



Toray Composite Materials America, Inc.

## 2510 PREPREG SYSTEM

The 2510 prepreg system is specifically formulated for out-of-autoclave (OOA) processing of aerospace primary structures. This prepreg system has excellent all-around structural properties with a high wet and dry Tg while offering low-energy curing (250-270°F, 121-132°C).



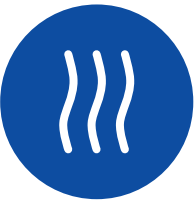
### Industry Material Specification

Product can be purchased to Aerospace Material Specifications 3960, 3914, and 3915.



### Industry Database

FAA approved design allowable values (AGATE methodology), results in a low cost one-batch equivalency.



### High Heat Tolerance

High Tg is suitable for structures exposed to elevated service temperatures.



### Easy Layup

Product allows complex part layup with minimal cuts or ridge lines. It maintains a comparable class A finish through post-cure, minimizing sanding and finishing times.



### Readily Available

Product is in stock and ready to ship.



### Flexible Cure Methods

Curing methods include autoclave or oven cure. Product can be cured with or without using a dwell.



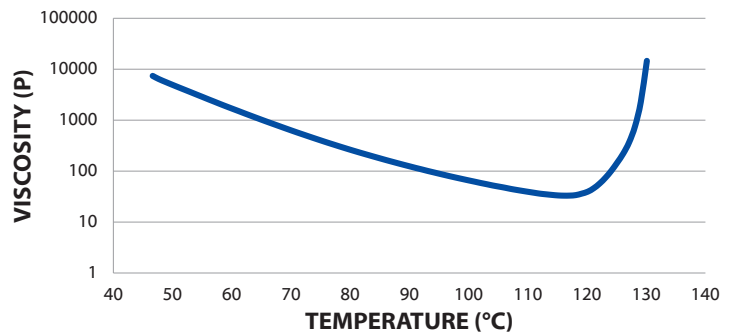
## AVAILABLE PRODUCT FORMATS

| PART NUMBER            | FIBER FORMAT   | FIBER TYPE/STYLE | FAW (GSM) | RC % WEIGHT | ROLL WIDTH    |
|------------------------|----------------|------------------|-----------|-------------|---------------|
| P707AG-15 (AMS 3960)   | Unidirectional | T700G            | 150       | 35          | 39,36,24,12,6 |
| F6273C-07M (AMS 3914)  | Plain Weave    | T700S-12K        | 190       | 42          | 38            |
| FGF7781-07I (AMS 3915) | Glass Fabric   | 7781             | 294       | 38          | 38            |

## NEAT RESIN PHYSICAL PROPERTIES

| PROPERTY        | METHOD     | UNITS                 | VALUE     |
|-----------------|------------|-----------------------|-----------|
| Density         | ASTM D595  | g/cc                  | 1.267     |
| Tg (Dry)        | DMA        | °F (°C)               | 294 (146) |
| Tg (Wet)        | DMA        | °F (°C)               | 267 (131) |
| Gel Time        | ASTM 3532  | Minutes @ 250F (121C) | 8-13      |
| K <sub>1c</sub> | ASTM D5045 | ksi*in <sup>0.5</sup> | 0.72      |

## RESIN VISCOSITY CURVE



## LAMINA/LAMINATE MECHANICAL PROPERTIES: P707AG-15 (OVEN CURE)

| PROPERTY                                  | SYMBOL          | METHOD         | UNITS       | CTA            | RTA         | ETW         |
|---|-----------------|----------------|-------------|----------------|-------------|-------------|
| 0° Tensile Strength                       | F <sub>1t</sub> | ASTM D3039     | Ksi (MPa)   | 244 (1682)     | 315 (2172)  | 328 (2261)  |
| 90° Tensile Strength                      | F <sub>2t</sub> | ASTM D3039     | Ksi (MPa)   | 7.68 (52.9)    | 6.42 (44.3) | 3.76 (25.9) |
| 0° Tensile Modulus                        | E <sub>1t</sub> | ASTM D3039     | Msi (GPa)   | 18.5 (128)     | 18.2 (125)  | 17.7 (122)  |
| 90° Tensile Modulus                       | E <sub>2t</sub> | ASTM D3039     | Msi (GPa)   | 1.31 (9.03)    | 1.22 (8.41) | 0.92 (6.34) |
| 0° Compressive Strength                   | F <sub>1c</sub> | SACMA SRM1R-94 | Ksi (MPa)   | 203 (1400)     | 210 (1448)  | 174 (1200)  |
| 90° Compressive Strength                  | F <sub>2c</sub> | SACMA SRM1R-94 | Ksi (MPa)   | 41.0 (283)     | 28.8 (199)  | 16.9 (117)  |
| 0° Compressive Modulus                    | E <sub>1c</sub> | SACMA SRM1R-94 | Msi (GPa)   | 16.5 (114)     | 16.3 (112)  | 16.9 (117)  |
| 90° Compressive Modulus                   | E <sub>2c</sub> | SACMA SRM1R-94 | Msi (GPa)   | 2.04 (14.1)    | 1.23 (8.48) | 1.15 (7.93) |
| In-Plane Shear Strength @ 5% or Ultimate  | F <sub>12</sub> | ASTM D5379     | Ksi (MPa)   | 23.1 (159)     | 22.4 (154)  | 13.8 (95.1) |
| In-Plane Shear Modulus                    | G <sub>12</sub> | ASTM D5379     | Msi (GPa)   | 0.76 (5.22)    | 0.61 (4.23) | 0.45 (3.12) |
| Short Beam Shear Strength                 | SBS             | ASTM D2344     | Ksi (MPa)   | -              | 12.5 (86.2) | -           |
| Poisson's Ratio                           | ν <sub>12</sub> | ASTM D3039     | -           | 0.35           | 0.31        | 0.32        |
| Open Hole Tension Strength (25/50/25)     | OHT             | ASTM D5766     | Ksi (MPa)   | -              | 50.5 (348)  | 64.1 (442)  |
| Open Hole Compression Strength (25/50/25) | OHC             | ASTM D6484     | Ksi (MPa)   | -              | 40.1 (276)  | 35.8 (247)  |
| Compression After Impact (25/50/25)       | CAI             | -              | Ksi (MPa)   | -              | 19.8 (137)  | -           |
| Laminate Density                          | ρ               | ASTM D792      | g/cc        | 1.517          |             |             |
| Fiber Volume Fraction                     | V <sub>f</sub>  | ASTM D3171     | %           | 54.4           |             |             |
| Cured Ply Thickness                       | CPT             | -              | Inches (mm) | 0.0060 (0.152) |             |             |

Tension and compression values are normalized to the indicated V<sub>f</sub> herein.

Please refer to SDS for handling and disposal.

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## LAMINA/LAMINATE MECHANICAL PROPERTIES: F6273C-07M (OVEN CURE)

| PROPERTY                                  | SYMBOL     | METHOD         | UNITS       | CTA            | RTA         | ETW         |
|---|------------|----------------|-------------|----------------|-------------|-------------|
| 0° Tensile Strength                       | $F_{1t}$   | ASTM D3039     | Ksi (MPa)   | 116 (803)      | 132 (912)   | 152 (1049)  |
| 90° Tensile Strength                      | $F_{2t}$   | ASTM D3039     | Ksi (MPa)   | 105 (722)      | 112 (772)   | 129 (892)   |
| 0° Tensile Modulus                        | $E_{1t}$   | ASTM D3039     | Msi (GPa)   | 8.29 (57.1)    | 8.09 (55.8) | 8.40 (57.9) |
| 90° Tensile Modulus                       | $E_{2t}$   | ASTM D3039     | Msi (GPa)   | 8.17 (56.4)    | 8.12 (56.0) | 7.87 (54.2) |
| 0° Compressive Strength                   | $F_{1c}$   | SACMA SRM1R-94 | Ksi (MPa)   | 109 (750)      | 103 (709)   | 68.7 (474)  |
| 90° Compressive Strength                  | $F_{2c}$   | SACMA SRM1R-94 | Ksi (MPa)   | 108 (742)      | 101 (698)   | 69.4 (479)  |
| 0° Compressive Modulus                    | $E_{1c}$   | SACMA SRM1R-94 | Msi (GPa)   | 7.94 (54.8)    | 7.97 (54.9) | 7.94 (54.7) |
| 90° Compressive Modulus                   | $E_{2c}$   | SACMA SRM1R-94 | Msi (GPa)   | 7.07 (48.7)    | 7.74 (53.4) | 7.93 (54.7) |
| In-Plane Shear Strength @ 5% or Ultimate  | $F_{12}$   | ASTM D5379     | Ksi (MPa)   | 22.5 (155)     | 19.2 (133)  | 10.8 (74.6) |
| In-Plane Shear Modulus                    | $G_{12}$   | ASTM D5379     | Msi (GPa)   | 0.62 (4.30)    | 0.61 (4.21) | 0.46 (3.17) |
| Short Beam Shear Strength                 | SBS        | ASTM D2344     | Ksi (MPa)   |                | 8.7 (60)    |             |
| Poisson's Ratio                           | $\nu_{12}$ | ASTM D3039     | -           | 0.09           | 0.04        | 0.03        |
| Open Hole Tension Strength (25/50/25)     | OHT        | ASTM D5766     | Ksi (MPa)   | -              | 49.3 (340)  | 57.5 (396)  |
| Open Hole Compression Strength (25/50/25) | OHC        | ASTM D6484     | Ksi (MPa)   | -              | 38.7 (267)  | 32.9 (227)  |
| Compression After Impact (25/50/25)       | CAI        | -              | Ksi (MPa)   | -              | 26.9 (185)  | -           |
| Laminate Density                          | $\rho$     | ASTM D792      | g/cc        | 1.502          |             |             |
| Fiber Volume Fraction                     | $V_f$      | ASTM D3171     | %           | 49.6           |             |             |
| Cured Ply Thickness                       | CPT        | -              | Inches (mm) | 0.0086 (0.218) |             |             |

Tension and compression values are normalized to the indicated  $V_f$  herein.

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Updated October 4, 2017

## LAMINA/LAMINATE MECHANICAL PROPERTIES: FGF7781-07I (OVEN CURE)

| PROPERTY                                  | SYMBOL     | METHOD         | UNITS       | CTA            | RTA          | ETW          |
|---|------------|----------------|-------------|----------------|--------------|--------------|
| 0° Tensile Strength                       | $F_{1t}$   | ASTM D3039     | Ksi (MPa)   | 81.1 (559)     | 64.1 (442)   | 49.3 (340)   |
| 90° Tensile Strength                      | $F_{2t}$   | ASTM D3039     | Ksi (MPa)   | 62.8 (433)     | 50.4 (347)   | 42.4 (292)   |
| 0° Tensile Modulus                        | $E_{1t}$   | ASTM D3039     | Msi (GPa)   | 3.696 (25.5)   | 3.424 (23.6) | 3.149 (21.7) |
| 90° Tensile Modulus                       | $E_{2t}$   | ASTM D3039     | Msi (GPa)   | 3.52 (24.2)    | 3.30 (22.7)  | 2.93 (20.2)  |
| 0° Compressive Strength                   | $F_{1c}$   | SACMA SRM1R-94 | Ksi (MPa)   | 88.4 (609)     | 76.2 (526)   | 50.9 (351)   |
| 90° Compressive Strength                  | $F_{2c}$   | SACMA SRM1R-94 | Ksi (MPa)   | 78.8 (543)     | 65.4 (451)   | 43.1 (297)   |
| 0° Compressive Modulus                    | $E_{1c}$   | SACMA SRM1R-94 | Msi (GPa)   | 3.87 (26.7)    | 3.82 (26.4)  | 3.52 (24.3)  |
| 90° Compressive Modulus                   | $E_{2c}$   | SACMA SRM1R-94 | Msi (GPa)   | 3.69 (25.4)    | 3.61 (24.9)  | 3.37 (23.2)  |
| In-Plane Shear Strength @ 5% or Ultimate  | $F_{12}$   | ASTM D5379     | Ksi (MPa)   | 23.7 (164)     | 18.4 (127)   | 11.6 (80.3)  |
| In-Plane Shear Modulus                    | $G_{12}$   | ASTM D5379     | Msi (GPa)   | 0.72 (4.96)    | 0.63 (4.37)  | 0.46 (3.15)  |
| Short Beam Shear Strength                 | SBS        | ASTM D2344     | Ksi (MPa)   | -              | 8.7 (60)     | -            |
| Poisson's Ratio                           | $\nu_{12}$ | ASTM D3039     | -           | 0.16           | 0.14         | 0.12         |
| Open Hole Tension Strength (25/50/25)     | OHT        | ASTM D5766     | Ksi (MPa)   | -              | 24.8 (171)   | 20.7 (143)   |
| Open Hole Compression Strength (25/50/25) | OHC        | ASTM D6484     | Ksi (MPa)   | -              | 36.3 (250)   | 27.9 (192)   |
| Laminate Density                          | $\rho$     | ASTM D792      | g/cc        | 1.805          |              |              |
| Fiber Volume Fraction                     | $V_f$      | ASTM D3171     | %           | 44.9           |              |              |
| Cured Ply Thickness                       | CPT        | -              | Inches (mm) | 0.0104 (0.264) |              |              |

Tension and compression values are normalized to the indicated  $V_f$  herein.

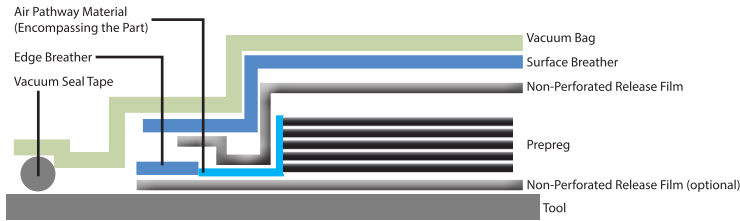
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**BAGGING PROCEDURE**



**STORAGE LIFE**

|              |                    |
|--------------|--------------------|
| Out Life*    | 28 days @ 72 °F    |
| Freezer Life | 24 months @ <10 °F |

\*Tack and drape is optimum at 72F and 65% RH

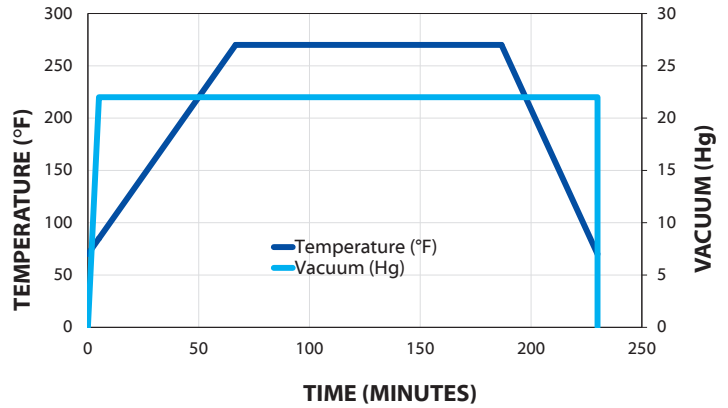
**CURE CYCLE – OVEN (THIN LAMINATE)**

1. De-bulk every four plies, or as needed, when laying up material.
2. Apply a minimum 22” Hg (74.5 kPa) vacuum. Higher vacuum levels will yield better results.
3. Leak check the vacuum before beginning the cure cycle. The leak rate shall be less than 2.0 inches of Hg (7 kPa) over 5 minutes.
4. For optimum results, keep the part under vacuum for 16+ hours before the oven cure. This promotes the extraction of trapped air and gases, producing a lower void content.
5. Ramp to 270 ± 10°F at 1-5°F/min (132 ± 5°C at 0.6-2.8°C/min) and hold for 120 minutes.
6. Cool temperature down to 130°F at max rate of 5°F/min (54°C at 2.8°C/min).

**CURE CYCLE – OVEN (THICK LAMINATE)**

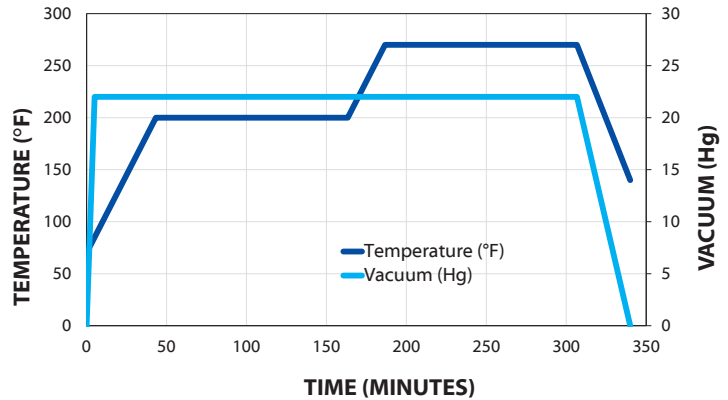
1. De-bulk every four plies, or as needed, when laying up material.
2. Apply a minimum 22” Hg (74.5 kPa) vacuum. Higher vacuum levels will yield better results.
3. Leak check the vacuum before beginning the cure cycle. The leak rate shall be less than 2.0 inches of Hg (7 kPa) over 5 minutes.
4. For optimum results, keep the part under vacuum for 16+ hours before the oven cure. This promotes the extraction of trapped air and gases, producing a lower void content.
5. Ramp to 200 ± 10°F at 1-5°F/min (88 ± 5°C at 0.6-2.8°C/min) and hold for 90 minutes.
6. Ramp to 270 ± 10°F at 1-5°F/min (132 ± 5°C at 0.6-2.8°C/min) and hold for 120 minutes.
7. Cool temperature down to 130°F at max rate of 5°F/min (54°C at 2.8°C/min).

**RECOMMENDED OVEN CURE CYCLE (270°F)**



Cure temp: 270°F  
Cure time: 120 minutes  
Ramp Rate: 3°F/minutes  
Vacuum: 22 in Hg (minutes)

**RECOMMENDED THICK LAMINATE CURE CYCLE**



Cure temp: 270°F  
Cure time: 120 minutes  
Ramp Rate: 3°F/minutes  
Vacuum: 22 in Hg (minutes)

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