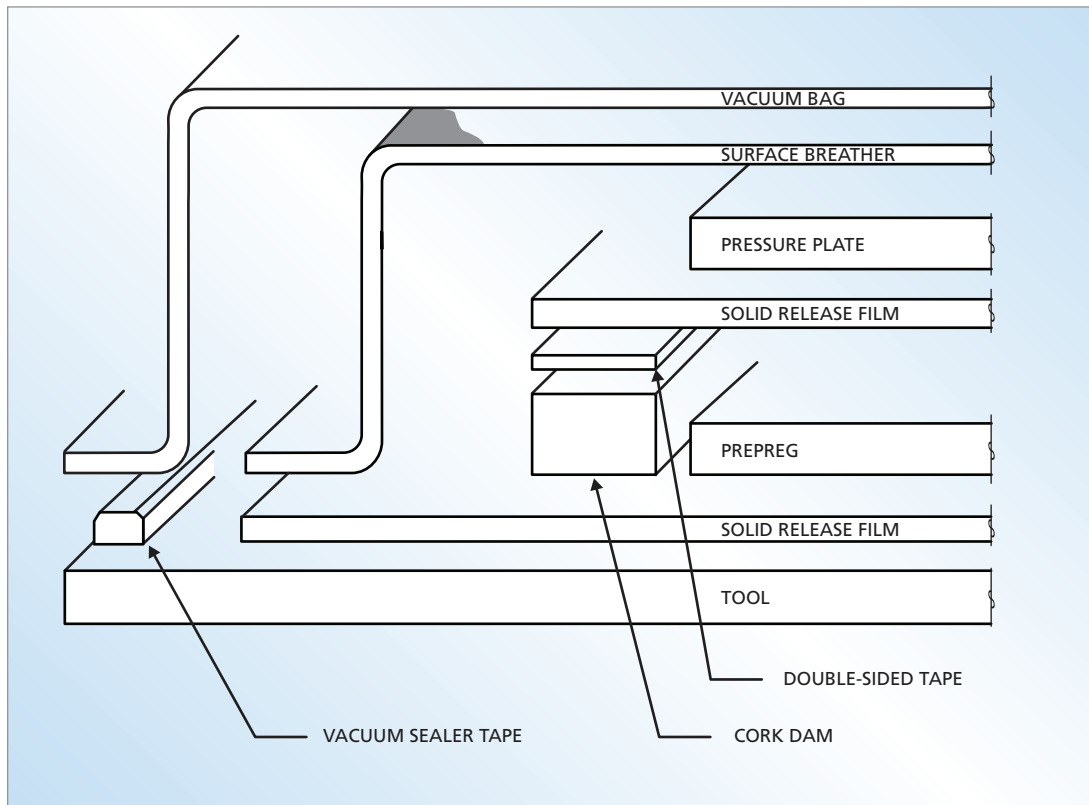
### Preparation for Laminate Curing

Treat surfaces that lay-up will touch with a release agent. As each ply of material is positioned, work out any wrinkles or entrapped air with a paddle or roller before removing backing. Take care not to distort the material during lay-up. Insert a thermocouple into the lay-up near the center ply of the thickest edge section, outside the net trim line.

To eliminate porosity, keep the resin under pressure during cure with the use of a compressible dam. Non-permeable fluorocarbon-coated fabric should be placed over the lay-up to protect the bag system in vacuum or autoclave cures.

Install a vacuum bag by standard techniques. Insert at least two vacuum ports through the bag, connecting one to a vacuum source and the other, at a point furthest away from the source, to a calibrated vacuum gage. Position the part in the oven or autoclave and draw vacuum to check for bag or system leaks. Figure 2 shows the recommended lay-up for CYCOM 977-3 materials.

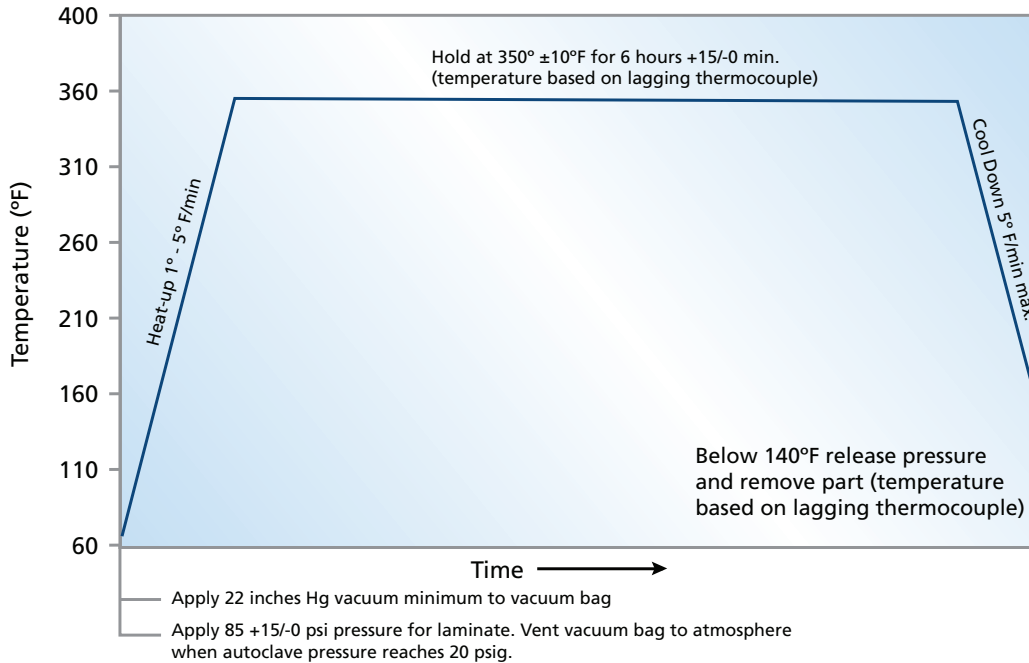
Figure 2 | Recommended Lay-up for CYCOM 977-3



## Recommended Cure Cycles

The following cure cycle is recommended for CYCOM 977-3 materials. Cure cycles should be tailored based on application.

Figure 3 | Recommended Cure Cycle for CYCOM 977-3



## PRODUCT HANDLING AND SAFETY

Cytec Engineered Materials recommends wearing clean, impervious gloves when working with epoxy resin systems to reduce skin contact and to avoid contamination of the product.

Materials Safety Data Sheets (MSDS) and product labels are available upon request and can be obtained from any Cytec Engineered Materials Office.

## DISPOSAL OF SCRAP MATERIAL

Disposal of scrap material should be in accordance with local, state, and federal regulations.

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