
# Advanced General Aviation Transport Experiments

## B – Basis Design Allowables for Epoxy – Based Prepreg

## Fiberite Graphite Unitape G30-500 12K / 7740

***AGATE-WP3.3-033051-101***

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# 1.0 INTRODUCTION

## 1.1 Scope

The test methods and results described in this document are intended to provide basic composite properties essential to most methods of analysis. These properties are considered to provide the initial base of the “building block” approach. Additional coupon level tests and subelement tests may be required to fully substantiate the full-scale design.

The test methods and results contained in this document are consistent with MIL-HDBK-17-1E,2D,3E - Military Handbook for Polymer Matrix Composites. All material, specimens, fixtures and test results contained within this document were traceable and conformed by the Federal Aviation Administration (FAA). It should be noted that before application of the basis values presented in this document to design, demonstration of the ability to consistently produce equivalent material properties as that evaluated during this program should be substantiated through an acceptable test program.

## 1.2 Symbols Used

| | |
|---|---|
| $\nu_{12}^{tu}$ | major Poisson's ratio, tension |
| $\mu\varepsilon$ | micro-strain |
| $E_1^c$ | compressive modulus, longitudinal |
| $E_1^t$ | tensile modulus, longitudinal |
| $E_2^c$ | compressive modulus, transverse |
| $E_2^t$ | tensile modulus, transverse |
| $F_{12}^{su}$ | in – plane shear strength |
| $F_{13}^{su}$ | apparent interlaminar shear strength |
| $F_1^{cu}$ | compressive strength, longitudinal |
| $F_1^{tu}$ | tensile strength, longitudinal |
| $F_2^{cu}$ | compressive strength, transverse |
| $F_2^{tu}$ | tensile strength, transverse |
| $G_{12}^s$ | in – plane shear modulus |

**Superscripts**

| | |
|---|---|
| c | compression |
| cu | compression ultimate |
| s | shear |
| su | shear ultimate |
| t | tension |
| tu | tension ultimate |

**Subscripts**

| | |
|---|---|
| 1 | 1 – axis; longitudinal<br>(parallel to warp direction of reinforcement) |
| 2 | 2 – axis; transverse<br>(parallel to fill direction of reinforcement) |
| 12 | in – plane shear |
| 13 | interlaminar shear (apparent) |

## 1.3 Acronyms and Definitions

| | |
|---|---|
| A – Basis | 95% lower confidence limit on the first population percentile |
| AGATE | Advanced General Aviation Transport Experiments |
| ASTM | American Society for Testing and Materials |
| B – Basis | 95% lower confidence limit on the tenth population percentile |
| C. V. | coefficient of variation |
| CTD | cold temperature dry |
| CPT | cured ply thickness |
| DMA | dynamic mechanical analysis |
| dry | specimen tested with an “as fabricated” moisture content |
| ETD | elevated temperature dry |
| ETW | elevated temperature wet |
| FAR | Federal Aviation Regulations |
| FAW | fiber areal weight |
| Gr/Ep | Graphite/Epoxy |
| NASA | National Aeronautics and Space Administration |
| RTD | room temperature dry |
| SACMA | Suppliers of Advanced Composite Materials Association |
| SRM | SACMA Recommended Method |
| $T_g$ | glass transition temperature |
| $t_{ply}$ | cured ply thickness |
| wet | specimen tested with an equilibrium moisture content per section 1.5.2 |

## 1.4 References

### ASTM Standards

| | |
|---|---|
| D3039-95 | Tensile Properties of Polymer Matrix Composite Materials |
| D5379-93 | Shear Properties of Composite Materials by the V-Notched Beam Method |
| D2344-89 | Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short – Beam Method |
| D792-91 | Density and Specific Gravity (Relative Density) of Plastics by Displacement |
| D2734-94 | Void Content of Reinforced Plastics |
| D3171-90 | Fiber Content of Resin – Matrix Composites by Matrix Digestion |
| D695-91 | Compressive Properties of Rigid Plastics |

### SACMA Standards

| | |
|---|---|
| SRM 1-94 | Compressive Properties of Oriented Fiber-Resin Composites |
| SRM 8-94 | Short Beam Shear Strength of Oriented Fiber-Resin Composites |
| SRM 18-94 | Glass Transition Temperature ($T_g$) Determination by DMA of Oriented Fiber-Resin Composites |

### Other Documents

FAA Document DOT/FAA/AR-00/47: Material Qualification and Equivalency for Polymer Matrix Composite Material Systems, J.S. Tomblin, Y.C. Ng and K.S. Raju, 2001.

MIL-HDBK-17 1E, 2D, 3E – Military Handbook for Polymer Matrix Composites

Cessna Aircraft Company, Document # 98-87-005: B-Basis Design Allowables Test Plan for Preimpregnated Carbon/Epoxy Broadgoods, Revision B, January 1999.

## 1.5 Methodology

### 1.5.1 Test Matrix

Testing was performed according to the test methods delineated in the test matrix, with modifications as referenced in the AGATE report, *Material Qualification and Equivalency for Polymer Matrix Composite Material Systems*. The test matrix for properties included in this document is listed on the next page, with the following notation cited in each column:

**# x #**

where the first # represents the required number of prepreg batches, defined as: Prepreg containing G30-500 12K graphite fibers from one mill roll, impregnated with one batch of resin in one continuous manufacturing operation with traceability to all components. The second # represents the required number of replicates per prepreg batch. For example, “3 x 6” refers to three prepreg batches of material and six specimens per prepreg batch for a total requirement of 18 test specimens.

**Table 1.5.1: Test Matrix and Standards Used**

| TEST | METHOD | NO. OF REPLICATES PER TEST CONDITION | | | |
|---|---|---|---|---|---|
| | | CTD[1,5] | RTD[2,5] | ETW[3] | ETD[4,5] |
| $0^o$ (warp) Tension Strength | ASTM D3039-95 | 1x4 | 3x4 | 3x4 | 3x4 |
| $0^o$ (warp) Tension Modulus, Strength and Poisson's Ratio | ASTM D3039-95 | 1x2 | 3x2 | 3x2 | 3x2 |
| $90^o$ (fill) Tension Strength | ASTM D3039-95 | 1x4 | 3x4 | 3x4 | 3x4 |
| $90^o$ (fill) Tension Modulus and Strength | ASTM D3039-95 | 1x2 | 3x2 | 3x2 | 3x2 |
| $0^o$ (warp) Compression Strength | SACMA SRM 1-94 | 1x6 | 3x6 | 3x6 | 3x6 |
| $0^o$ (warp) Compression Modulus | SACMA SRM 1-94 | 1x2 | 3x2 | 3x2 | 3x2 |
| $90^o$ (fill) Compression Strength | SACMA SRM 1-94 | 1x6 | 3x6 | 3x6 | 3x6 |
| $90^o$ (fill) Compression Modulus | SACMA SRM 1-94 | 1x2 | 3x2 | 3x2 | 3x2 |
| In-Plane Shear Strength | ASTM D5379-93 | 1x4 | 3x4 | 3x4 | 3x4 |
| In-Plane Shear Modulus and Strength | ASTM D5379-93 | 1x2 | 3x2 | 3x2 | 3x2 |
| Short Beam Shear | ASTM D2344-89 | -- | 3x6 | -- | -- |
| Fiber Volume | ASTM D3171-90 | One sample per panel | | | |
| Resin Volume | ASTM D3171-90 | One sample per panel | | | |
| Void Content | ASTM D2734-94 | One sample per panel | | | |
| Cured Neat Resin Density | --- | Supplied by manufacturer for material | | | |
| Glass Transition Temperature | SACMA SRM 18-94 | 3 dry, 3 wet per prepreg lot | | | |

**Notes :**

1 CTD: One prepreg lot of material tested (test temperature = -65 $\pm$ $5^o$ F, moisture content = as fabricated, soak time at –65 was 3 min.)

2 RTD: Three prepreg lots of material tested (test temperature = 70 $\pm$ $10^o$ F, moisture content = as fabricated)

3 ETW: Three prepreg lots of material tested (test temperature = 180 $\pm$ $5^o$ F, moisture content = equilibrium per section 1.5.2, soak time at 180 was 60 sec.)

4 ETD: Three prepreg lots of material tested (test temperature = 180 $\pm$ $5^o$ F, moisture content = as fabricated, soak time at 180 was 60 sec.)

5 Dry specimens are "as fabricated" specimens that have been maintained at ambient conditions in an environmentally controlled laboratory.

### 1.5.2 Environmental Conditioning

All 'wet' conditioned samples were exposed to elevated temperature and humidity conditions to establish moisture saturation of the material. Specimens were exposed to 85 ± 5 % relative humidity and 145 ± 5 °F until an equilibrium moisture weight gain of traveler, or witness coupons (1" x 1" x specimen thickness) was achieved. ASTM D5229 and SACMA SRM 11 were used as guidelines for environmental conditioning and moisture absorption.

Effective moisture equilibrium was achieved when the average moisture content of the traveler specimen changed by less than 0.05% for two consecutive readings within a span of 7 ± 0.5 days and was expressed by:

$$\frac{W_i - W_{i-1}}{W_b} < 0.0005$$

where $W_i$ = weight at current time
$W_{i-1}$ = weight at previous time
$W_b$ = baseline weight prior to conditioning

It is common to see small fluctuations in an unfitted plot of the weight gain vs. time curve. There were no fluctuations that made significant errors in results or caused rejection in the moisture equilibrium criteria. Once the traveler coupons passed the criteria for two consecutive readings, the samples were removed from the environmental chamber and placed in a sealed bag with a moist paper or cotton towel for a maximum of 14 days until mechanical testing. Strain gauged specimens were removed from the controlled environment for a maximum of 2 hours for application of gages in ambient laboratory conditions.

### 1.5.3 Fluid Sensitivity Screening

All 'wet' conditioned samples were exposed to elevated temperature and humidity conditions to establish moisture saturation of the material. Specimens were exposed to 85 ± 5 % relative humidity and 145 ± 5 °F until an equilibrium moisture weight gain of traveler, or witness coupons (1" x 1" x specimen thickness) was achieved. ASTM D5229 and SACMA SRM 11 were used as guidelines for environmental conditioning and moisture absorption.

Effective moisture equilibrium was achieved when the average moisture content of the traveler specimen changed by less than 0.05% for two consecutive readings within a span of 7 ± 0.5 days and was expressed by:

$$\frac{W_i - W_{i-1}}{W_b} < 0.0005$$

where $W_i$ = weight at current time
$W_{i-1}$ = weight at previous time
$W_b$ = baseline weight prior to conditioning

It is common to see small fluctuations in an unfitted plot of the weight gain vs. time curve. There were no fluctuations that made significant errors in results or caused rejection in the moisture equilibrium criteria. Once the traveler coupons passed the criteria for two consecutive readings, the samples were removed from the environmental chamber and placed in a sealed bag with a moist paper or cotton towel for a maximum of 14 days until mechanical testing. Strain gauged specimens were removed from the controlled environment for a maximum of 2 hours for application of gages in ambient laboratory conditions.

### 1.5.4 Normalization Procedures

The normalization procedure attempts to reduce variability in fiber-dominated material properties by adjusting raw test values to a specified fiber volume content. Only the following properties were normalized:

- 0° (warp)Tensile Strength and Modulus
- 0° (warp)Compression Strength and Modulus

The normalization procedure was adopted from MIL-HDBK-17-1E, section 2.4.3.3. The procedure which was used to normalize the data is based on two primary assumptions:

- The relationship between fiber volume fraction and ultimate laminate strength is linear over the entire range of fiber/resin ratios. (It neglects the effects of resin starvation at high fiber contents.)
- Fiber volume is not commonly measured for each test sample, so this method accounts for the fiber volume variation between individual test specimens by utilizing a relationship between fiber volume fraction and laminate cured ply thickness. This relationship is virtually linear in the 0.45 to 0.65 fiber volume fraction range.

Additional information is detailed in FAA Document DOT/FAA/AR-00/47: Material Qualification and Equivalency for Polymer Matrix Composite Material Systems. For all

normalized data contained in this document, the test values are normalized by cured ply thickness according to:

$$Normalized\ \ Value = Test\ Value \times \frac{CPT_{specimen}}{CPT_{normalizing}}$$

where:

$$CPT_{specimen} = \frac{Average\ \ Sample\ Thickness}{\#\ of\ \ plies}$$

### 1.5.5 Statistical Analysis

When compared to metallic materials, fiber reinforced composite materials exhibit a high degree of material property variability. This variability is due to many factors, including but not limited to: raw material and prepreg manufacture, material handling, part fabrication techniques, ply stacking sequence, environmental conditions, and testing techniques. This inherent variability drives up the cost of composite testing and tends to render smaller data sets than those produced for metallic materials. This necessitates the usage of statistical techniques for determining reasonable design allowables for composites.

The analyses and design allowable generation for both A and B basis values were performed using the procedure detailed in section 5.3 of FAA Document DOT/FAA/AR-00/47: Material Qualification and Equivalency for Polymer Matrix Composite Material Systems.

### 1.5.6 Material Performance Envelope and Interpolation

Using the B-basis numbers, a material performance envelope may be generated for the material system by plotting these values as a function of temperature. Figure 1.5.1 shows an example material performance envelope using B-basis values.

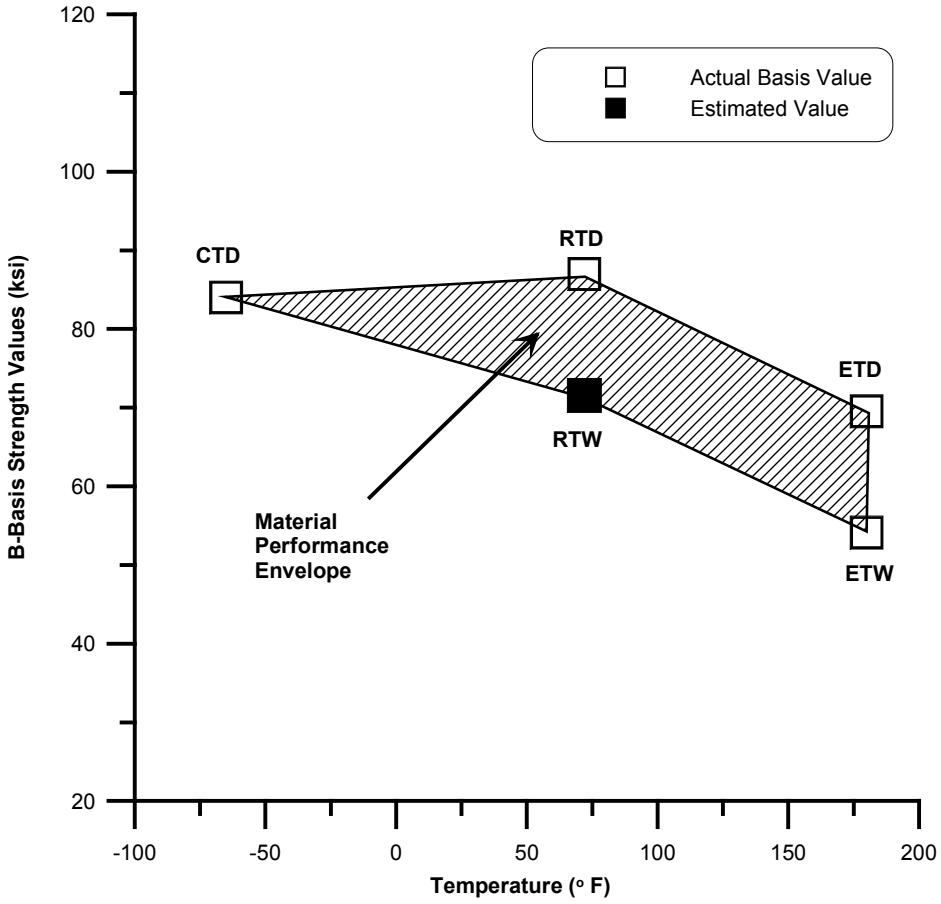



**Figure 1.5.1 Material performance envelope.**

Since each specific aircraft application of the qualified material may have different Material Operational Limits (MOL) than those tested in the material qualification (which is usually the upper limit), some applications may require a reduced MOL. In this case, simple linear interpolation may be used to obtain the corresponding basis values at the new application MOL.

This interpolation may be accomplished using the following simple relationships assuming $T_{RTD} < T_{MOL} < T_{ETD}$ :

For the corresponding MOL "dry" basis value, the "interpolated" basis value using the qualification data is

$$B_{MOL} = B_{RTD} - \frac{(B_{RTD} - B_{ETD})(T_{RTD} - T_{MOL})}{(T_{RTD} - T_{ETD})}$$

where $B_{MOL}$ = new application basis value interpolated to $T_{MOL}$

$B_{RTD}$ = basis RTD strength value
$B_{ETD}$ = basis ETD strength value
$T_{RTD}$ = RTD test temperature
$T_{ETD}$ = ETD test temperature
$T_{MOL}$ = new application MOL temperature

For the corresponding MOL "wet" basis value, an estimated Room Temperature Wet (RTW) value must be calculated. This may be accomplished by the simple relation

$$B_{RTW} = B_{RTD} - (B_{ETD} - B_{ETW})$$

The "interpolated" wet basis value using the qualification data may then be obtained by

$$B_{MOL} = B_{RTW} - \frac{(B_{RTW} - B_{ETW})(T_{RTW} - T_{MOL})}{(T_{RTW} - T_{ETW})}$$

where:
$B_{MOL}$ = new application basis value interpolated to $T_{MOL}$
$B_{RTW}$ = estimated basis RTW strength value
$B_{ETW}$ = basis ETW strength value
$T_{RTW}$ = RTW (i.e., RTD) test temperature
$T_{ETW}$ = ETW test temperature
$T_{MOL}$ = new application MOL temperature

These equations may also be used for interpolated mean strengths as well as A-basis values with the appropriate substitutions. It should be noted that because unforeseen material property drop-offs with respect to temperature and environment can occur, *extrapolation* to a higher MOL should not be attempted without additional testing and verification. In addition, the interpolation equations shown above are practical for materials obeying *typical* mechanical behavior. In most cases, some minimal amount of testing may also be required to verify the interpolated values.

#### 1.5.6.1 Interpolation Example

This section provides an example of linear interpolations to a specific application environment less than the tested upper material limit used in qualification. Assuming a specific application environment of 150° F, Figure 1.5.2 depicts the linear interpolation of the B-basis design allowable to this environment. Using the above equations along with the nominal testing temperatures (see Table 1.5.1), the interpolated basis values at 150° F become

ETD : $B_{MOL}$ = 75.106 ksi

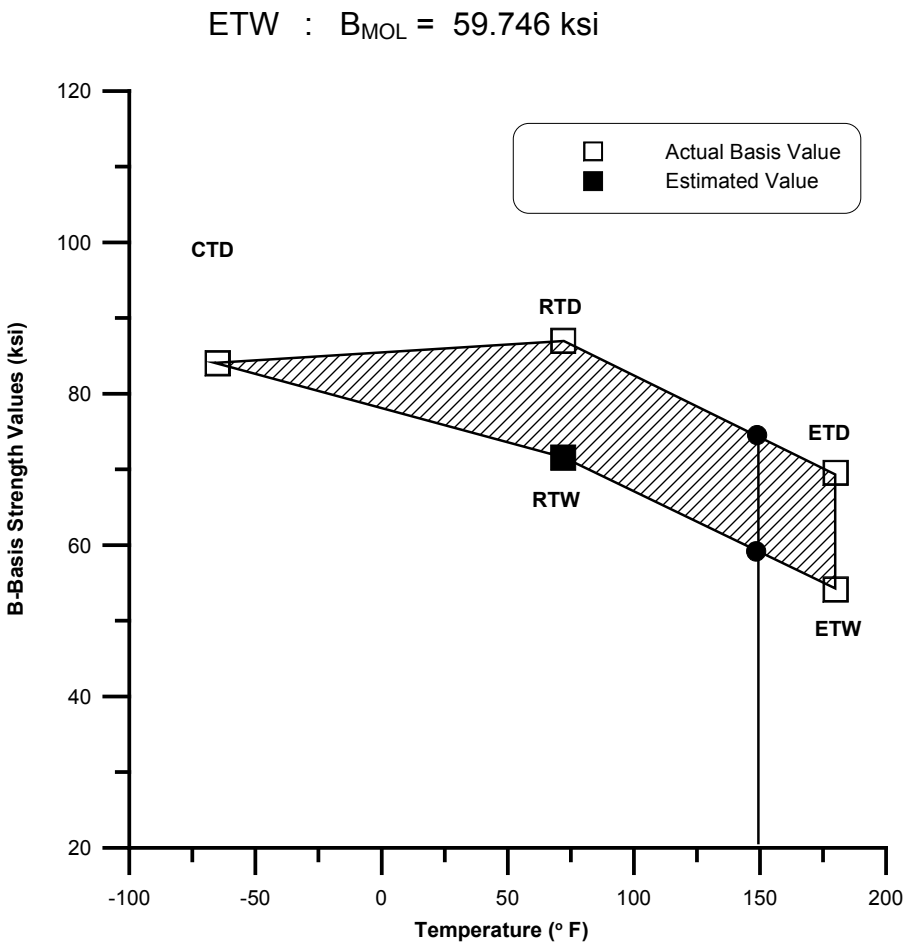



**Figure 1.5.2 Example of 150° F interpolation for B-basis values.**

# 2.0 FIBERITE G30-500 12K / 7740 PREPREG PROPERTIES

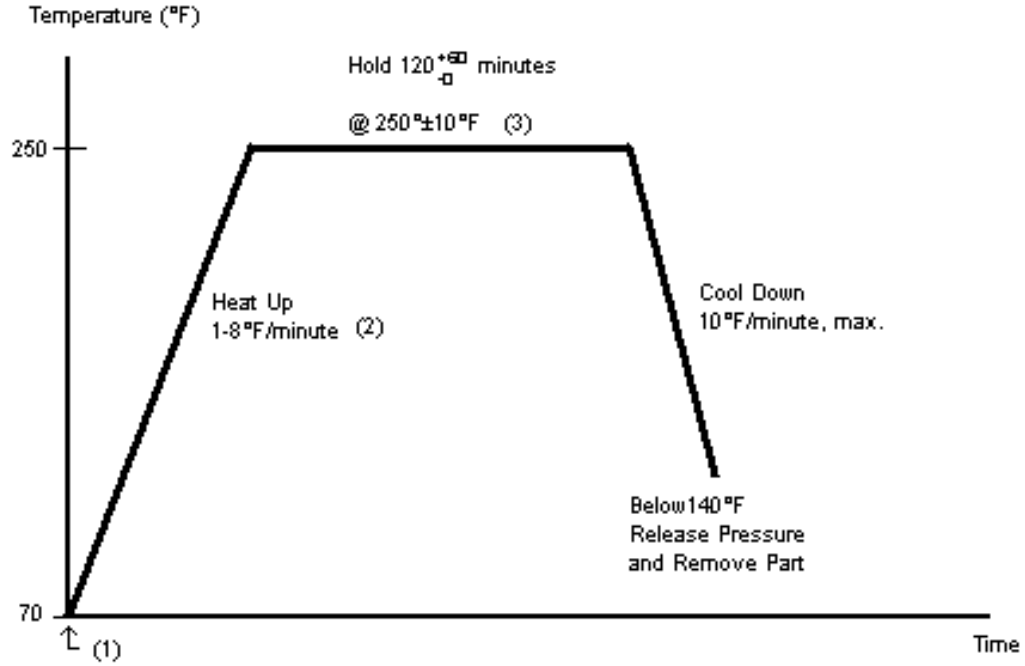
### 2.1 Prepreg Documentation by Prepreg Lot

| **Prepreg Documentation** | **Prepreg Manufacturer & Product ID:**<br>**HyE 7740/G30-500 12K UNI-145-12"**<br>**Impregnation Method: Solvent** | | |
|---|---|---|---|
| Prepreg Batch or Lot # | **370744** | **370746** | **370748** |
| Batch (Lot) ID as labeled on samples | **1** | **2** | **3** |
| Date of Manufacture | **11-13-97** | **11-13-97** | **11-13-97** |
| Expiration Date | **5-13-97** | **5-13-97** | **5-13-97** |
| Resin Content [%] | **35** | **34** | **36** |
| Reinforcement Areal Weight & Test Method | **144 g/sq m** | **145 g/sq m** | **149 g/sq m** |
| Resin Flow & Test Conditions | **16%** | **16%** | **16%** |
| Gel Time & Test Conditions | **4 min @ 177 C** | **3 min @ 177 C** | **3 min @ 177 C** |
| Volatile Content | **0.3 %** | **0.1%** | **0.3%** |
| **Reinforcement Documentation** | **Fiber/Fabric Manufacturer & Product ID:**<br>**BESFIGHT® 30-500 / 12K HTA-7C EP03**<br>**Precursor Type: PAN**<br>**Nominal Filament Count: 12K**<br>**Finish/Sizing Type and %: EP03, 1.24-1.25%**<br>**Nominal tow or yarn count/inch: 08.1 g/m**<br>**Twist: never twisted.** | | |
| Fabric Batch or Lot # | **7035122** | **7035122** | **7045122** |
| Sizing weight, % | **1.24** | **1.24** | **1.25** |
| Date of Manufacture | **8-1-97** | **8-1-97** | **8-1-97** |
| Average Fiber Density per Lot & Test Method | **1.75 g/cc** | **1.75 g/cc** | **1.75 g/cc** |
| **Matrix Documentation** | **Resin Manufacturer & Product ID:** | | |
| Matrix Batch or Lot # | **370744** | **370746** | **370748** |
| Date of Manufacture | **11-5-97** | **11-5-97** | **11-5-97** |
| Average Neat Resin Density by Lot & Test Method | **1.27 g/ccm** | **1.27 g/ccm** | **1.27 g/ccm** |

## 2.2 Process Specification

This specification does not address issues relating to safety, quality control, bagging material selection, bagging procedure, tool preparation, or equipment selection. Although these may affect overall part quality, it is the responsibility of the end user to develop procedures related to these issues in a manner that produces parts with high quality and consistency.

The following autoclave cure procedures are excerpts from Cessna process specification CSAC005. The exception to this specification is the cure cycle and ply orientation tolerance. The cure cycle for panel fabrication is 250°F, ±10°: for 120 minutes, +60, -0; 45 psi, ±5. Individual ply orientation is ±2° with respect to the tooled reference edge. The detailed cure cycle procedure is given below. All test specimens were cured per this specification by Cessna Aircraft Company. However, the effects of the upper and lower limits of vacuum, temperature, cure time, heat-up rate and hold temperature on the mechanical and thermal properties




have not been investigated.

(1) Apply 22 in-Hg of vacuum minimum to vacuum bag. Initiate autoclave pressure 3 psi/minute minimum, vent bag at 20±10 psig. Final vessel pressure 45±5 psi.
(2) From 230°F to 240°F, a minimum heat up rate of 0.3°F/minute is acceptable.
(3) All thermocouples shall be at temperature

# 3.0 FIBERITE G30-500 12K / 7740 LAMINATE PROPERTIES

## 3.1 Test Results

### 3.1.1 Summary

| | | |
|---|---|---|
| **MATERIAL:** | Fiberite 7740/G30-500 12K Graphite Unitape | **7740/G30-500 12K Summary** |
| **PREPREG:** | Fiberite HyE 7740/G30-500 12K UNI-145-12" | |
| **FIBER:** | Celion BESFIGHT® 30-500/12K HTA-7C EP03 | **RESIN:** Fiberite Hy-E 7740 |
| **$T_g$ (dry):** 254.50 °F | **$T_g$ (wet):** 226.00 °F | **$T_g$ METHOD:** DMA (SRM 18-94) |
| **PROCESSING:** | Autoclave cure: 250±10°F for 120+60,–0 min. @ 45±5 psi | |

| | | | |
|---|---|---|---|
| **Date of fiber manufacture** | 8/1/97 | **Date of testing** | 2/8/99 - 4/21/99 |
| **Date of resin manufacture** | 11/5/97 | **Date of data submittal** | 8/99 |
| **Date of prepreg manufacture** | 11/13/97 | **Date of analysis** | 2/9/99 - 4/21/99 |
| **Date of composite manufacture** | 2/17/98 – 3/12/98 | | |

**LAMINA MECHANICAL PROPERTY SUMMARY**
**Data Reported as: Measured**
**(Normalized by CPT=0.0057 in)**

| | CTD | | RTD | | ETD | | ETW | |
|---|---|---|---|---|---|---|---|---|
| | **B-Basis** | **Mean** | **B-Basis** | **Mean** | **B-Basis** | **Mean** | **B-Basis** | **Mean** |
| **$F_1^{tu}$ (ksi)** | 275.01 (283.37) | 328.48 (334.44) | 268.50 (274.46) | 312.50 (316.23) | 265.81 (272.40) | 309.10 (313.59) | 264.72 (271.48) | 305.83 (310.66) |
| **$E_1^t$ (Msi)** | --- | 21.12 (21.48) | --- | 18.76 (19.06) | --- | 18.70 (19.02) | --- | 18.79 (18.87) |
| **$\nu_{12}^{tu}$** | --- | 0.456 | --- | 0.322 | --- | 0.318 | --- | 0.342 |
| **$F_2^{tu}$ (ksi)** | 4.52 | 6.92 | 3.99 | 5.65 | 3.78 | 5.35 | 2.78 | 3.90 |
| **$E_2^t$ (Msi)** | --- | 1.47 | --- | 1.26 | --- | 1.06 | --- | 1.03 |
| **$F_1^{cu}$ (ksi)** | 167.33 (163.43) | 201.21 (197.33) | 156.19 (156.00) | 184.25 (184.69) | 154.62 (152.73) | 182.40 (180.83) | 120.47 (121.14) | 141.04 (142.31) |
| **$E_1^c$ (Msi)** | --- | 18.57 (17.98) | --- | 18.96 (18.62) | --- | 18.17 (17.89) | --- | 18.99 (18.57) |
| **$F_2^{cu}$ (ksi)** | 30.66 | 34.94 | 27.76 | 31.06 | 18.23 | 20.39 | 15.83 | 17.62 |
| **$E_2^c$ (Msi)** | --- | 1.84 | --- | 1.60 | --- | 1.32 | --- | 1.19 |
| **$F_{12}^{su}$ (ksi)** | 23.11 | 26.12 | 17.84 | 19.80 | 12.49 | 13.91 | 11.23 | 12.43 |
| **$G_{12}^s$ (Msi)** | --- | 0.74 | --- | 0.67 | --- | 0.49 | --- | 0.48 |
| **$F_{13}^{su**}$ (ksi)** | --- | --- | 12.86 | 13.32 | --- | --- | --- | --- |

** *Apparent* interlaminar shear strength

### 3.1.2 Individual Test Summaries

## 3.1.2.1 Tension, 1-axis

**Tension, 1-axis**
**G/Ep**
**Fiberite 7740/G30-500 12K Graphite Uni**
**$[0]_8$**

| | | | |
|---|---|---|---|
| **Material:** | Fiberite 7740/G30-500 12K Graphite Unitape | | |
| **Resin content:** | 26 - 34 wt% | **Comp. density:** | 1.52 - 1.54 g/cc |
| **Fiber volume:** | 58 - 64 vol% | **Void content:** | 1.0 to 4.1 % |
| **Ply thickness:** | 0.0052 - 0.0060 in. | | |
| **Ply range:** | 8 plies | | |
| **Test method:** | D3039-95 | **Modulus calculation:** | linear fit from 1000 - 3000 με |
| **Normalized by:** | 0.0057 in. ply thickness | | |

| | | CTD (B) | | RTD (A) | | ETD (G) | | ETW (F) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 180 | | 180 | | | |
| **Moisture Conditioning** | | dry | | dry | | dry | | 43 days, .55-.60% wt gain | | | |
| **Equilibrium at T, RH** | | as fabricated | | as fabricated | | as fabricated | | 145 F, 85 % | | | |
| **Source code** | | BBJXXXXB | | BBJXXXXA | | BBJXXXXG | | BBJXXXXF | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | 334.44 | 328.48 | 316.23 | 312.50 | 313.59 | 309.10 | 310.66 | 305.83 | | |
| | **Minimum** | 326.16 | 317.46 | 281.82 | 266.98 | 262.11 | 252.07 | 245.79 | 240.04 | | |
| | **Maximum** | 344.82 | 339.49 | 339.68 | 334.79 | 346.86 | 338.94 | 341.50 | 334.40 | | |
| | **C.V.(%)** | 2.32 | 2.60 | 5.38 | 6.27 | 8.49 | 9.42 | 8.95 | 9.11 | | |
| $F_1^{tu}$ (ksi) | **B-value** | 283.37 | 275.01 | 274.46 | 268.50 | 272.40 | 265.81 | 271.48 | 264.72 | | |
| | **A-value** | 254.99 | 245.30 | 246.97 | 239.54 | 245.10 | 237.13 | 244.15 | 236.03 | | |
| | **No. Specimens** | 6 | | 18 | | 19 | | 30 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |
| | **Mean** | 21.48 | 21.12 | 19.06 | 18.76 | 19.02 | 18.70 | 18.87 | 18.79 | | |
| | **Minimum** | 20.72 | 20.22 | 18.51 | 18.02 | 18.58 | 18.35 | 17.75 | 18.01 | | |
| | **Maximum** | 22.23 | 22.02 | 19.48 | 19.18 | 19.23 | 19.00 | 19.65 | 19.10 | | |
| $E_1^t$ (Msi) | **C.V.(%)** | 4.98 | 6.02 | 2.01 | 2.28 | 1.25 | 1.35 | 3.35 | 2.15 | | |
| | **No. Specimens** | 2 | | 6 | | 6 | | 6 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |
| | **Mean** | 0.456 | | 0.322 | | 0.318 | | 0.342 | | | |
| $\nu_{12}^t$ | **No. Specimens** | 2 | | 6 | | 6 | | 6 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |

## 3.1.2.2 Tension, 2-axis

**Tension, 2-axis**
**G/Ep**
**Fiberite 7740/G30-500 12K Graphite Uni**
**$[0]_{18}$**

| | | | |
|---|---|---|---|
| **Material:** | Fiberite 7740/G30-500 12K Graphite Unitape | | |
| **Resin content:** | 27 - 35 wt% | **Comp. density:** | 1.52 - 1.55 g/cc |
| **Fiber volume:** | 57 - 64 vol% | **Void content:** | 0.5 to 4.0 % |
| **Ply thickness:** | 0.0054 - 0.0060 in. | | |
| **Ply range:** | 18 plies | | |
| **Test method:** | D3039-95 | **Modulus calculation:** | linear fit from 1000 - 3000 με |
| **Normalized by:** | N/A | | |

| | | CTD (B) | | RTD (A) | | ETD (G) | | ETW (F) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 180 | | 180 | | | |
| **Moisture Conditioning** | | dry | | dry | | dry | | 50 days, .53-.59% wt gain | | | |
| **Equilibrium at T, RH** | | as fabricated | | as fabricated | | as fabricated | | 145 F, 85 % | | | |
| **Source code** | | BBUXXXXB | | BBUXXXXA | | BBUXXXXG | | BBUXXXXF | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| | **Mean** | | 6.92 | | 5.65 | | 5.35 | | 3.90 | | |
| | **Minimum** | | 6.31 | | 2.81 | | 3.08 | | 3.06 | | |
| | **Maximum** | | 8.38 | | 7.33 | | 6.96 | | 4.28 | | |
| | **C.V.(%)** | | 10.71 | | 23.29 | | 21.59 | | 7.91 | | |
| $F_2^{tu}$ (ksi) | **B-value** | | 4.52 | | 3.99 | | 3.78 | | 2.78 | | |
| | **A-value** | | 3.20 | | 2.87 | | 2.72 | | 2.01 | | |
| | **No. Specimens** | 6 | | 21 | | 21 | | 29 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |
| | **Mean** | | 1.47 | | 1.26 | | 1.06 | | 1.03 | | |
| | **Minimum** | | 1.36 | | 1.24 | | 1.00 | | 0.95 | | |
| | **Maximum** | | 1.58 | | 1.29 | | 1.09 | | 1.17 | | |
| $E_2^t$ (Msi) | **C.V.(%)** | | 10.77 | | 1.38 | | 3.43 | | 7.47 | | |
| | **No. Specimens** | 2 | | 6 | | 6 | | 6 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |

## 3.1.2.3 Compression, 1-axis

**Compression, 1-axis**
**G/Ep**
**Fiberite 7740/G30-500 12K Graphite Uni**
**$[0]_8$ & $[0]_7$**

| | | | |
|---|---|---|---|
| **Material:** | Fiberite 7740/G30-500 12K Graphite Unitape | | |
| **Resin content:** | 27 - 32 wt% | **Comp. density:** | 1.53 - 1.55 g/cc |
| **Fiber volume:** | 59 - 64 vol% | **Void content:** | 1.2 to 3.6 % |
| **Ply thickness:** | 0.0054 - 0.0059 in. | | |
| **Ply range:** | 7 - 8 plies | | |
| **Test method:** | SRM 1-94, D695-91 (mod) | **Modulus calculation:** | linear fit from 1000 - 3000 με |
| **Normalized by:** | 0.0057 in. ply thickness | | |

| | | CTD (B) | | RTD (A) | | ETD (G) | | ETW (F) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 180 | | 180 | | | |
| **Moisture Conditioning** | | dry | | dry | | dry | | 50 days, .62-.70% wt gain | | | |
| **Equilibrium at T, RH** | | as fabricated | | as fabricated | | as fabricated | | 145 F, 85 % | | | |
| **Source code** | | BBKXXXXB | | BBKXXXXA | | BBKXXXXG | | BBKXXXXF | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $F_1^{cu}$ (ksi) | **Mean** | 197.33 | 201.21 | 184.69 | 184.25 | 180.83 | 182.40 | 142.31 | 141.04 | | |
| | **Minimum** | 171.15 | 177.38 | 146.02 | 146.11 | 155.90 | 156.16 | 103.26 | 100.99 | | |
| | **Maximum** | 215.99 | 218.26 | 215.30 | 211.13 | 200.66 | 202.44 | 168.24 | 167.40 | | |
| | **C.V.(%)** | 7.84 | 7.21 | 10.49 | 9.70 | 6.71 | 7.25 | 9.75 | 9.72 | | |
| | **B-value** | 163.43 | 167.33 | 156.00 | 156.19 | 152.73 | 154.62 | 121.14 | 120.47 | | |
| | **A-value** | 143.62 | 147.53 | 137.11 | 137.72 | 134.24 | 136.34 | 106.42 | 106.18 | | |
| | **No. Specimens** | 8 | | 18 | | 18 | | 29 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |
| $E_1^c$ (Msi) | **Mean** | 17.98 | 18.57 | 18.62 | 18.96 | 17.89 | 18.17 | 18.57 | 18.99 | | |
| | **Minimum** | 17.59 | 18.14 | 17.88 | 18.37 | 17.67 | 17.41 | 17.84 | 18.77 | | |
| | **Maximum** | 18.37 | 19.00 | 19.75 | 19.89 | 18.26 | 18.70 | 18.87 | 19.22 | | |
| | **C.V.(%)** | 3.08 | 3.28 | 3.56 | 2.74 | 1.14 | 2.59 | 2.00 | 0.95 | | |
| | **No. Specimens** | 2 | | 6 | | 6 | | 6 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |

## 3.1.2.4 Compression, 2-axis

**Compression, 2-axis**
**G/Ep**
**Fiberite 7740/G30-500 12K Graphite Uni**
**$[0]_8$ & $[0]_7$**

| | | | |
|---|---|---|---|
| **Material:** | Fiberite 7740/G30-500 12K Graphite Unitape | | |
| **Resin content:** | 27 - 40 wt% | **Comp. density:** | 1.52 - 1.55 g/cc |
| **Fiber volume:** | 53 - 65 vol% | **Void content:** | 0.0 to 3.4 % |
| **Ply thickness:** | 0.0051 - 0.0060 in. | | |
| **Ply range:** | 7 - 8 plies | | |
| **Test method:** | SRM 1-94, D695-91 (mod) | **Modulus calculation:** | linear fit from 1000 - 3000 με |
| **Normalized by:** | N/A | | |

| | | CTD (B) | | RTD (A) | | ETD (G) | | ETW (F) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 180 | | 180 | | | |
| **Moisture Conditioning** | | dry | | dry | | dry | | 50 days, .59-.61% wt gain | | | |
| **Equilibrium at T, RH** | | as fabricated | | as fabricated | | as fabricated | | 145 F, 85 % | | | |
| **Source code** | | BBWXXXXB | | BBWXXXXA | | BBWXXXXG | | BBWXXXXF | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $F_2^{cu}$ (ksi) | **Mean** | | 34.94 | | 31.06 | | 20.39 | | 17.62 | | |
| | **Minimum** | | 31.57 | | 27.25 | | 18.90 | | 14.75 | | |
| | **Maximum** | | 37.45 | | 34.53 | | 21.59 | | 20.53 | | |
| | **C.V.(%)** | | 6.63 | | 6.26 | | 4.09 | | 7.09 | | |
| | **B-value** | | 30.66 | | 27.76 | | 18.23 | | 15.83 | | |
| | **A-value** | | 28.28 | | 25.60 | | 16.81 | | 14.59 | | |
| | **No. Specimens** | 7 | | 18 | | 18 | | 30 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |
| $E_2^c$ (Msi) | **Mean** | | 1.84 | | 1.60 | | 1.32 | | 1.19 | | |
| | **Minimum** | | 1.80 | | 1.43 | | 1.24 | | 1.15 | | |
| | **Maximum** | | 1.88 | | 1.76 | | 1.45 | | 1.22 | | |
| | **C.V.(%)** | | 3.21 | | 7.92 | | 6.44 | | 2.59 | | |
| | **No. Specimens** | 2 | | 6 | | 6 | | 6 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |

## 3.1.2.5 Shear, 12 axis

**Shear, 12-axis**
**G/Ep**
**Fiberite 7740/G30-500 12K Graphite Uni**
**$[(0/90)_5/0/(90/0)_5]$, $[(0/90)_5/0/90/0/(90/0)_5]$, $[(0/90)_6/0/(90/0)_6]$**

| | | | | |
|---|---|---|---|---|
| **Material:** | Fiberite 7740/G30-500 12K Graphite Unitape | | | |
| **Resin content:** | 21 - 34 wt% | **Comp. density:** | 1.53 - 1.56 g/cc | |
| **Fiber volume:** | 57 - 70 vol% | **Void content:** | 1.0 to 5.1 % | |
| **Ply thickness:** | 0.0054 - 0.0063 in. | | | |
| **Ply range:** | 21 - 25 plies | | | |
| **Test method:** | D5379-93 | **Modulus calculation:** | linear fit from 1000 - 6000 με | |
| **Normalized by:** | N/A | | | |

| | | CTD (B) | | RTD (A) | | ETD (G) | | ETW (F) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | -65 | | 75 | | 180 | | 180 | | | |
| **Moisture Conditioning** | | dry | | dry | | dry | | 57 days, .53-.59% wt gain | | | |
| **Equilibrium at T, RH** | | as fabricated | | as fabricated | | as fabricated | | 145 F, 85 % | | | |
| **Source code** | | BBNXXXXB | | BBNXXXXA | | BBNXXXXG | | BBNXXXXF | | | |
| | | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** | **Normalized** | **Measured** |
| $F_{12}^{su}$ (ksi) | **Mean** | | 26.12 | | 19.80 | | 13.91 | | 12.43 | | |
| | **Minimum** | | 24.19 | | 18.18 | | 12.23 | | 11.65 | | |
| | **Maximum** | | 29.24 | | 20.91 | | 15.86 | | 13.27 | | |
| | **C.V.(%)** | | 6.56 | | 3.86 | | 9.69 | | 3.37 | | |
| | **B-value** | | 23.11 | | 17.84 | | 12.49 | | 11.23 | | |
| | **A-value** | | 21.44 | | 16.53 | | 11.58 | | 10.40 | | |
| | **No. Specimens** | 6 | | 20 | | 15 | | 24 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |
| $G_{12}^{s}$ (Msi) | **Mean** | | 0.74 | | 0.67 | | 0.49 | | 0.48 | | |
| | **Minimum** | | 0.70 | | 0.62 | | 0.44 | | 0.41 | | |
| | **Maximum** | | 0.79 | | 0.75 | | 0.53 | | 0.53 | | |
| | **C.V.(%)** | | 8.56 | | 7.61 | | 6.63 | | 8.76 | | |
| | **No. Specimens** | 2 | | 5 | | 5 | | 5 | | | |
| | **No. Prepreg Lots** | 1 | | 3 | | 3 | | 3 | | | |

### 3.1.2.6 Shear, 13 axis

**Shear, 13-axis**
**G/Ep**
**Fiberite 7740/G30-500 12K Graphite Uni**
**[0]**

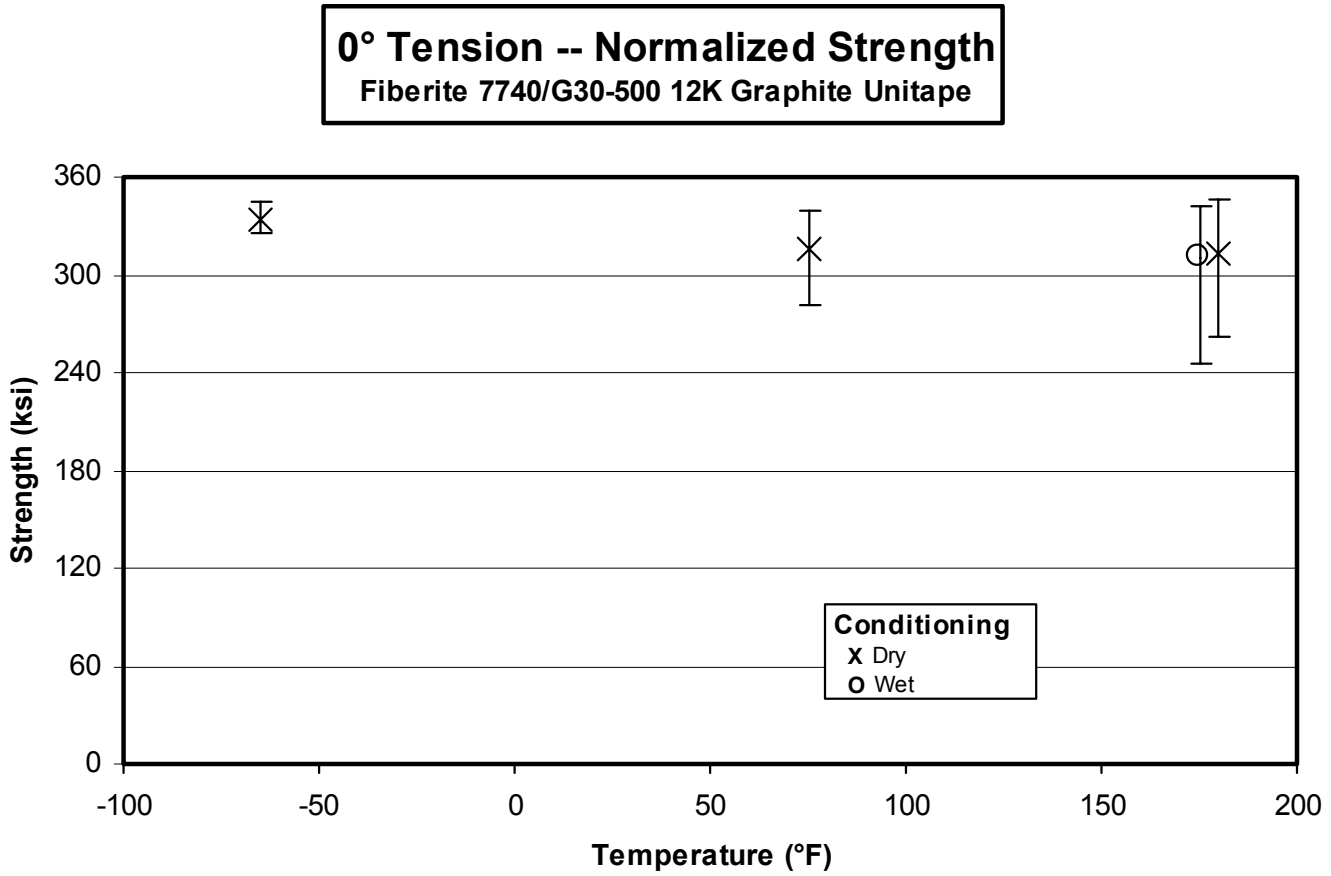
| | | | |
|---|---|---|---|
| **Material:** | Fiberite 7740/G30-500 12K Graphite Unitape | | |
| **Resin content:** | 31 - 35 wt% | **Comp. density:** | 1.51 - 1.53 g/cc |
| **Fiber volume:** | 56 - 60 vol% | **Void content:** | 1.0 to 2.9 % |
| **Ply thickness:** | 0.0052 - 0.0057 in. | | |
| **Ply range:** | 18 plies | | |
| **Test method:** | D2344-89 | **Modulus calculation:** | N/A |
| **Normalized by:** | N/A | | |

| | | CTD (B) | | RTD (A) | | ETD (G) | | ETW (F) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Temperature [°F]** | | | | 75 | | | | | | | |
| **Moisture Conditioning** | | | | dry | | | | | | | |
| **Equilibrium at T, RH** | | | | as fabricated | | | | | | | |
| **Source code** | | | | BBQXXXXA | | | | | | | |
| | | Normalized | Measured | Normalized | Measured | Normalized | Measured | Normalized | Measured | Normalized | Measured |
| | **Mean** | | | | 13.32 | | | | | | |
| | **Minimum** | | | | 12.52 | | | | | | |
| | **Maximum** | | | | 13.58 | | | | | | |
| | **C.V.(%)** | | | | 1.76 | | | | | | |
| $F_{13}^{su}$ (ksi) | **B-value** | | | | 12.85 | | | | | | |
| | **A-value** | | | | 12.52 | | | | | | |
| | **No. Specimens** | | | 18 | | | | | | | |
| | **No. Prepreg Lots** | | | 3 | | | | | | | |

NOTES: These values represent the apparent interlaminar shear properties and are to be used for quality control purposes only. Do not use these values for interlaminar shear strength design values.

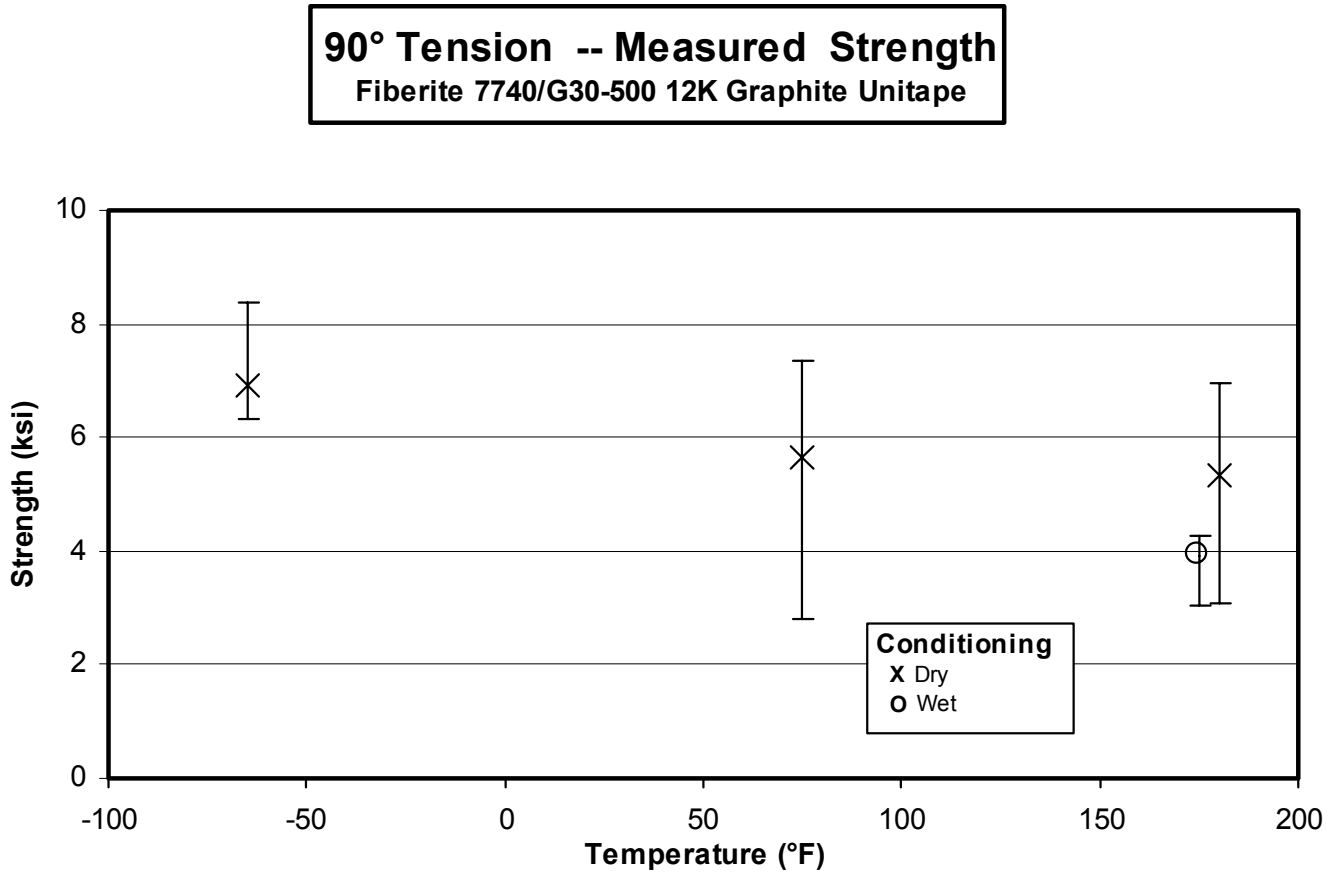
### 3.1.3 Individual Test Charts

### 3.1.3.1 Tension, 1-axis



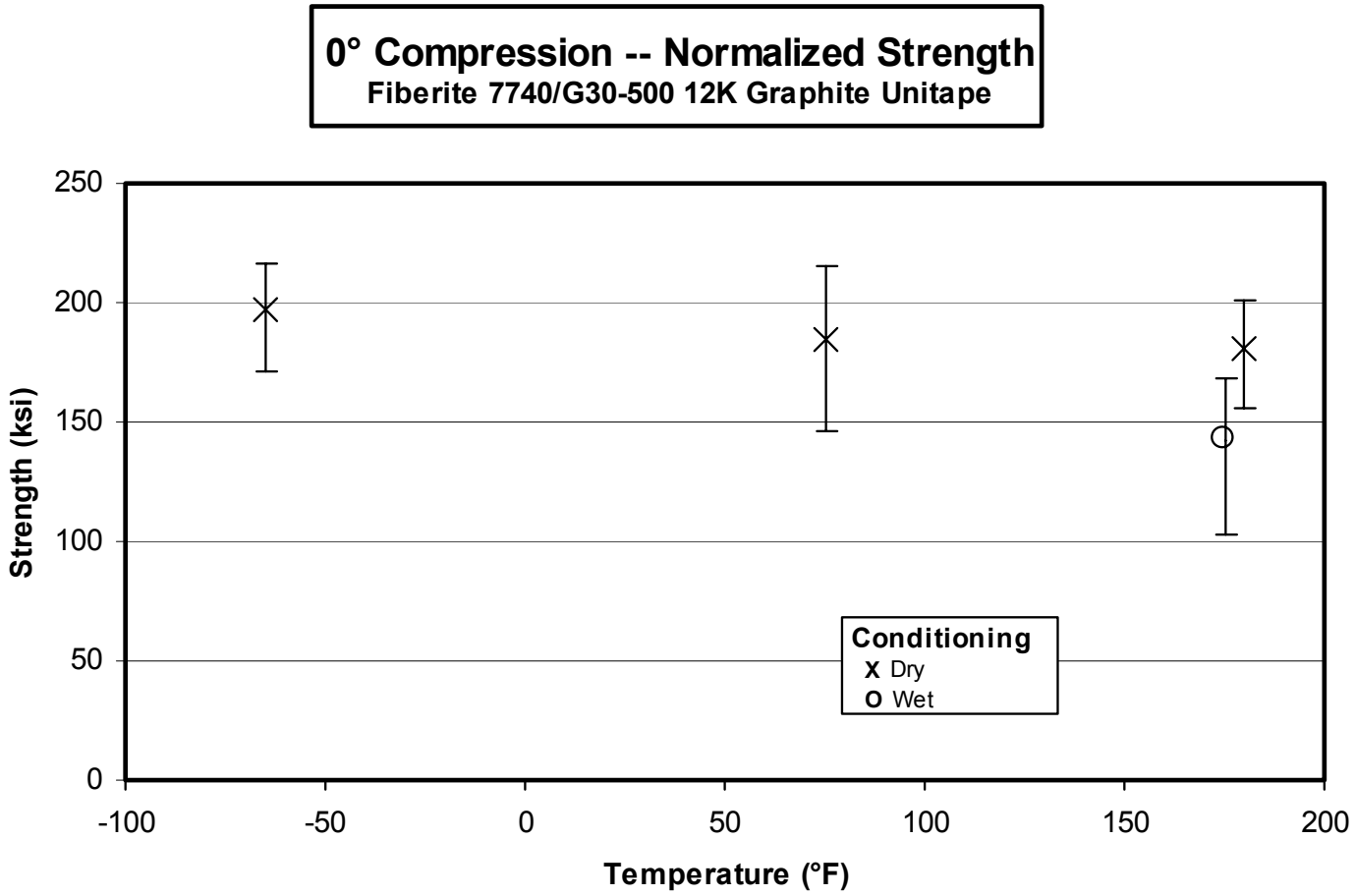

NOTE: The symbols represent the 'pooled' average of all tests, and the bars represent the upper and lower limit of the data. The 180° dry and wet data have been staggered for clarity.

### 3.1.3.2 Tension, 2-axis



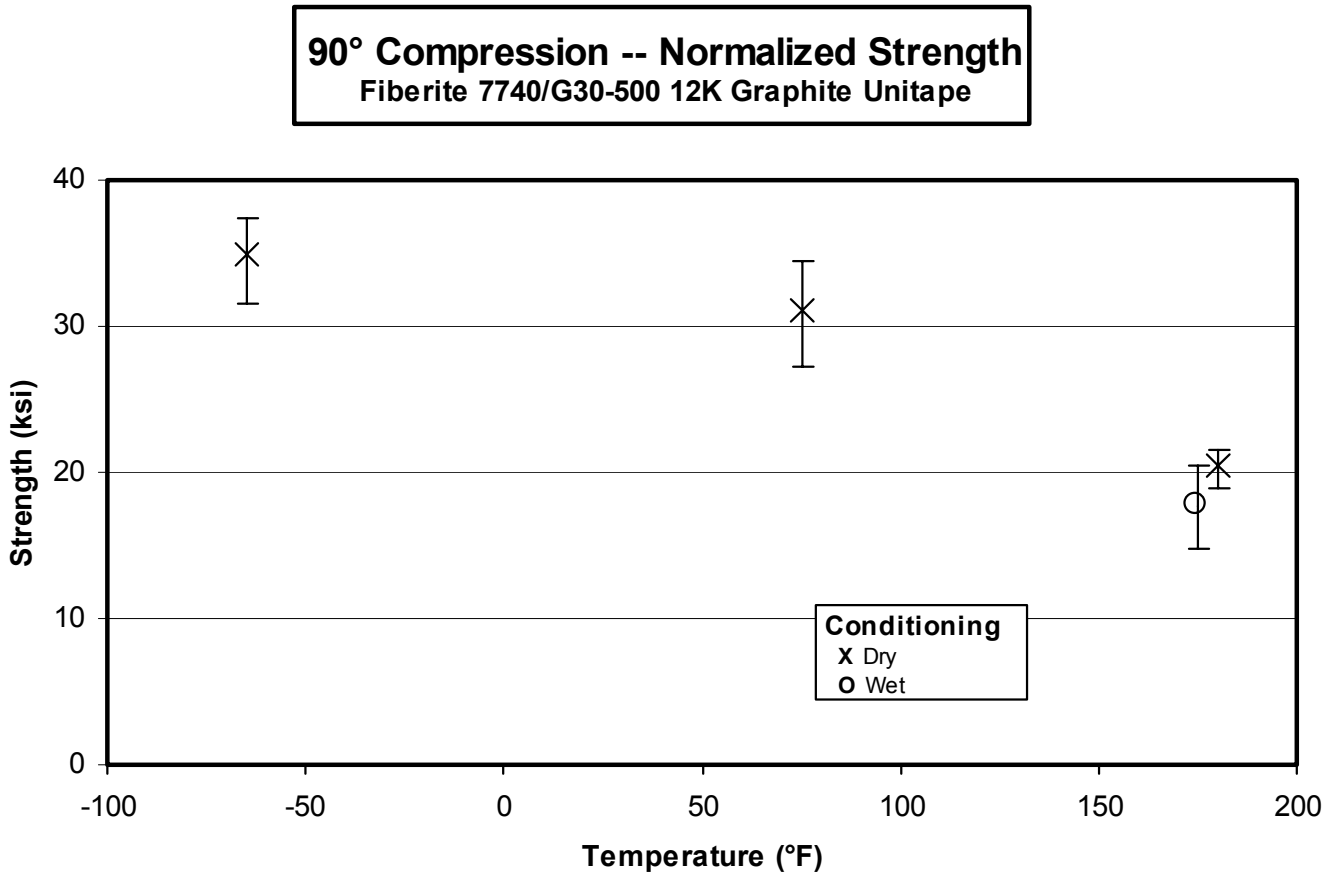

NOTE: The symbols represent the 'pooled' average of all tests, and the bars represent the upper and lower limit of the data. The 180° dry and wet data have been staggered for clarity.

### 3.1.3.3 Compression, 1-axis



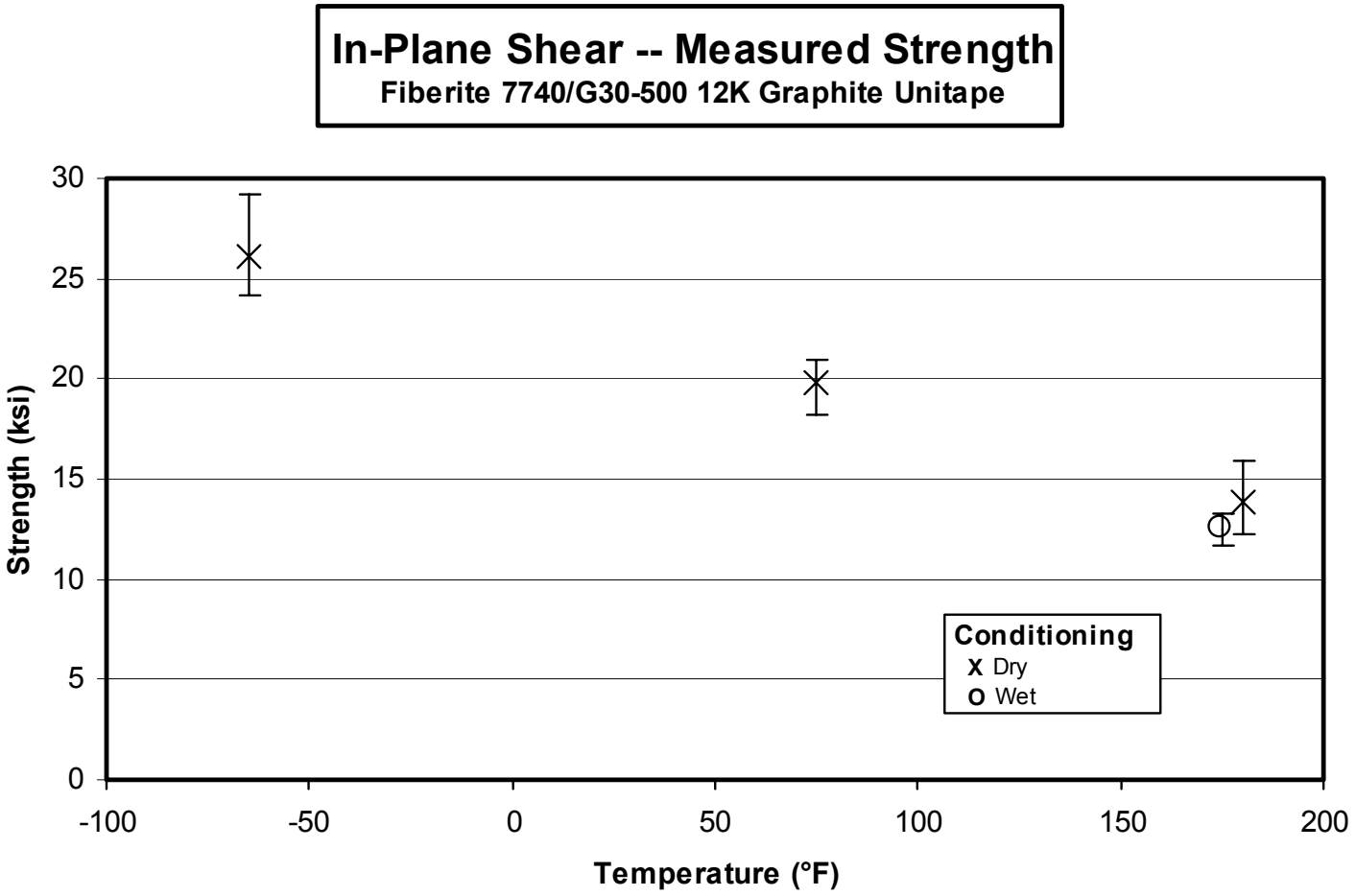

NOTE: The symbols represent the 'pooled' average of all tests, and the bars represent the upper and lower limit of the data. The 180° dry and wet data have been staggered for clarity.

### 3.1.3.4 Compression, 2-axis



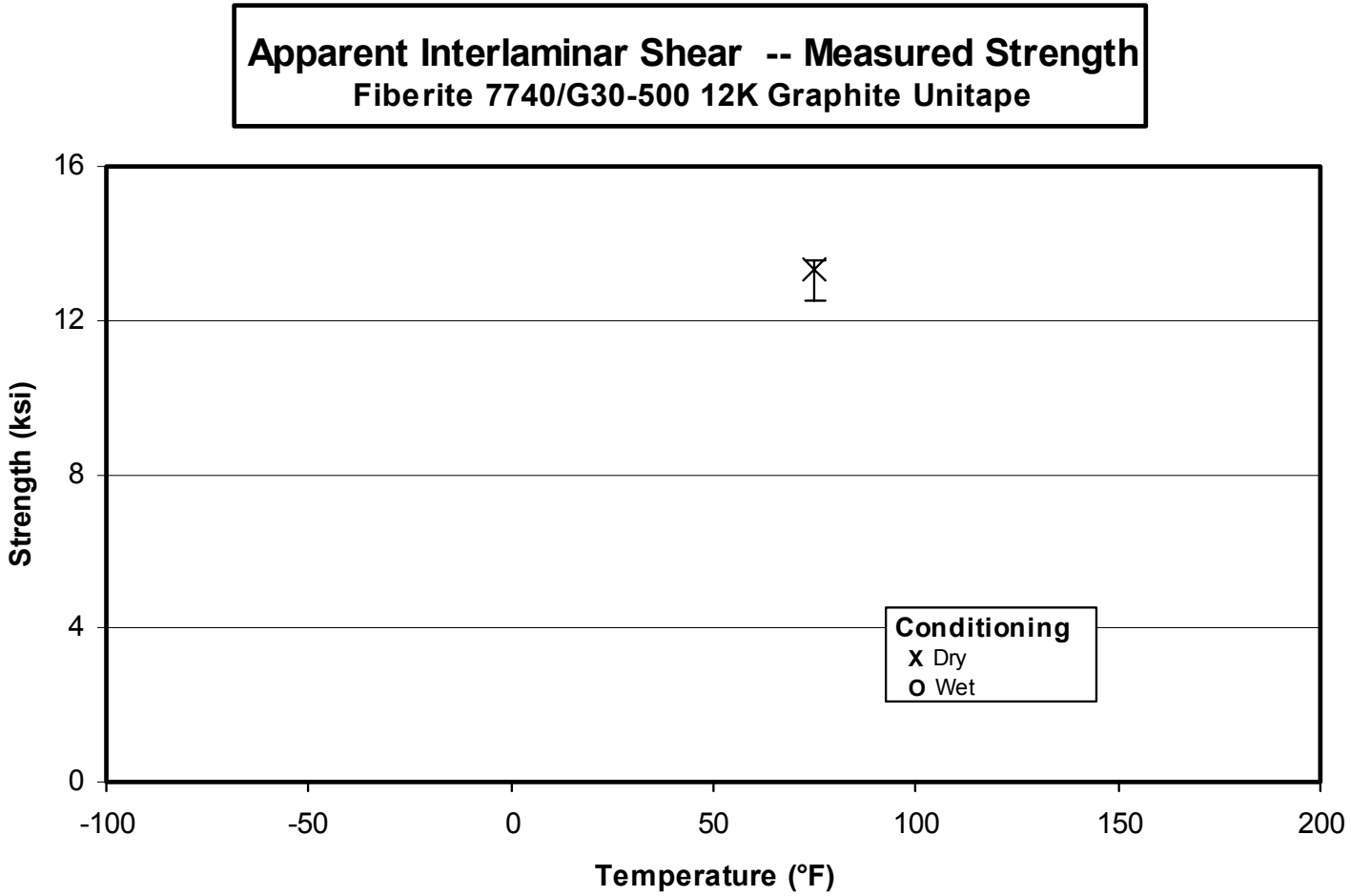

NOTE: The symbols represent the 'pooled' average of all tests, and the bars represent the upper and lower limit of the data. The 180° dry and wet data have been staggered for clarity.

### 3.1.3.5 Shear, 12 axis




NOTE: The symbols represent the 'pooled' average of all tests, and the bars represent the upper and lower limit of the data. The 180° dry and wet data have been staggered for clarity.

### 3.1.3.6 Shear, 13 axis




NOTE: The symbols represent the 'pooled' average of all tests, and the bars represent the upper and lower limit of the data.

## 3.2 Raw Data

Specimen Naming Convention

Test coupons were identified using an eight-digit specimen code, with the significance of each digit delineated below. A representative sample ID is shown for reference purposes.

**B B J 2 1 2 5 F**

1st Character: Fabricator
'B' designates Cessna

2nd Character: Material System
'B' designates G30-500 12K / 7740

3rd Character: Test Type
'J' designates 0° Tension Strength and Modulus, other test types will be clearly labeled at the top of each sheet

4th Character: Prepreg Batch ID
See Table 2.1 for Fiberite Batch ID / Sample Batch ID correlation.

5th Character: Panel Number
The panel(s) fabricated for a specific test method.

6th Character: Subpanel Number
The sub-panel(s) cut from each panel, with subpanel numbers labeled increasing from reference edge.

7th Character: Sample Number
The sample(s) cut from each subpanel, with sample numbers labeled increasing from reference edge.

8th Character: Test Condition
'A' --- RTD
'B' --- CTD
'F' --- ETW
'G' --- ETD
See Table 1.5.1 for condition parameters.

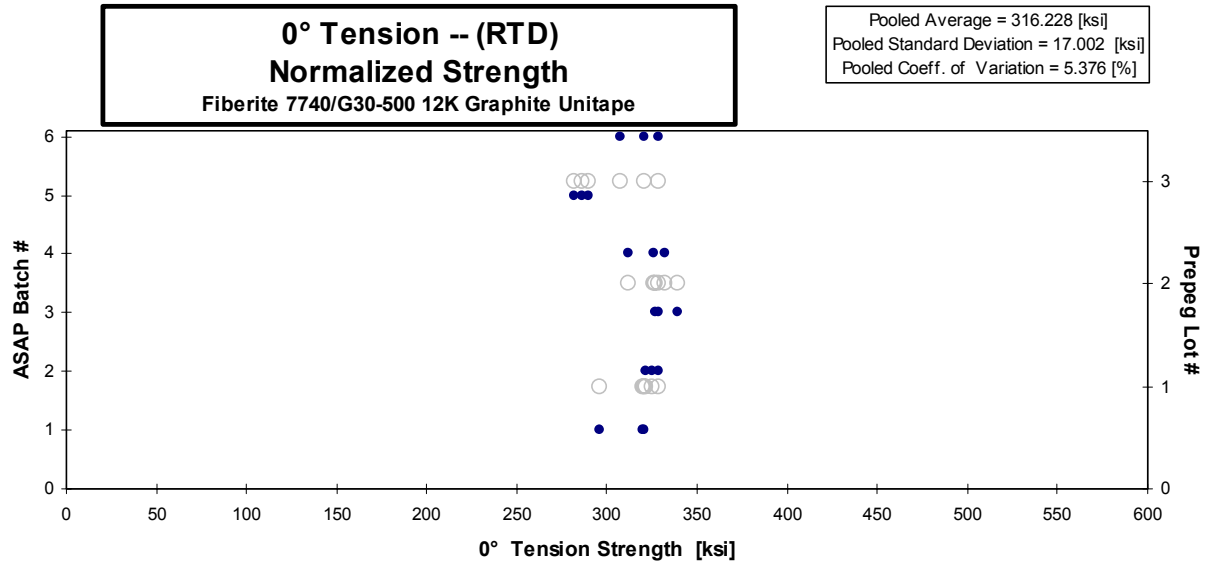
### 3.2.1 Raw Data Spreadsheets and Scatter Charts

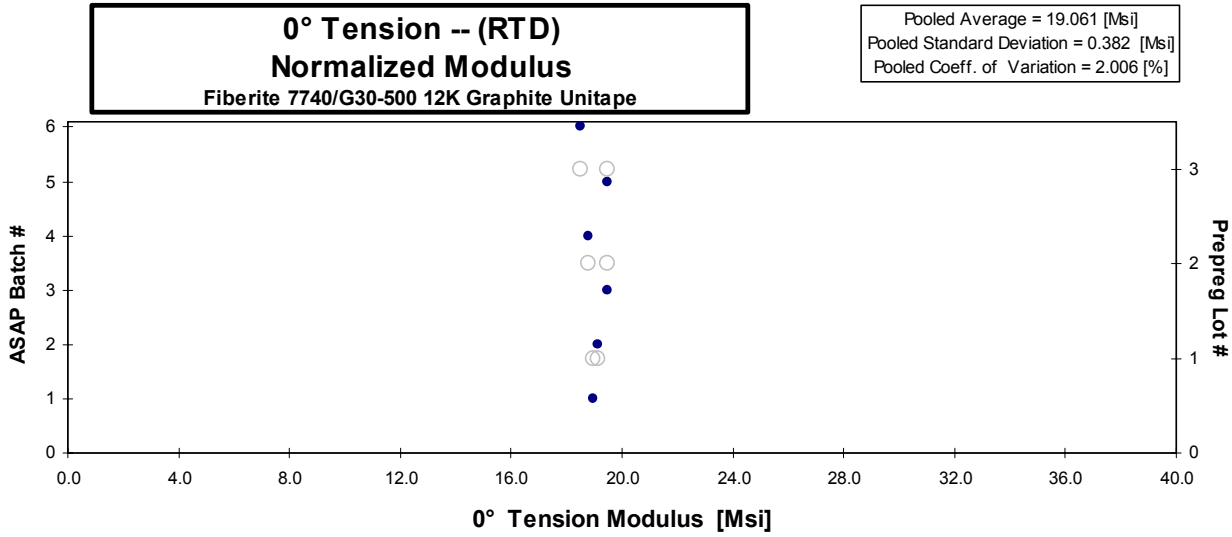
## 0° Tension -- (RTD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

normalizing $t_{ply}$ [in]: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BBJ12X6A | 1 | 1 | 1 | 322.120 | 19.069 | 0.331 | 0.045 | 8 | 0.00567 | 320.354 | 18.964 |
| BBJ12X7A | 1 | 1 | 1 | 325.613 | | | 0.041 | 8 | 0.00518 | 295.860 | |
| BBJ12X8A | 1 | 1 | 1 | 311.742 | | | 0.047 | 8 | 0.00584 | 319.604 | |
| BBJ14XBA | 2 | 1 | 2 | 322.422 | 18.997 | 0.341 | 0.046 | 8 | 0.00575 | 325.250 | 19.164 |
| BBJ14XCA | 2 | 1 | 2 | 318.736 | | | 0.046 | 8 | 0.00575 | 321.532 | |
| BBJ14XDA | 2 | 1 | 2 | 323.253 | | | 0.046 | 8 | 0.00579 | 328.570 | |
| BBJ22X6A | 1 | 2 | 3 | 334.788 | 19.177 | 0.333 | 0.046 | 8 | 0.00578 | 339.682 | 19.457 |
| BBJ22X7A | 1 | 2 | 3 | 323.948 | | | 0.046 | 8 | 0.00579 | 328.921 | |
| BBJ22X8A | 1 | 2 | 3 | 331.048 | | | 0.045 | 8 | 0.00563 | 326.934 | |
| BBJ24X6A | 2 | 2 | 4 | 298.956 | 18.024 | 0.349 | 0.048 | 8 | 0.00594 | 311.741 | 18.794 |
| BBJ24X7A | 2 | 2 | 4 | 313.722 | | | 0.047 | 8 | 0.00592 | 325.762 | |
| BBJ24X8A | 2 | 2 | 4 | 319.907 | | | 0.047 | 8 | 0.00593 | 332.535 | |
| BBJ31XBA | 1 | 3 | 5 | 276.202 | 18.765 | 0.271 | 0.047 | 8 | 0.00592 | 286.701 | 19.478 |
| BBJ31XCA | 1 | 3 | 5 | 279.087 | | | 0.047 | 8 | 0.00591 | 289.593 | |
| BBJ31XDA | 1 | 3 | 5 | 266.983 | | | 0.048 | 8 | 0.00602 | 281.816 | |
| BBJ33X6A | 2 | 3 | 6 | 321.729 | 18.546 | 0.306 | 0.046 | 8 | 0.00569 | 321.023 | 18.505 |
| BBJ33X7A | 2 | 3 | 6 | 326.106 | | | 0.046 | 8 | 0.00574 | 328.370 | |
| BBJ33X8A | 2 | 3 | 6 | 308.647 | | | 0.045 | 8 | 0.00569 | 307.857 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Average** | **312.500** | **18.763** | **0.322** | **$Average_{norm}$** | **0.00577** | **316.228** | **19.061** |
| **Standard Dev.** | **19.585** | **0.427** | **0.029** | **$Standard\ Dev._{norm}$** | | **17.002** | **0.382** |
| **Coeff. of Var. [%]** | **6.267** | **2.278** | **8.975** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **5.376** | **2.006** |
| **Min.** | **266.983** | **18.024** | **0.271** | **Min.** | **0.0052** | **281.816** | **18.505** |
| **Max.** | **334.788** | **19.177** | **0.349** | **Max.** | **0.0060** | **339.682** | **19.478** |
| **Number of Spec.** | **18** | **6** | **6** | **Number of Spec.** | | **18** | **6** |



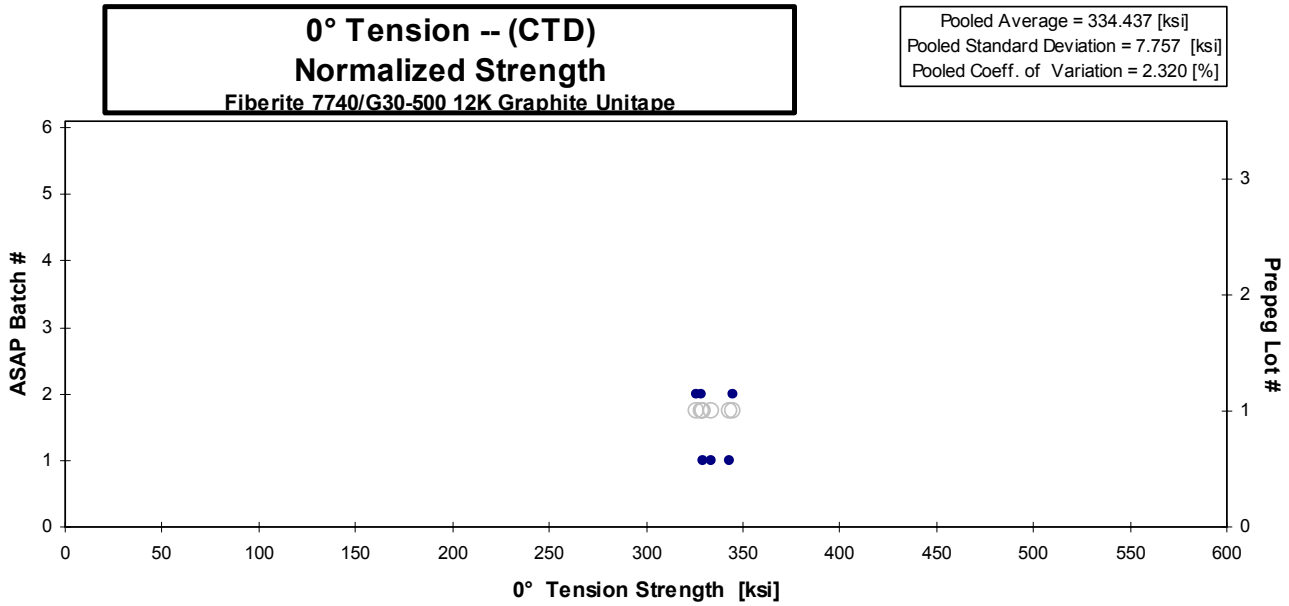



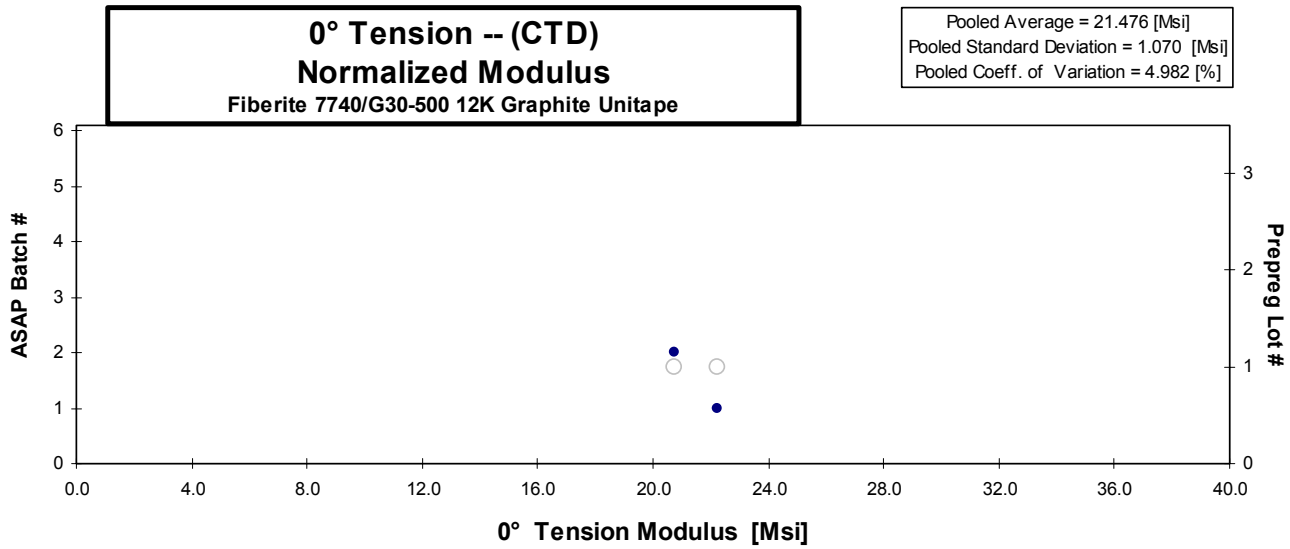
## 0° Tension -- (CTD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

normalizing $t_{ply}$ [in]: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BBJ12X1B | 1 | 1 | 1 | 326.832 | 22.023 | 0.471 | 0.046 | 8 | 0.00575 | 329.938 | 22.233 |
| BBJ12X2B | 1 | 1 | 1 | 329.312 | | | 0.046 | 8 | 0.00577 | 333.525 | |
| BBJ12X3B | 1 | 1 | 1 | 339.491 | | | 0.046 | 8 | 0.00576 | 343.089 | |
| BBJ14X4B | 2 | 1 | 2 | 321.218 | 20.224 | 0.440 | 0.047 | 8 | 0.00584 | 329.084 | 20.720 |
| BBJ14X6B | 2 | 1 | 2 | 336.580 | | | 0.047 | 8 | 0.00584 | 344.822 | |
| BBJ14X7B | 2 | 1 | 2 | 317.461 | | | 0.047 | 8 | 0.00586 | 326.163 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **328.482** | **21.124** | **0.456** | **$Average_{norm}$** | **0.00580** | **334.437** | **21.476** |
| **Standard Dev.** | **8.537** | **1.272** | **0.022** | **$Standard\ Dev._{norm}$** | | **7.757** | **1.070** |
| **Coeff. of Var. [%]** | **2.599** | **6.022** | **4.749** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **2.320** | **4.982** |
| **Min.** | **317.461** | **20.224** | **0.440** | **Min.** | **0.0058** | **326.163** | **20.720** |
| **Max.** | **339.491** | **22.023** | **0.471** | **Max.** | **0.0059** | **344.822** | **22.233** |
| **Number of Spec.** | **6** | **2** | **2** | **Number of Spec.** | | **6** | **2** |



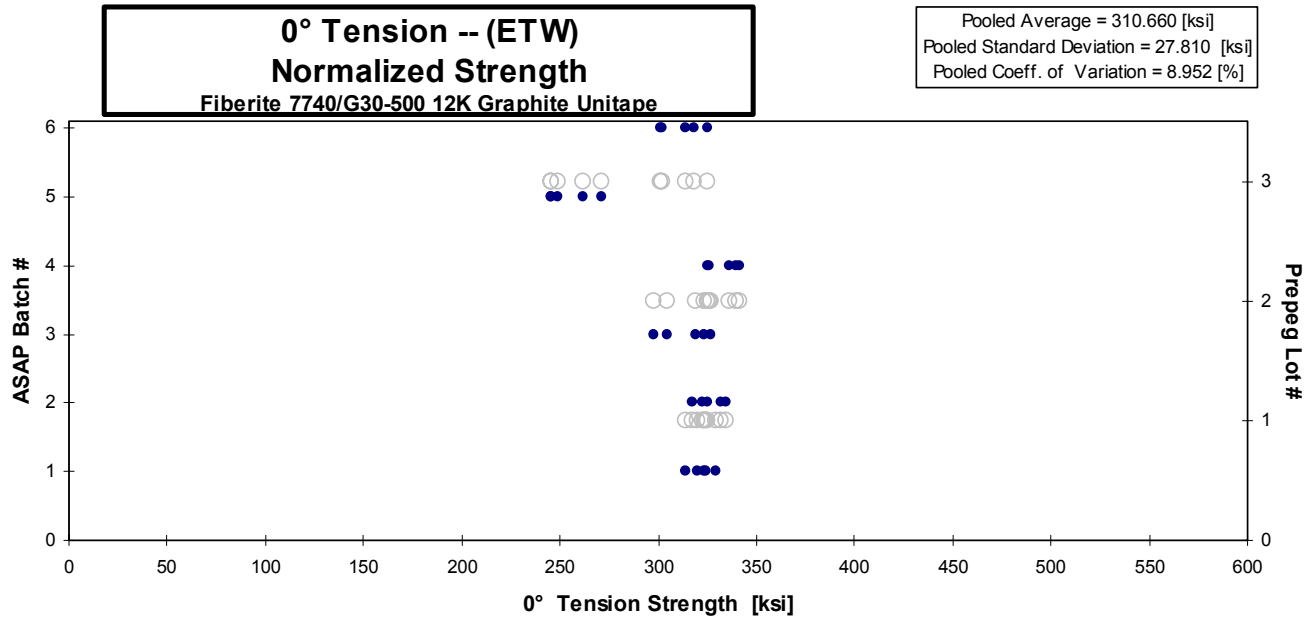



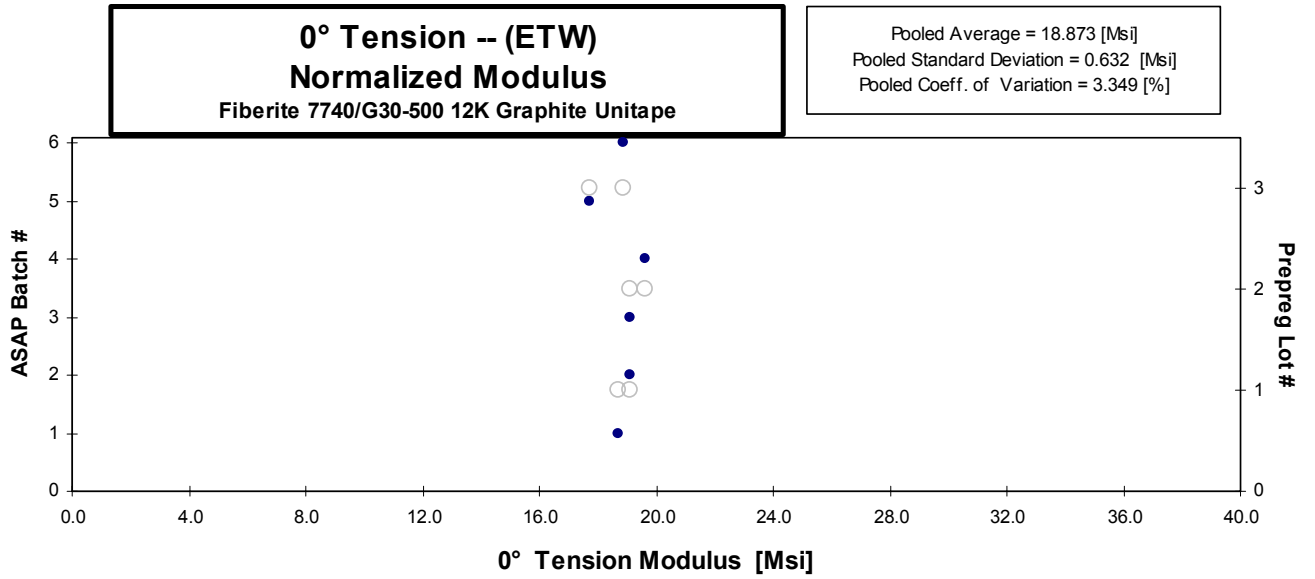
## 0° Tension -- (ETW)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

**normalizing $t_{ply}$ [in]**: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BBJ11X1F | 1 | 1 | 1 | 328.382 | 18.982 | 0.340 | 0.045 | 8 | 0.00562 | 323.941 | 18.725 |
| BBJ11X2F | 1 | 1 | 1 | 317.717 | | | 0.046 | 8 | 0.00574 | 319.691 | |
| BBJ11X3F | 1 | 1 | 1 | 313.615 | | | 0.046 | 8 | 0.00570 | 313.844 | |
| BBJ11X4F | 1 | 1 | 1 | 326.984 | | | 0.046 | 8 | 0.00574 | 329.255 | |
| BBJ11X5F | 1 | 1 | 1 | 320.501 | | | 0.046 | 8 | 0.00578 | 324.718 | |
| BBJ13X1F | 2 | 1 | 2 | 334.397 | 19.056 | 0.363 | 0.046 | 8 | 0.00571 | 334.886 | 19.084 |
| BBJ13X2F | 2 | 1 | 2 | 329.274 | | | 0.046 | 8 | 0.00574 | 331.681 | |
| BBJ13X3F | 2 | 1 | 2 | 313.160 | | | 0.046 | 8 | 0.00578 | 317.624 | |
| BBJ13X4F | 2 | 1 | 2 | 320.251 | | | 0.046 | 8 | 0.00578 | 324.933 | |
| BBJ13X5F | 2 | 1 | 2 | 318.422 | | | 0.046 | 8 | 0.00578 | 322.845 | |
| BBJ22X1F | 1 | 2 | 3 | 312.701 | 18.731 | 0.328 | 0.047 | 8 | 0.00582 | 319.444 | 19.135 |
| BBJ22X2F | 1 | 2 | 3 | 293.873 | | | 0.047 | 8 | 0.00590 | 304.399 | |
| BBJ22X3F | 1 | 2 | 3 | 294.352 | | | 0.046 | 8 | 0.00577 | 297.795 | |
| BBJ22X4F | 1 | 2 | 3 | 320.704 | | | 0.046 | 8 | 0.00580 | 326.565 | |
| BBJ22X5F | 1 | 2 | 3 | 319.295 | | | 0.046 | 8 | 0.00577 | 323.379 | |
| BBJ24X1F | 2 | 2 | 4 | 326.151 | 18.841 | 0.333 | 0.048 | 8 | 0.00595 | 340.217 | 19.654 |
| BBJ24X2F | 2 | 2 | 4 | 324.943 | | | 0.047 | 8 | 0.00589 | 335.988 | |
| BBJ24X3F | 2 | 2 | 4 | 330.627 | | | 0.047 | 8 | 0.00589 | 341.502 | |
| BBJ24X4F | 2 | 2 | 4 | 314.312 | | | 0.047 | 8 | 0.00589 | 324.995 | |
| BBJ24X5F | 2 | 2 | 4 | 313.537 | | | 0.047 | 8 | 0.00593 | 326.028 | |
| BBJ31X1F | 1 | 3 | 5 | 249.453 | 18.010 | 0.334 | 0.045 | 8 | 0.00562 | 245.897 | 17.754 |
| BBJ31X2F | 1 | 3 | 5 | 240.949 | | | 0.047 | 8 | 0.00581 | 245.793 | |
| BBJ31X3F | 1 | 3 | 5 | 251.926 | | | 0.047 | 8 | 0.00593 | 261.870 | |
| BBJ31X4F | 1 | 3 | 5 | 240.036 | | | 0.047 | 8 | 0.00591 | 248.897 | |
| BBJ31X5F | 1 | 3 | 5 | 263.040 | | | 0.047 | 8 | 0.00588 | 271.501 | |
| BBJ33X1F | 2 | 3 | 6 | 318.023 | 19.100 | 0.353 | 0.045 | 8 | 0.00564 | 314.420 | 18.884 |
| BBJ33X2F | 2 | 3 | 6 | 323.211 | | | 0.046 | 8 | 0.00574 | 325.338 | |
| BBJ33X3F | 2 | 3 | 6 | 316.113 | | | 0.046 | 8 | 0.00575 | 318.770 | |
| BBJ33X4F | 2 | 3 | 6 | 299.503 | | | 0.046 | 8 | 0.00575 | 301.911 | |
| BBJ33X5F | 2 | 3 | 6 | 299.596 | | | 0.046 | 8 | 0.00574 | 301.676 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **305.835** | **18.787** | **0.342** | **$Average_{norm}$** | **0.00579** | **310.660** | **18.873** |
| **Standard Dev.** | **27.852** | **0.404** | **0.014** | **$Standard\ Dev._{norm}$** | | **27.810** | **0.632** |
| **Coeff. of Var. [%]** | **9.107** | **2.152** | **3.964** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **8.952** | **3.349** |
| **Min.** | **240.036** | **18.010** | **0.328** | **Min.** | **0.0056** | **245.793** | **17.754** |
| **Max.** | **334.397** | **19.100** | **0.363** | **Max.** | **0.0059** | **341.502** | **19.654** |
| **Number of Spec.** | **30** | **6** | **6** | **Number of Spec.** | | **30** | **6** |



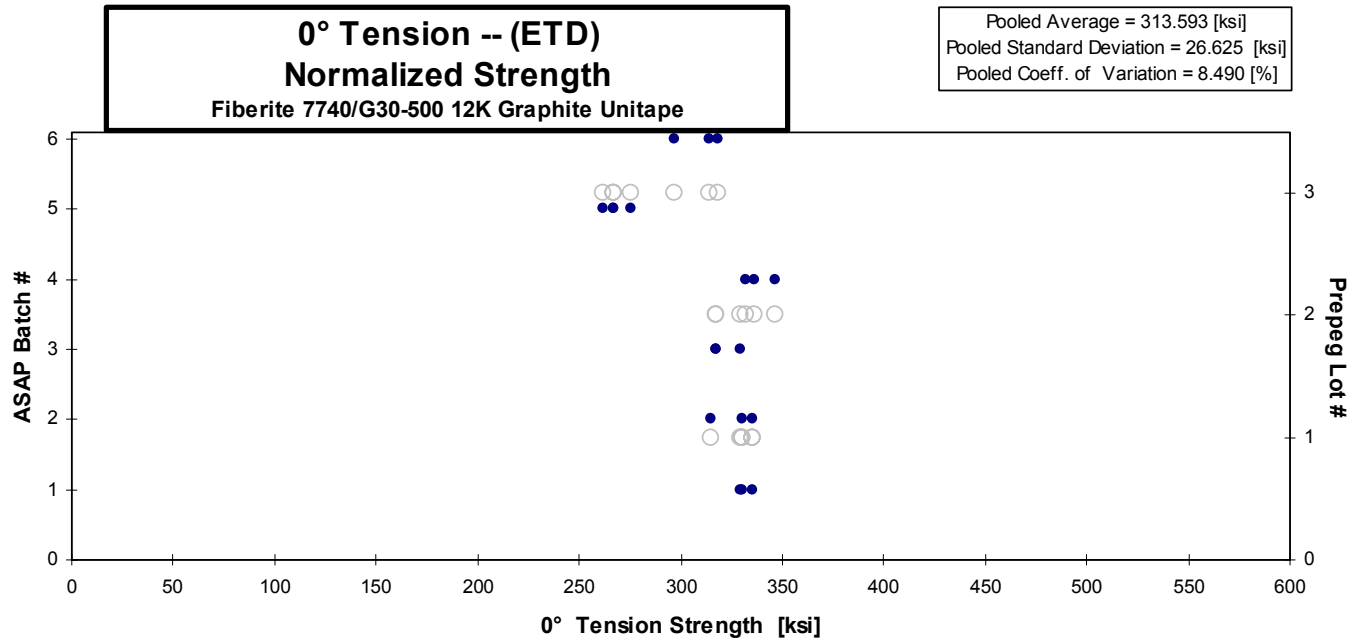



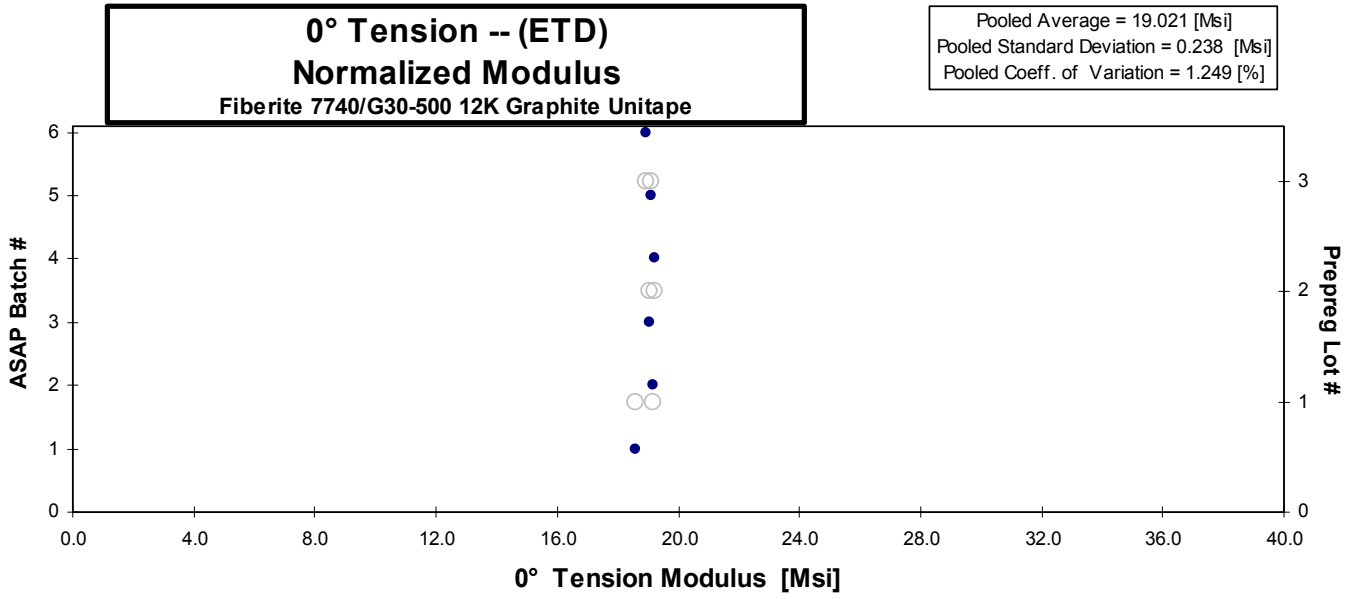
## 0° Tension -- (ETD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

**normalizing $t_{ply}$ [in]**: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Poisson's Ratio | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BBJ11X6G | 1 | 1 | 1 | 327.506 | 18.448 | 0.314 | 0.046 | 8 | 0.00574 | 329.780 | 18.576 |
| BBJ11X7G | 1 | 1 | 1 | 325.917 | | | 0.046 | 8 | 0.00578 | 330.206 | |
| BBJ11X8G | 1 | 1 | 1 | 331.044 | | | 0.046 | 8 | 0.00577 | 335.279 | |
| BBJ13X6G | 2 | 1 | 2 | 325.226 | 18.878 | 0.318 | 0.046 | 8 | 0.00580 | 330.694 | 19.195 |
| BBJ13X7G | 2 | 1 | 2 | 332.745 | | | 0.046 | 8 | 0.00575 | 335.542 | |
| BBJ13X8G | 2 | 1 | 2 | 338.945 | | | 0.042 | 8 | 0.00530 | 315.283 | |
| BBJ22XAG | 1 | 2 | 3 | 313.784 | 18.808 | 0.328 | 0.046 | 8 | 0.00578 | 317.913 | 19.055 |
| BBJ22XBG | 1 | 2 | 3 | 333.166 | | | 0.045 | 8 | 0.00564 | 329.635 | |
| BBJ22XCG | 1 | 2 | 3 | 312.024 | | | 0.046 | 8 | 0.00581 | 317.840 | |
| BBJ24XAG | 2 | 2 | 4 | 322.291 | 18.681 | 0.333 | 0.047 | 8 | 0.00587 | 331.715 | 19.228 |
| BBJ24XBG | 2 | 2 | 4 | 322.433 | | | 0.048 | 8 | 0.00595 | 336.339 | |
| BBJ24XCG | 2 | 2 | 4 | 327.920 | | | 0.048 | 8 | 0.00603 | 346.856 | |
| BBJ31X6G | 1 | 3 | 5 | 265.329 | | | 0.047 | 8 | 0.00593 | 275.996 | |
| BBJ31X7G | 1 | 3 | 5 | 252.071 | | | 0.047 | 8 | 0.00593 | 262.113 | |
| BBJ31X8G | 1 | 3 | 5 | 255.449 | | | 0.048 | 8 | 0.00595 | 266.840 | |
| BBJ31X9G | 1 | 3 | 5 | 256.474 | 18.355 | 0.329 | 0.047 | 8 | 0.00593 | 266.973 | 19.106 |
| BBJ33XAG | 2 | 3 | 6 | 319.008 | 19.002 | 0.284 | 0.046 | 8 | 0.00569 | 318.425 | 18.967 |
| BBJ33XBG | 2 | 3 | 6 | 315.756 | | | 0.045 | 8 | 0.00567 | 314.025 | |
| BBJ33XCG | 2 | 3 | 6 | 295.737 | | | 0.046 | 8 | 0.00572 | 296.818 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **309.096** | **18.695** | **0.318** | **$Average_{norm}$** | **0.00579** | **313.593** | **19.021** |
| **Standard Dev.** | **29.122** | **0.252** | **0.018** | **$Standard\ Dev._{norm}$** | | **26.625** | **0.238** |
| **Coeff. of Var. [%]** | **9.422** | **1.347** | **5.640** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **8.490** | **1.249** |
| **Min.** | **252.071** | **18.355** | **0.284** | **Min.** | **0.0053** | **262.113** | **18.576** |
| **Max.** | **338.945** | **19.002** | **0.333** | **Max.** | **0.0060** | **346.856** | **19.228** |
| **Number of Spec.** | **19** | **6** | **6** | **Number of Spec.** | | **19** | **6** |

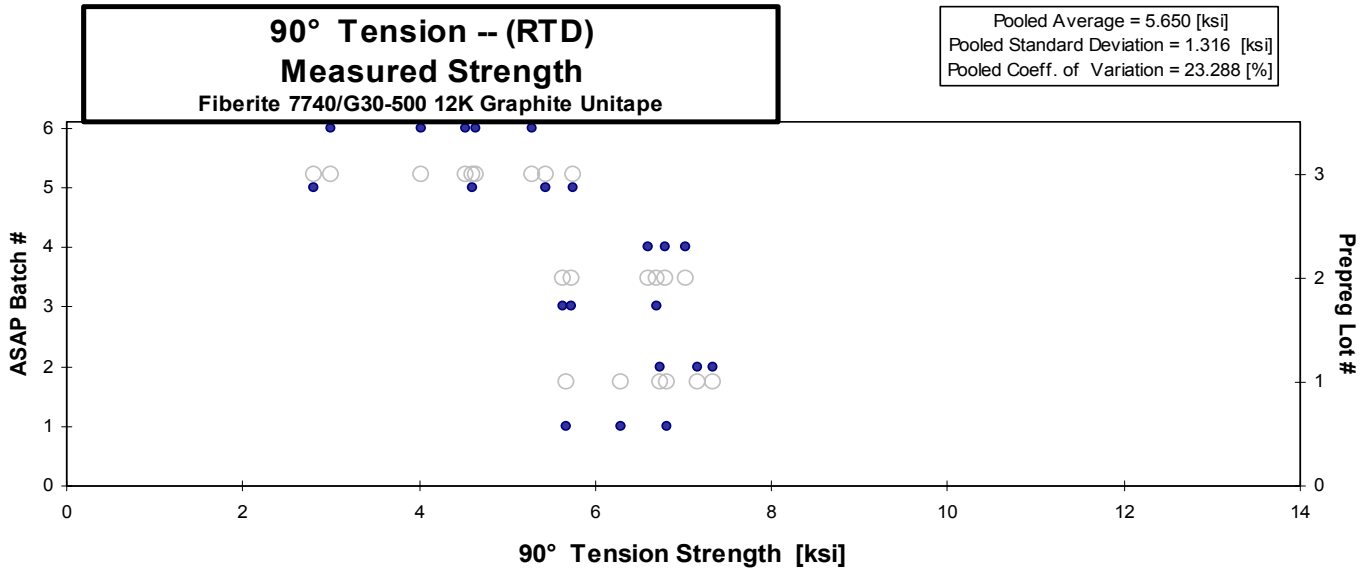


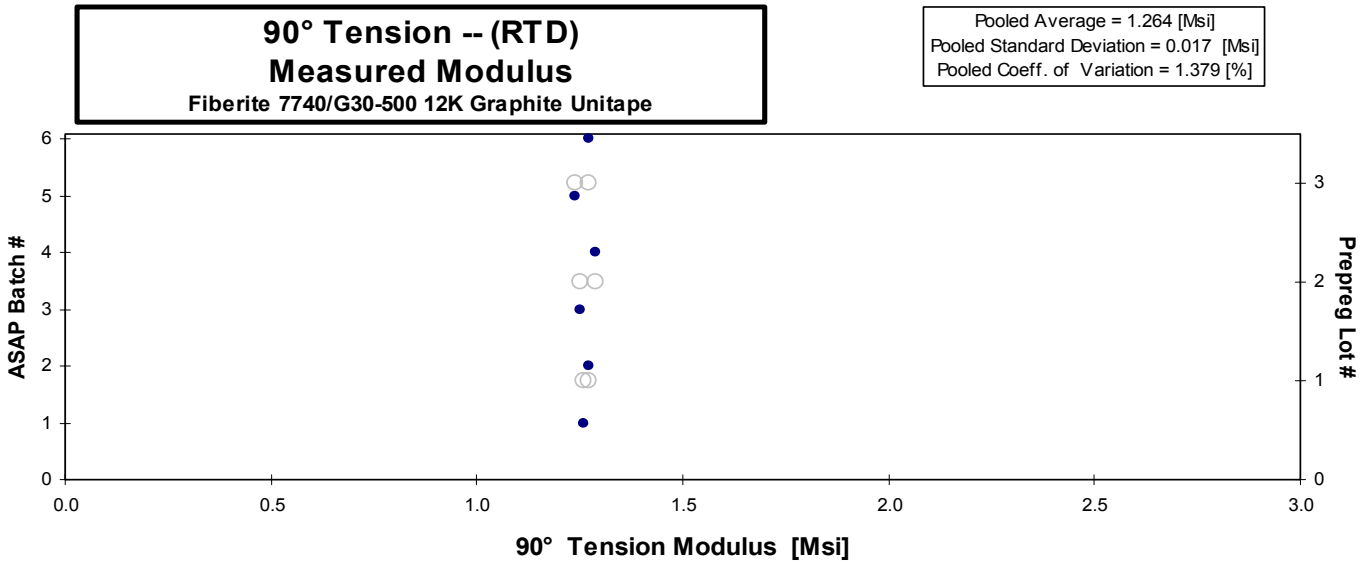



# 90° Tension -- (RTD)
# Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBU12X1A | 1 | 1 | 1 | 6.299 | 1.259 | 0.104 | 18 | 0.00577 |
| BBU12X2A | 1 | 1 | 1 | 6.824 | | 0.105 | 18 | 0.00582 |
| BBU12X3A | 1 | 1 | 1 | 5.667 | | 0.101 | 18 | 0.00564 |
| BBU14X1A | 2 | 1 | 2 | 7.333 | 1.271 | 0.104 | 18 | 0.00576 |
| BBU14X2A | 2 | 1 | 2 | 7.171 | | 0.099 | 18 | 0.00550 |
| BBU14X3A | 2 | 1 | 2 | 6.740 | | 0.105 | 18 | 0.00581 |
| BBU21X6A | 1 | 2 | 3 | 5.644 | 1.253 | 0.105 | 18 | 0.00583 |
| BBU21X7A | 1 | 2 | 3 | 6.704 | | 0.103 | 18 | 0.00573 |
| BBU21X8A | 1 | 2 | 3 | 5.730 | | 0.101 | 18 | 0.00559 |
| BBU23X6A | 2 | 2 | 4 | 7.034 | 1.289 | 0.106 | 18 | 0.00588 |
| BBU23X7A | 2 | 2 | 4 | 6.598 | | 0.106 | 18 | 0.00587 |
| BBU23X8A | 2 | 2 | 4 | 6.801 | | 0.106 | 18 | 0.00590 |
| BBU32X1A | 1 | 3 | 5 | 2.809 | 1.239 | 0.105 | 18 | 0.00581 |
| BBU32X4A | 1 | 3 | 5 | 4.604 | | 0.107 | 18 | 0.00594 |
| BBU31X6A | 1 | 3 | 5 | 5.437 | | 0.106 | 18 | 0.00590 |
| BBU31X7A | 1 | 3 | 5 | 5.756 | | 0.103 | 18 | 0.00571 |
| BBU33X1A | 2 | 3 | 6 | 3.010 | 1.272 | 0.100 | 18 | 0.00557 |
| BBU33X2A | 2 | 3 | 6 | 5.291 | | 0.104 | 18 | 0.00579 |
| BBU33X3A | 2 | 3 | 6 | 4.533 | | 0.105 | 18 | 0.00585 |
| BBU33X5A | 2 | 3 | 6 | 4.018 | | 0.097 | 18 | 0.00539 |
| BBU33X7A | 2 | 3 | 6 | 4.649 | | 0.105 | 18 | 0.00586 |

| | | | | |
|---|---|---|---|---|
| **Average** | **5.650** | **1.264** | | **0.0058** |
| **Standard Dev.** | **1.316** | **0.017** | | |
| **Coeff. of Var. [%]** | **23.288** | **1.379** | | |
| **Min.** | **2.809** | **1.239** | **Min.** | **0.0054** |
| **Max.** | **7.333** | **1.289** | **Max.** | **0.0059** |
| **Number of Spec.** | **21** | **6** | | |

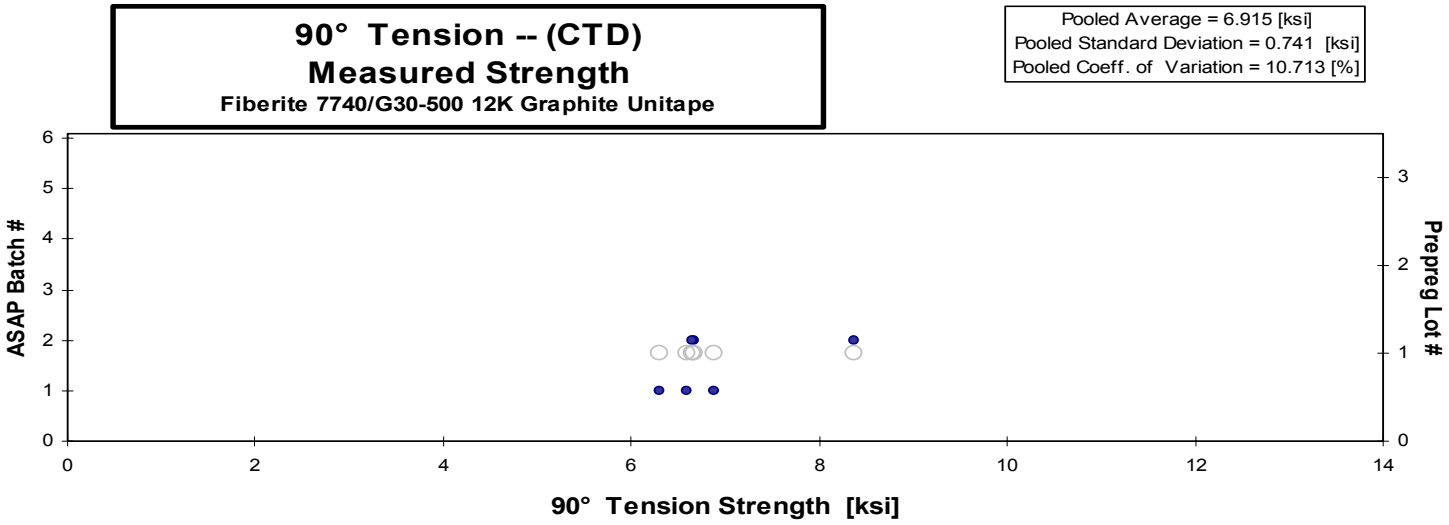


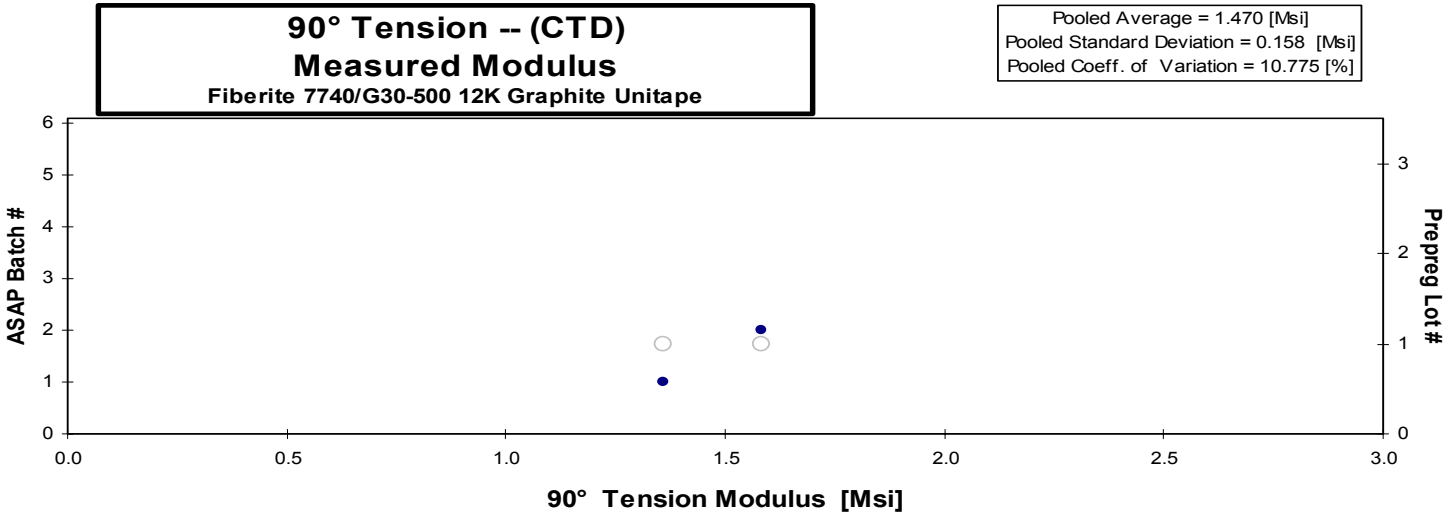



# 90° Tension -- (CTD)
# Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBU12X5B | 1 | 1 | 1 | 6.307 | 1.358 | 0.105 | 18 | 0.00582 |
| BBU12X6B | 1 | 1 | 1 | 6.602 | | 0.104 | 18 | 0.00580 |
| BBU12X7B | 1 | 1 | 1 | 6.877 | | 0.104 | 18 | 0.00580 |
| BBU14X5B | 2 | 1 | 2 | 6.668 | 1.582 | 0.105 | 18 | 0.00582 |
| BBU14X6B | 2 | 1 | 2 | 8.380 | | 0.105 | 18 | 0.00583 |
| BBU14X7B | 2 | 1 | 2 | 6.657 | | 0.102 | 18 | 0.00565 |

| | | | | |
|---|---|---|---|---|
| **Average** | **6.915** | **1.470** | | **0.0058** |
| **Standard Dev.** | **0.741** | **0.158** | | |
| **Coeff. of Var. [%]** | **10.713** | **10.775** | | |
| **Min.** | **6.307** | **1.358** | **Min.** | **0.0057** |
| **Max.** | **8.380** | **1.582** | **Max.** | **0.0058** |
| **Number of Spec.** | **6** | **2** | | |

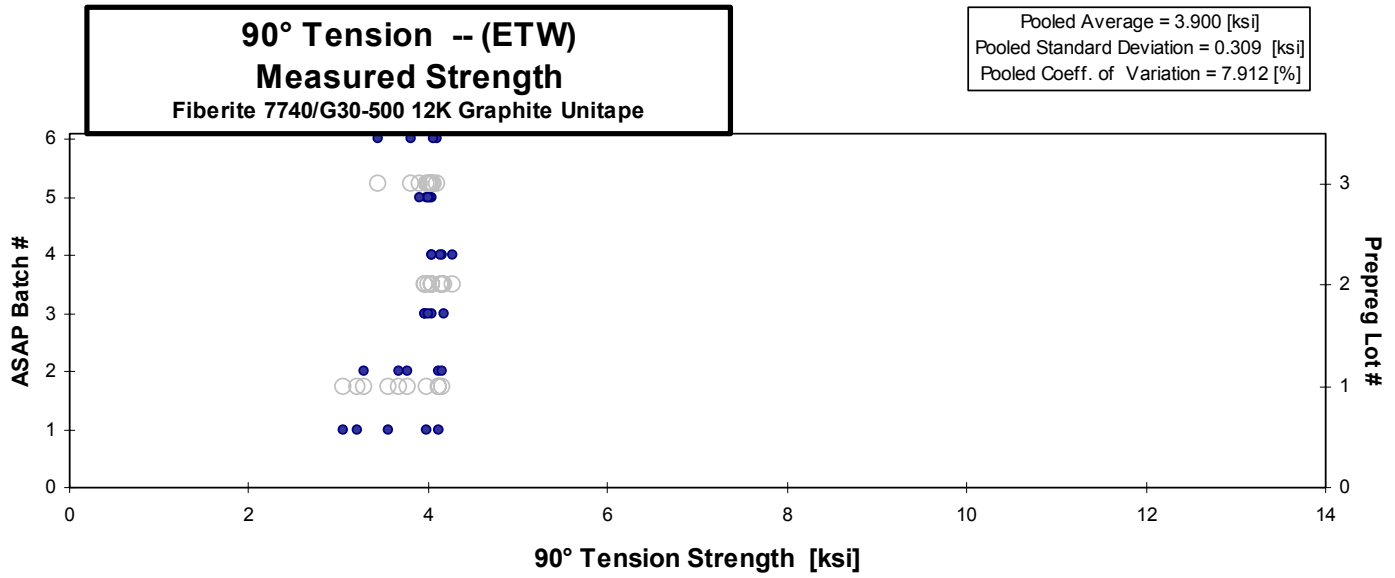


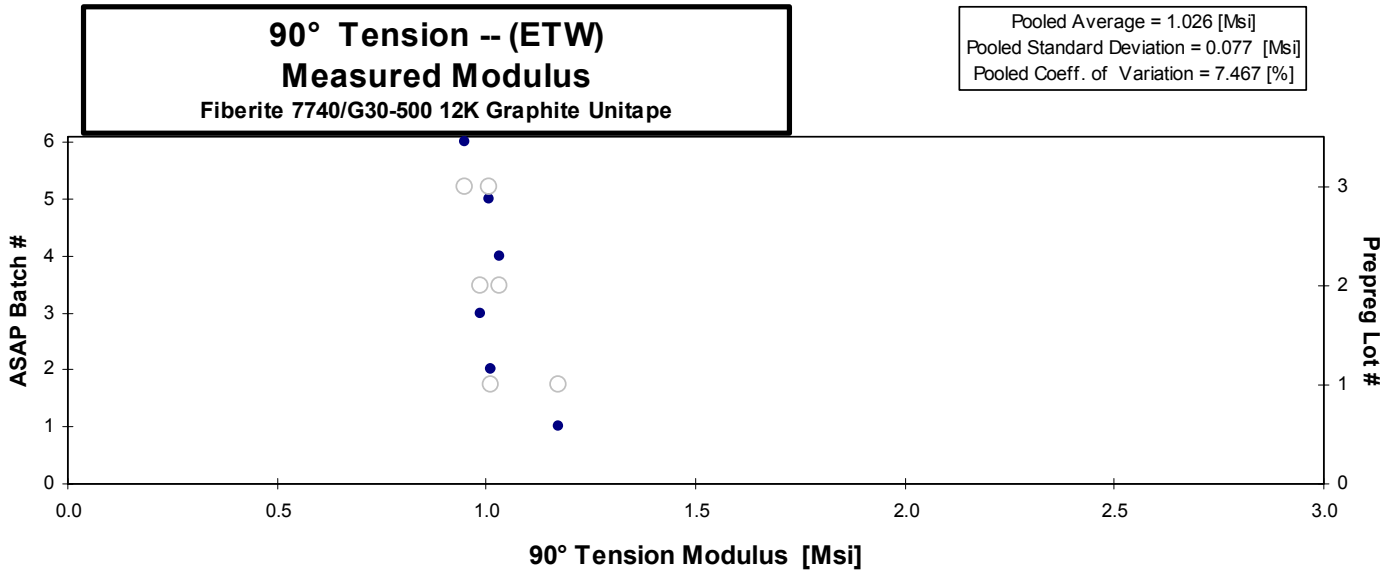



# 90° Tension -- (ETW)
## Strength & Modulus
### Fiberite 7740/G30-500 12K Graphite Unitape

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBU11X1F | 1 | 1 | 1 | 3.062 | 1.171 | 0.098 | 18 | 0.00547 |
| BBU11X2F | 1 | 1 | 1 | 3.202 | | 0.103 | 18 | 0.00572 |
| BBU11X3F | 1 | 1 | 1 | 3.550 | | 0.105 | 18 | 0.00583 |
| BBU11X4F | 1 | 1 | 1 | 4.125 | | 0.104 | 18 | 0.00580 |
| BBU11X5F | 1 | 1 | 1 | 3.976 | | 0.099 | 18 | 0.00549 |
| BBU15X1F | 3 | 1 | 2 | 3.682 | 1.011 | 0.103 | 18 | 0.00571 |
| BBU15X2F | 3 | 1 | 2 | 4.117 | | 0.104 | 18 | 0.00576 |
| BBU15X3F | 3 | 1 | 2 | 3.777 | | 0.100 | 18 | 0.00553 |
| BBU15X4F | 3 | 1 | 2 | 3.291 | | 0.105 | 18 | 0.00582 |
| BBU15X5F | 3 | 1 | 2 | 4.153 | | 0.105 | 18 | 0.00582 |
| BBU21X1F | 1 | 2 | 3 | 4.176 | 0.987 | 0.104 | 18 | 0.00576 |
| BBU21X2F | 1 | 2 | 3 | 3.968 | | 0.101 | 18 | 0.00564 |
| BBU21X3F | 1 | 2 | 3 | 3.970 | | 0.104 | 18 | 0.00580 |
| BBU21X4F | 1 | 2 | 3 | 4.041 | | 0.105 | 18 | 0.00582 |
| BBU21X5F | 1 | 2 | 3 | 4.001 | | 0.104 | 18 | 0.00579 |
| BBU23X1F | 2 | 2 | 4 | 4.276 | 1.031 | 0.106 | 18 | 0.00590 |
| BBU23X2F | 2 | 2 | 4 | 4.034 | | 0.098 | 18 | 0.00543 |
| BBU23X3F | 2 | 2 | 4 | 4.160 | | 0.101 | 18 | 0.00563 |
| BBU23X4F | 2 | 2 | 4 | 4.141 | | 0.105 | 18 | 0.00584 |
| BBU23X5F | 2 | 2 | 4 | 4.034 | | 0.106 | 18 | 0.00586 |
| BBU34X1F | 2 | 3 | 5 | 3.984 | 1.006 | 0.105 | 18 | 0.00582 |
| BBU34X2F | 2 | 3 | 5 | 3.903 | | 0.098 | 18 | 0.00545 |
| BBU34X3F | 2 | 3 | 5 | 4.051 | | 0.105 | 18 | 0.00584 |
| BBU34X4F | 2 | 3 | 5 | 4.026 | | 0.105 | 18 | 0.00582 |
| BBU34X5F | 2 | 3 | 5 | 3.995 | | 0.105 | 18 | 0.00582 |
| BBU31X2F | 1 | 3 | 6 | 4.098 | | 0.107 | 18 | 0.00594 |
| BBU31X3F | 1 | 3 | 6 | 4.059 | | 0.107 | 18 | 0.00593 |
| BBU31X4F | 1 | 3 | 6 | 3.802 | | 0.107 | 18 | 0.00592 |
| BBU31X5F | 1 | 3 | 6 | 3.448 | 0.948 | 0.107 | 18 | 0.00596 |

| | | | | |
|---|---|---|---|---|
| **Average** | **3.900** | **1.026** | | **0.0058** |
| **Standard Dev.** | **0.309** | **0.077** | | |
| **Coeff. of Var. [%]** | **7.912** | **7.467** | | |
| **Min.** | **3.062** | **0.948** | **Min.** | **0.0054** |
| **Max.** | **4.276** | **1.171** | **Max.** | **0.0060** |
| **Number of Spec.** | **29** | **6** | | |

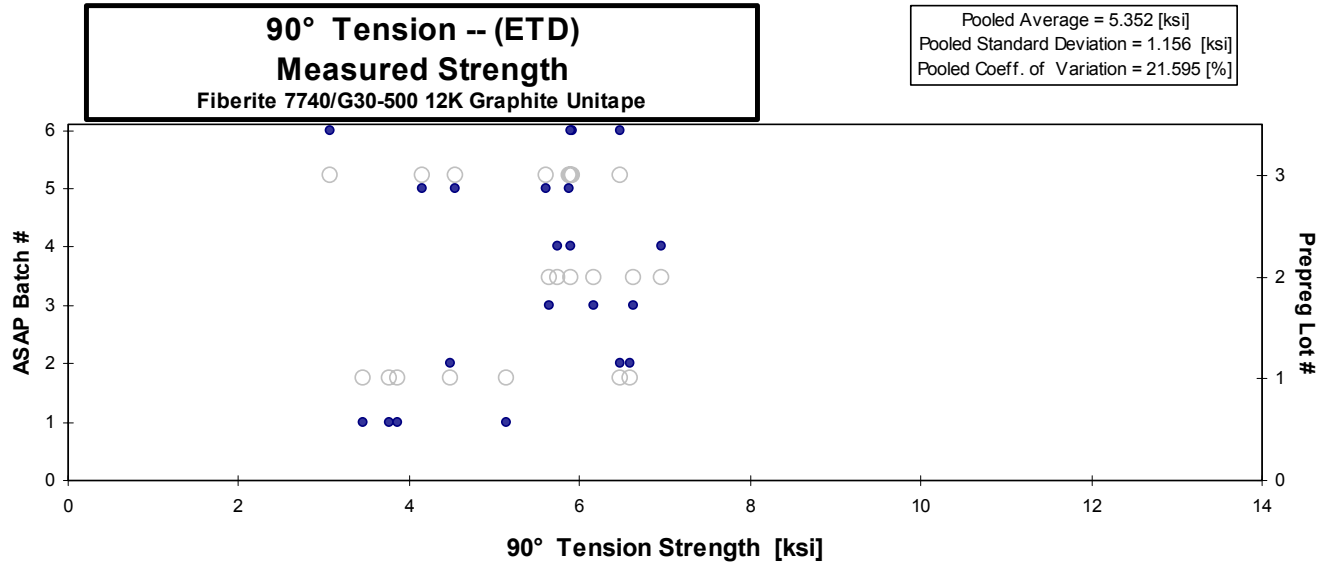


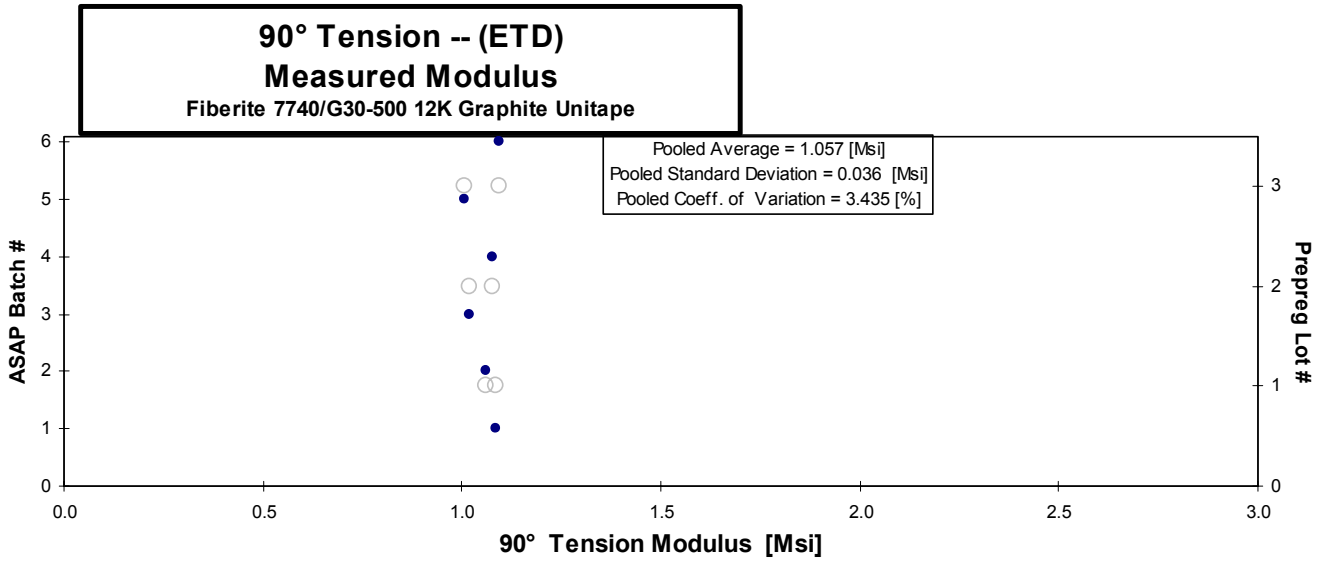



# 90° Tension -- (ETD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBU11X6G | 1 | 1 | 1 | 5.136 | 1.086 | 0.104 | 18 | 0.00576 |
| BBU11X7G | 1 | 1 | 1 | 3.779 | | 0.104 | 18 | 0.00576 |
| BBU11X8G | 1 | 1 | 1 | 3.464 | | 0.105 | 18 | 0.00583 |
| BBU11X9G | 1 | 1 | 1 | 3.860 | | 0.100 | 18 | 0.00558 |
| BBU15X6G | 3 | 1 | 2 | 6.477 | 1.060 | 0.104 | 18 | 0.00580 |
| BBU15X7G | 3 | 1 | 2 | 4.489 | | 0.097 | 18 | 0.00538 |
| BBU15X8G | 3 | 1 | 2 | 6.589 | | 0.104 | 18 | 0.00580 |
| BBU24X1G | 2 | 2 | 3 | 6.633 | 1.020 | 0.101 | 18 | 0.00558 |
| BBU24X2G | 2 | 2 | 3 | 5.637 | | 0.106 | 18 | 0.00591 |
| BBU24X3G | 2 | 2 | 3 | 6.168 | | 0.105 | 18 | 0.00585 |
| BBU22X1G | 1 | 2 | 4 | 5.752 | 1.077 | 0.105 | 18 | 0.00582 |
| BBU22X2G | 1 | 2 | 4 | 6.957 | | 0.105 | 18 | 0.00585 |
| BBU22X3G | 1 | 2 | 4 | 5.895 | | 0.105 | 18 | 0.00582 |
| BBU34X6G | 2 | 3 | 5 | 4.160 | 1.005 | 0.098 | 18 | 0.00546 |
| BBU34X7G | 2 | 3 | 5 | 4.549 | | 0.103 | 18 | 0.00574 |
| BBU34X8G | 2 | 3 | 5 | 5.881 | | 0.105 | 18 | 0.00582 |
| BBU34X9G | 2 | 3 | 5 | 5.604 | | 0.103 | 18 | 0.00574 |
| BBU32X5G | 1 | 3 | 6 | 3.077 | 1.093 | 0.108 | 18 | 0.00598 |
| BBU32X6G | 1 | 3 | 6 | 6.469 | | 0.103 | 18 | 0.00570 |
| BBU32X7G | 1 | 3 | 6 | 5.911 | | 0.107 | 18 | 0.00597 |
| BBU32X8G | 1 | 3 | 6 | 5.898 | | 0.107 | 18 | 0.00593 |

| | | | | |
|---|---|---|---|---|
| **Average** | **5.352** | **1.057** | | **0.0058** |
| **Standard Dev.** | **1.156** | **0.036** | | |
| **Coeff. of Var. [%]** | **21.595** | **3.435** | | |
| **Min.** | **3.077** | **1.005** | **Min.** | **0.0054** |
| **Max.** | **6.957** | **1.093** | **Max.** | **0.0060** |
| **Number of Spec.** | **21** | **6** | | |



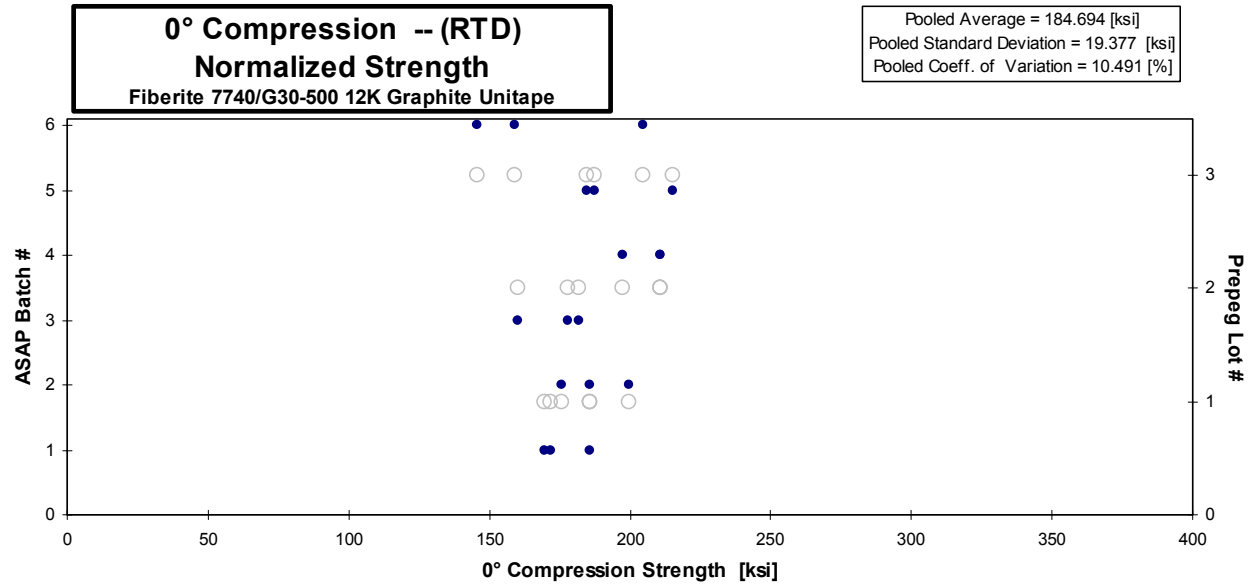



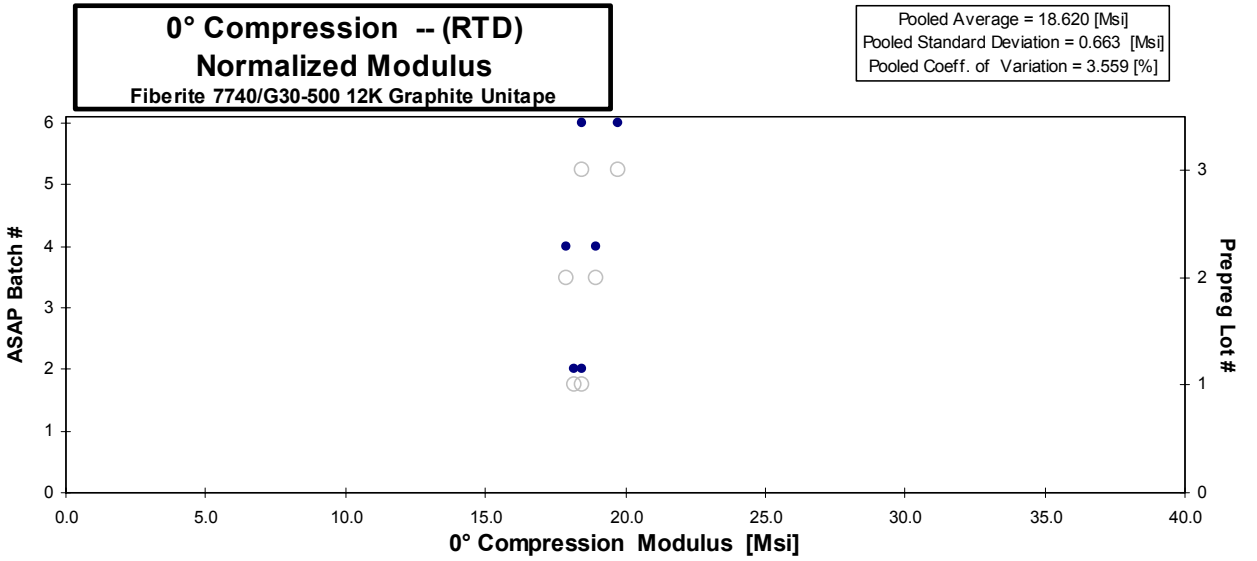
## 0° Compression -- (RTD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

**normalizing $t_{ply}$ [in]**: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| BBK1121A | 1 | 1 | 1 | 184.530 | | 0.046 | 8 | 0.00573 | 185.542 | |
| BBK1122A | 1 | 1 | 1 | 169.534 | | 0.046 | 8 | 0.00570 | 169.534 | |
| BBK1123A | 1 | 1 | 1 | 173.520 | | 0.045 | 8 | 0.00565 | 171.903 | |
| BBK1219A | 3 | 1 | 2 | 181.160 | | 0.044 | 8 | 0.00553 | 175.797 | |
| BBK1226A | 3 | 1 | 2 | 198.779 | | 0.046 | 8 | 0.00572 | 199.542 | |
| BBK1227A | 3 | 1 | 2 | 186.421 | | 0.045 | 8 | 0.00568 | 185.705 | |
| BBL1116A | 3 | 1 | 2 | | 18.833 | 0.044 | 8 | 0.00551 | | 18.203 |
| BBL1117A | 3 | 1 | 2 | | 19.046 | 0.044 | 8 | 0.00553 | | 18.461 |
| BBK2111A | 2 | 2 | 3 | 158.995 | | 0.046 | 8 | 0.00574 | 160.129 | |
| BBK2112A | 2 | 2 | 3 | 175.390 | | 0.046 | 8 | 0.00578 | 177.986 | |
| BBK2113A | 2 | 2 | 3 | 180.345 | | 0.046 | 8 | 0.00575 | 182.026 | |
| BBK2216A | 3 | 2 | 4 | 206.484 | | 0.047 | 8 | 0.00583 | 211.012 | |
| BBK2217A | 3 | 2 | 4 | 196.379 | | 0.046 | 8 | 0.00573 | 197.563 | |
| BBK2218A | 3 | 2 | 4 | 210.921 | | 0.046 | 8 | 0.00569 | 210.574 | |
| BBL2127A | 3 | 2 | 4 | | 18.372 | 0.044 | 8 | 0.00555 | | 17.878 |
| BBL2128A | 3 | 2 | 4 | | 18.982 | 0.046 | 8 | 0.00570 | | 18.982 |
| BBK3121A | 3 | 3 | 5 | 183.343 | | 0.046 | 8 | 0.00575 | 184.951 | |
| BBK3123A | 3 | 3 | 5 | 184.232 | | 0.046 | 8 | 0.00579 | 187.263 | |
| BBK3124A | 3 | 3 | 5 | 211.132 | | 0.047 | 8 | 0.00581 | 215.299 | |
| BBK3221A | 4 | 3 | 6 | 167.087 | | 0.038 | 7 | 0.00542 | 158.921 | |
| BBK3223A | 4 | 3 | 6 | 146.113 | | 0.040 | 7 | 0.00570 | 146.021 | |
| BBK3217A | 4 | 3 | 6 | 202.189 | | 0.040 | 7 | 0.00577 | 204.722 | |
| BBL3126A | 4 | 3 | 6 | | 18.629 | 0.040 | 7 | 0.00564 | | 18.442 |
| BBL3127A | 4 | 3 | 6 | | 19.890 | 0.040 | 7 | 0.00566 | | 19.753 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Average** | **184.253** | **18.959** | **$Average_{norm}$** | **0.00568** | **184.694** | **18.620** |
| **Standard Dev.** | **17.881** | **0.519** | **Standard $Dev._{norm}$** | | **19.377** | **0.663** |
| **Coeff. of Var. [%]** | **9.705** | **2.735** | **Coeff. of $Var._{norm}$ [%]** | | **10.491** | **3.559** |
| **Min.** | **146.113** | **18.372** | **Min.** | **0.0054** | **146.021** | **17.878** |
| **Max.** | **211.132** | **19.890** | **Max.** | **0.0058** | **215.299** | **19.753** |
| **Number of Spec.** | **18** | **6** | **Number of Spec.** | | **18** | **6** |



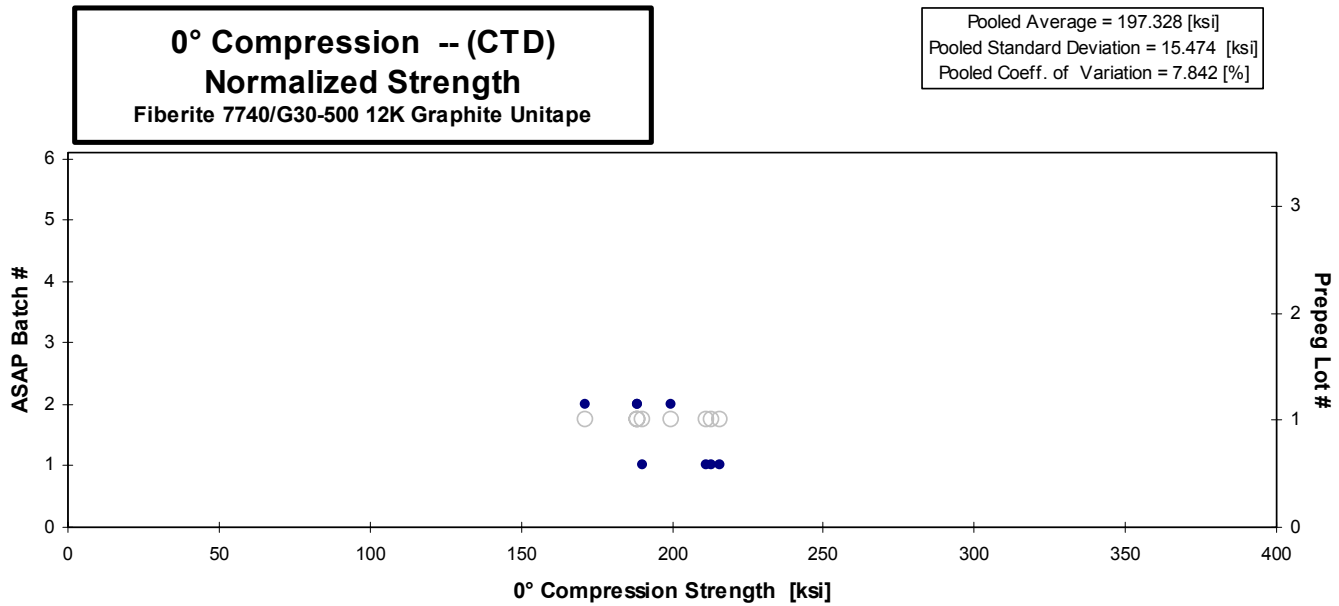



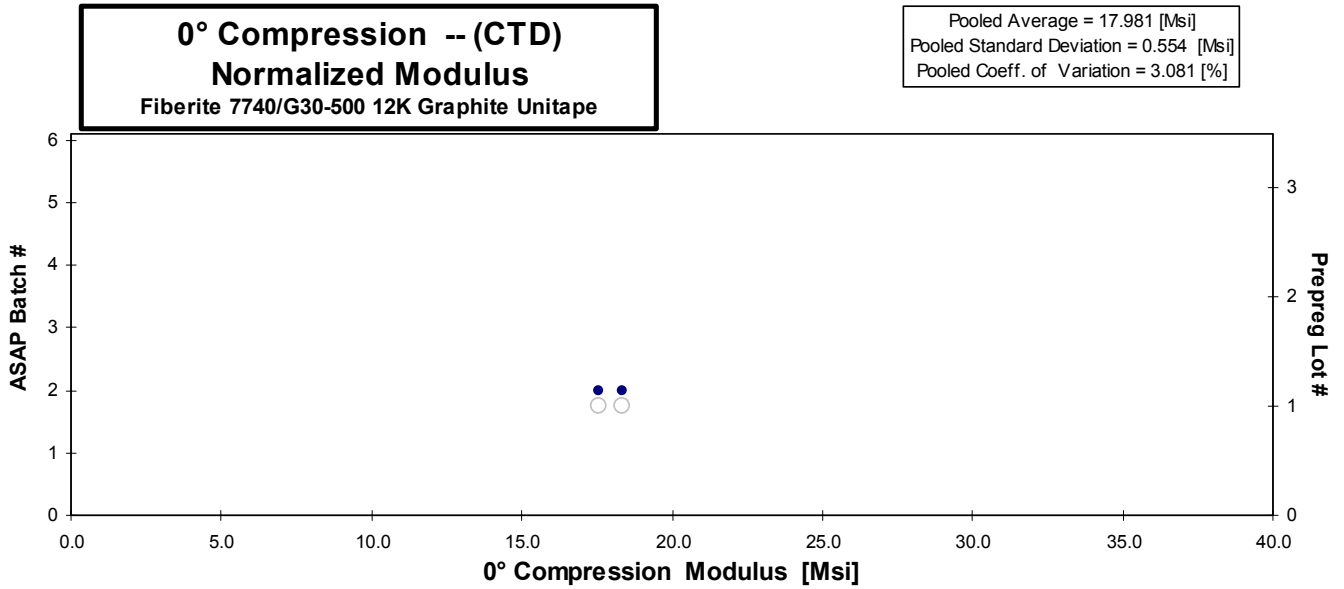
## 0° Compression -- (CTD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

**normalizing $t_{ply}$ [in]**: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| BBK1116B | 1 | 1 | 1 | 218.262 | | 0.045 | 8 | 0.00564 | 215.989 | |
| BBK1117B | 1 | 1 | 1 | 215.171 | | 0.045 | 8 | 0.00560 | 211.278 | |
| BBK1118B | 1 | 1 | 1 | 192.163 | | 0.045 | 8 | 0.00564 | 190.161 | |
| BBK1119B | 1 | 1 | 1 | 215.127 | | 0.045 | 8 | 0.00564 | 213.004 | |
| BBK1215B | 3 | 1 | 2 | 193.234 | | 0.045 | 8 | 0.00557 | 188.784 | |
| BBK1216B | 3 | 1 | 2 | 193.108 | | 0.045 | 8 | 0.00557 | 188.767 | |
| BBK1217B | 3 | 1 | 2 | 205.231 | | 0.044 | 8 | 0.00554 | 199.493 | |
| BBK1218B | 3 | 1 | 2 | 177.375 | | 0.044 | 8 | 0.00550 | 171.152 | |
| BBL1119B | 3 | 1 | 2 | | 18.136 | 0.044 | 8 | 0.00553 | | 17.589 |
| BBL111AB | 3 | 1 | 2 | | 18.998 | 0.044 | 8 | 0.00551 | | 18.373 |

| | | | | | |
|---|---|---|---|---|---|
| **Average** | **201.209** | **18.567** | **$Average_{norm}$** | **0.00557** | **197.328** | **17.981** |
| **Standard Dev.** | **14.515** | **0.609** | **$Standard\ Dev._{norm}$** | | **15.474** | **0.554** |
| **Coeff. of Var. [%]** | **7.214** | **3.281** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **7.842** | **3.081** |
| **Min.** | **177.375** | **18.136** | **Min.** | **0.0055** | **171.152** | **17.589** |
| **Max.** | **218.262** | **18.998** | **Max.** | **0.0056** | **215.989** | **18.373** |
| **Number of Spec.** | **8** | **2** | **Number of Spec.** | | **8** | **2** |



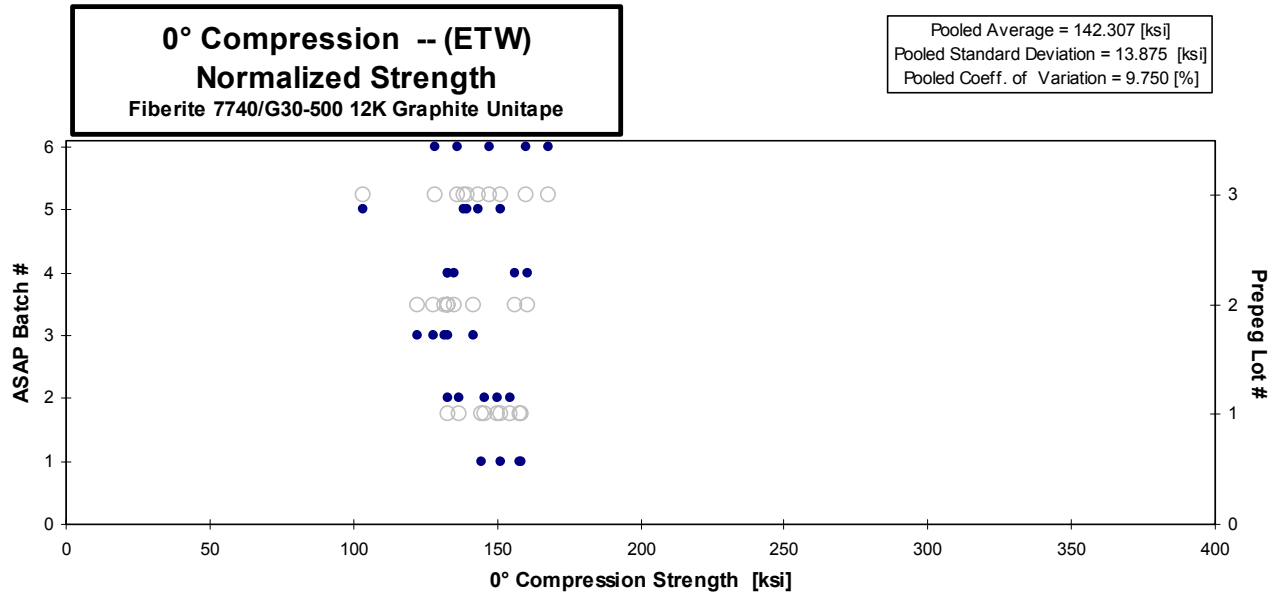



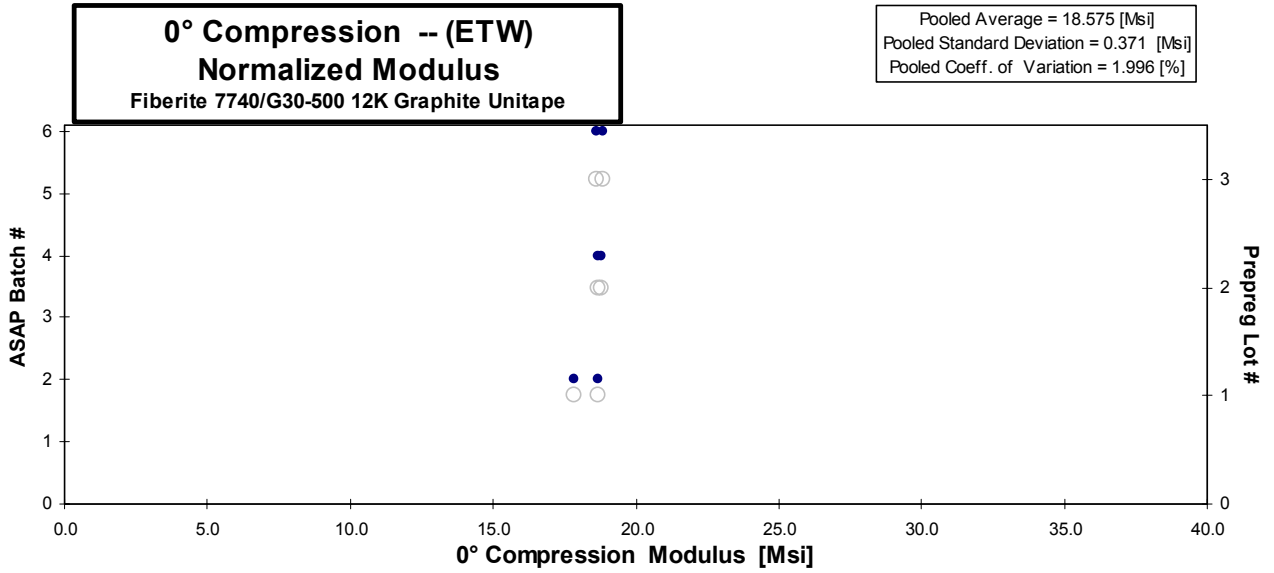
# 0° Compression -- (ETW)
# Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

**normalizing $t_{ply}$ [in]**: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| BBK1111F | 1 | 1 | 1 | 153.685 | | 0.045 | 8 | 0.00562 | 151.495 | |
| BBK1112F | 1 | 1 | 1 | 145.163 | | 0.045 | 8 | 0.00568 | 144.606 | |
| BBK1114F | 1 | 1 | 1 | 157.095 | | 0.046 | 8 | 0.00574 | 158.128 | |
| BBK1115F | 1 | 1 | 1 | 158.312 | | 0.046 | 8 | 0.00571 | 158.659 | |
| BBK1221F | 3 | 1 | 2 | 136.053 | | 0.045 | 8 | 0.00557 | 132.846 | |
| BBK1222F | 3 | 1 | 2 | 148.938 | | 0.046 | 8 | 0.00576 | 150.408 | |
| BBK1223F | 3 | 1 | 2 | 135.533 | | 0.046 | 8 | 0.00576 | 137.019 | |
| BBK1224F | 3 | 1 | 2 | 152.793 | | 0.046 | 8 | 0.00577 | 154.636 | |
| BBK1225F | 3 | 1 | 2 | 145.068 | | 0.046 | 8 | 0.00573 | 145.704 | |
| BBL1111F | 3 | 1 | 2 | | 18.883 | 0.043 | 8 | 0.00538 | | 17.838 |
| BBL1112F | 3 | 1 | 2 | | 19.219 | 0.044 | 8 | 0.00554 | | 18.671 |
| BBK2121F | 2 | 2 | 3 | 131.792 | | 0.046 | 8 | 0.00571 | 131.936 | |
| BBK2122F | 2 | 2 | 3 | 124.032 | | 0.045 | 8 | 0.00563 | 122.604 | |
| BBK2123F | 2 | 2 | 3 | 143.455 | | 0.045 | 8 | 0.00564 | 142.039 | |
| BBK2124F | 2 | 2 | 3 | 134.267 | | 0.045 | 8 | 0.00564 | 132.795 | |
| BBK2125F | 2 | 2 | 3 | 127.823 | | 0.046 | 8 | 0.00571 | 128.034 | |
| BBK2211F | 3 | 2 | 4 | 132.675 | | 0.046 | 8 | 0.00571 | 132.966 | |
| BBK2212F | 3 | 2 | 4 | 158.118 | | 0.046 | 8 | 0.00579 | 160.546 | |
| BBK2213F | 3 | 2 | 4 | 154.033 | | 0.046 | 8 | 0.00579 | 156.567 | |
| BBK2214F | 3 | 2 | 4 | 133.503 | | 0.046 | 8 | 0.00578 | 135.406 | |
| BBK2215F | 3 | 2 | 4 | 130.712 | | 0.046 | 8 | 0.00579 | 132.791 | |
| BBL2121F | 3 | 2 | 4 | | 18.925 | 0.045 | 8 | 0.00565 | | 18.770 |
| BBL2123F | 3 | 2 | 4 | | 18.769 | 0.045 | 8 | 0.00567 | | 18.666 |
| BBK3111F | 3 | 3 | 5 | 138.130 | | 0.047 | 8 | 0.00593 | 143.582 | |
| BBK3112F | 3 | 3 | 5 | 135.293 | | 0.047 | 8 | 0.00588 | 139.669 | |
| BBK3113F | 3 | 3 | 5 | 100.987 | | 0.047 | 8 | 0.00583 | 103.257 | |
| BBK3114F | 3 | 3 | 5 | 133.711 | | 0.047 | 8 | 0.00592 | 138.769 | |
| BBK3115F | 3 | 3 | 5 | 147.208 | | 0.047 | 8 | 0.00587 | 151.566 | |
| BBK3211F | 4 | 3 | 6 | 129.236 | | 0.040 | 7 | 0.00567 | 128.507 | |
| BBK3212F | 4 | 3 | 6 | 142.768 | | 0.041 | 7 | 0.00588 | 147.330 | |
| BBK3213F | 4 | 3 | 6 | 159.063 | | 0.040 | 7 | 0.00575 | 160.458 | |
| BBK3214F | 4 | 3 | 6 | 167.399 | | 0.040 | 7 | 0.00573 | 168.238 | |
| BBK3215F | 4 | 3 | 6 | 133.247 | | 0.041 | 7 | 0.00583 | 136.336 | |
| BBL3121F | 4 | 3 | 6 | | 19.192 | 0.039 | 7 | 0.00554 | | 18.638 |
| BBL3122F | 4 | 3 | 6 | | 18.924 | 0.040 | 7 | 0.00568 | | 18.865 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **141.038** | **18.985** | **$Average_{norm}$** | **0.00572** | **142.307** | **18.575** |
| **Standard Dev.** | **13.706** | **0.180** | **$Standard\ Dev._{norm}$** | | **13.875** | **0.371** |
| **Coeff. of Var. [%]** | **9.718** | **0.946** | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **9.750** | **1.996** |
| **Min.** | **100.987** | **18.769** | **Min.** | **0.0054** | **103.257** | **17.838** |
| **Max.** | **167.399** | **19.219** | **Max.** | **0.0059** | **168.238** | **18.865** |
| **Number of Spec.** | **29** | **6** | **Number of Spec.** | | **29** | **6** |



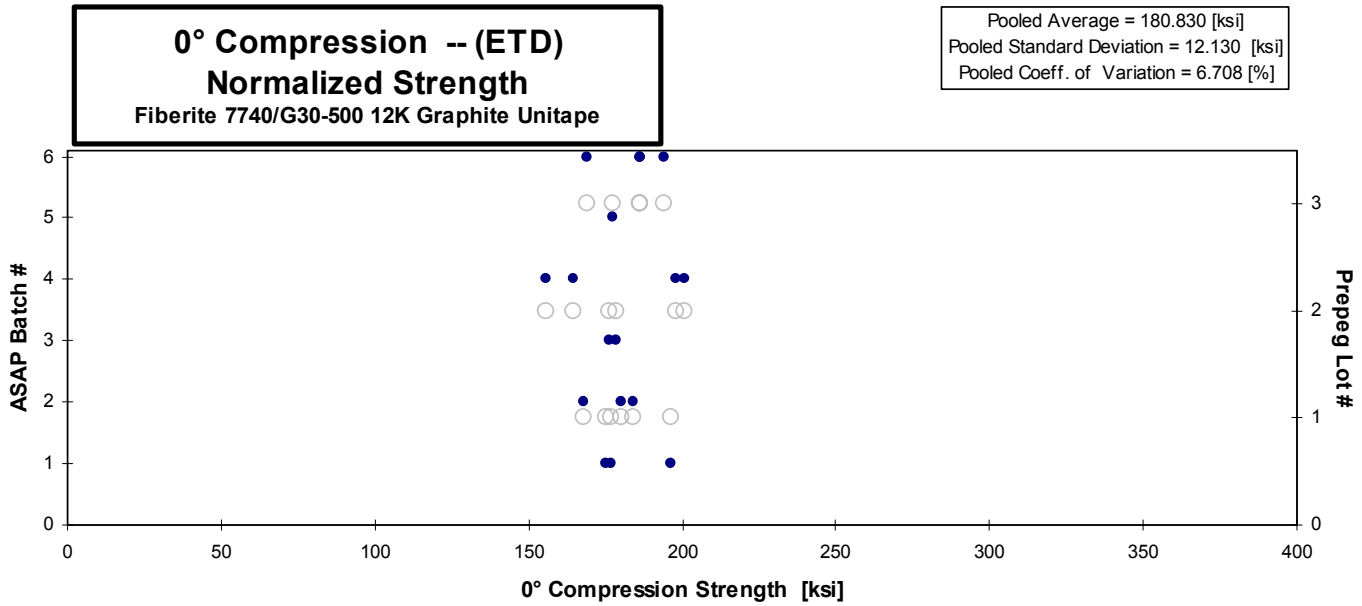



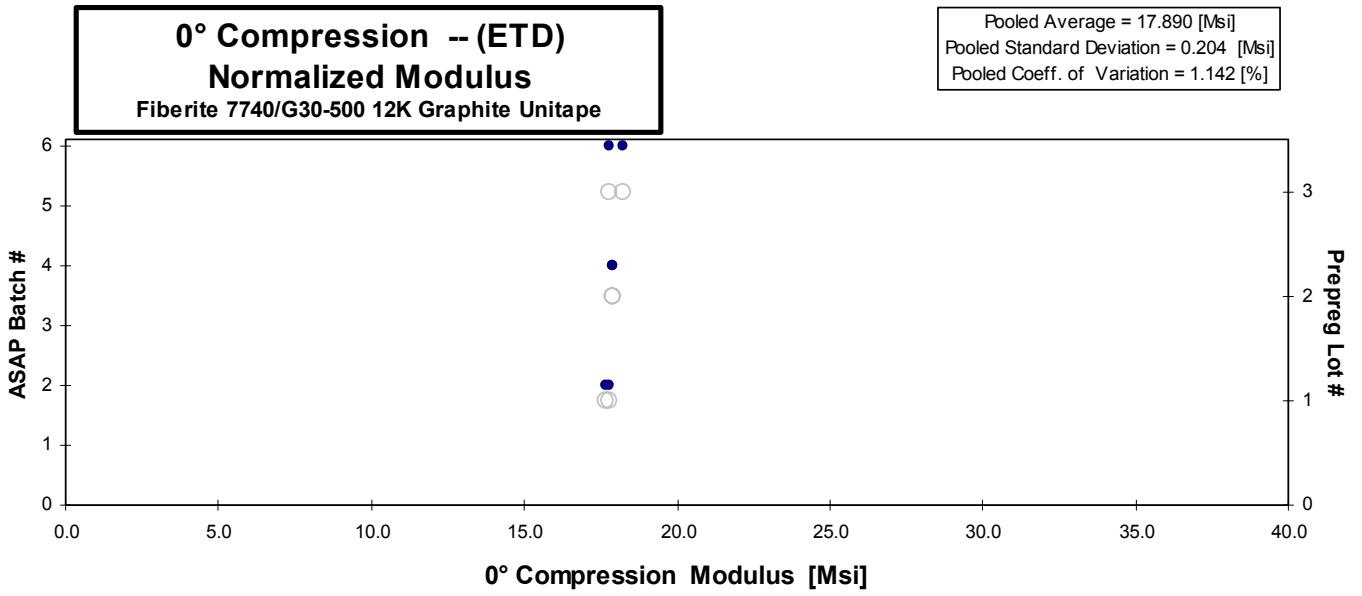
## 0° Compression -- (ETD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

normalizing $t_{ply}$ [in]: 0.0057

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] | $Strength_{norm}$ [ksi] | $Modulus_{norm}$ [Msi] |
|---|---|---|---|---|---|---|---|---|---|---|
| BBK1125G | 1 | 1 | 1 | 174.543 | | 0.046 | 8 | 0.00577 | 176.744 | |
| BBK1126G | 1 | 1 | 1 | 173.051 | | 0.046 | 8 | 0.00578 | 175.328 | |
| BBK1127G | 1 | 1 | 1 | 195.114 | | 0.046 | 8 | 0.00574 | 196.612 | |
| BBK1211G | 3 | 1 | 2 | 192.167 | | 0.044 | 8 | 0.00546 | 184.054 | |
| BBK1212G | 3 | 1 | 2 | 184.217 | | 0.045 | 8 | 0.00558 | 180.177 | |
| BBK1213G | 3 | 1 | 2 | 171.862 | | 0.045 | 8 | 0.00557 | 167.811 | |
| BBL1121G | 3 | 1 | 2 | | 17.827 | 0.046 | 8 | 0.00569 | | 17.808 |
| BBL1122G | 3 | 1 | 2 | | 17.414 | 0.046 | 8 | 0.00578 | | 17.672 |
| BBK2116G | 2 | 2 | 3 | 176.513 | | 0.046 | 8 | 0.00577 | 178.545 | |
| BBK2118G | 2 | 2 | 3 | 176.294 | | 0.046 | 8 | 0.00570 | 176.391 | |
| BBK2221G | 3 | 2 | 4 | 202.439 | | 0.045 | 8 | 0.00565 | 200.663 | |
| BBK2222G | 3 | 2 | 4 | 200.740 | | 0.045 | 8 | 0.00563 | 198.099 | |
| BBK2223G | 3 | 2 | 4 | 156.159 | | 0.046 | 8 | 0.00569 | 155.902 | |
| BBK2224G | 3 | 2 | 4 | 165.661 | | 0.045 | 8 | 0.00566 | 164.571 | |
| BBL2129G | 3 | 2 | 4 | | 18.253 | 0.045 | 8 | 0.00559 | | 17.903 |
| BBL212AG | 3 | 2 | 4 | | 18.511 | 0.044 | 8 | 0.00552 | | 17.922 |
| BBK3128G | 3 | 3 | 5 | 175.740 | | 0.046 | 8 | 0.00576 | 177.571 | |
| BBK3225G | 4 | 3 | 6 | 199.481 | | 0.039 | 7 | 0.00555 | 194.232 | |
| BBK3226G | 4 | 3 | 6 | 190.195 | | 0.039 | 7 | 0.00559 | 186.382 | |
| BBK3227G | 4 | 3 | 6 | 190.401 | | 0.039 | 7 | 0.00559 | 186.583 | |
| BBK3228G | 4 | 3 | 6 | 189.081 | | 0.039 | 7 | 0.00561 | 186.237 | |
| BBK3229G | 4 | 3 | 6 | 169.455 | | 0.040 | 7 | 0.00569 | 169.031 | |
| BBL3129G | 4 | 3 | 6 | | 18.313 | 0.039 | 7 | 0.00553 | | 17.773 |
| BBL312AG | 4 | 3 | 6 | | 18.697 | 0.039 | 7 | 0.00557 | | 18.263 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Average** | **182.395** | **18.169** | | **$Average_{norm}$** | **0.00564** | **180.830** | **17.890** |
| **Standard Dev.** | **13.223** | **0.471** | | **$Standard\ Dev._{norm}$** | | **12.130** | **0.204** |
| **Coeff. of Var. [%]** | **7.249** | **2.593** | | **$Coeff.\ of\ Var.\ [\%]_{norm}$** | | **6.708** | **1.142** |
| **Min.** | **156.159** | **17.414** | | **Min.** | **0.0055** | **155.902** | **17.672** |
| **Max.** | **202.439** | **18.697** | | **Max.** | **0.0058** | **200.663** | **18.263** |
| **Number of Spec.** | **18** | **6** | | **Number of Spec.** | | **18** | **6** |

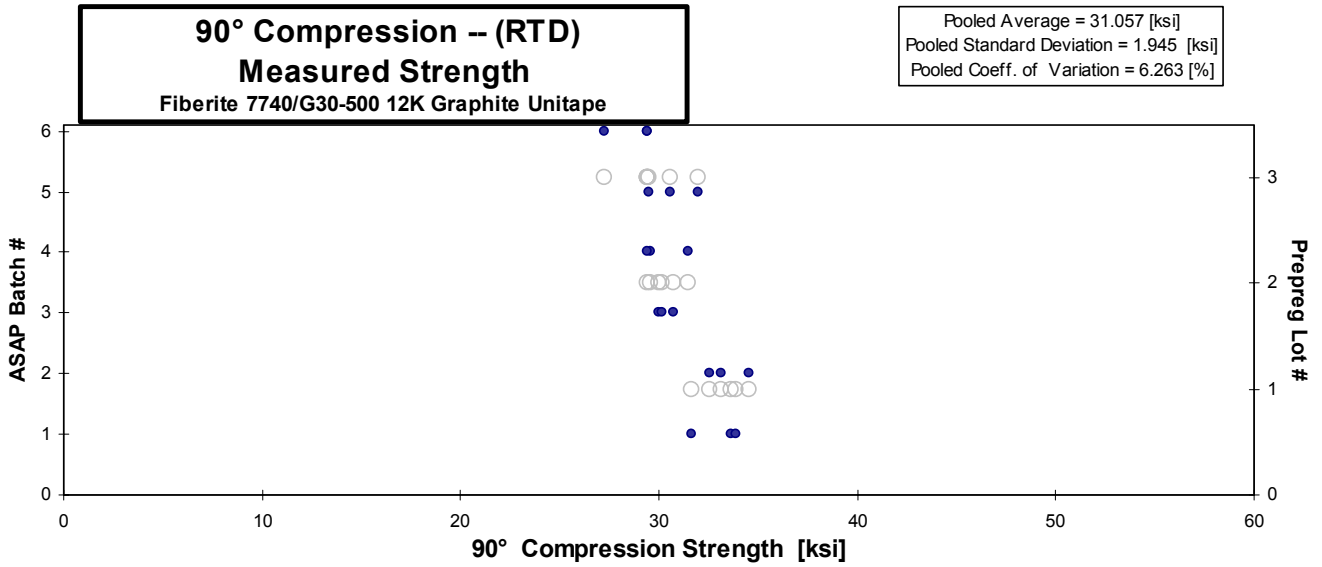


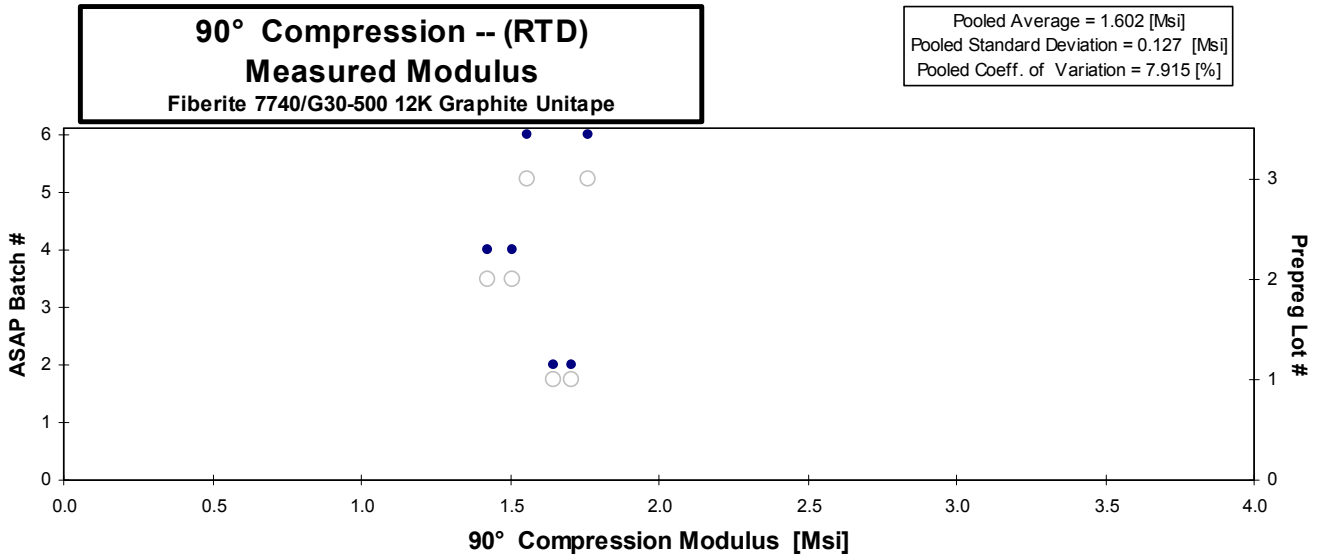



# 90° Compression -- (RTD)
# Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBW1127A | 1 | 1 | 1 | 33.655 | | 0.046 | 8 | 0.00571 |
| BBW1128A | 1 | 1 | 1 | 33.904 | | 0.046 | 8 | 0.00571 |
| BBW1129A | 1 | 1 | 1 | 31.621 | | 0.046 | 8 | 0.00573 |
| BBW1226A | 4 | 1 | 2 | 33.149 | | 0.039 | 7 | 0.00551 |
| BBW1227A | 4 | 1 | 2 | 34.530 | | 0.039 | 7 | 0.00563 |
| BBW1228A | 4 | 1 | 2 | 32.587 | | 0.039 | 7 | 0.00564 |
| BBZ1116A | 4 | 1 | 2 | | 1.648 | 0.040 | 7 | 0.00577 |
| BBZ1117A | 4 | 1 | 2 | | 1.704 | 0.038 | 7 | 0.00542 |
| BBW2119A | 2 | 2 | 3 | 30.721 | | 0.044 | 8 | 0.00545 |
| BBW2127A | 2 | 2 | 3 | 29.994 | | 0.046 | 8 | 0.00576 |
| BBW2128A | 2 | 2 | 3 | 30.146 | | 0.046 | 8 | 0.00580 |
| BBW2226A | 4 | 2 | 4 | 31.459 | | 0.046 | 8 | 0.00579 |
| BBW2227A | 4 | 2 | 4 | 29.603 | | 0.046 | 8 | 0.00581 |
| BBW2228A | 4 | 2 | 4 | 29.426 | | 0.047 | 8 | 0.00582 |
| BBZ2119A | 4 | 2 | 4 | | 1.510 | 0.046 | 8 | 0.00573 |
| BBZ211AA | 4 | 2 | 4 | | 1.425 | 0.046 | 8 | 0.00577 |
| BBW3126A | 3 | 3 | 5 | 29.527 | | 0.047 | 8 | 0.00588 |
| BBW3127A | 3 | 3 | 5 | 32.030 | | 0.047 | 8 | 0.00583 |
| BBW3128A | 3 | 3 | 5 | 30.585 | | 0.048 | 8 | 0.00596 |
| BBW3211A | 4 | 3 | 6 | 27.245 | | 0.040 | 7 | 0.00568 |
| BBW3212A | 4 | 3 | 6 | 29.425 | | 0.041 | 7 | 0.00581 |
| BBW3213A | 4 | 3 | 6 | 29.427 | | 0.041 | 7 | 0.00583 |
| BBZ3116A | 4 | 3 | 6 | | 1.558 | 0.040 | 7 | 0.00573 |
| BBZ3117A | 4 | 3 | 6 | | 1.764 | 0.036 | 7 | 0.00509 |

| | | | | |
|---|---|---|---|---|
| **Average** | **31.057** | **1.602** | | **0.0057** |
| **Standard Dev.** | **1.945** | **0.127** | | |
| **Coeff. of Var. [%]** | **6.263** | **7.915** | | |
| **Min.** | **27.245** | **1.425** | **Min.** | **0.0051** |
| **Max.** | **34.530** | **1.764** | **Max.** | **0.0060** |
| **Number of Spec.** | **18** | **6** | | |

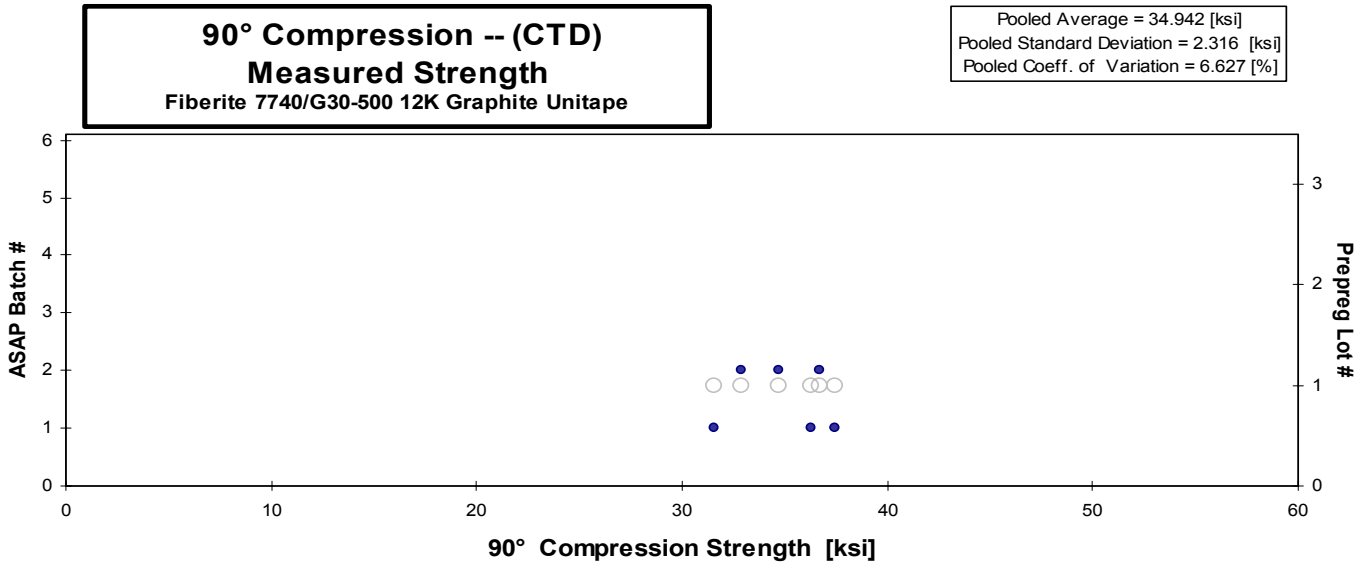


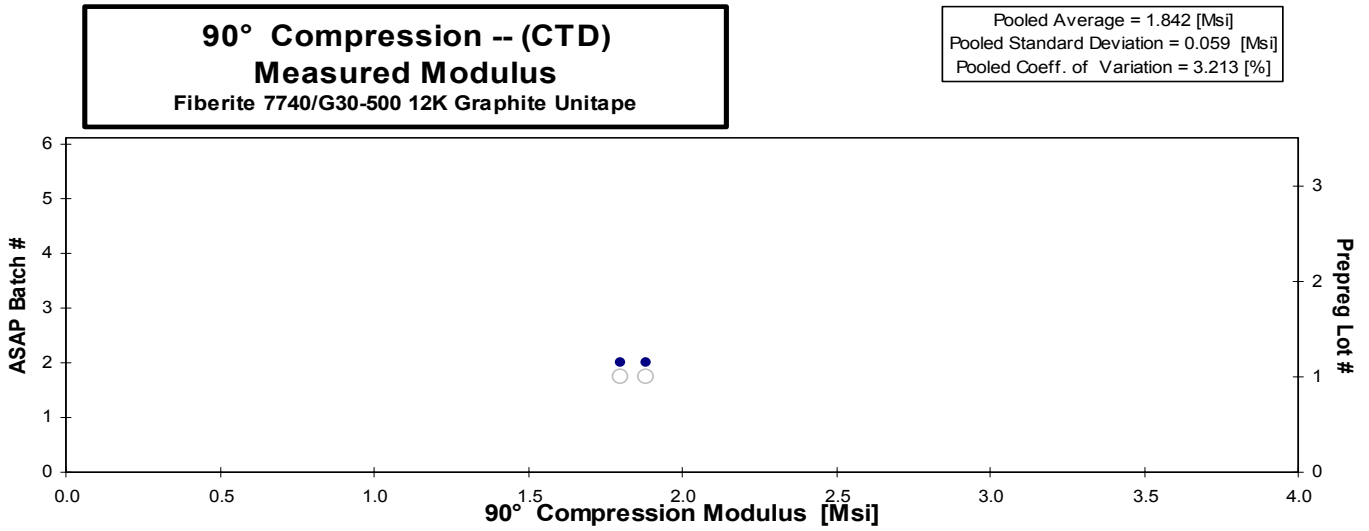



# 90° Compression -- (CTD)
# Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBW1112B | 1 | 1 | 1 | 36.272 | | 0.045 | 8 | 0.00562 |
| BBW1113B | 1 | 1 | 1 | 31.568 | | 0.045 | 8 | 0.00565 |
| BBW1115B | 1 | 1 | 1 | 37.454 | | 0.046 | 8 | 0.00573 |
| BBW1212B | 4 | 1 | 2 | 32.931 | | 0.039 | 7 | 0.00561 |
| BBW1213B | 4 | 1 | 2 | 36.741 | | 0.040 | 7 | 0.00572 |
| BBW1214B | 4 | 1 | 2 | 34.689 | | 0.040 | 7 | 0.00578 |
| BBZ1121B | 4 | 1 | 2 | | 1.800 | 0.038 | 7 | 0.00545 |
| BBZ1122B | 4 | 1 | 2 | | 1.884 | 0.038 | 7 | 0.00541 |

| | | | | |
|---|---|---|---|---|
| **Average** | **34.942** | **1.842** | | **0.0056** |
| **Standard Dev.** | **2.316** | **0.059** | | |
| **Coeff. of Var. [%]** | **6.627** | **3.213** | | |
| **Min.** | **31.568** | **1.800** | **Min.** | **0.0054** |
| **Max.** | **37.454** | **1.884** | **Max.** | **0.0058** |
| **Number of Spec.** | **6** | **2** | | |

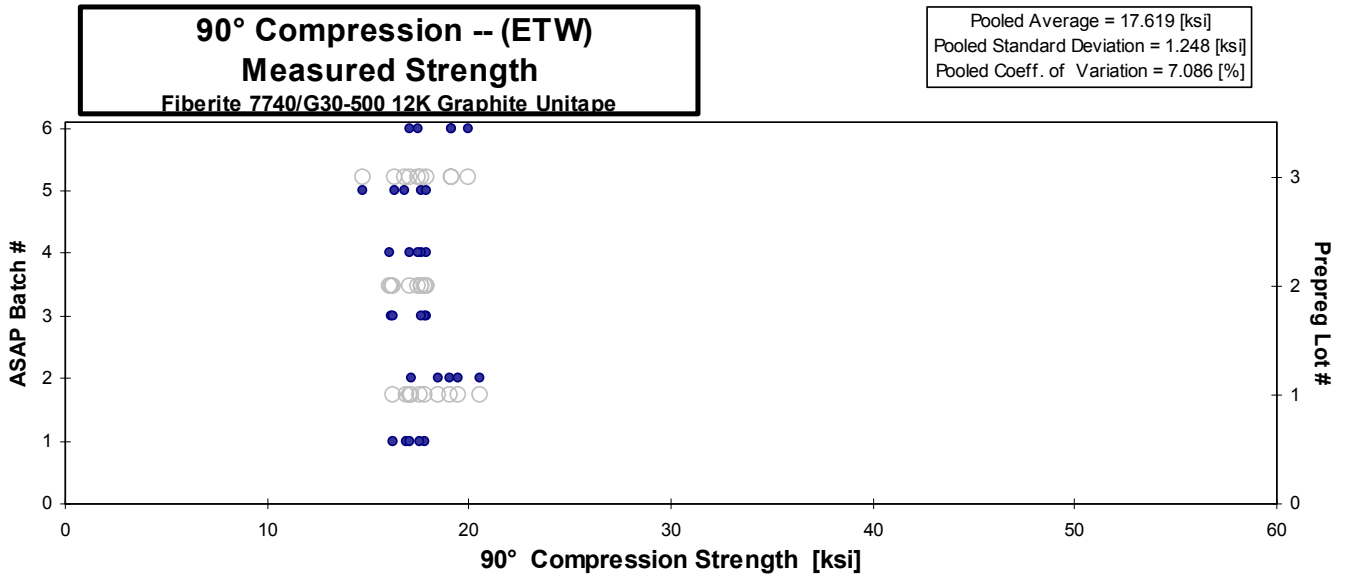


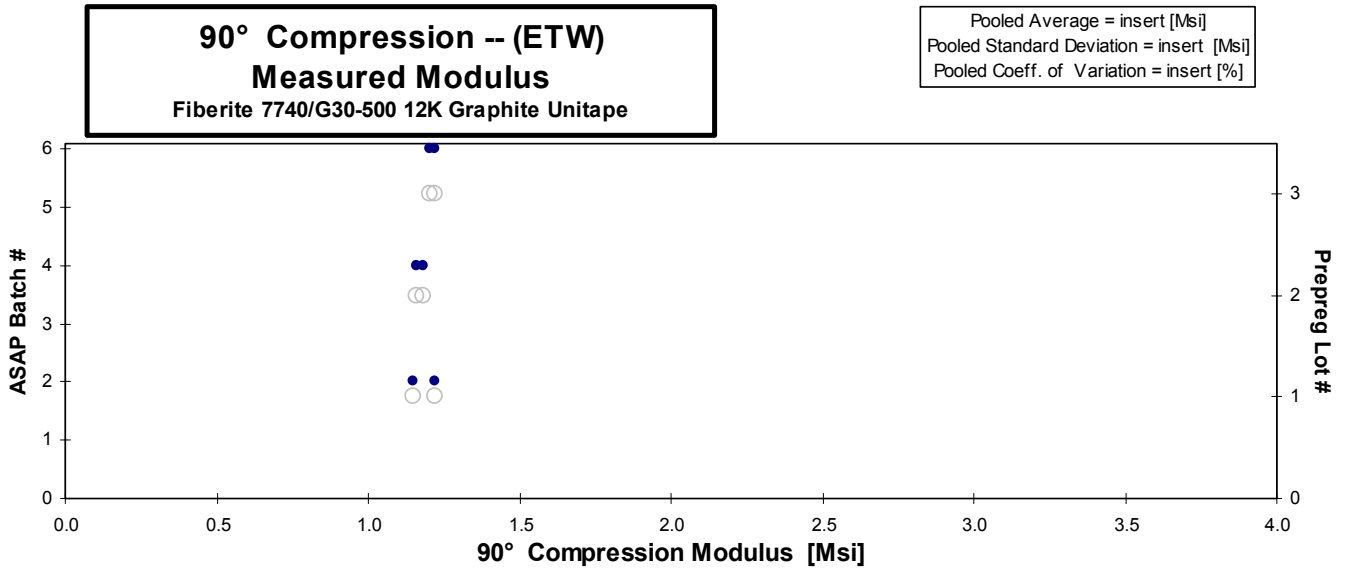



## 90° Compression -- (ETW)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBW1122F | 1 | 1 | 1 | 16.899 | | 0.045 | 8 | 0.00559 |
| BBW1123F | 1 | 1 | 1 | 16.221 | | 0.046 | 8 | 0.00579 |
| BBW1124F | 1 | 1 | 1 | 17.815 | | 0.046 | 8 | 0.00575 |
| BBW1125F | 1 | 1 | 1 | 17.528 | | 0.047 | 8 | 0.00583 |
| BBW1126F | 1 | 1 | 1 | 17.089 | | 0.046 | 8 | 0.00575 |
| BBW1221F | 4 | 1 | 2 | 18.502 | | 0.040 | 7 | 0.00576 |
| BBW1222F | 4 | 1 | 2 | 17.141 | | 0.040 | 7 | 0.00572 |
| BBW1223F | 4 | 1 | 2 | 19.053 | | 0.040 | 7 | 0.00568 |
| BBW1224F | 4 | 1 | 2 | 19.444 | | 0.040 | 7 | 0.00572 |
| BBW1225F | 4 | 1 | 2 | 20.525 | | 0.040 | 7 | 0.00570 |
| BBZ1111F | 4 | 1 | 2 | | 1.149 | 0.040 | 7 | 0.00576 |
| BBZ1112F | 4 | 1 | 2 | | 1.218 | 0.040 | 7 | 0.00572 |
| BBW2121F | 2 | 2 | 3 | 17.875 | | 0.045 | 8 | 0.00568 |
| BBW2122F | 2 | 2 | 3 | 17.841 | | 0.046 | 8 | 0.00569 |
| BBW2123F | 2 | 2 | 3 | 17.642 | | 0.046 | 8 | 0.00570 |
| BBW2124F | 2 | 2 | 3 | 16.193 | | 0.046 | 8 | 0.00579 |
| BBW2125F | 2 | 2 | 3 | 16.278 | | 0.046 | 8 | 0.00578 |
| BBW2221F | 4 | 2 | 4 | 17.941 | | 0.045 | 8 | 0.00562 |
| BBW2222F | 4 | 2 | 4 | 17.079 | | 0.045 | 8 | 0.00568 |
| BBW2223F | 4 | 2 | 4 | 17.622 | | 0.046 | 8 | 0.00575 |
| BBW2224F | 4 | 2 | 4 | 17.474 | | 0.046 | 8 | 0.00578 |
| BBW2225F | 4 | 2 | 4 | 16.074 | | 0.044 | 8 | 0.00549 |
| BBZ2111F | 4 | 2 | 4 | | 1.158 | 0.044 | 8 | 0.00548 |
| BBZ2112F | 4 | 2 | 4 | | 1.184 | 0.045 | 8 | 0.00566 |
| BBW3121F | 3 | 3 | 5 | 14.752 | | 0.045 | 8 | 0.00563 |
| BBW3122F | 3 | 3 | 5 | 16.353 | | 0.046 | 8 | 0.00578 |
| BBW3123F | 3 | 3 | 5 | 17.633 | | 0.047 | 8 | 0.00590 |
| BBW3124F | 3 | 3 | 5 | 17.890 | | 0.047 | 8 | 0.00593 |
| BBW3125F | 3 | 3 | 5 | 16.861 | | 0.047 | 8 | 0.00587 |
| BBW3221F | 4 | 3 | 6 | 19.935 | | 0.041 | 7 | 0.00582 |
| BBW3222F | 4 | 3 | 6 | 17.088 | | 0.041 | 7 | 0.00587 |
| BBW3223F | 4 | 3 | 6 | 17.516 | | 0.040 | 7 | 0.00575 |
| BBW3224F | 4 | 3 | 6 | 19.132 | | 0.041 | 7 | 0.00591 |
| BBW3225F | 4 | 3 | 6 | 19.164 | | 0.039 | 7 | 0.00558 |
| BBZ3111F | 4 | 3 | 6 | | 1.206 | 0.041 | 7 | 0.00582 |
| BBZ3112F | 4 | 3 | 6 | | 1.221 | 0.040 | 7 | 0.00576 |

| | | | | |
|---|---|---|---|---|
| **Average** | **17.619** | **1.189** | | **0.0057** |
| **Standard Dev.** | **1.248** | **0.031** | | |
| **Coeff. of Var. [%]** | **7.086** | **2.593** | | |
| **Min.** | **14.752** | **1.149** | **Min.** | **0.0055** |
| **Max.** | **20.525** | **1.221** | **Max.** | **0.0059** |
| **Number of Spec.** | **30** | **6** | | |

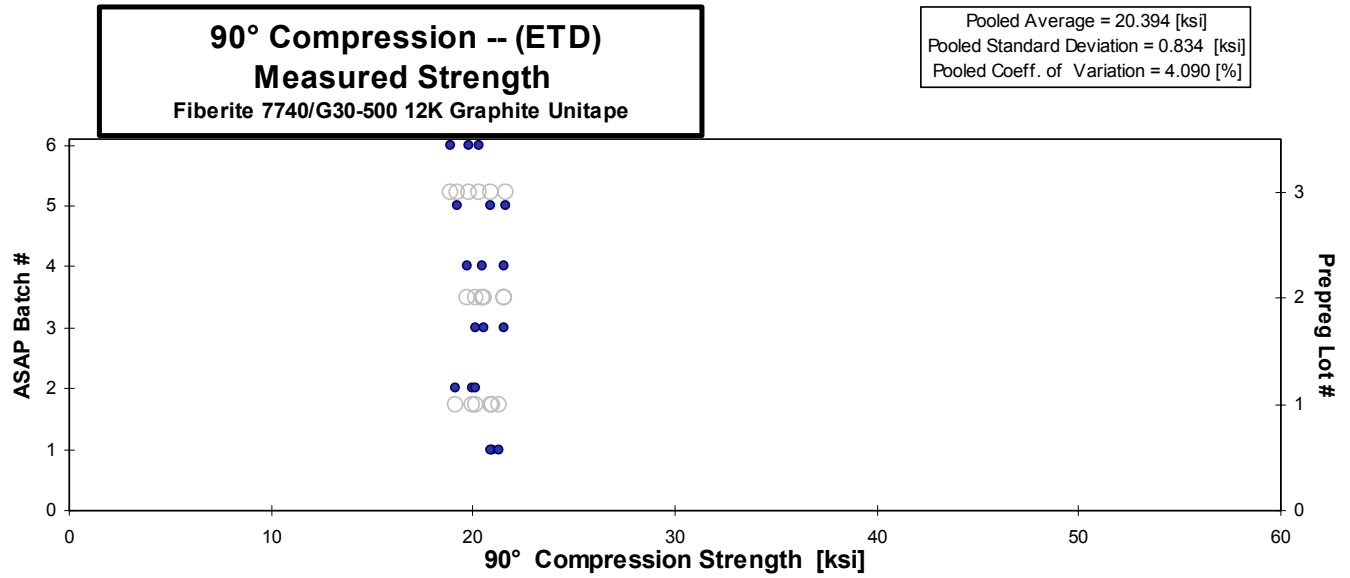


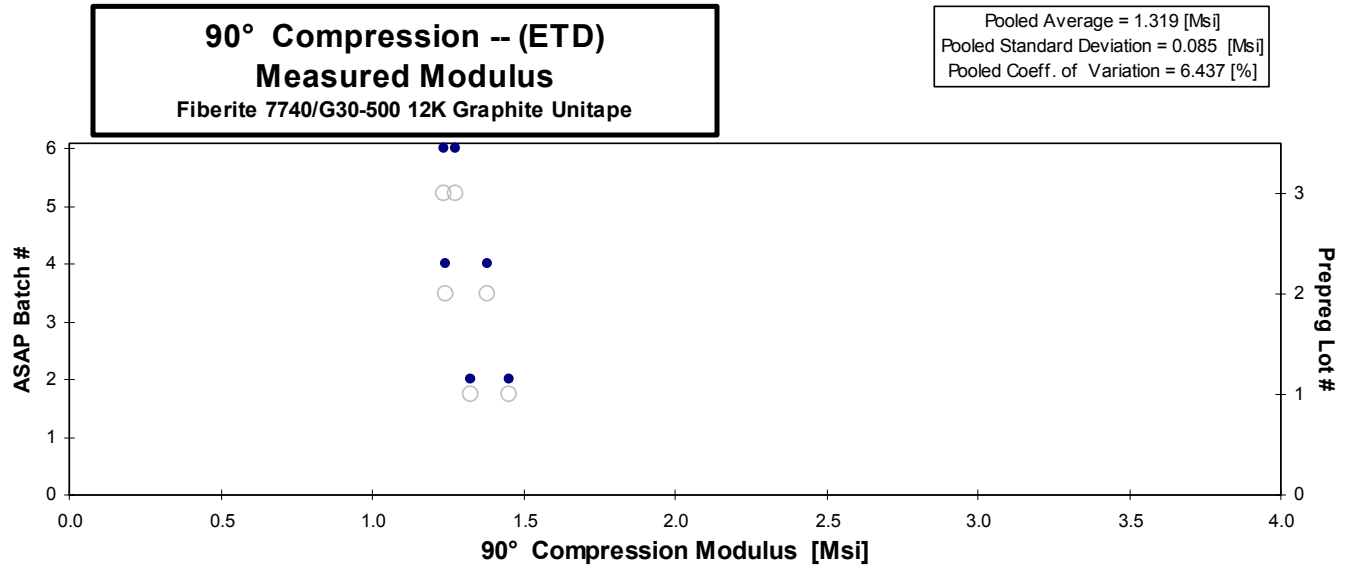



# 90° Compression -- (ETD)
# Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBW1116G | 1 | 1 | 1 | 20.949 | | 0.046 | 8 | 0.00570 |
| BBW1118G | 1 | 1 | 1 | 21.272 | | 0.046 | 8 | 0.00572 |
| BBW112BG | 1 | 1 | 1 | 20.924 | | 0.046 | 8 | 0.00575 |
| BBW1215G | 4 | 1 | 2 | 19.987 | | 0.040 | 7 | 0.00578 |
| BBW1216G | 4 | 1 | 2 | 19.168 | | 0.041 | 7 | 0.00579 |
| BBW1217G | 4 | 1 | 2 | 20.162 | | 0.040 | 7 | 0.00576 |
| BBZ1119G | 4 | 1 | 2 | | 1.327 | 0.040 | 7 | 0.00573 |
| BBZ111AG | 4 | 1 | 2 | | 1.453 | 0.039 | 7 | 0.00556 |
| BBW2111G | 2 | 2 | 3 | 21.511 | | 0.045 | 8 | 0.00561 |
| BBW2112G | 2 | 2 | 3 | 20.585 | | 0.045 | 8 | 0.00568 |
| BBW2113G | 2 | 2 | 3 | 20.113 | | 0.045 | 8 | 0.00562 |
| BBW2211G | 4 | 2 | 4 | 21.521 | | 0.044 | 8 | 0.00547 |
| BBW2212G | 4 | 2 | 4 | 19.715 | | 0.045 | 8 | 0.00562 |
| BBW2213G | 4 | 2 | 4 | 20.456 | | 0.046 | 8 | 0.00575 |
| BBZ2116G | 4 | 2 | 4 | | 1.242 | 0.046 | 8 | 0.00578 |
| BBZ2117G | 4 | 2 | 4 | | 1.380 | 0.046 | 8 | 0.00576 |
| BBW3116G | 3 | 3 | 5 | 21.594 | | 0.047 | 8 | 0.00591 |
| BBW3117G | 3 | 3 | 5 | 20.896 | | 0.047 | 8 | 0.00592 |
| BBW3118G | 3 | 3 | 5 | 19.226 | | 0.047 | 8 | 0.00588 |
| BBW3215G | 4 | 3 | 6 | 19.805 | | 0.041 | 7 | 0.00585 |
| BBW3216G | 4 | 3 | 6 | 20.317 | | 0.041 | 7 | 0.00584 |
| BBW3217G | 4 | 3 | 6 | 18.899 | | 0.041 | 7 | 0.00587 |
| BBZ3119G | 4 | 3 | 6 | | 1.276 | 0.041 | 7 | 0.00581 |
| BBZ311AG | 4 | 3 | 6 | | 1.238 | 0.041 | 7 | 0.00585 |

| | | | | |
|---|---|---|---|---|
| **Average** | **20.394** | **1.319** | | **0.0057** |
| **Standard Dev.** | **0.834** | **0.085** | | |
| **Coeff. of Var. [%]** | **4.090** | **6.437** | | |
| **Min.** | **18.899** | **1.238** | **Min.** | **0.0055** |
| **Max.** | **21.594** | **1.453** | **Max.** | **0.0059** |
| **Number of Spec.** | **18** | **6** | | |

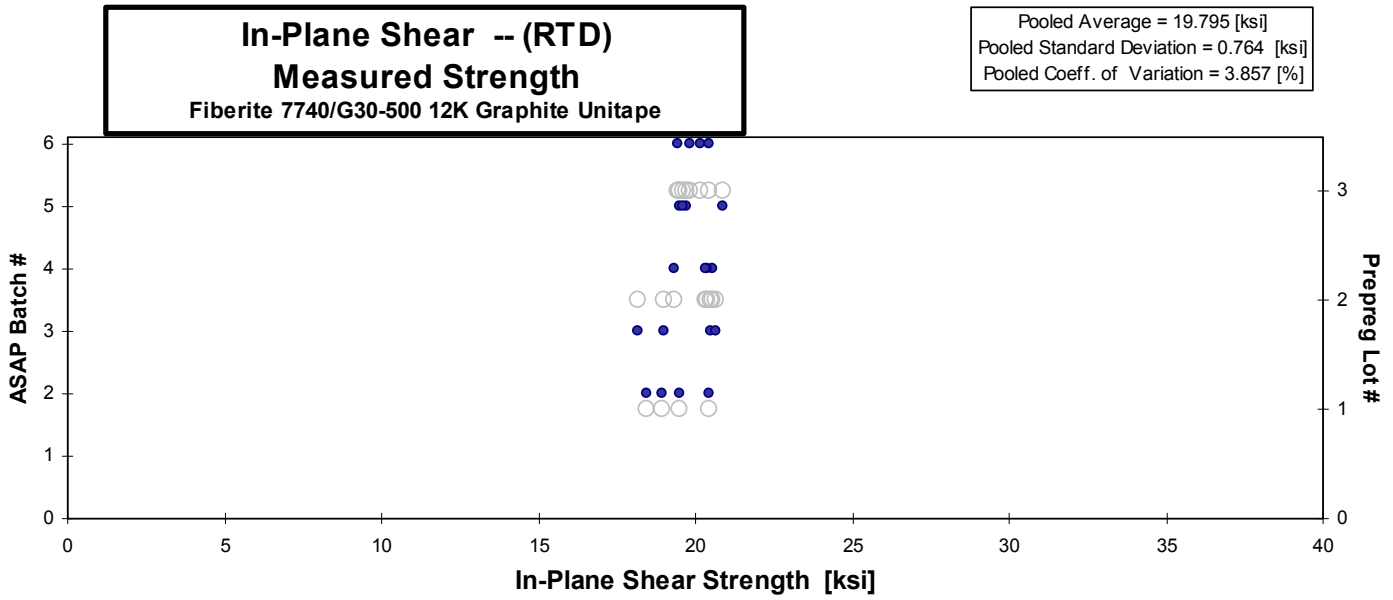


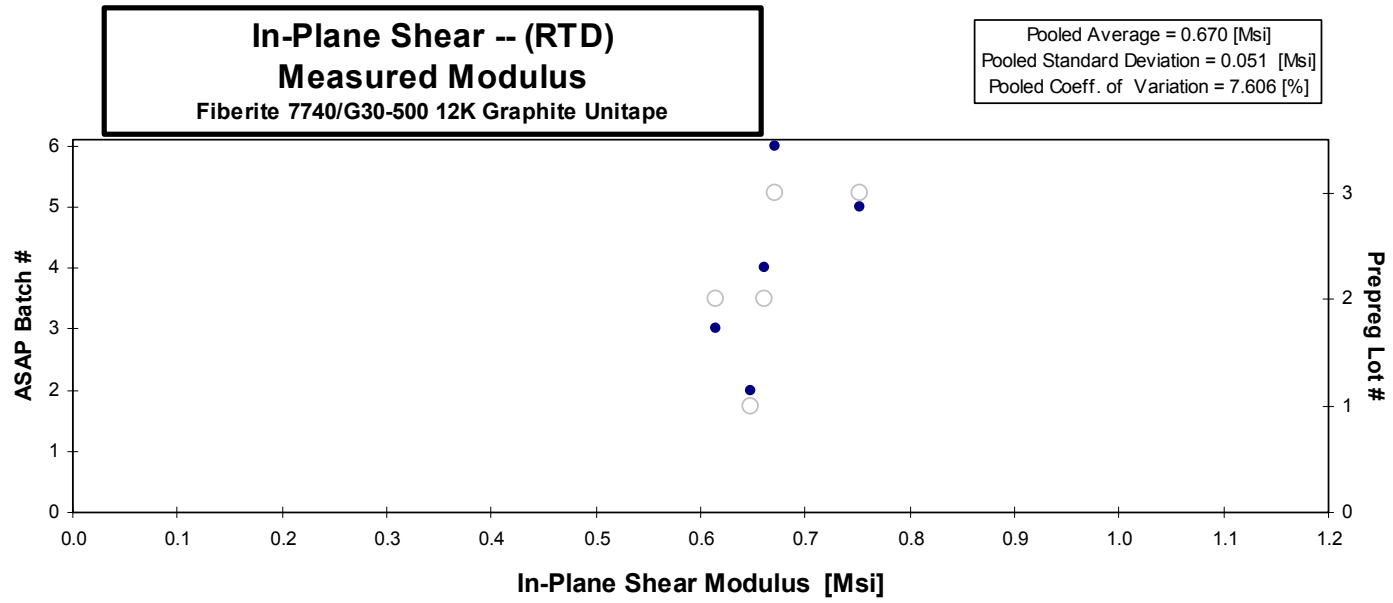



# In-Plane Shear -- (RTD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBN1216A | 4 | 1 | 2 | 18.427 | 0.648 | 0.122 | 21 | 0.00583 |
| BBN1217A | 4 | 1 | 2 | 18.942 | | 0.122 | 21 | 0.00581 |
| BBN1218A | 4 | 1 | 2 | 20.421 | | 0.121 | 21 | 0.00577 |
| BBN1219A | 4 | 1 | 2 | 19.490 | | 0.121 | 21 | 0.00576 |
| BBN2126A | 2 | 2 | 3 | 20.471 | 0.616 | 0.145 | 25 | 0.00581 |
| BBN2127A | 2 | 2 | 3 | 18.996 | | 0.145 | 25 | 0.00579 |
| BBN2128A | 2 | 2 | 3 | 18.180 | | 0.145 | 25 | 0.00580 |
| BBN2129A | 2 | 2 | 3 | 20.672 | | 0.144 | 25 | 0.00576 |
| BBN2216A | 4 | 2 | 4 | 19.364 | 0.661 | 0.139 | 25 | 0.00555 |
| BBN2217A | 4 | 2 | 4 | 20.548 | | 0.143 | 25 | 0.00574 |
| BBN2218A | 4 | 2 | 4 | 20.406 | | 0.145 | 25 | 0.00580 |
| BBN2219A | 4 | 2 | 4 | 20.342 | | 0.144 | 25 | 0.00577 |
| BBN3126A | 3 | 3 | 5 | 19.710 | 0.753 | 0.149 | 25 | 0.00596 |
| BBN3127A | 3 | 3 | 5 | 20.908 | | 0.148 | 25 | 0.00593 |
| BBN3128A | 3 | 3 | 5 | 19.504 | | 0.148 | 25 | 0.00590 |
| BBN3129A | 3 | 3 | 5 | 19.630 | | 0.149 | 25 | 0.00594 |
| BBN3226A | 4 | 3 | 6 | 19.427 | 0.672 | 0.137 | 23 | 0.00594 |
| BBN3227A | 4 | 3 | 6 | 20.462 | | 0.136 | 23 | 0.00592 |
| BBN3228A | 4 | 3 | 6 | 20.191 | | 0.137 | 23 | 0.00597 |
| BBN3229A | 4 | 3 | 6 | 19.811 | | 0.137 | 23 | 0.00594 |

| | | | | |
|---|---|---|---|---|
| **Average** | **19.795** | **0.670** | **Average** | **0.0058** |
| **Standard Dev.** | **0.764** | **0.051** | | |
| **Coeff. of Var. [%]** | **3.857** | **7.606** | | |
| **Min.** | **18.180** | **0.616** | **Min.** | **0.0056** |
| **Max.** | **20.908** | **0.753** | **Max.** | **0.0060** |
| **Number of Spec.** | **20** | **5** | | |

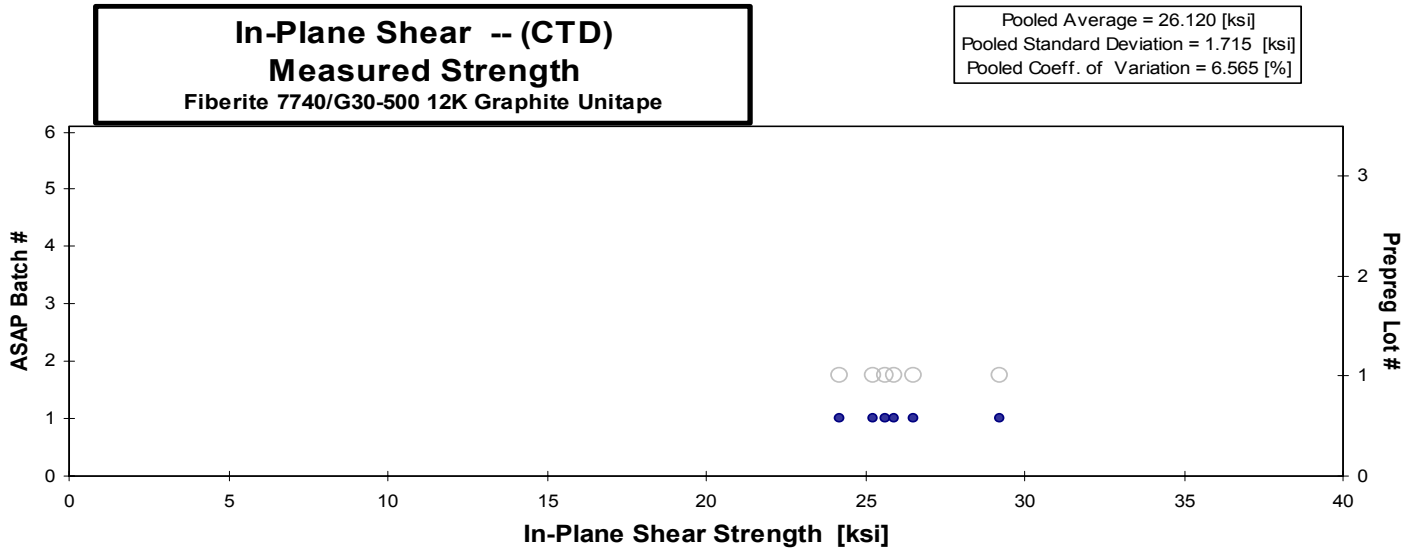


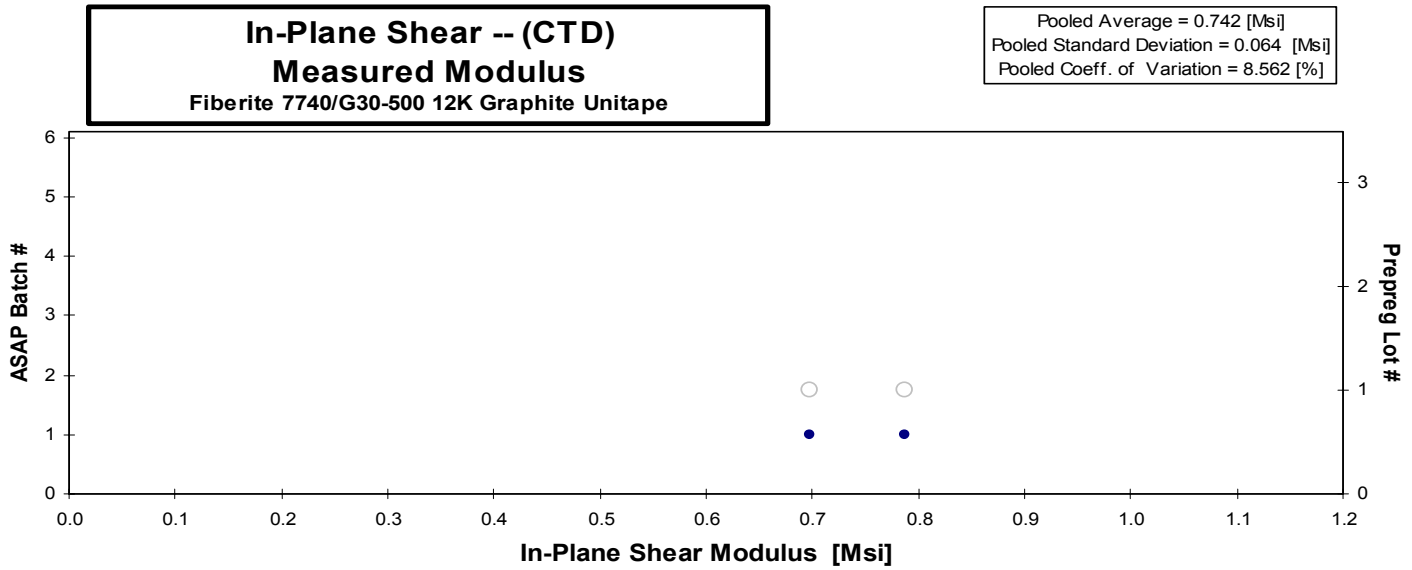



## In-Plane Shear -- (CTD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBN1225B | 4 | 1 | 1 | 25.239 | 0.697 | 0.120 | 21 | 0.00574 |
| BBN1226B | 4 | 1 | 1 | 26.507 | | 0.120 | 21 | 0.00570 |
| BBN1227B | 4 | 1 | 1 | 29.242 | | 0.119 | 21 | 0.00564 |
| BBN1228B | 4 | 1 | 1 | 24.188 | 0.787 | 0.119 | 21 | 0.00566 |
| BBN1229B | 4 | 1 | 1 | 25.610 | | 0.118 | 21 | 0.00563 |
| BBN122AB | 4 | 1 | 1 | 25.934 | | 0.118 | 21 | 0.00564 |

| | | | | |
|---|---|---|---|---|
| **Average** | **26.120** | **0.742** | **Average** | **0.0057** |
| **Standard Dev.** | **1.715** | **0.064** | | |
| **Coeff. of Var. [%]** | **6.565** | **8.562** | | |
| **Min.** | **24.188** | **0.697** | **Min.** | **0.0056** |
| **Max.** | **29.242** | **0.787** | **Max.** | **0.0057** |
| **Number of Spec.** | **6** | **2** | | |

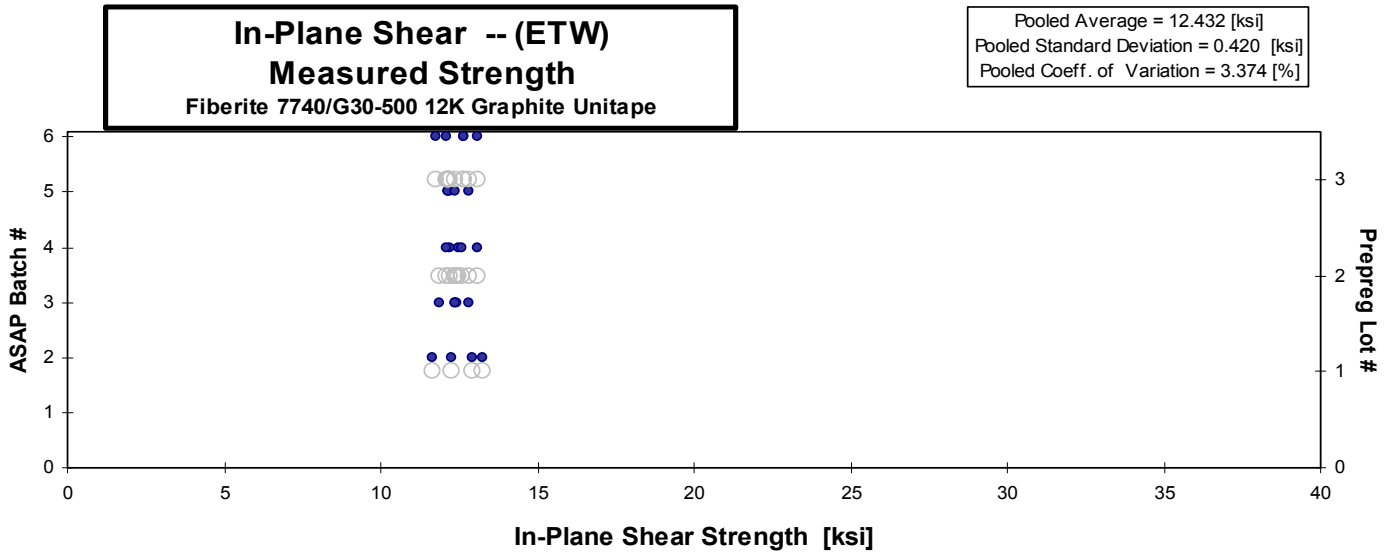


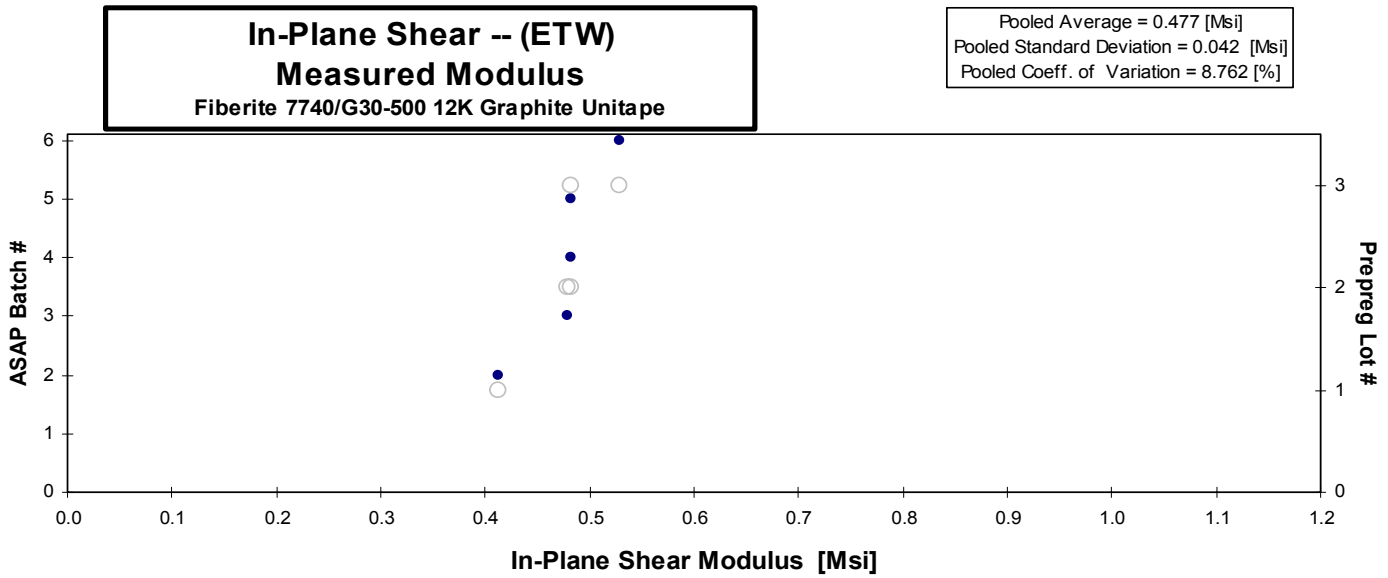



# In-Plane Shear -- (ETW)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBN1212F | 4 | 1 | 2 | 12.926 | 0.412 | 0.121 | 21 | 0.00576 |
| BBN1213F | 4 | 1 | 2 | 13.270 | | 0.122 | 21 | 0.00579 |
| BBN1214F | 4 | 1 | 2 | 11.651 | | 0.121 | 21 | 0.00577 |
| BBN1215F | 4 | 1 | 2 | 12.251 | | 0.122 | 21 | 0.00583 |
| BBN2211F | 4 | 2 | 3 | 12.824 | 0.479 | 0.142 | 25 | 0.00567 |
| BBN2212F | 4 | 2 | 3 | 11.902 | | 0.144 | 25 | 0.00577 |
| BBN2213F | 4 | 2 | 3 | 12.397 | | 0.144 | 25 | 0.00576 |
| BBN2214F | 4 | 2 | 3 | 12.450 | | 0.144 | 25 | 0.00575 |
| BBN2215F | 4 | 2 | 3 | 12.384 | | 0.143 | 25 | 0.00572 |
| BBN2121F | 2 | 2 | 4 | 13.076 | 0.482 | 0.143 | 25 | 0.00571 |
| BBN2122F | 2 | 2 | 4 | 12.476 | | 0.146 | 25 | 0.00583 |
| BBN2123F | 2 | 2 | 4 | 12.588 | | 0.145 | 25 | 0.00581 |
| BBN2124F | 2 | 2 | 4 | 12.182 | | 0.138 | 25 | 0.00550 |
| BBN2125F | 2 | 2 | 4 | 12.100 | | 0.145 | 25 | 0.00581 |
| BBN3221F | 4 | 3 | 5 | 12.139 | 0.483 | 0.136 | 23 | 0.00589 |
| BBN3222F | 4 | 3 | 5 | 12.816 | | 0.137 | 23 | 0.00594 |
| BBN3223F | 4 | 3 | 5 | 12.209 | | 0.130 | 23 | 0.00565 |
| BBN3224F | 4 | 3 | 5 | 12.152 | | 0.136 | 23 | 0.00593 |
| BBN3225F | 4 | 3 | 5 | 12.349 | | 0.136 | 23 | 0.00590 |
| BBN3121F | 3 | 3 | 6 | 11.783 | 0.530 | 0.139 | 25 | 0.00555 |
| BBN3122F | 3 | 3 | 6 | 13.081 | | 0.147 | 25 | 0.00586 |
| BBN3123F | 3 | 3 | 6 | 12.628 | | 0.148 | 25 | 0.00593 |
| BBN3124F | 3 | 3 | 6 | 12.098 | | 0.148 | 25 | 0.00592 |
| BBN3125F | 3 | 3 | 6 | 12.644 | | 0.148 | 25 | 0.00593 |

| | | | | |
|---|---|---|---|---|
| **Average** | **12.432** | **0.477** | **Average** | **0.0058** |
| **Standard Dev.** | **0.420** | **0.042** | | |
| **Coeff. of Var. [%]** | **3.374** | **8.762** | | |
| **Min.** | **11.651** | **0.412** | **Min.** | **0.0055** |
| **Max.** | **13.270** | **0.530** | **Max.** | **0.0059** |
| **Number of Spec.** | **24** | **5** | | |

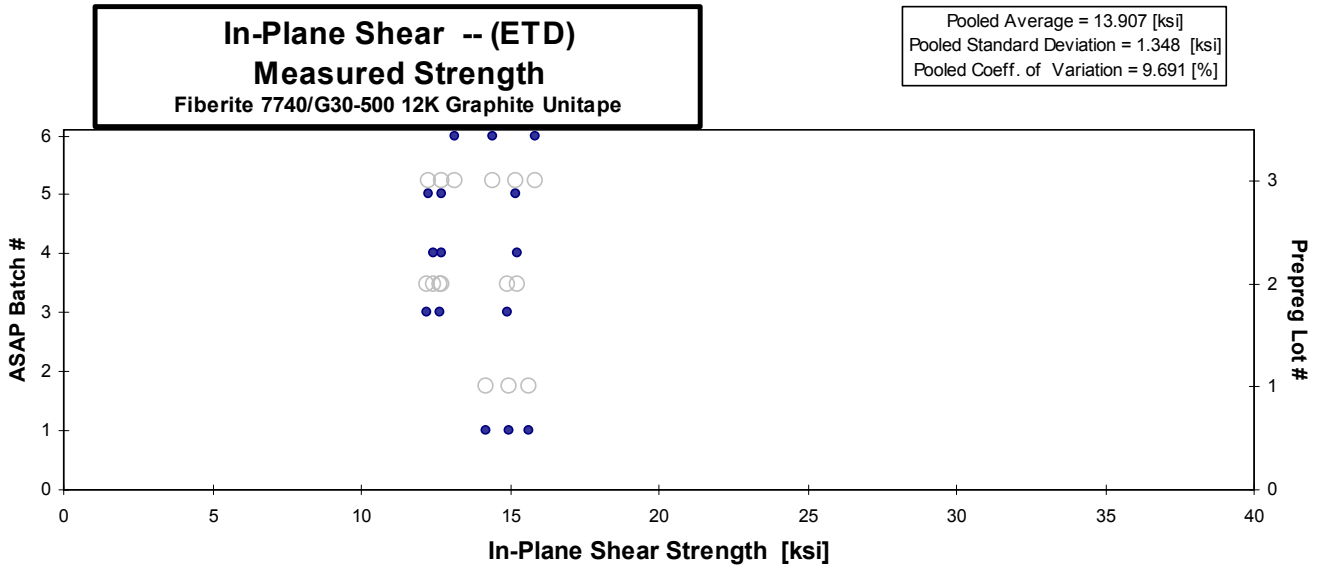


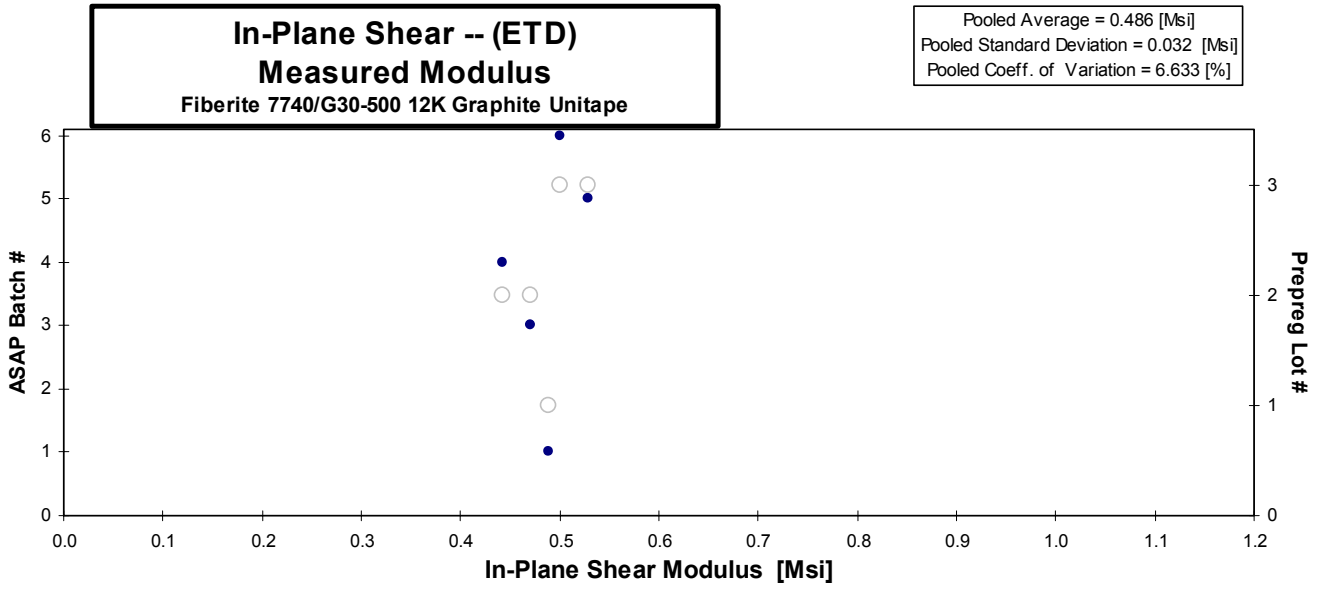



# In-Plane Shear -- (ETD)
## Strength & Modulus
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Modulus [Msi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|---|
| BBN1221G | 4 | 1 | 1 | 14.987 | 0.488 | 0.119 | 21 | 0.00567 |
| BBN1222G | 4 | 1 | 1 | 15.611 | | 0.114 | 21 | 0.00545 |
| BBN1223G | 4 | 1 | 1 | 14.182 | | 0.120 | 21 | 0.00572 |
| BBN2221G | 4 | 2 | 3 | 14.942 | 0.471 | 0.144 | 25 | 0.00574 |
| BBN2222G | 4 | 2 | 3 | 12.658 | | 0.144 | 25 | 0.00577 |
| BBN2224G | 4 | 2 | 3 | 12.232 | | 0.144 | 25 | 0.00575 |
| BBN2111G | 2 | 2 | 4 | 15.226 | 0.443 | 0.144 | 25 | 0.00575 |
| BBN2112G | 2 | 2 | 4 | 12.715 | | 0.144 | 25 | 0.00577 |
| BBN2113G | 2 | 2 | 4 | 12.428 | | 0.142 | 25 | 0.00570 |
| BBN3211G | 4 | 3 | 5 | 15.211 | 0.529 | 0.144 | 23 | 0.00628 |
| BBN3212G | 4 | 3 | 5 | 12.680 | | 0.144 | 23 | 0.00626 |
| BBN3213G | 4 | 3 | 5 | 12.282 | | 0.145 | 23 | 0.00630 |
| BBN3112G | 3 | 3 | 6 | 15.865 | 0.500 | 0.136 | 25 | 0.00542 |
| BBN3113G | 3 | 3 | 6 | 14.422 | | 0.135 | 25 | 0.00540 |
| BBN3115G | 3 | 3 | 6 | 13.164 | | 0.136 | 25 | 0.00544 |

| | | | | |
|---|---|---|---|---|
| **Average** | **13.907** | **0.486** | **Average** | **0.0058** |
| **Standard Dev.** | **1.348** | **0.032** | | |
| **Coeff. of Var. [%]** | **9.691** | **6.633** | | |
| **Min.** | **12.232** | **0.443** | **Min.** | **0.0054** |
| **Max.** | **15.865** | **0.529** | **Max.** | **0.0063** |
| **Number of Spec.** | **15** | **5** | | |



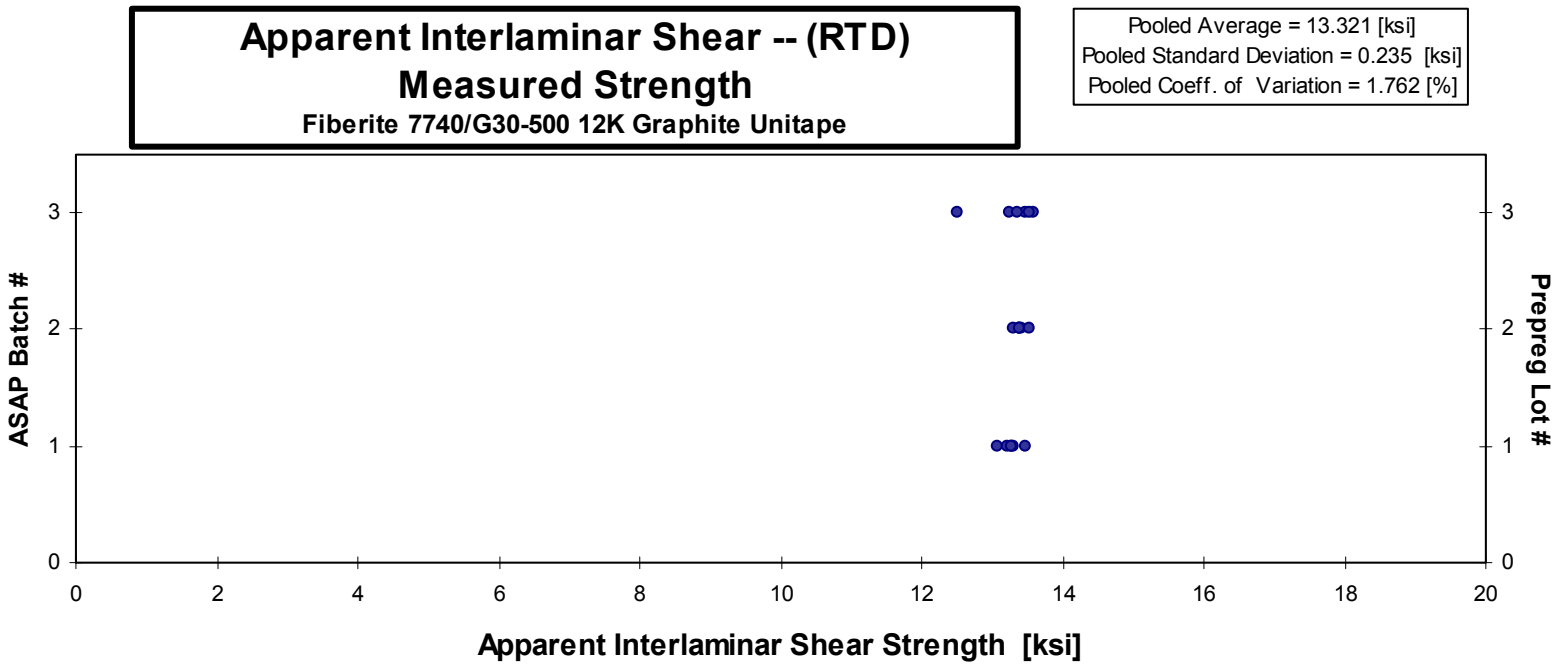



# Apparent Interlaminar Shear -- (RTD) Strength

**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Cure Cycle | Prepreg Lot # | ASAP Batch # | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|---|---|
| BBQ1121A | | 1 | 1 | 13.227 | 0.100 | 18 | 0.00556 |
| BBQ1124A | | 1 | 1 | 13.272 | 0.103 | 18 | 0.00570 |
| BBQ1125A | | 1 | 1 | 13.485 | 0.103 | 18 | 0.00570 |
| BBQ1127A | | 1 | 1 | 13.296 | 0.103 | 18 | 0.00572 |
| BBQ112AA | | 1 | 1 | 13.281 | 0.097 | 18 | 0.00540 |
| BBQ112DA | | 1 | 1 | 13.086 | 0.103 | 18 | 0.00572 |
| BBQ2111A | | 2 | 2 | 13.418 | 0.094 | 18 | 0.00520 |
| BBQ2112A | | 2 | 2 | 13.393 | 0.093 | 18 | 0.00518 |
| BBQ2113A | | 2 | 2 | 13.530 | 0.093 | 18 | 0.00519 |
| BBQ2114A | | 2 | 2 | 13.384 | 0.094 | 18 | 0.00522 |
| BBQ2115A | | 2 | 2 | 13.304 | 0.094 | 18 | 0.00520 |
| BBQ2116A | | 2 | 2 | 13.378 | 0.093 | 18 | 0.00517 |
| BBQ3116A | | 3 | 3 | 13.484 | 0.099 | 18 | 0.00552 |
| BBQ3117A | | 3 | 3 | 13.575 | 0.098 | 18 | 0.00547 |
| BBQ311AA | | 3 | 3 | 13.527 | 0.098 | 18 | 0.00546 |
| BBQ311CA | | 3 | 3 | 13.254 | 0.099 | 18 | 0.00547 |
| BBQ3121A | | 3 | 3 | 13.352 | 0.095 | 18 | 0.00526 |
| BBQ3123A | | 3 | 3 | 12.524 | 0.095 | 18 | 0.00526 |

| | | | |
|---|---|---|---|
| **Average** | **13.321** | | **0.0054** |
| **Standard Dev.** | **0.235** | | |
| **Coeff. of Var. [%]** | **1.762** | | |
| **Min.** | **12.524** | **Min.** | **0.0052** |
| **Max.** | **13.575** | **Max.** | **0.0057** |
| **Number of Spec.** | **18** | | |



### 3.2.2 Fluid Sensitivity Raw Data Spreadsheets and Scatter Charts

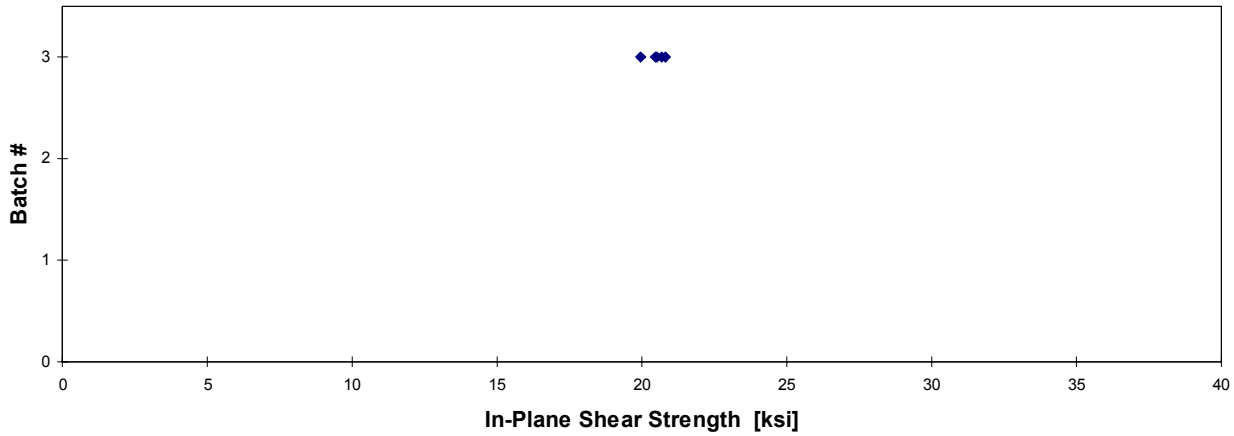
# In-Plane Shear -- (MEK - RTD)
# Strength
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Batch Number | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|
| BBN3215T | 3 | 20.687 | 0.145 | 23 | 0.00632 |
| BBN3216T | 3 | 20.482 | 0.145 | 23 | 0.00631 |
| BBN3217T | 3 | 20.496 | 0.146 | 23 | 0.00636 |
| BBN3218T | 3 | 20.794 | 0.144 | 23 | 0.00628 |
| BBN3219T | 3 | 19.964 | 0.140 | 23 | 0.00607 |

| | | | |
|---|---|---|---|
| **Average** | **20.485** | | **0.0063** |
| **Standard Dev.** | **0.319** | | |
| **Coeff. of Var. [%]** | **1.559** | | |
| **Min.** | **19.964** | **Min.** | **0.0061** |
| **Max.** | **20.794** | **Max.** | **0.0064** |
| **Number of Spec.** | **5** | | |

# In-Plane Shear -- (MEK - RTD)
# Measured Strength
**Fiberite 7740/G30-500 12K Graphite Unitape**

Pooled Average = 20.485 [ksi]
Pooled Standard Deviation = 0.319 [ksi]
Pooled Coeff. of Variation = 1.559 [%]



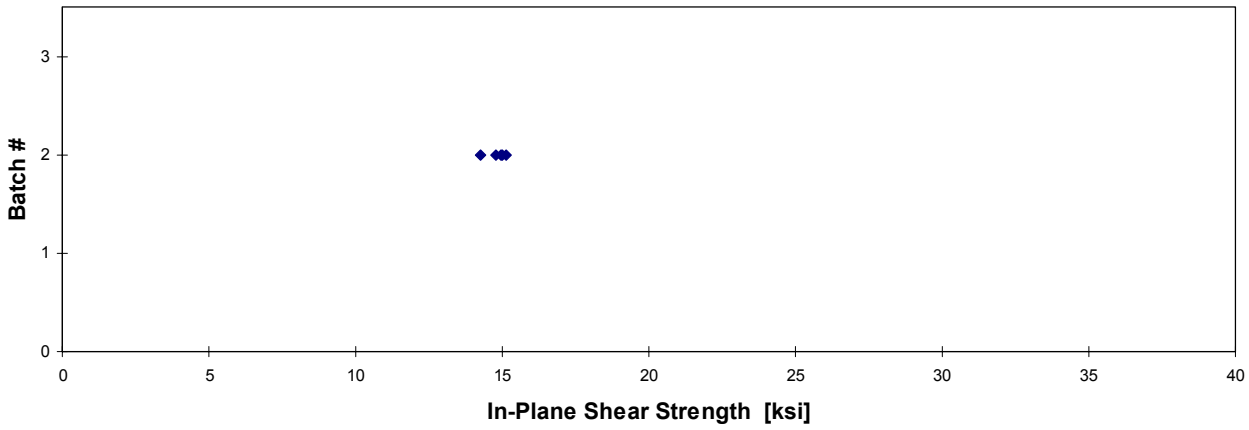
## In-Plane Shear -- (JP-4 JET FUEL - ETD)
## Strength
**Fiberite 7740/G30-500 12K Graphite Unitape**

| Specimen Number | Batch Number | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|
| BBN2115R | 2 | 15.130 | 0.144 | 25 | 0.00574 |
| BBN2116R | 2 | 14.966 | 0.138 | 25 | 0.00553 |
| BBN2117R | 2 | 14.795 | 0.144 | 25 | 0.00575 |
| BBN2118R | 2 | 14.995 | 0.143 | 25 | 0.00574 |
| BBN2119R | 2 | 14.240 | 0.142 | 25 | 0.00568 |

| | | | |
|---|---|---|---|
| **Average** | **14.825** | | **0.0057** |
| **Standard Dev.** | **0.348** | | |
| **Coeff. of Var. [%]** | **2.350** | | |
| **Min.** | **14.240** | **Min.** | **0.0055** |
| **Max.** | **15.130** | **Max.** | **0.0058** |
| **Number of Spec.** | **5** | | |

## In-Plane Shear -- (JP-4 JET FUEL - ETD)
## Measured Strength
**Fiberite 7740/G30-500 12K Graphite Unitape**

Pooled Average = 14.825 [ksi]
Pooled Standard Deviation = 0.348 [ksi]
Pooled Coeff. of Variation = 2.350 [%]



## In-Plane Shear -- (Hydraulic Fluid - ETD) Strength

**Fiberite 7740/G30-500 12K Graphite Unitape**

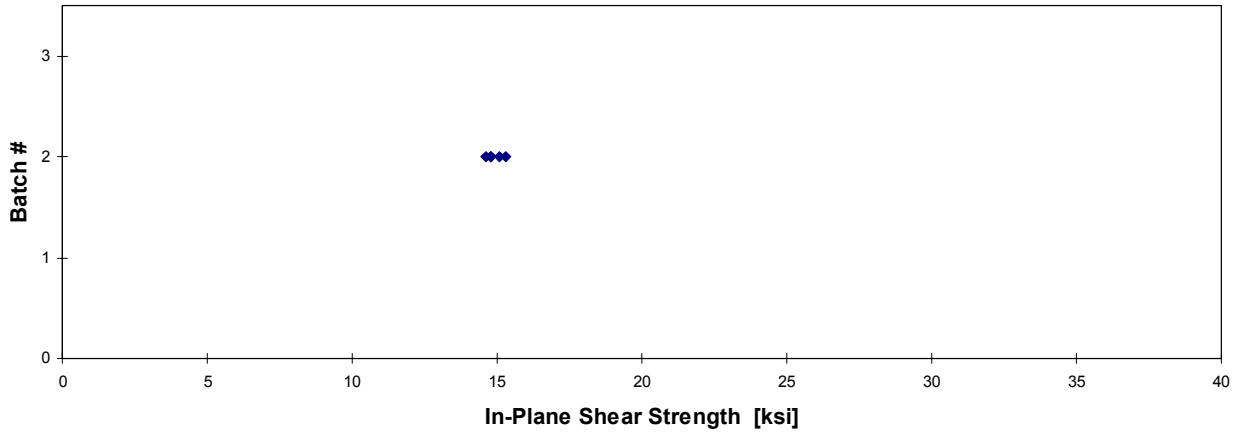
| Specimen Number | Batch Number | Strength [ksi] | Avg. Specimen Thickn. [in] | # Plies in Laminate | Avg. $t_{ply}$ [in] |
|---|---|---|---|---|---|
| BBN2225V | 2 | 14.632 | 0.143 | 25 | 0.00574 |
| BBN2226V | 2 | 15.086 | 0.145 | 25 | 0.00581 |
| BBN2227V | 2 | 14.794 | 0.143 | 25 | 0.00571 |
| BBN2228V | 2 | 14.802 | 0.139 | 25 | 0.00554 |
| BBN2229V | 2 | 15.320 | 0.144 | 25 | 0.00576 |

| | | | |
|---|---|---|---|
| **Average** | **14.927** | | **0.0057** |
| **Standard Dev.** | **0.274** | | |
| **Coeff. of Var. [%]** | **1.835** | | |
| **Min.** | **14.632** | **Min.** | **0.0055** |
| **Max.** | **15.320** | **Max.** | **0.0058** |
| **Number of Spec.** | **5** | | |

## In-Plane Shear -- (Hydraulic Fluid - ETD) Measured Strength

**Fiberite 7740/G30-500 12K Graphite Unitape**

Pooled Average = 14.927 [ksi]
Pooled Standard Deviation = 0.274 [ksi]
Pooled Coeff. of Variation = 1.835 [%]



**Fluid Sensitivity Comparison:**

| Average In-Plane Shear Strength with Fluid (ksi) | Same Environment In-Plane Shear Strength without Fluid (ksi) | Worst Case Environment In-Plane Shear Strength (ksi) |
|---|---|---|
| **MEK** (RTD) | (RTD) | (ETW) |
| 20.485 | 19.795 | 12.432 |

The RTD average in-plane shear strength was not reduced by after exposure to MEK.

| Average In-Plane Shear Strength with Fluid (ksi) | Same Environment In-Plane Shear Strength without Fluid (ksi) | Worst Case Environment In-Plane Shear Strength (ksi) |
|---|---|---|
| **JP-4 JET FUEL** (ETD) | (ETD) | (ETW) |
| 14.825 | 13.907 | 12.432 |

The ETD average in-plane shear strength was not reduced after exposure to JP-4 Jet Fuel.

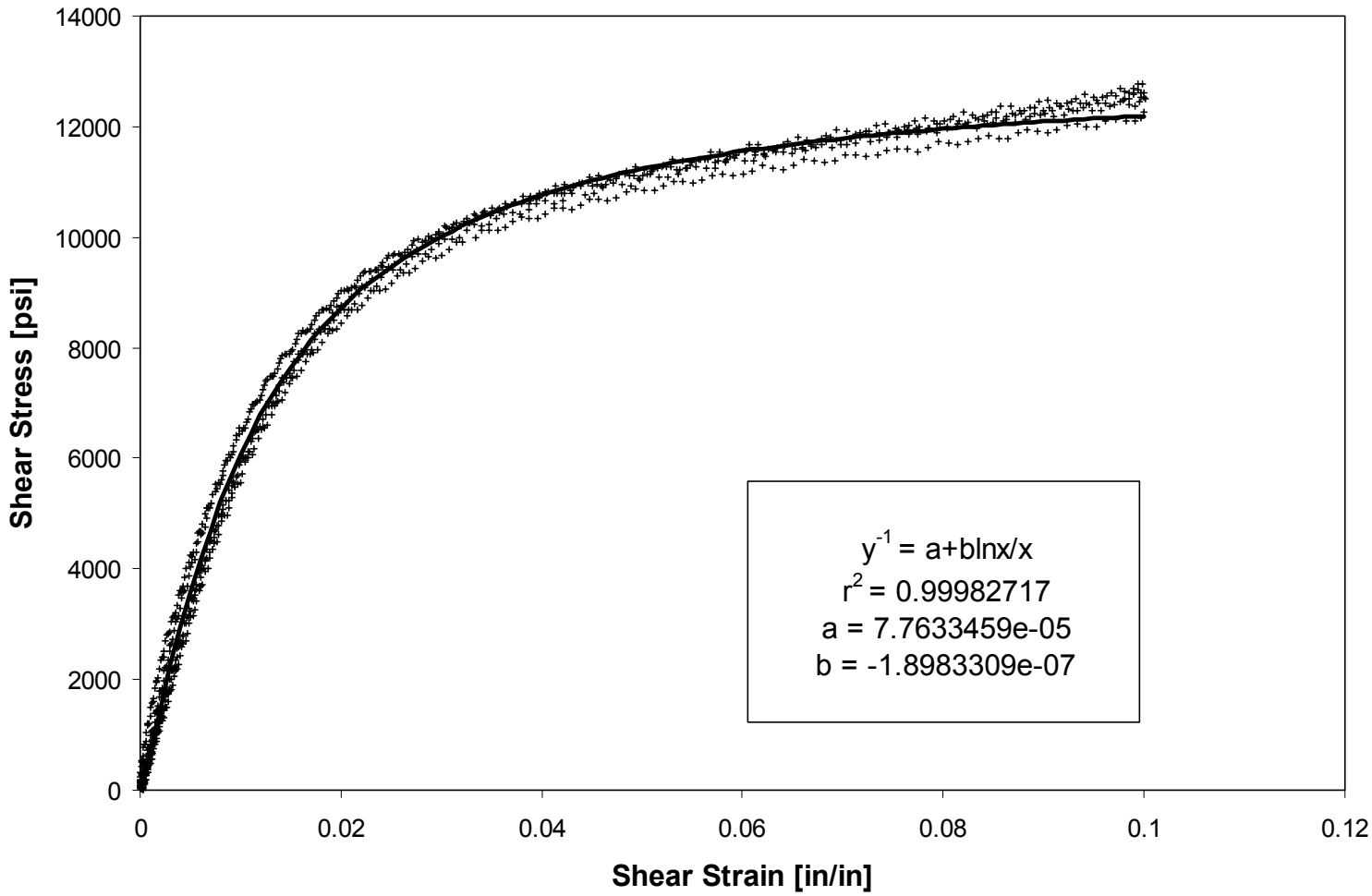
| Average In-Plane Shear Strength with Fluid (ksi) | Same Environment In-Plane Shear Strength without Fluid (ksi) | Worst Case Environment In-Plane Shear Strength (ksi) |
|---|---|---|
| **HYDRAULIC FLUID** (ETD) | (ETD) | (ETW) |
| 14.927 | 13.907 | 12.432 |

The ETD average in-plane shear strength was not reduced after exposure to Hydraulic Fluid.

### 3.2.3 Representative Shear Stress-Strain Curve

The following stress-strain curve is representative of the G30-500 12K / 7740 prepreg system. The tension and compression stress-strain curves are not presented in graphical form. If strain design allowables from these tests are required, simple one-dimensional linear stress-strain relationships may be used to obtain corresponding strain design values. This process should approximate tensile and compressive strain behavior relatively well but may produce extremely conservative strain values in shear due to the nonlinear behavior. A more realistic approach for shear strain design allowables is to use a maximum strain value of 5% (reference MIL-HDBK-17-1E, section 5.7.6). If a nonlinear analysis of the material's shear behavior is required, the curve-fit of the shear stress-strain curve may be used. The representative shear stress-strain curve was obtained by taking the average of all the sample shear curves and determining the best-fit line through the data. The actual data points also presented on the chart to demonstrate material variability.

# Shear Stress vs. Shear Strain, RTD

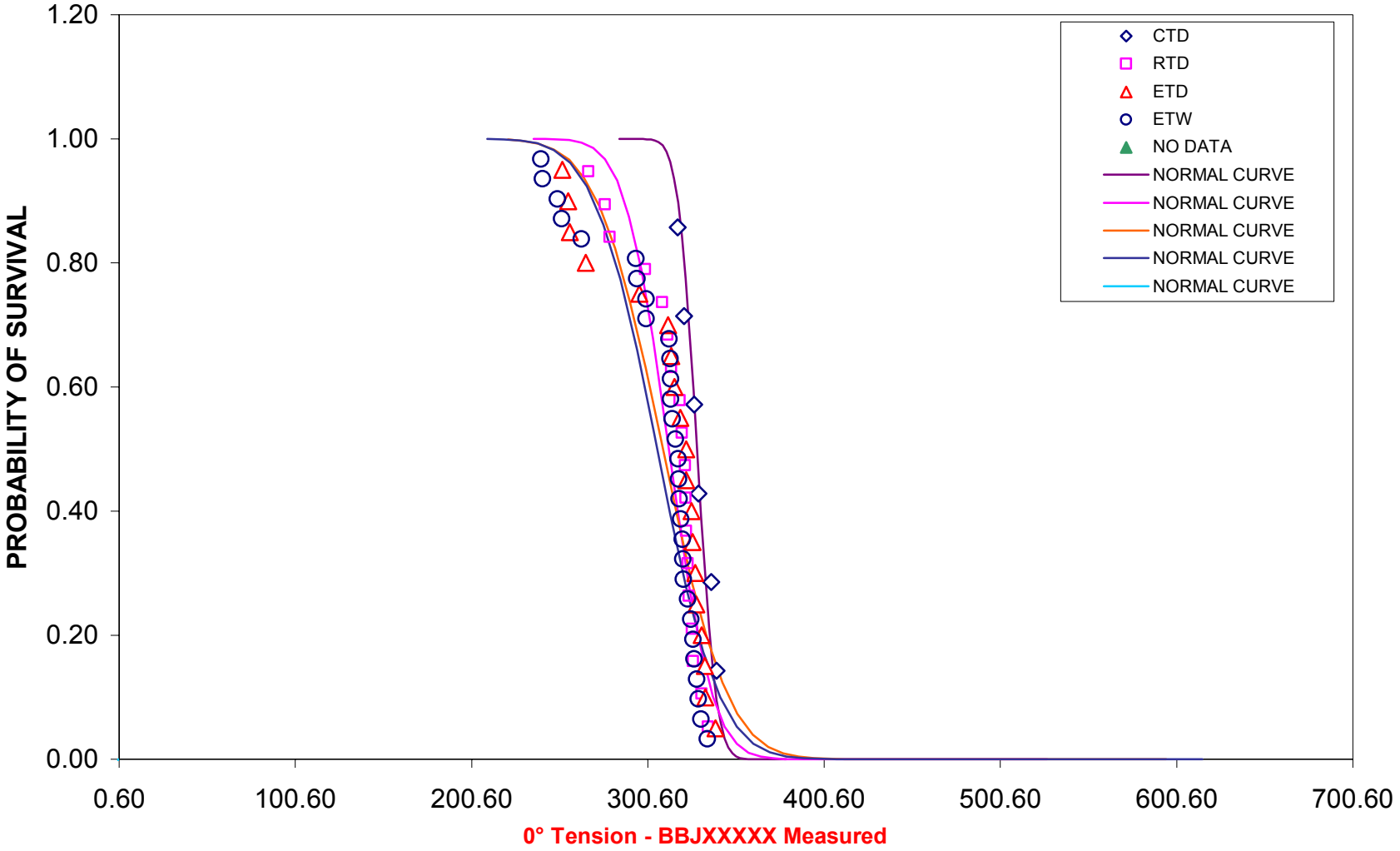


## 3.3 Statistical Results

### 3.3.1 Plot by Condition

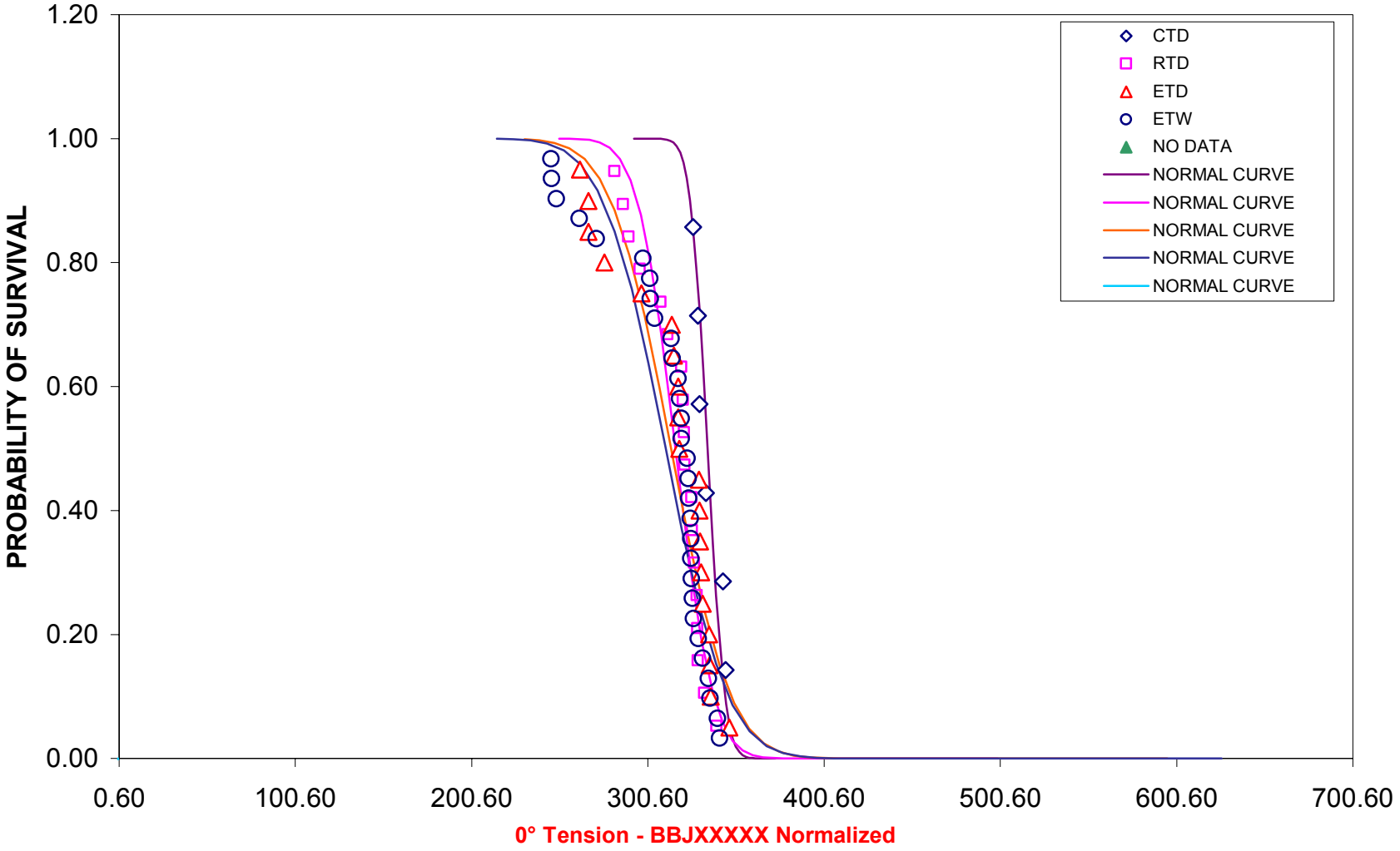
## DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



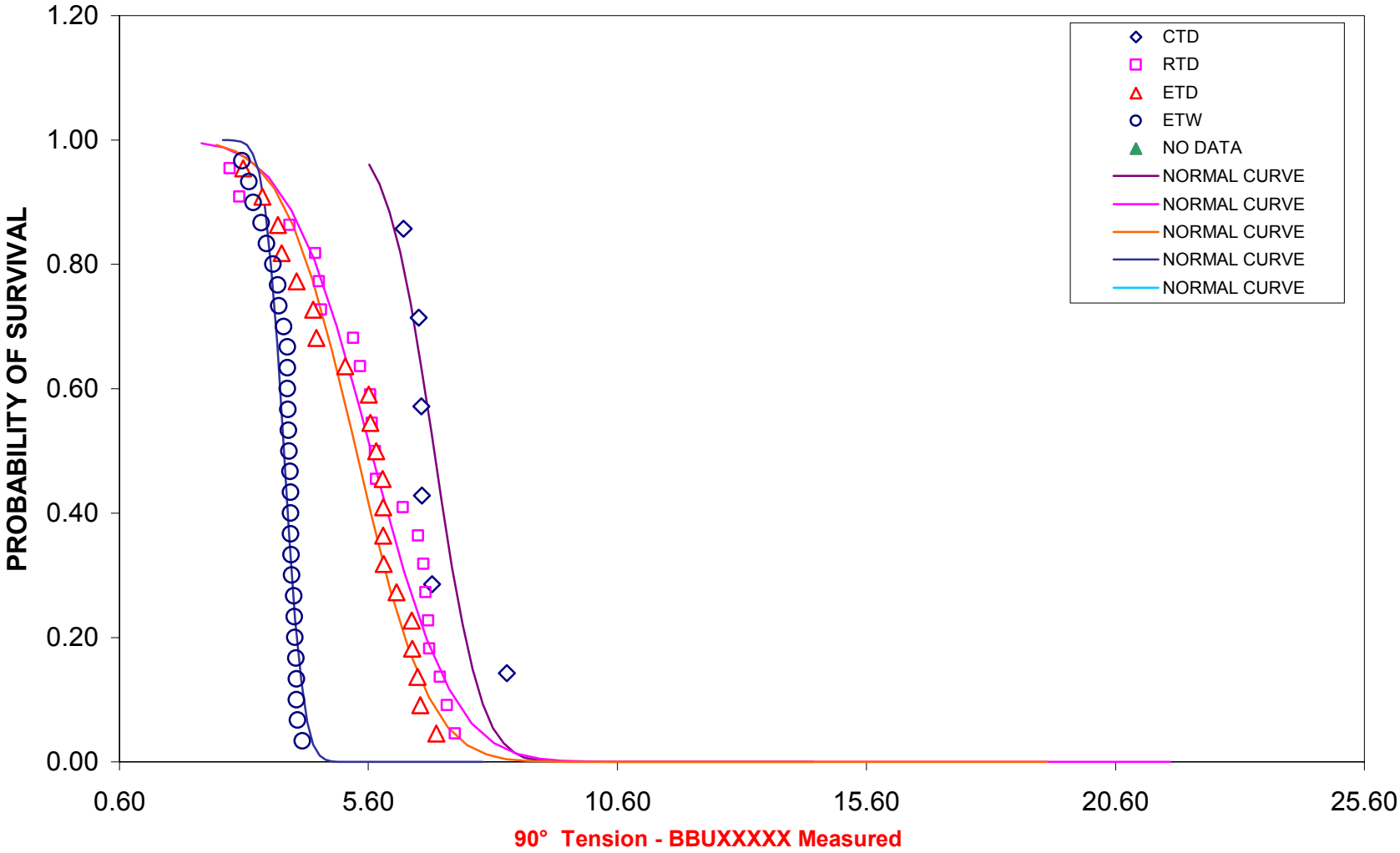
## DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



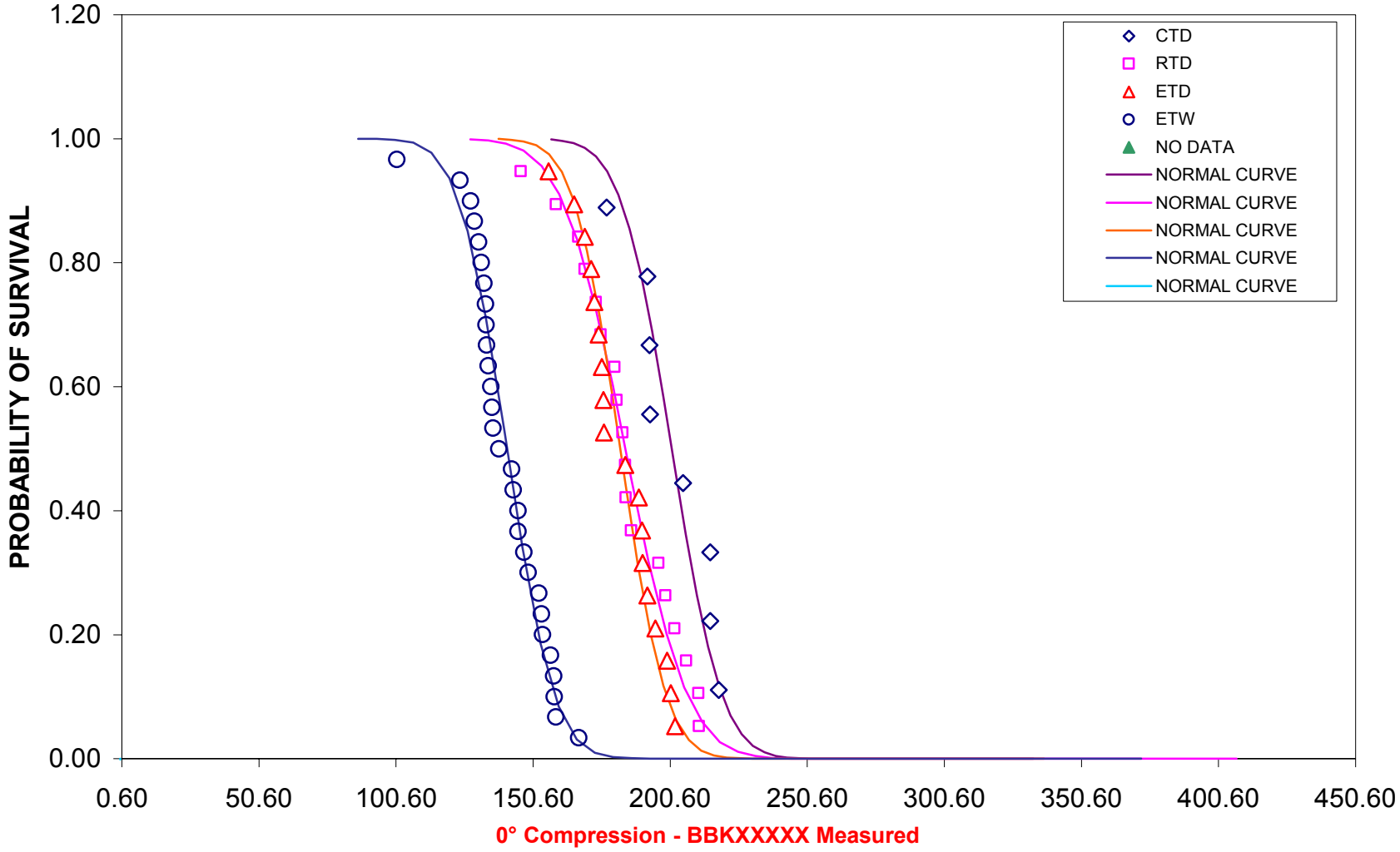
## DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



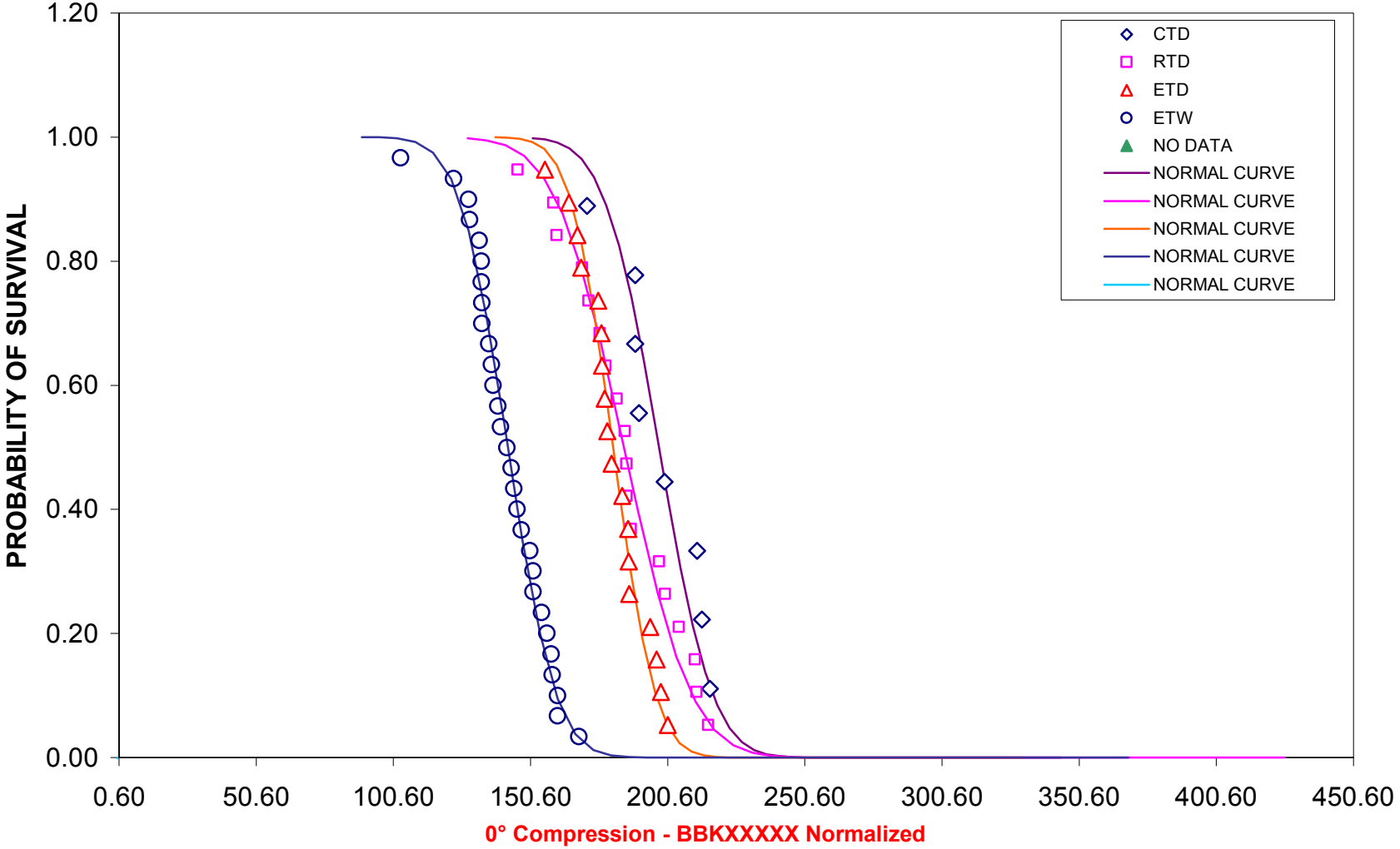
# DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



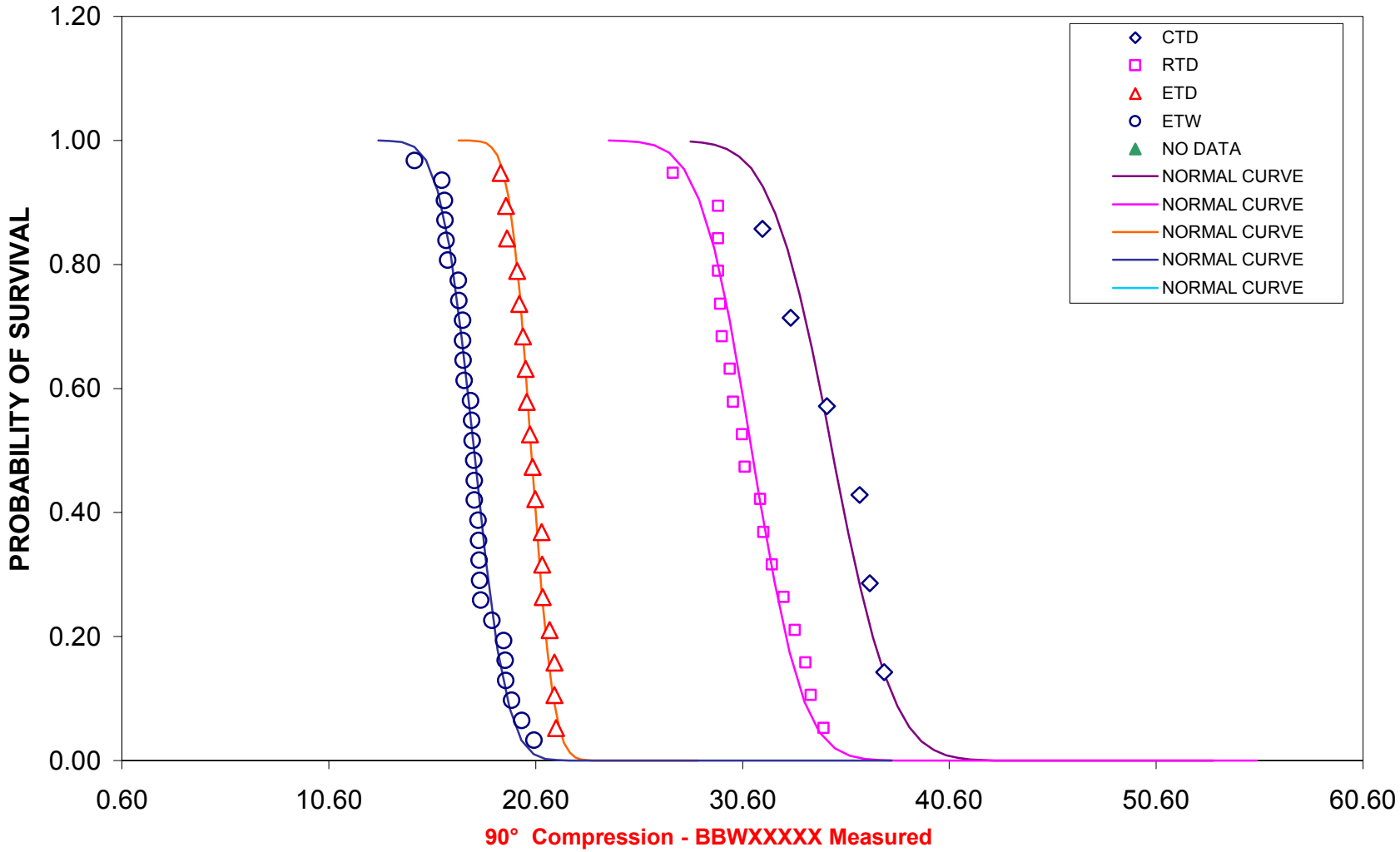
## DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



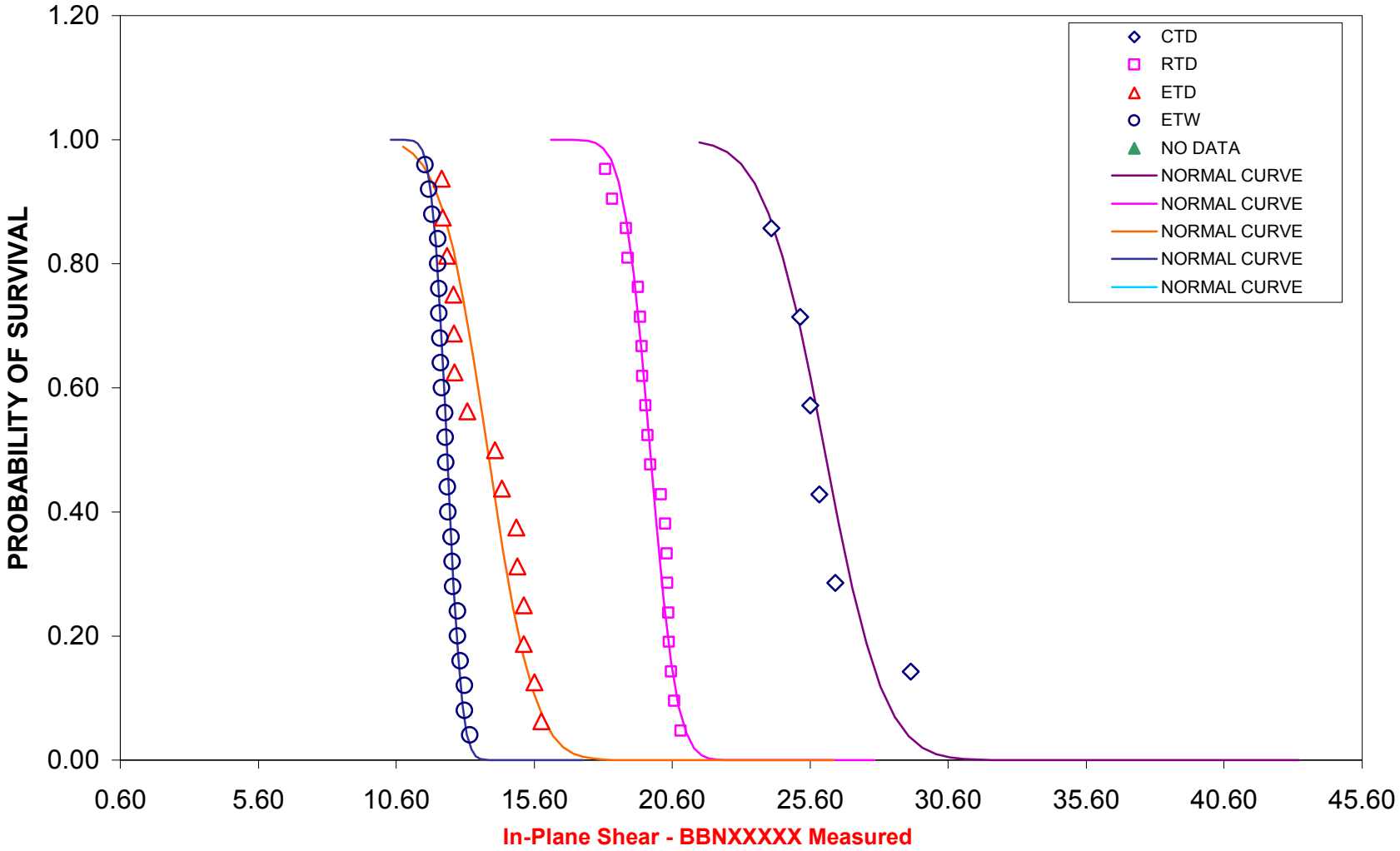
# DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



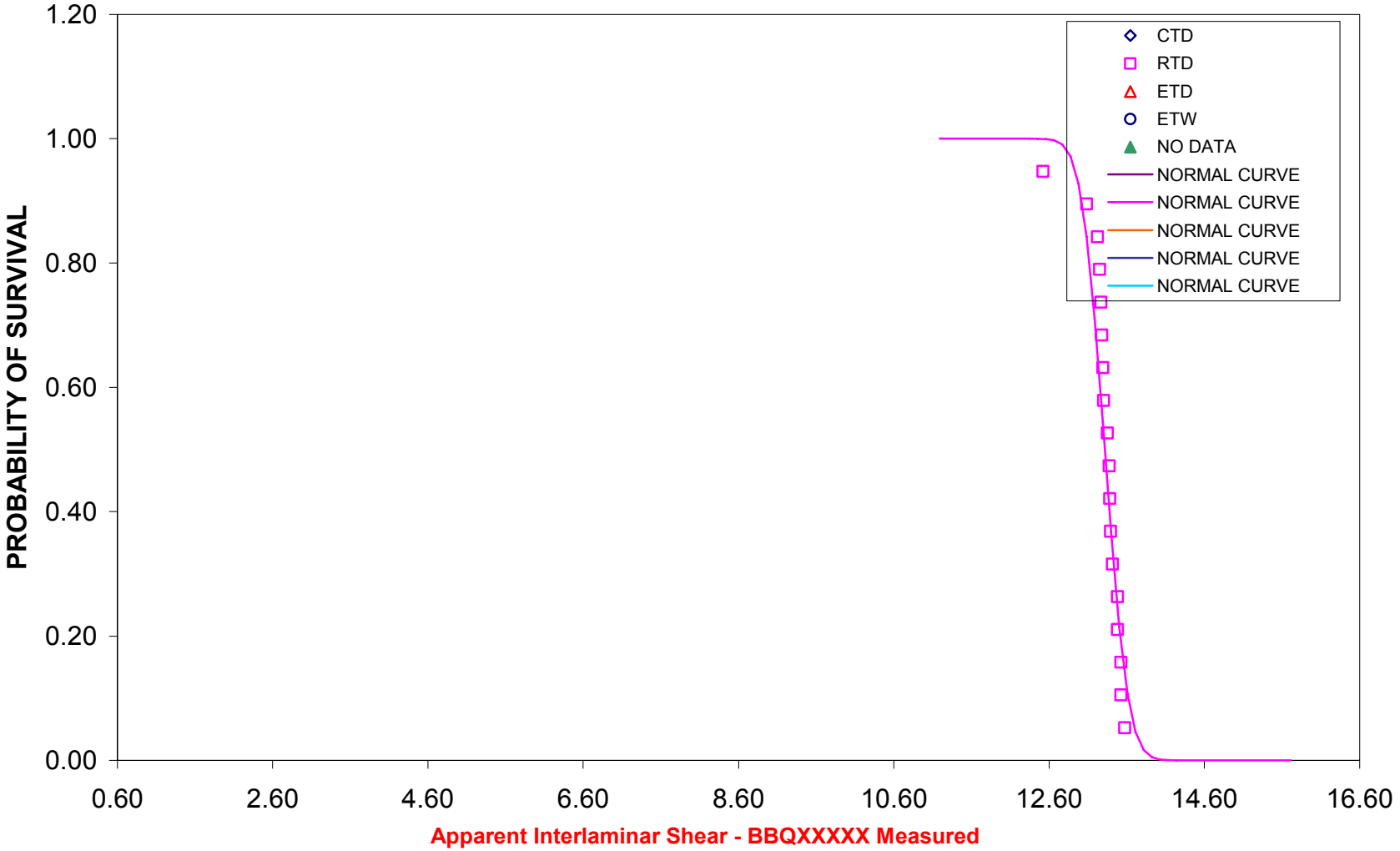
# DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



# DISTRIBUTION OF GROUPED DATA FOR DIFFERENT TEST CONDITIONS

**Fiberite 7740/G30-500 12K Graphite Unitape**
**Cessna**



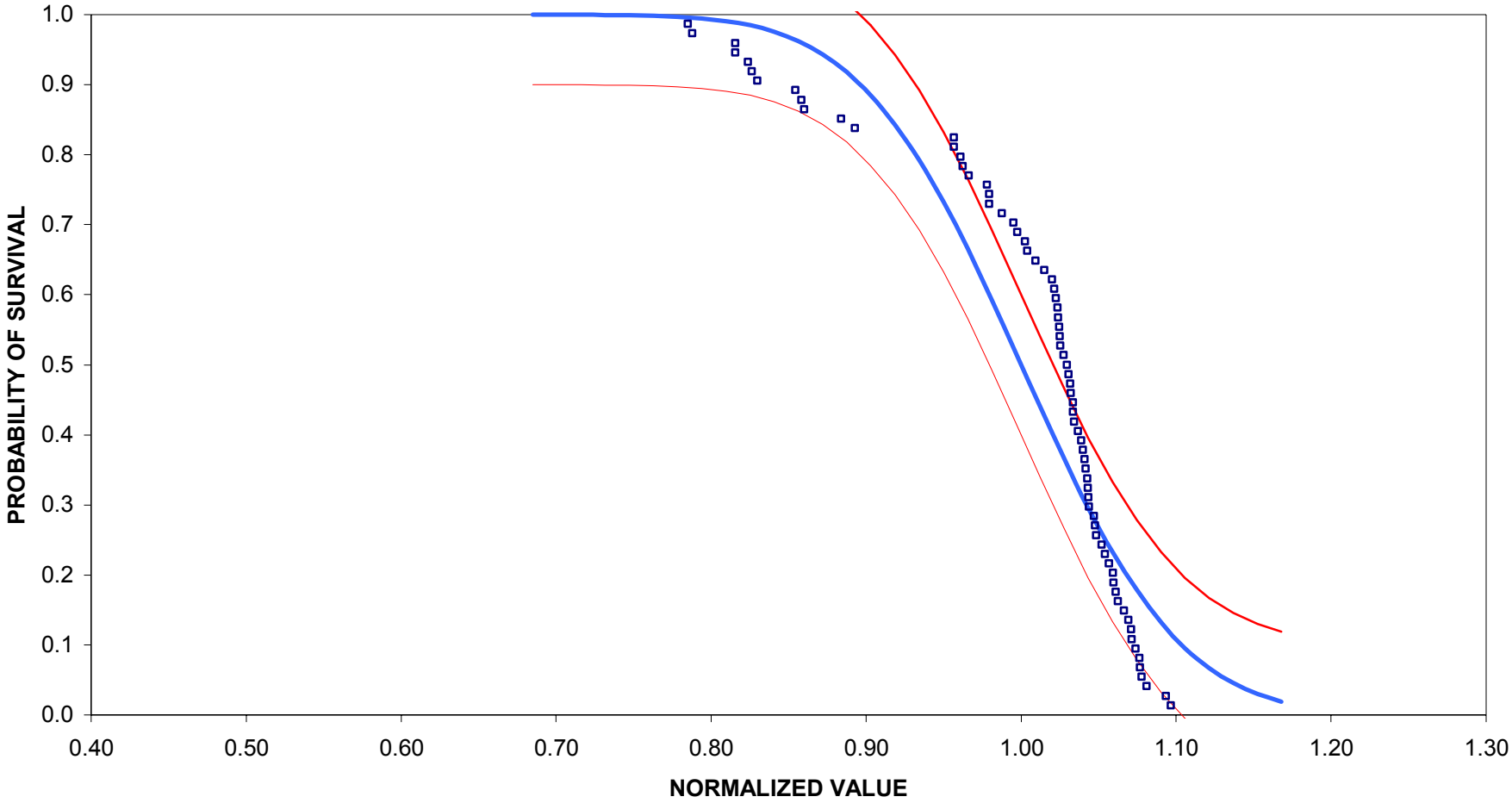
### 3.3.2 Plot of Pooled Data

## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**0° Tension - BBJXXXXX Measured**

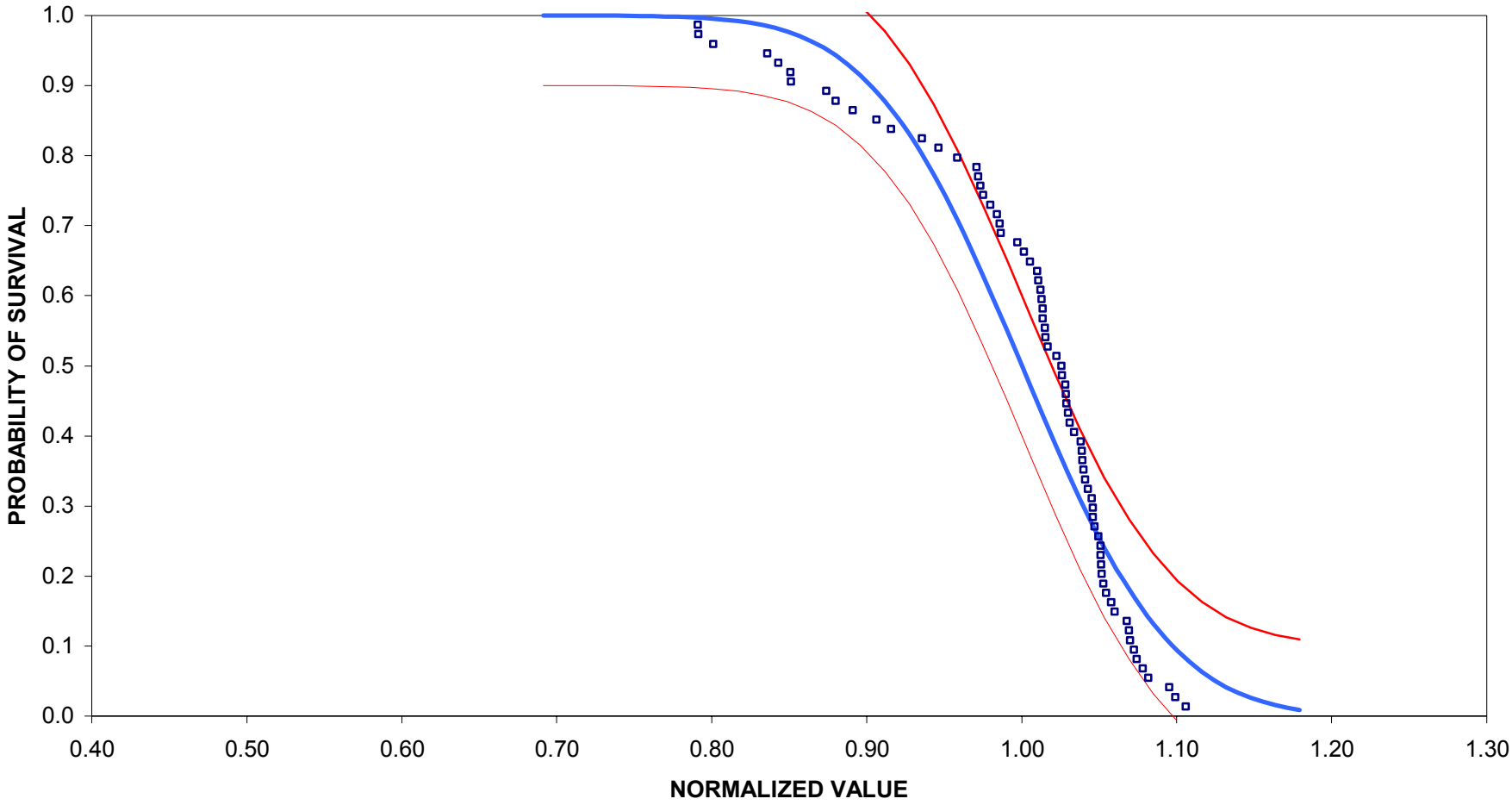


## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**0° Tension - BBJXXXXX Normalized**

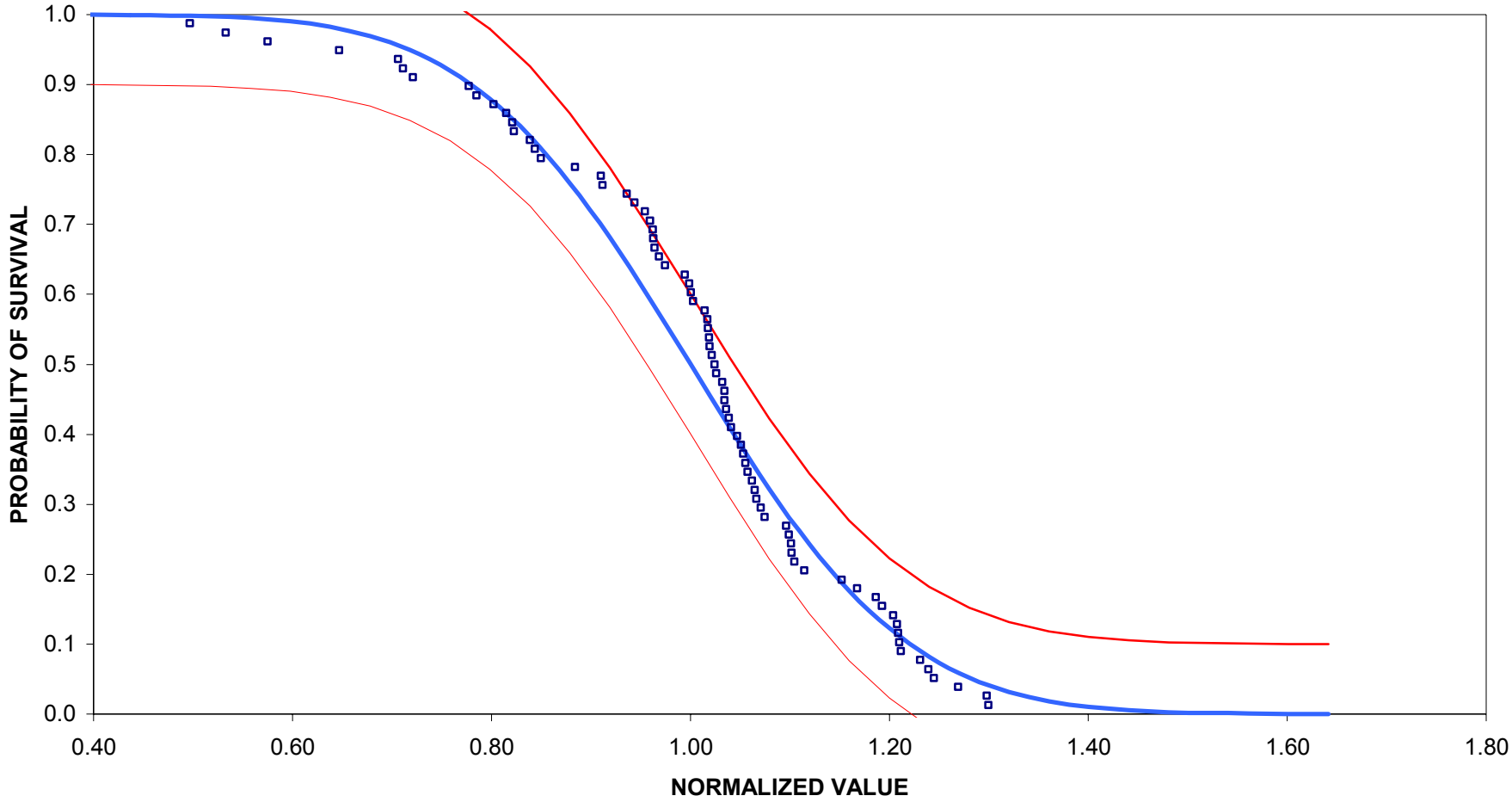


## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**90° Tension - BBUXXXXX Measured**

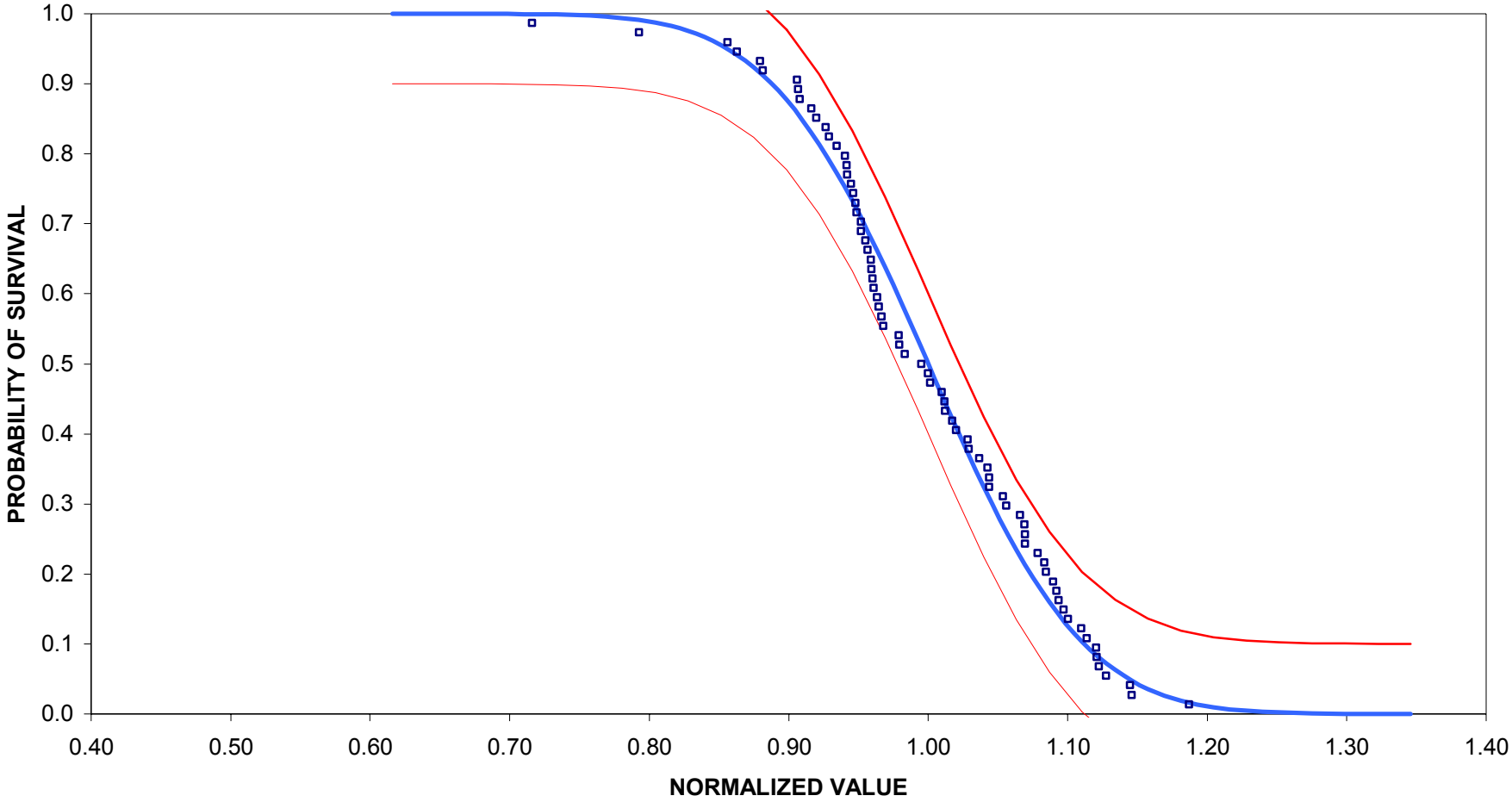


## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**0° Compression - BBKXXXXX Measured**

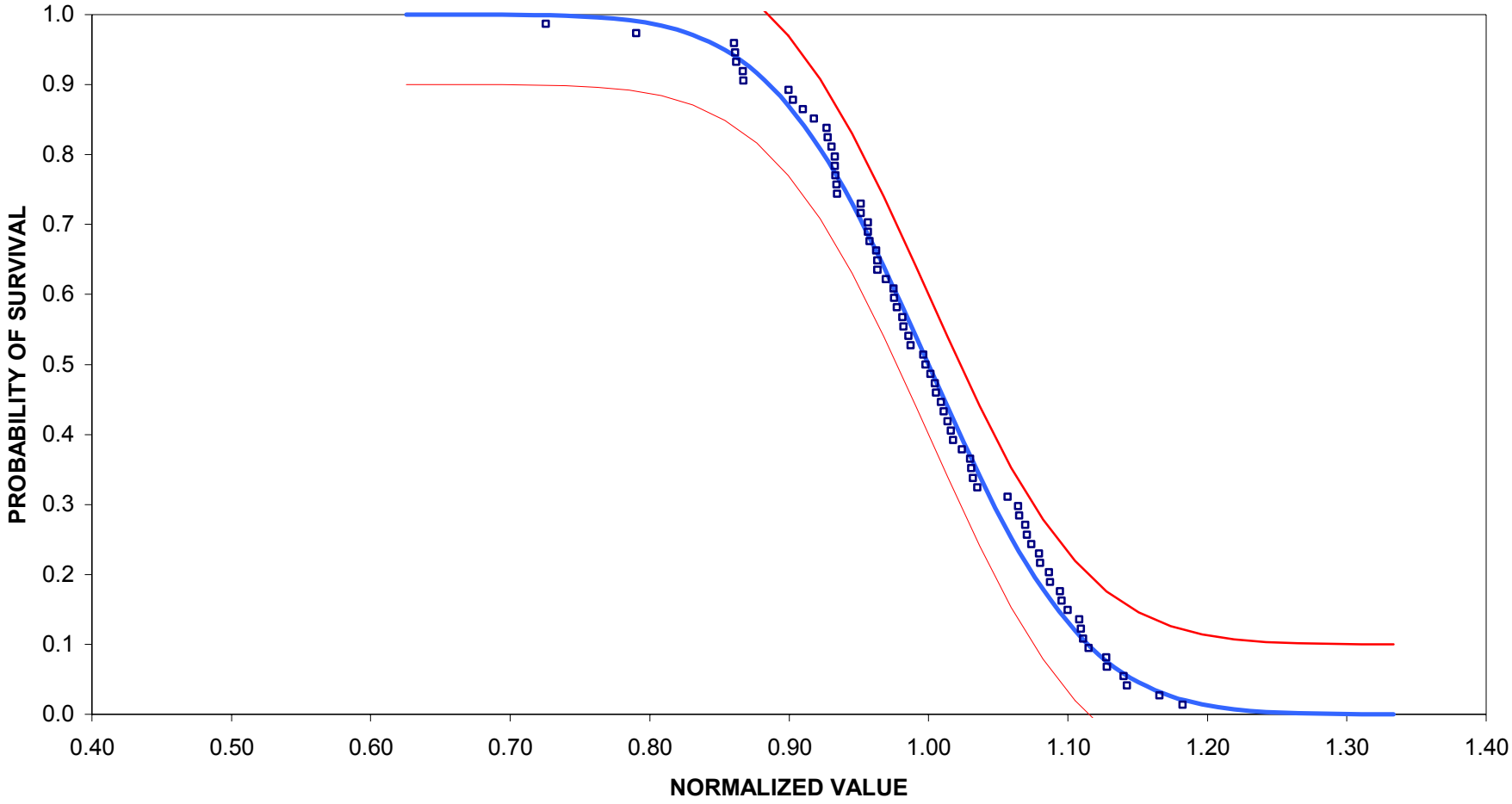


## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**0° Compression - BBKXXXXX Normalized**

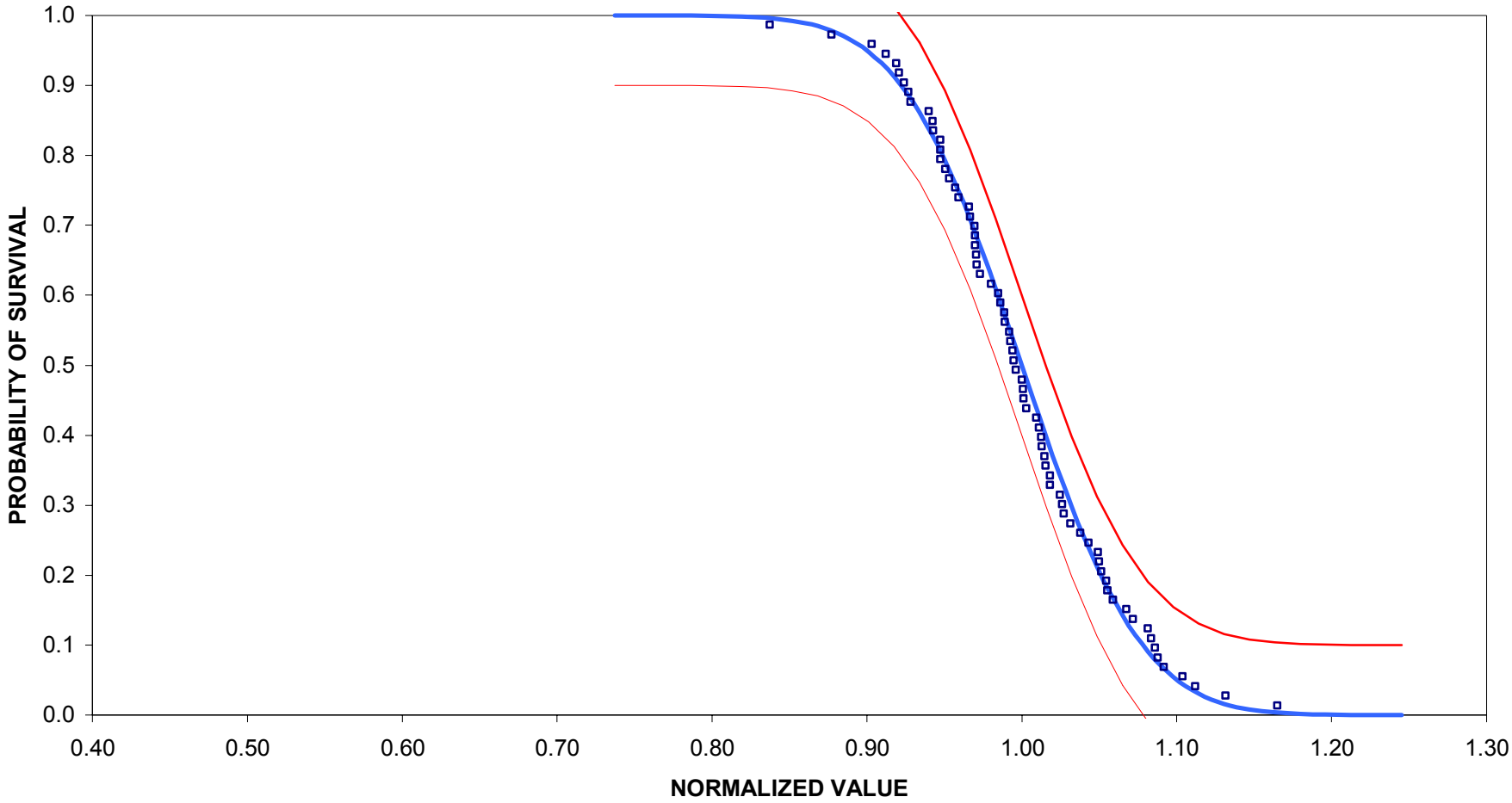


## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**90° Compression - BBWXXXXX Measured**

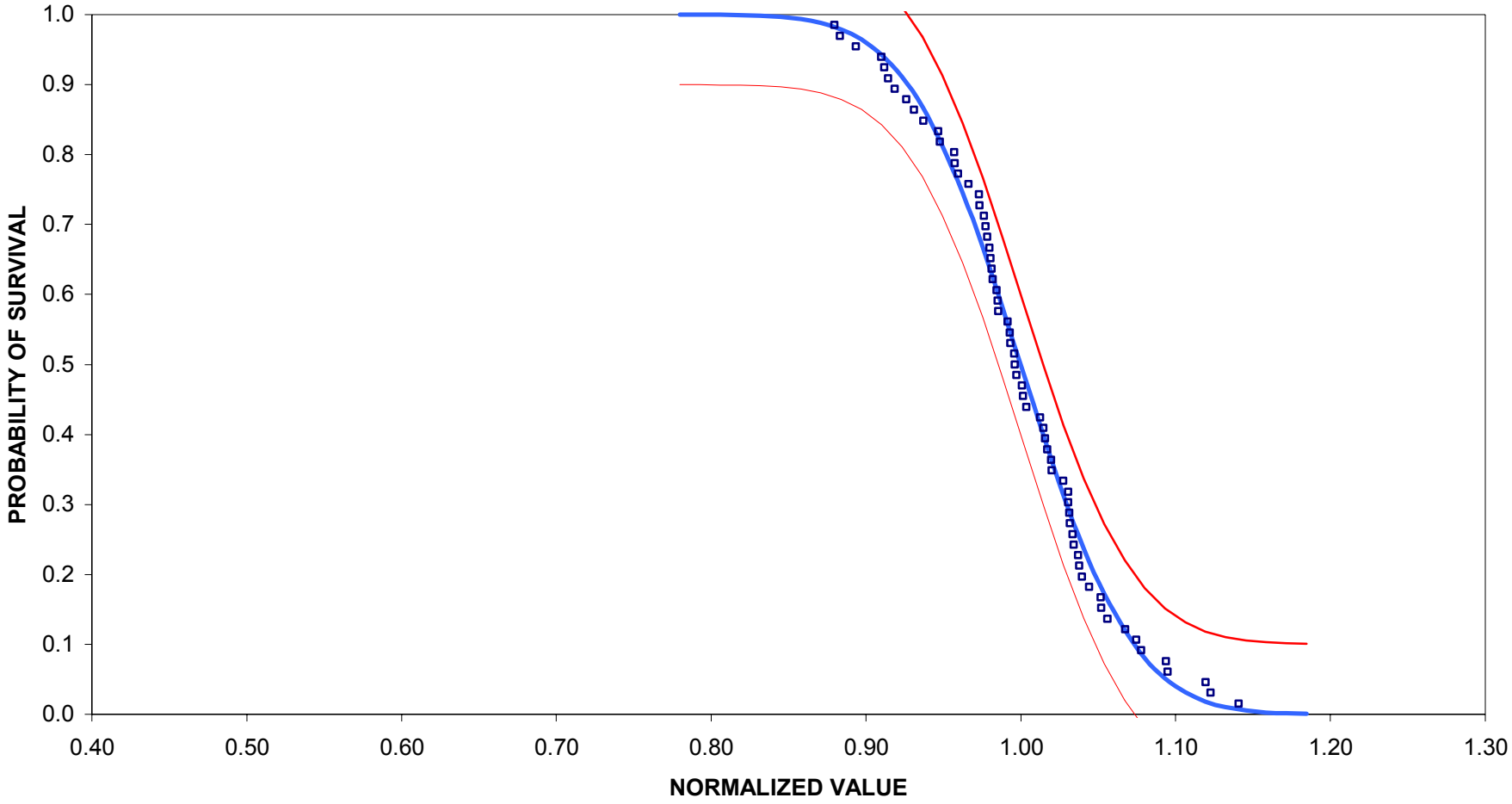


## DISTRIBUTION OF POOLED DATA

**Fiberite 7740/G30-500 12K Graphite Unitape**

**Cessna**

**In-Plane Shear - BBNXXXXX Measured**

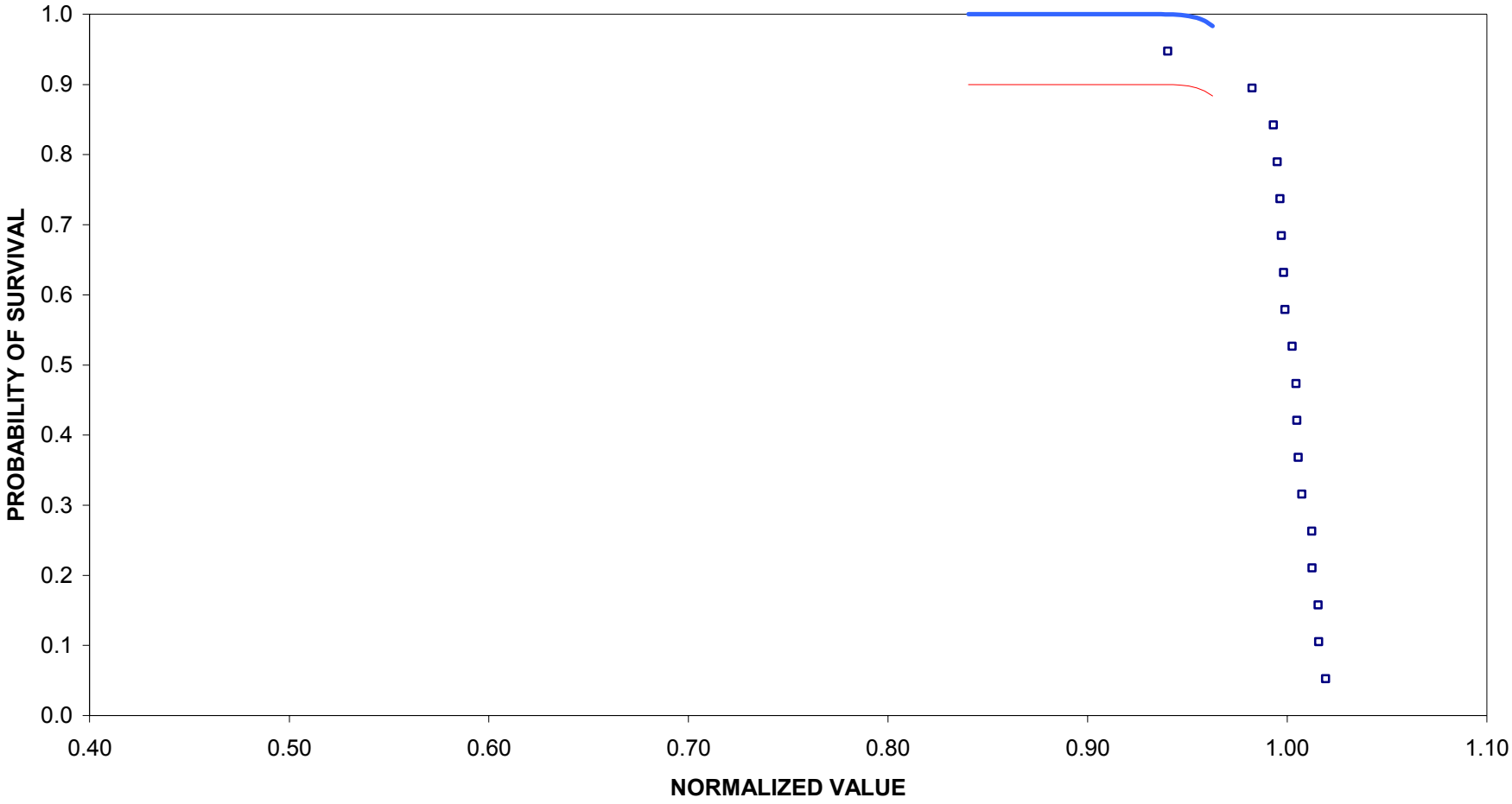


# DISTRIBUTION OF POOLED DATA

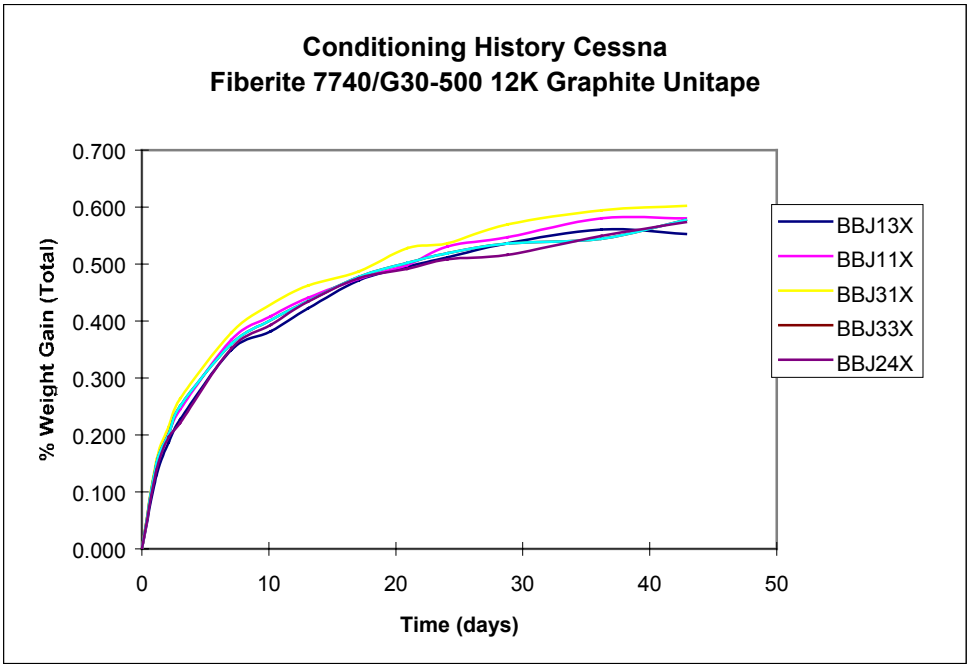
**Fiberite 7740/G30-500 12K Graphite Unitape**

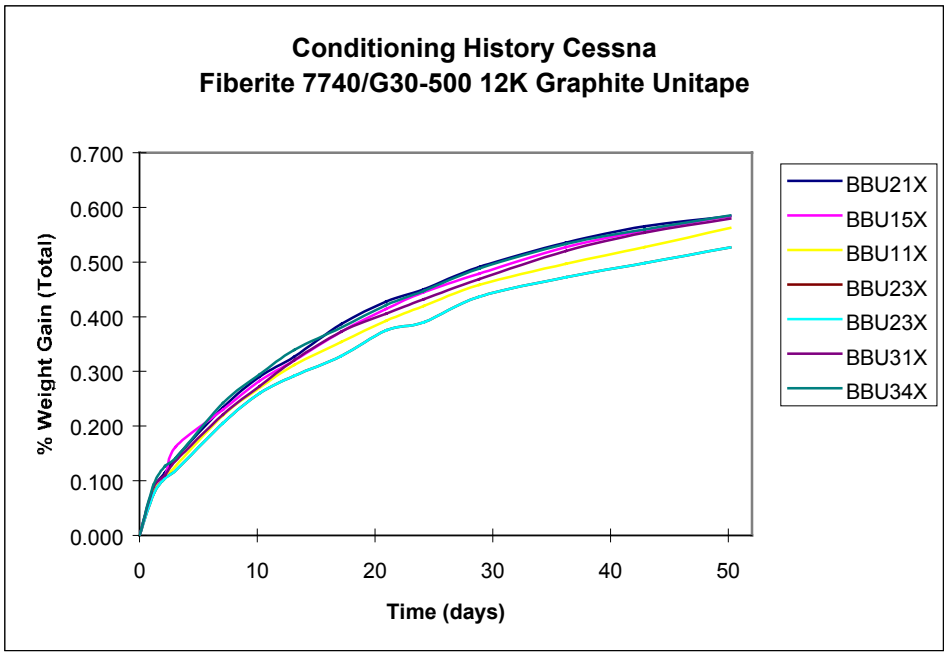
**Cessna**

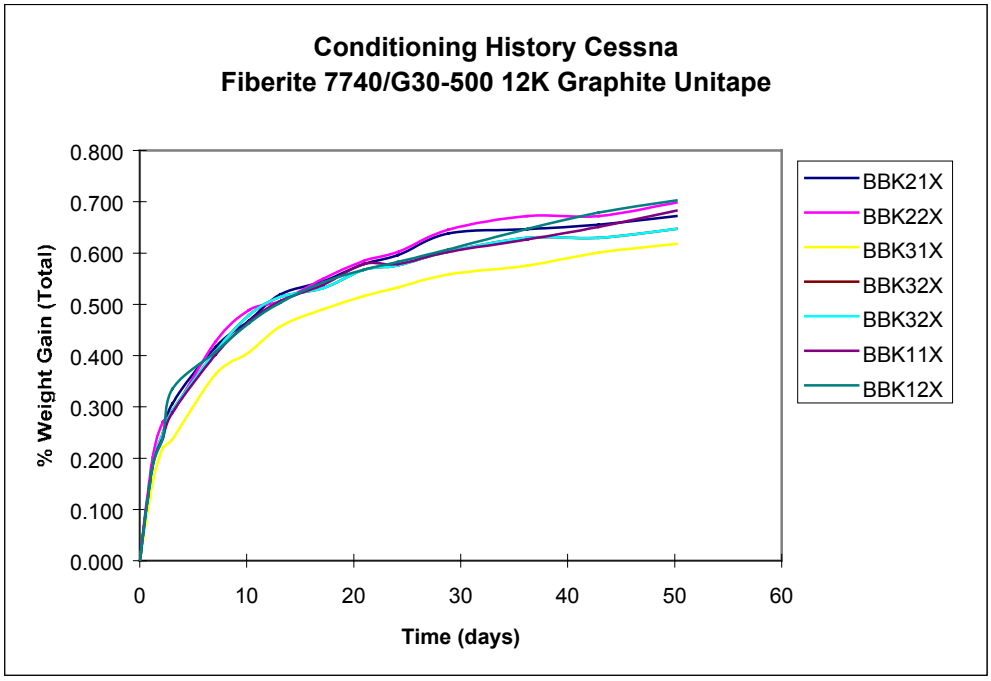
**Apparent Interlaminar Shear - BBQXXXXX Measured**

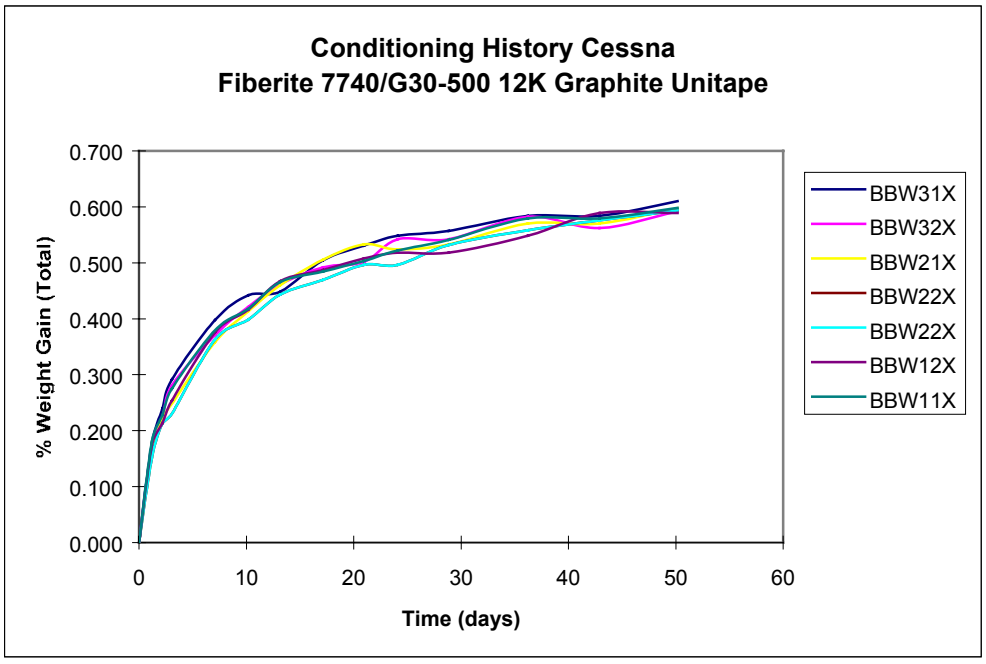


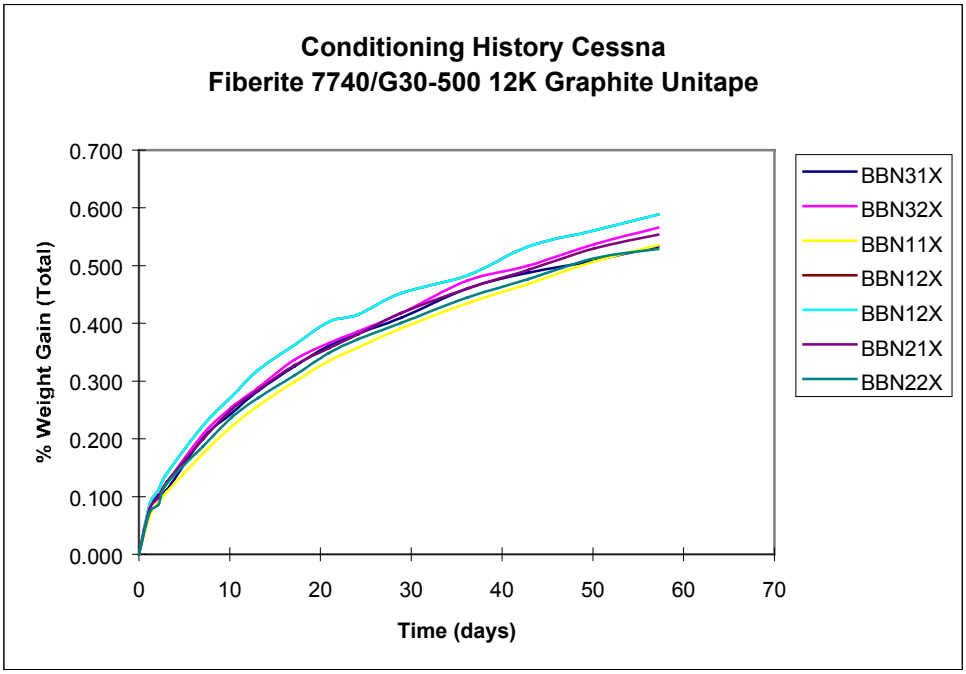
## 3.4 Moisture Conditioning History Charts

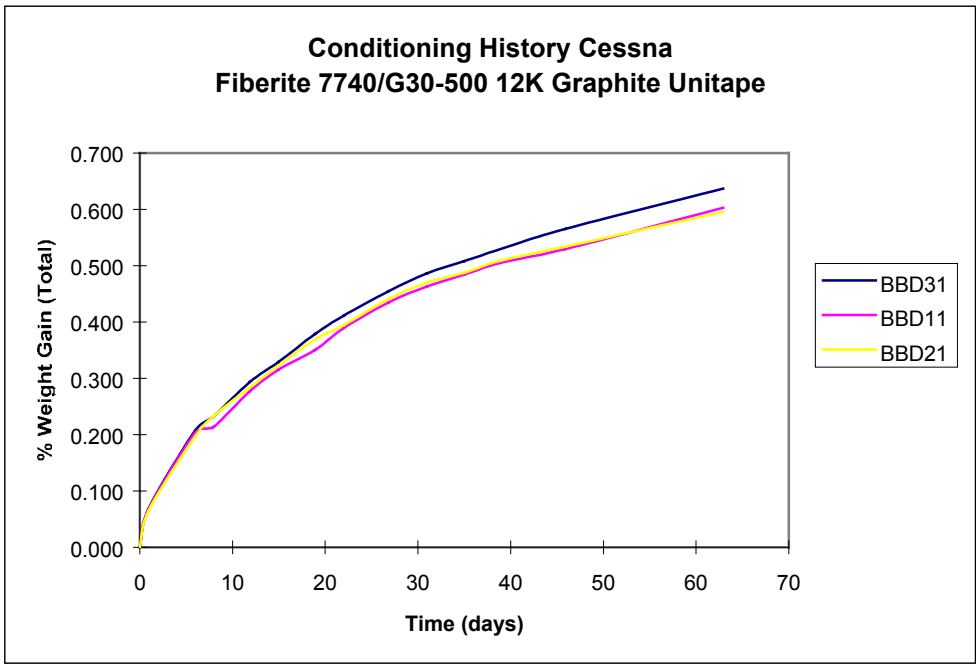






## 3.5 Physical Test Results

## Physical Test Summary
## Fiberite 7740/G30-500 12K Graphite Unitape

| | Composite Density [g/cc] | Resin Content [wt%] | Fiber Volume [vol%] | Void Content [vol%] |
|---|---|---|---|---|
| **0° Tension (BBJXXXXX)** | | | | |
| **No. of Specimens** | 11 | 11 | 11 | 11 |
| **Mean** | 1.532 | 30.854 | 60.551 | 2.218 |
| **Standard Deviation** | 0.008 | 2.348 | 2.079 | 0.932 |
| **90° Tension (BBUXXXXX)** | | | | |
| **No. of Specimens** | 12 | 12 | 12 | 12 |
| **Mean** | 1.530 | 32.222 | 59.262 | 1.910 |
| **Standard Deviation** | 0.010 | 2.412 | 2.072 | 1.106 |
| **0° Compression (BBKXXXXX)** | | | | |
| **No. of Specimens** | 7 | 7 | 7 | 7 |
| **Mean** | 1.536 | 29.720 | 61.666 | 2.399 |
| **Standard Deviation** | 0.011 | 2.104 | 1.847 | 1.042 |
| **90° Compression (BBWXXXXX)** | | | | |
| **No. of Specimens** | 9 | 9 | 9 | 9 |
| **Mean** | 1.537 | 29.862 | 61.621 | 2.238 |
| **Standard Deviation** | 0.009 | 3.898 | 3.546 | 1.257 |
| **In-Plane Shear (BBNXXXXX)** | | | | |
| **No. of Specimens** | 6 | 6 | 6 | 6 |
| **Mean** | 1.539 | 27.491 | 63.770 | 2.957 |
| **Standard Deviation** | 0.012 | 5.631 | 5.308 | 1.446 |
| **Interlaminar Shear (BBQXXXXX)** | | | | |
| **No. of Specimens** | 3 | 3 | 3 | 3 |
| **Mean** | 1.520 | 33.942 | 57.384 | 1.988 |
| **Standard Deviation** | 0.009 | 2.393 | 2.118 | 0.947 |
| **Overall No. of Specimens** | **48** | **48** | **48** | **48** |
| **Overall Mean** | **1.533** | **30.617** | **60.797** | **2.249** |
| **Overall Std. Deviation** | **0.010** | **3.487** | **3.228** | **1.114** |

COMPANY : **Cessna**
MATERIAL SYSTEM : **Fiberite 7740/G30-500 12K Graphite Unitape**
PROJECT : **980409C1**

## DMA Results -- Onset Storage Modulus

DRY

| As Fabricated | | |
|---|---|---|
| **Sample #** | **Tg [°C]** | **Tg [°F]** |
| BBD1X1GA | 122.73 | 252.92 |
| BBD1X1HA | 122.45 | 252.40 |
| BBD1X1IA | 125.14 | 257.25 |
| BBD2X1GA | 126.86 | 260.34 |
| BBD2X1HA | 124.46 | 256.03 |
| BBD2X1IA | 125.70 | 258.26 |
| BBD3X1GA | 123.33 | 254.00 |
| BBD3X1HA | 120.41 | 248.74 |
| BBD3X1IA | 121.43 | 250.58 |
| **Average [°F]** | | **254.50** |
| **Standard Dev. [°F]** | | **3.77** |
| **Coeff. Of Var. [%]** | | **1.48** |

WET

| Moisture Equilibirum at 85% RH | | |
|---|---|---|
| **Sample #** | **Tg [°C]** | **Tg [°F]** |
| BBD1X1BC | 103.32 | 217.98 |
| BBD1X1CC | 100.55 | 212.99 |
| BBD1X1DC | 109.81 | 229.65 |
| BBD2X1BC | 109.31 | 228.77 |
| BBD2X1CC | 106.61 | 223.89 |
| BBD2X1DC | 109.92 | 229.85 |
| BBD3X1BC | 115.66 | 240.19 |
| BBD3X1CC | 108.26 | 226.87 |
| BBD3X1DC | 106.59 | 223.85 |
| **Average [°F]** | | **226.00** |
| **Standard Dev. [°F]** | | **7.75** |
| **Coeff. Of Var. [%]** | | **3.43** |

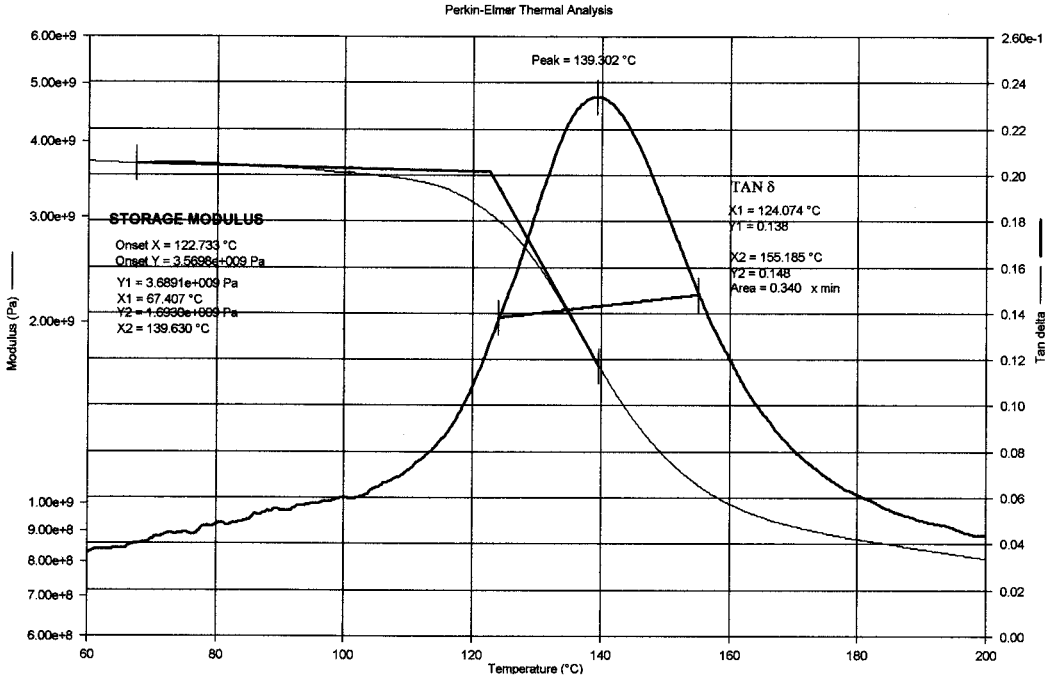
## DMA Results - Peak Tan Delta

DRY

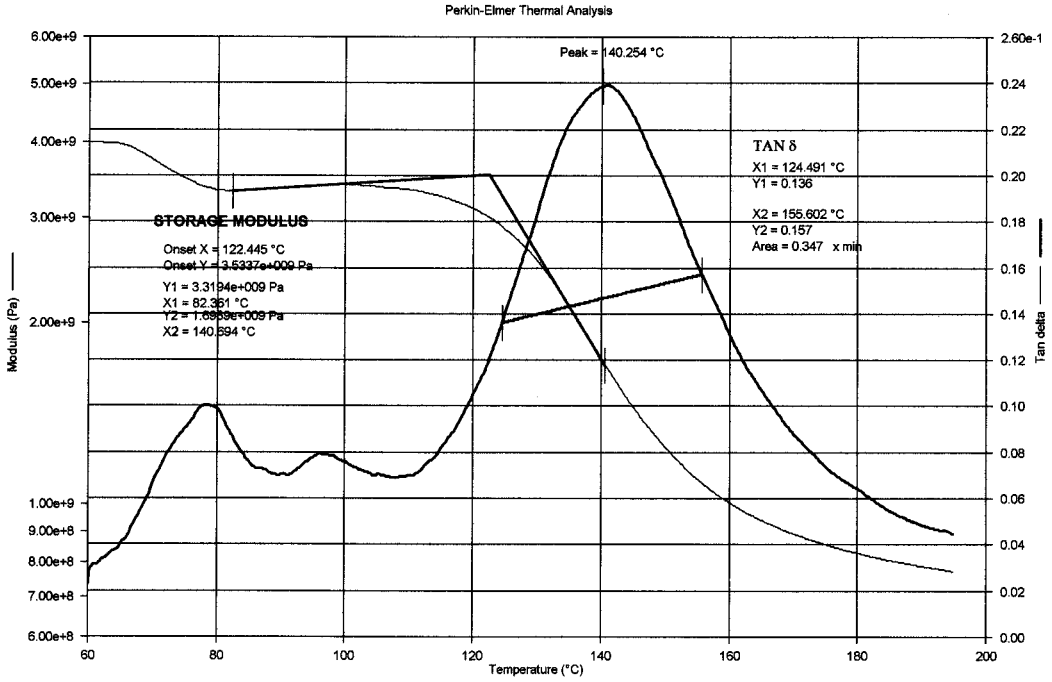
| As Fabricated | | |
|---|---|---|
| **Sample #** | **Tg [°C]** | **Tg [°F]** |
| BBD1X1GA | 139.30 | 282.74 |
| BBD1X1HA | 140.25 | 284.46 |
| BBD1X1IA | 139.04 | 282.28 |
| BBD2X1GA | 139.49 | 283.09 |
| BBD2X1HA | 139.28 | 282.71 |
| BBD2X1IA | 138.88 | 281.98 |
| BBD3X1GA | 138.76 | 281.77 |
| BBD3X1HA | 137.71 | 279.89 |
| BBD3X1IA | 138.67 | 281.60 |
| **Average [°F]** | | **282.28** |
| **Standard Dev. [°F]** | | **1.24** |
| **Coeff. Of Var. [%]** | | **0.44** |

WET

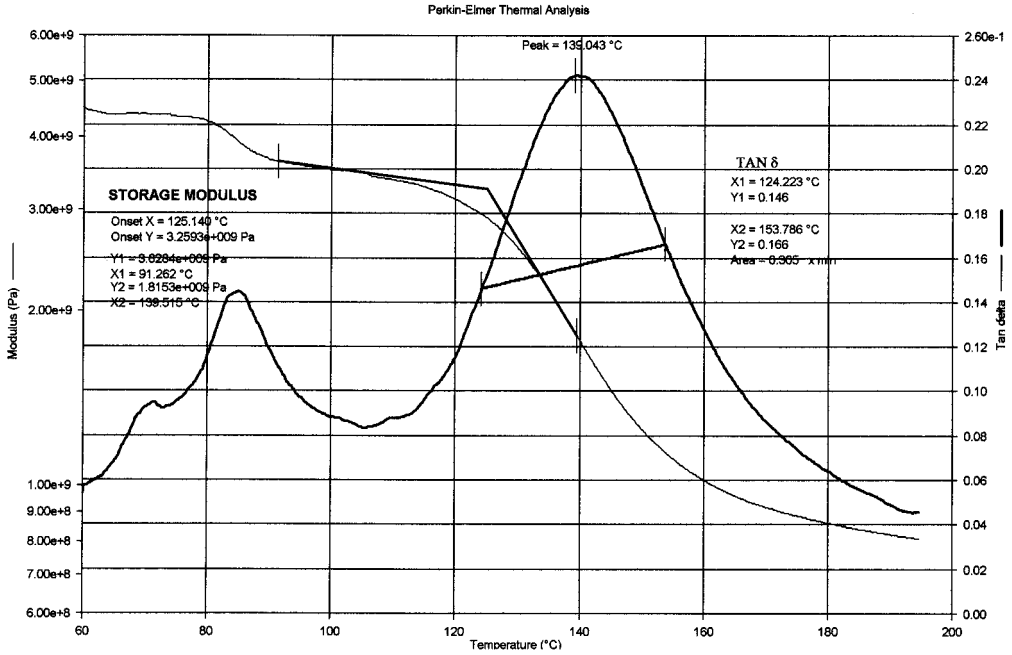
| Moisture Equilibirum at 85% RH | | |
|---|---|---|
| **Sample #** | **Tg [°C]** | **Tg [°F]** |
| BBD1X1BC | 122.10 | 251.78 |
| BBD1X1CC | 121.62 | 250.92 |
| BBD1X1DC | 122.68 | 252.83 |
| BBD2X1BC | 121.31 | 250.35 |
| BBD2X1CC | 120.74 | 249.33 |
| BBD2X1DC | 121.45 | 250.61 |
| BBD3X1BC | 119.72 | 247.49 |
| BBD3X1CC | 121.24 | 250.24 |
| BBD3X1DC | 122.44 | 252.38 |
| **Average [°F]** | | **250.66** |
| **Standard Dev. [°F]** | | **1.62** |
| **Coeff. Of Var. [%]** | | **0.65** |



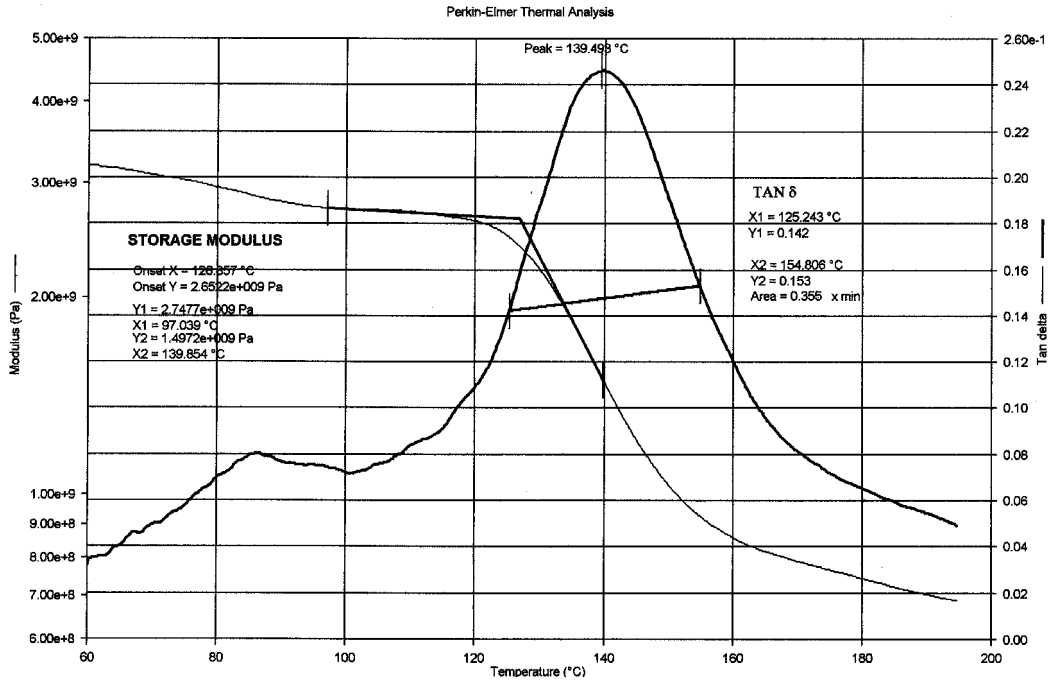

**BBD1X1GA**



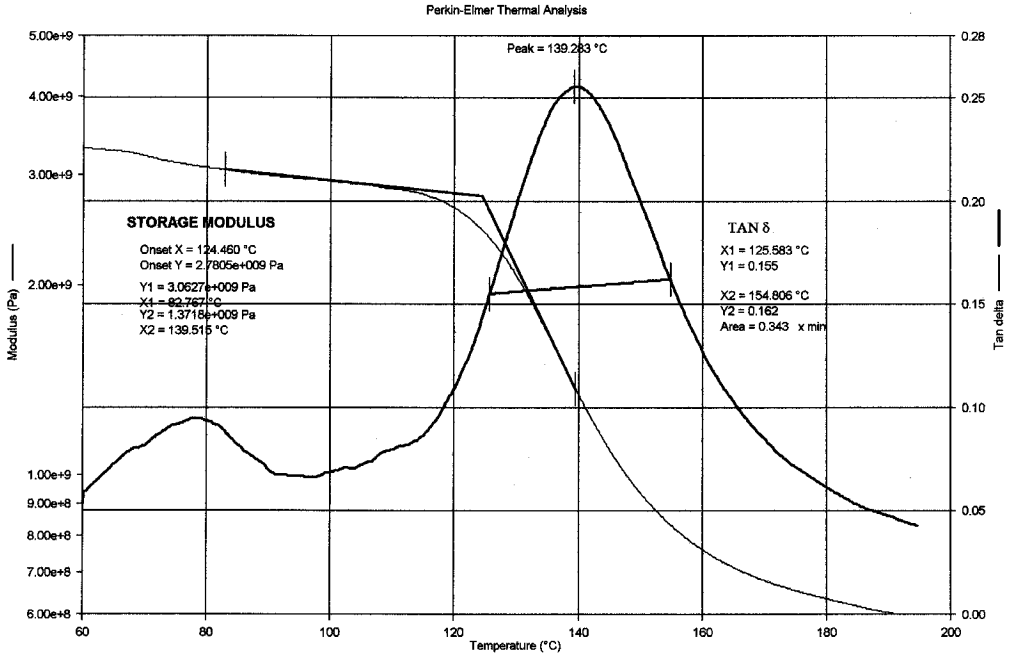

**BBD1X1HA**



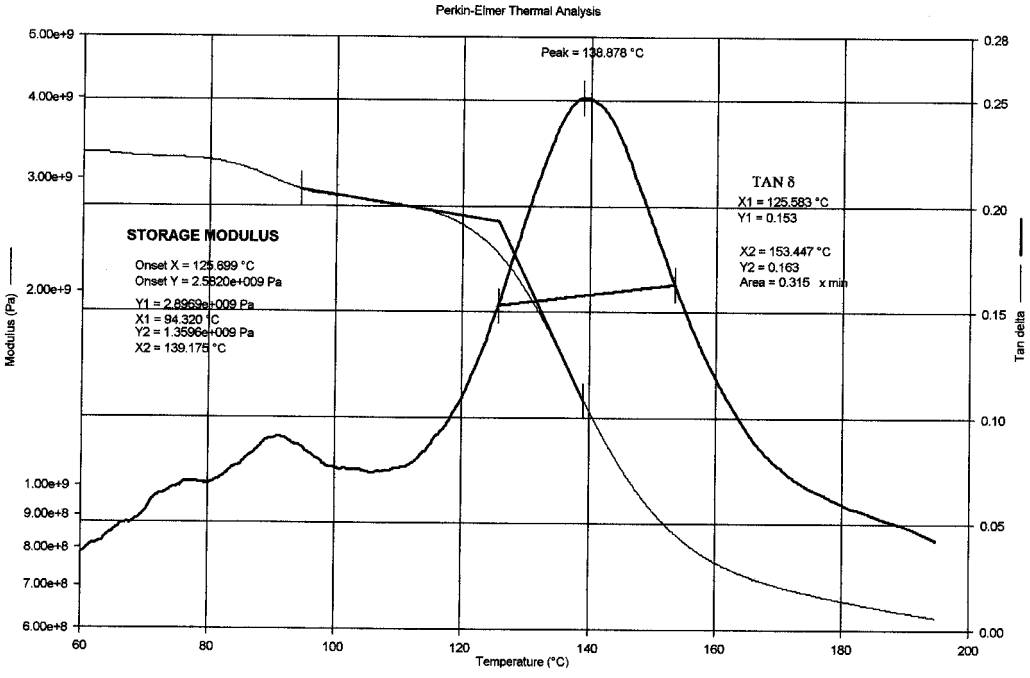

**BBD1X1IA**



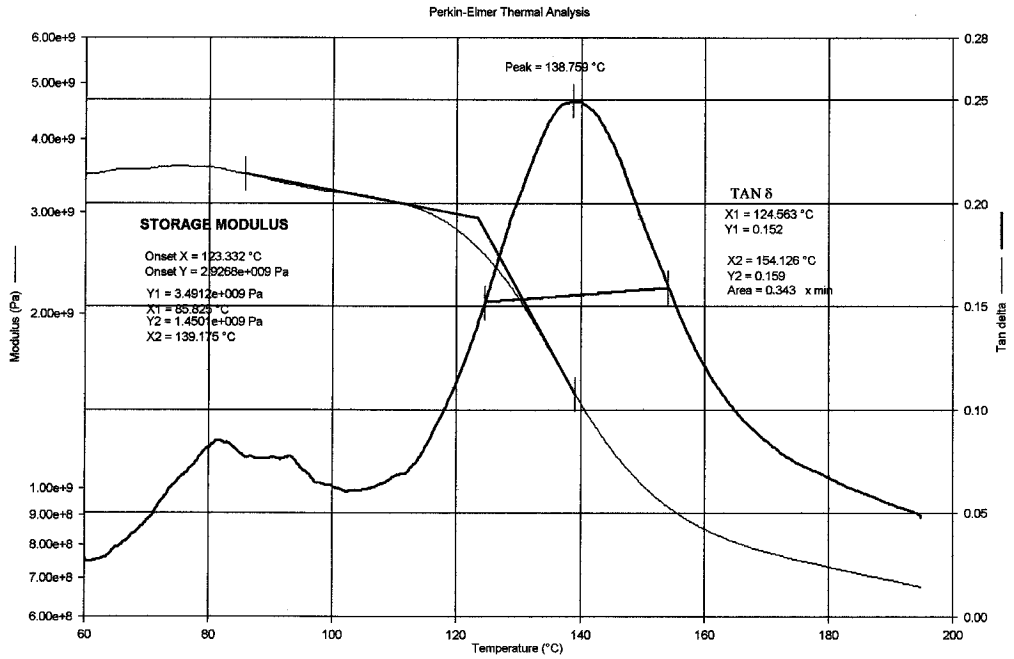

**BBD2X1GA**



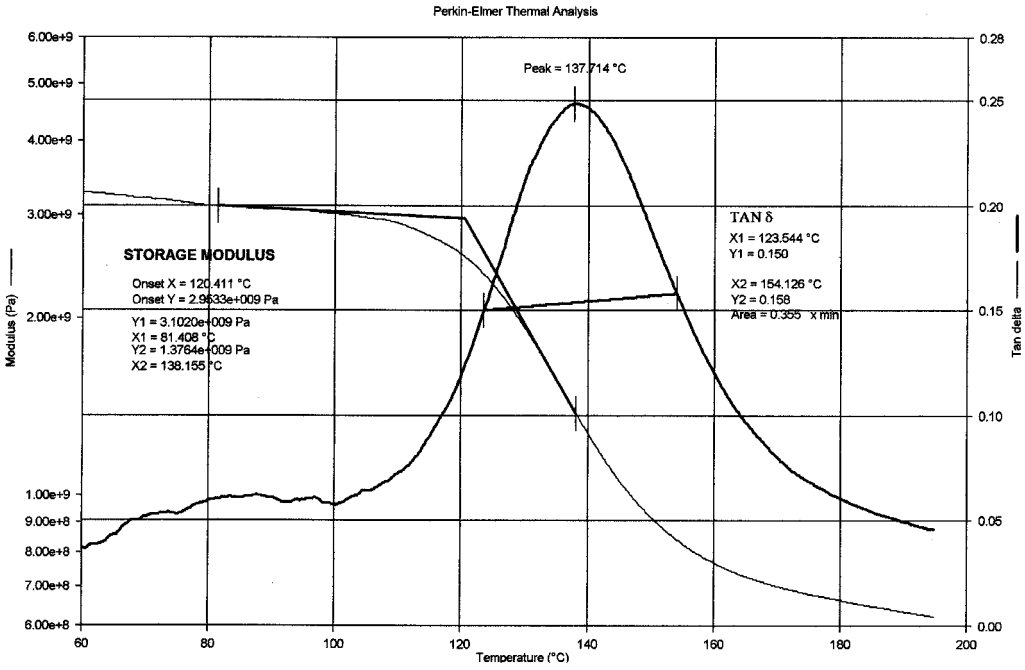

**BBD2X1HA**



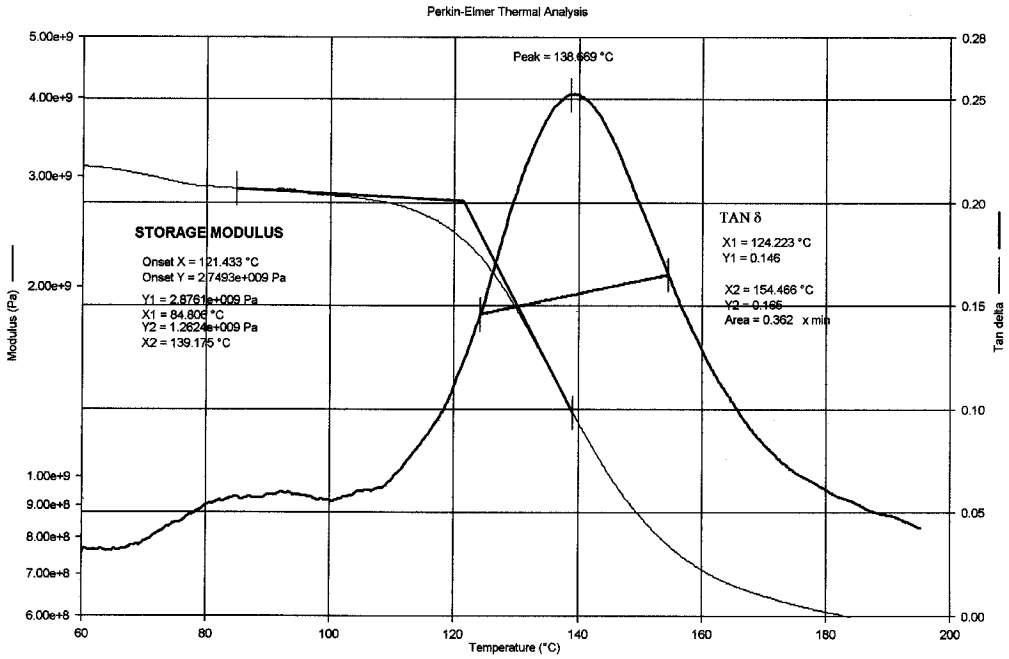

**BBD2X1IA**



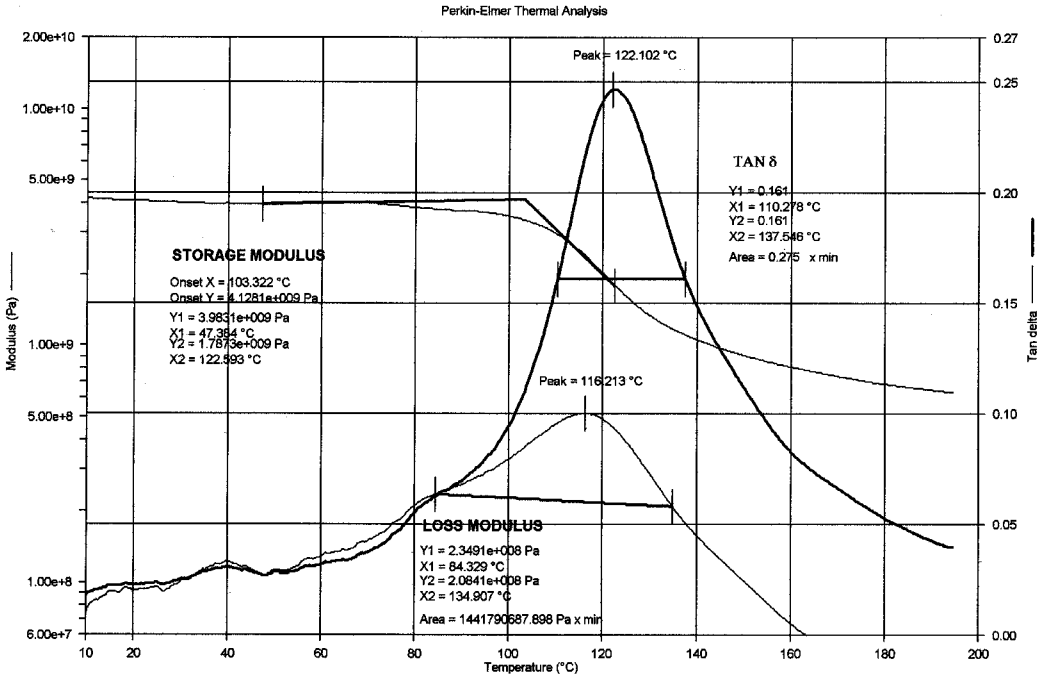

**BBD3X1GA**



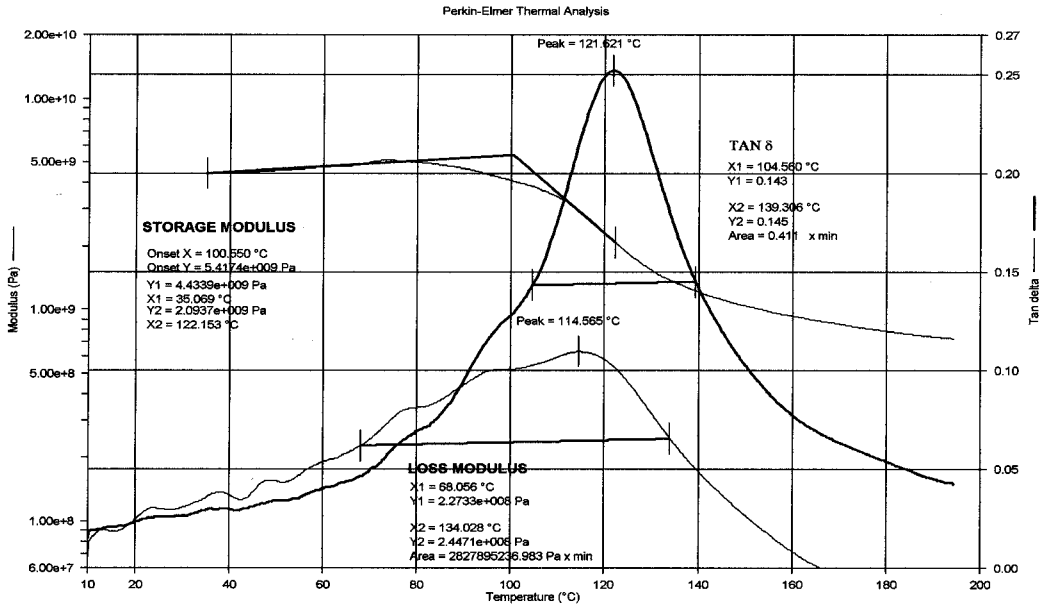

**BBD3X1HA**



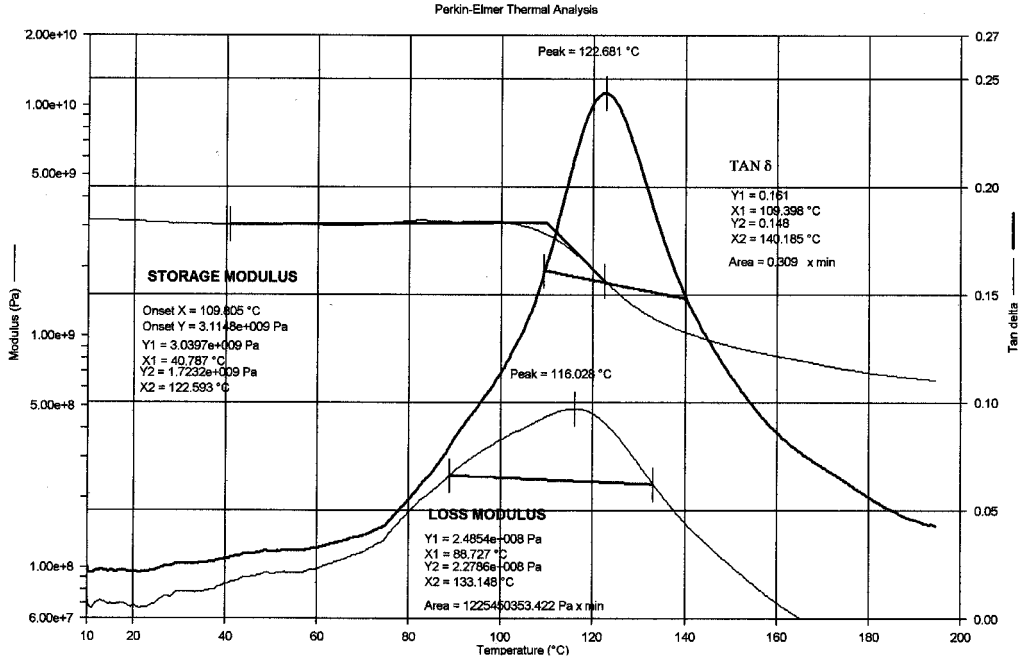

**BBD3X1IA**



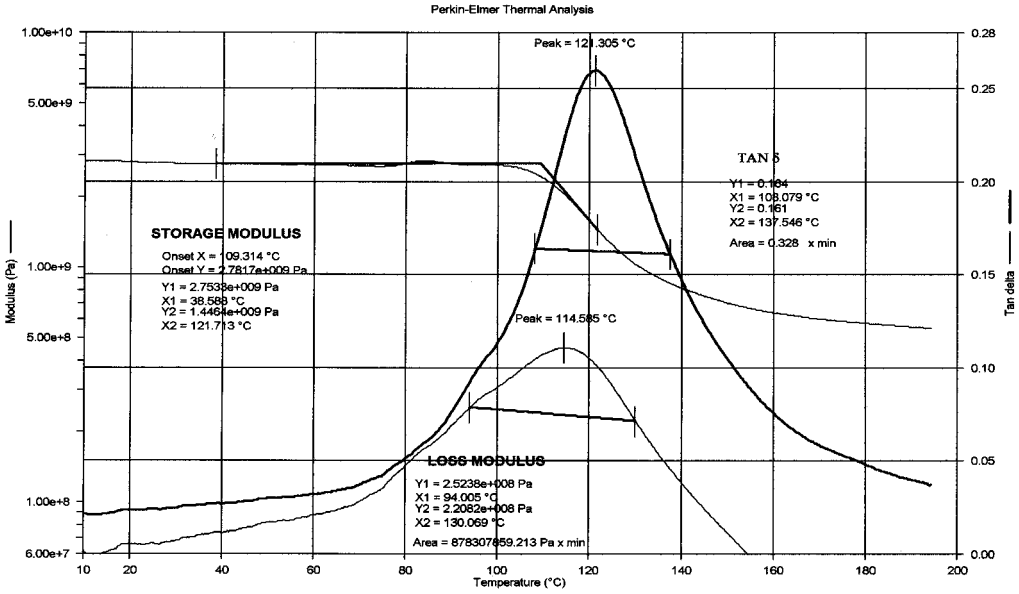

**BBD1X1BC**



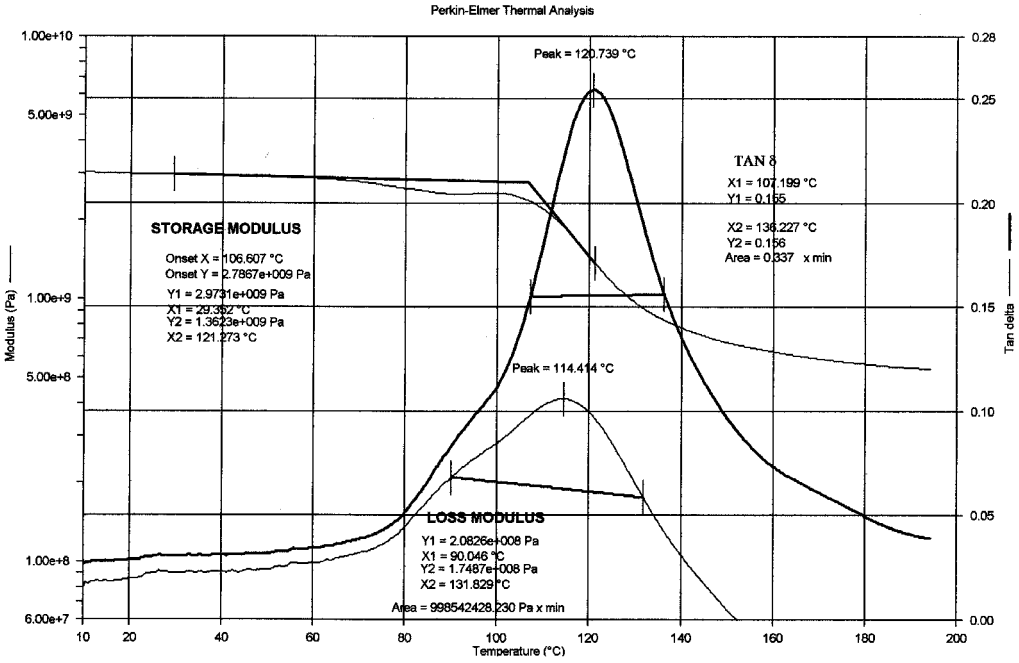

**BBD1X1CC**



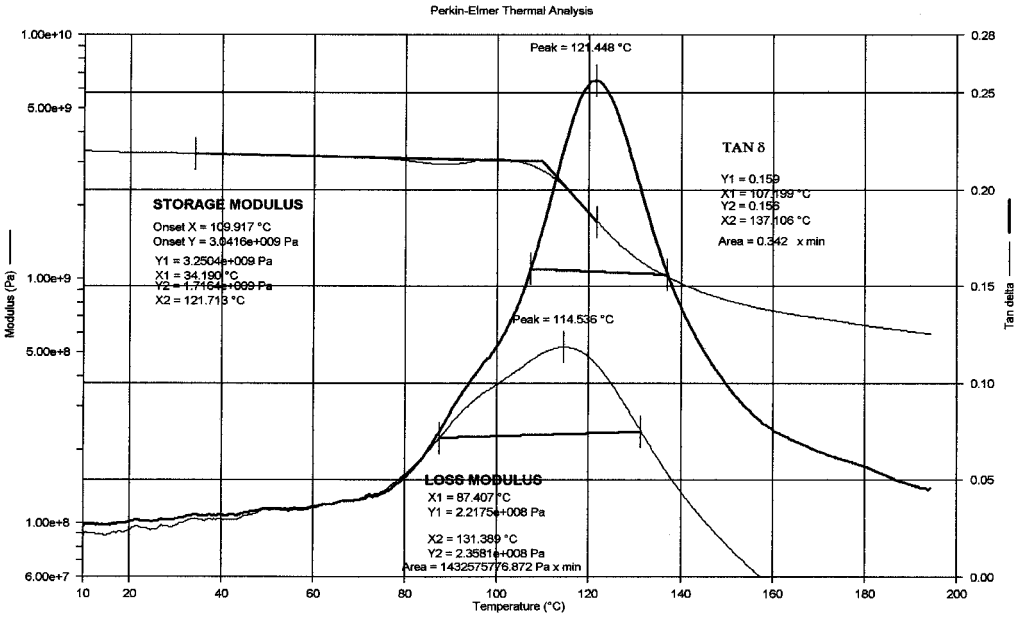

**BBD1X1DC**



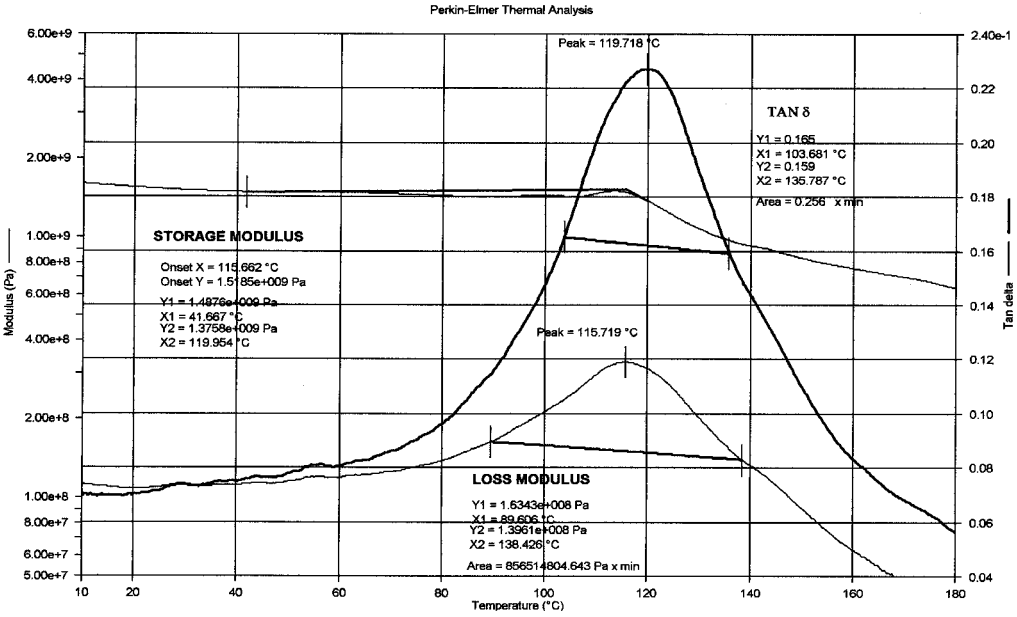

**BBD2X1BC**



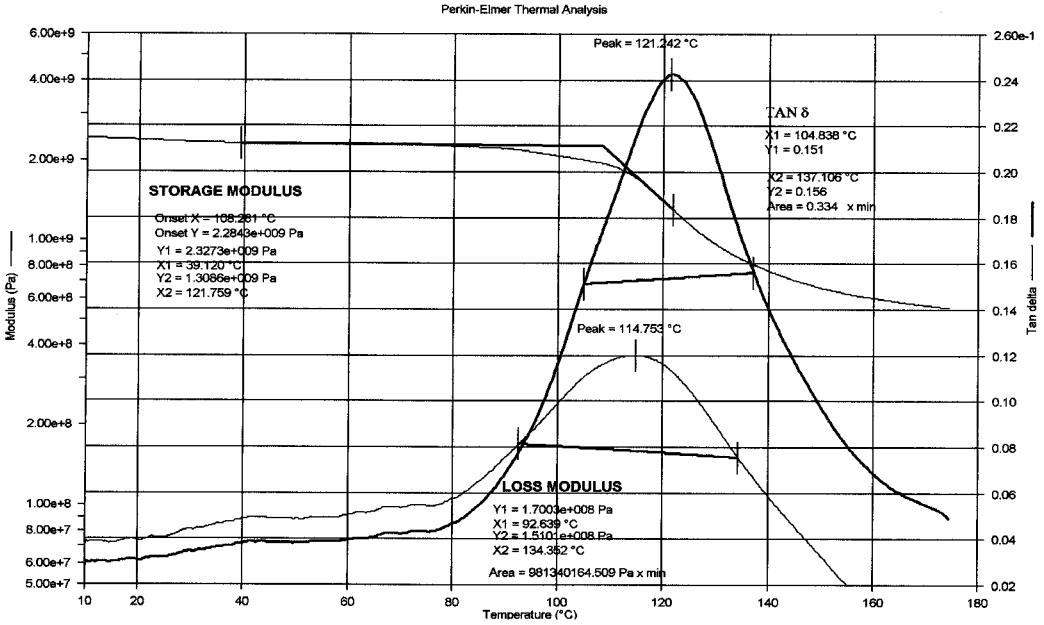

**BBD2X1CC**



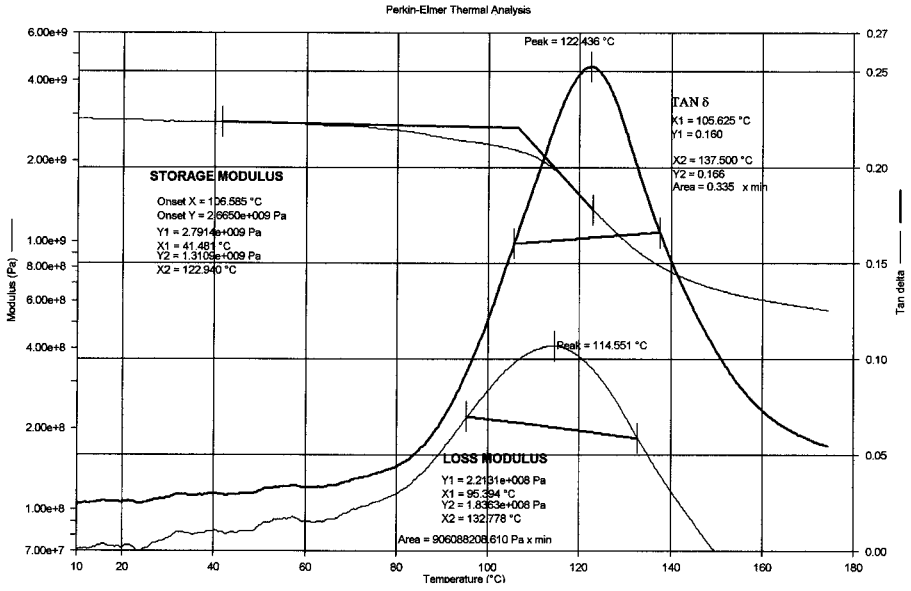

**BBD2X1DC**




**BBD3X1BC**




**BBD3X1CC**




**BBD3X1DC**

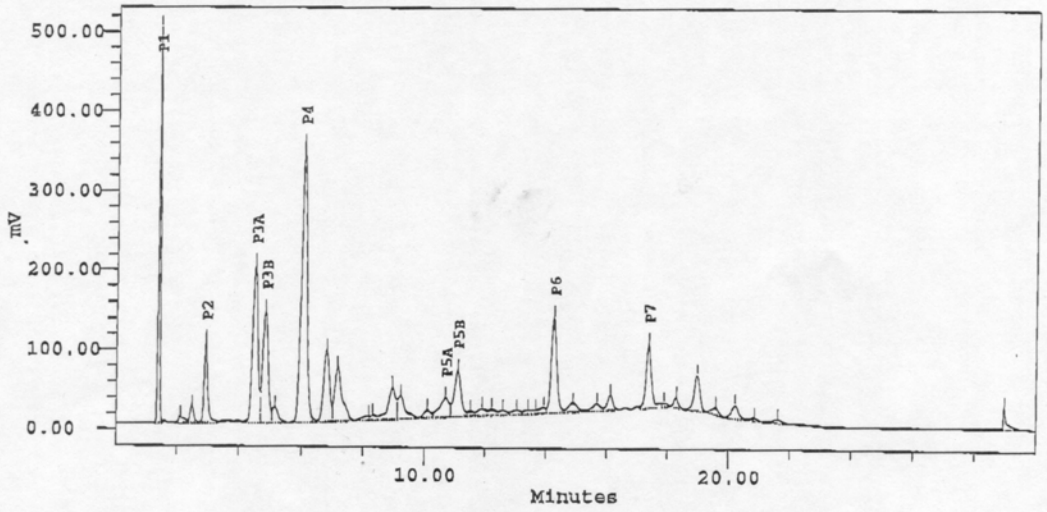
# 4.0 TESTING AND REPORTING COMMENTS

*All tests were conformed under Designated Option Authority (DOA) by Cessna Aircraft Co., Inc.*

# APPENDIX A. PHYSICAL TEST DATA SUPPLIED BY MATERIAL VENDOR

FIBERITE INC.
ANALYTICAL LABORATORY
GREENVILLE, TEXAS

| | | | |
|---|---|---|---|
| Project Name: | SYSTEM1 | Sample Type: | Unknown |
| Sample Name: | 370744/1 | Volume: | 10.00 |
| Vial: | 20 | Run Time: | 30.0 min |
| Injection: | 1 | Date Processed: | 11/05/97 10:55:38 AM |
| Channel: | SIM Ch1 | Dilution: | 1.00000 |
| Date Acquired: | 11/05/97 10:24:36 AM | Column_ID | 206294 |
| Scale Factor: | 1.00 | | |
| Acq Meth Set: | H1METHODSET | | |
| Processing Method: | H1METHOD | | |

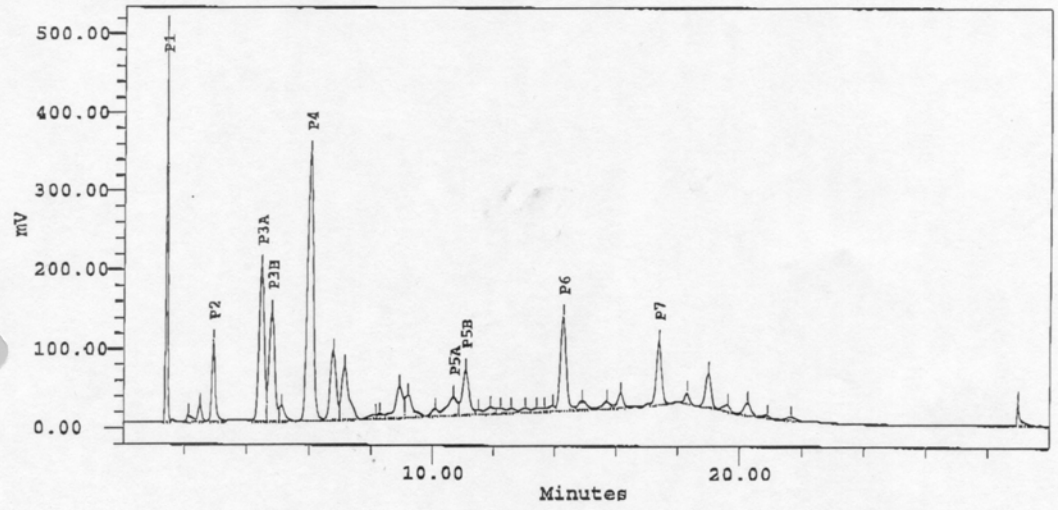



*Peak Results*

| # | Name | Ret Time (min) | Area (uV*sec) | Height (uV) | % Area | arearatio |
|---|---|---|---|---|---|---|
| 1 | P1 | 1.400 | 1976910 | 499045 | 8.62 | 0.434 |
| 2 | P2 | 2.933 | 862484 | 103244 | 3.76 | 0.189 |
| 3 | P3A | 4.500 | 2341440 | 198285 | 10.21 | 0.514 |
| 4 | P3 GROUP | 4.833 | 4071632 | 339186 | 17.75 | 0.894 |
| 5 | P3B | 4.833 | 1730192 | 140901 | 7.54 | 0.380 |
| 6 | P4 | 6.050 | 4553267 | 347267 | 19.85 | 1.000 |
| 7 | P5A | 10.700 | 543115 | 24157 | 2.37 | 0.119 |
| 8 | P5 GROUP | 11.100 | 1464283 | 82429 | 6.38 | 0.322 |
| 9 | P5B | 11.100 | 921168 | 58272 | 4.02 | 0.202 |
| 10 | P6 | 14.267 | 1559431 | 120068 | 6.80 | 0.342 |
| 11 | P7 | 17.383 | 987323 | 80382 | 4.31 | 0.217 |

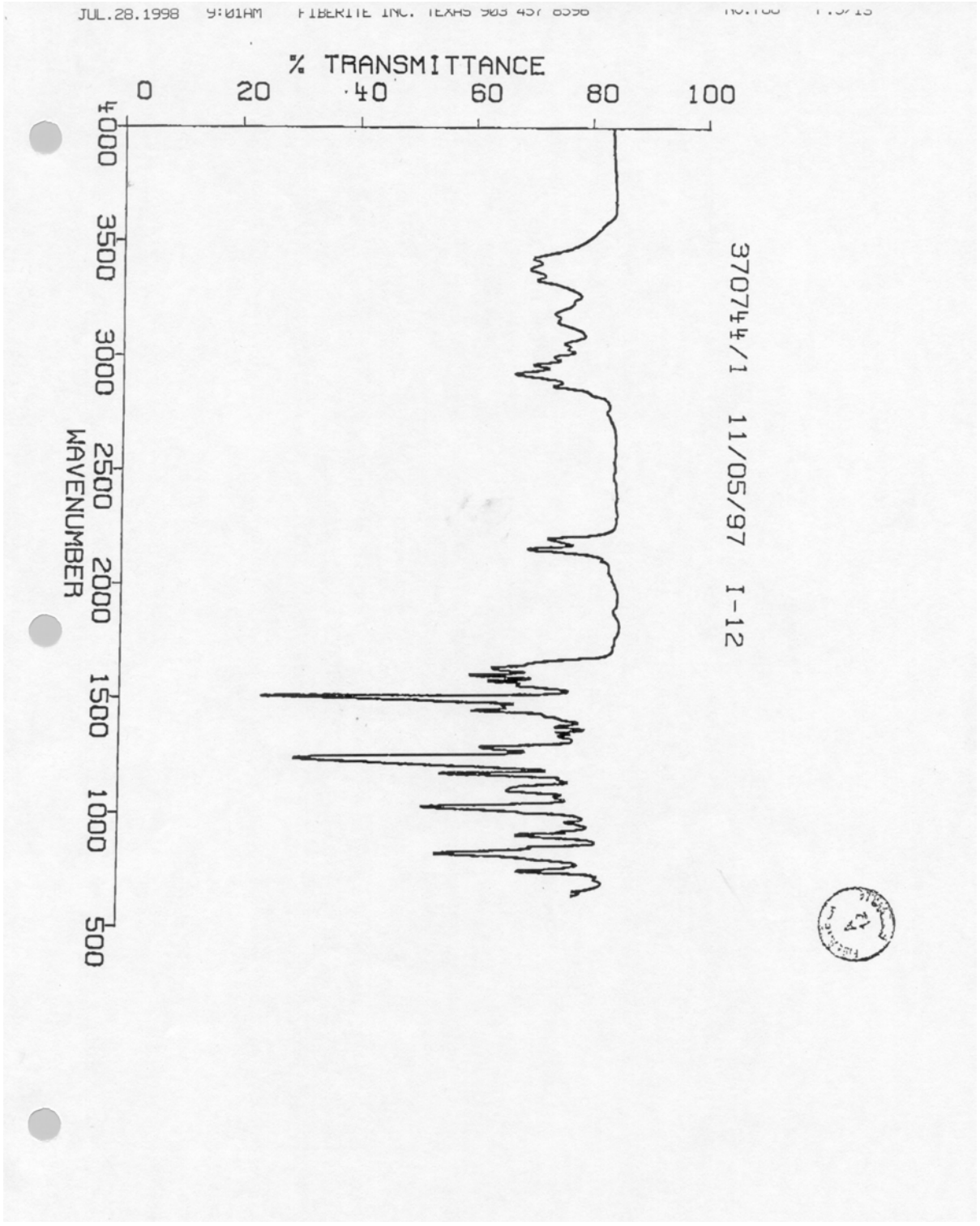
FIBERITE INC.
ANALYTICAL LABORATORY
GREENVILLE, TEXAS

| | | | |
|---|---|---|---|
| Project Name: | SYSTEM1 | Sample Type: | Unknown |
| Sample Name: | 370744/1 | Volume: | 10.00 |
| Vial: | 20 | Run Time: | 30.0 min |
| Injection: | 2 | Date Processed: | 11/05/97 11:26:55 AM |
| Channel: | SIM Ch1 | Dilution: | 1.00000 |
| Date Acquired: | 11/05/97 10:55:49 AM | Column_ID | 206294 |
| Scale Factor: | 1.00 | | |
| Acq Meth Set: | H1METHODSET | | |
| Processing Method: | H1METHOD | | |



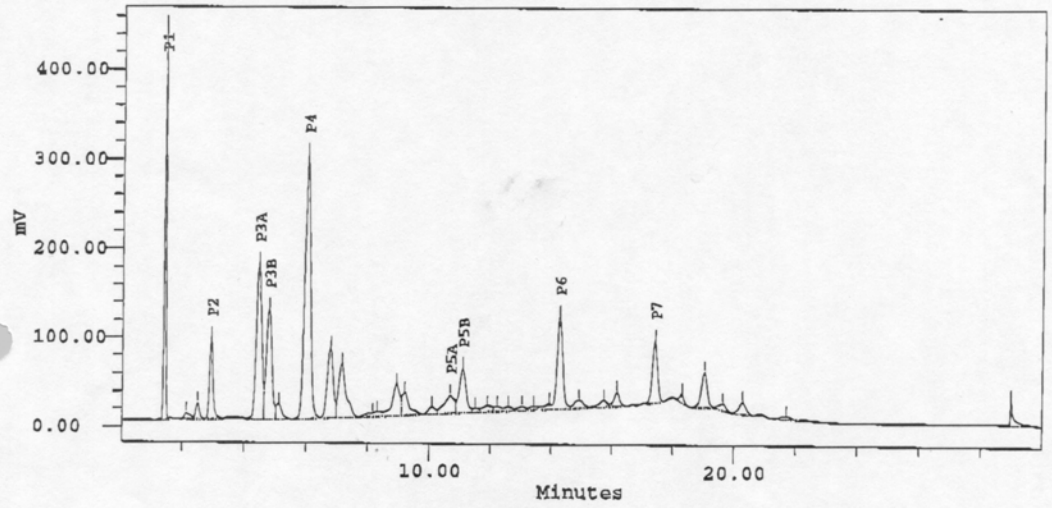

*Peak Results*

| # | Name | Ret Time (min) | Area (uV*sec) | Height (uV) | % Area | arearatio |
|---|---|---|---|---|---|---|
| 1 | P1 | 1.400 | 1938833 | 501510 | 8.52 | 0.429 |
| 2 | P2 | 2.917 | 861728 | 103517 | 3.79 | 0.191 |
| 3 | P3A | 4.450 | 2321250 | 196825 | 10.21 | 0.513 |
| 4 | P3 GROUP | 4.783 | 4059487 | 336140 | 17.85 | 0.898 |
| 5 | P3B | 4.783 | 1738236 | 139315 | 7.64 | 0.384 |
| 6 | P4 | 6.017 | 4522003 | 341533 | 19.88 | 1.000 |
| 7 | P5A | 10.683 | 541645 | 23865 | 2.38 | 0.120 |
| 8 | P5 GROUP | 11.083 | 1659329 | 81069 | 6.42 | 0.323 |
| 9 | P5B | 11.083 | 917684 | 57204 | 4.03 | 0.203 |
| 10 | P6 | 14.267 | 1559270 | 119630 | 6.86 | 0.345 |
| 11 | P7 | 17.383 | 972461 | 80389 | 4.28 | 0.215 |



FIBERITE INC.
ANALYTICAL LABORATORY
GREENVILLE, TEXAS

| | | | |
|---|---|---|---|
| Project Name: | SYSTEM1 | Sample Type: | Unknown |
| Sample Name: | 370746/1 | Volume: | 10.00 |
| Vial: | 21 | Run Time: | 30.0 min |
| Injection: | 2 | Date Processed: | 11/05/97 12:29:34 PM |
| Channel: | SIM Ch1 | Dilution: | 1.00000 |
| Date Acquired: | 11/05/97 11:58:27 AM | Column_ID | 206294 |
| Scale Factor: | 1.00 | | |
| Acq Meth Set: | H1METHODSET | | |
| Processing Method: | H1METHOD | | |

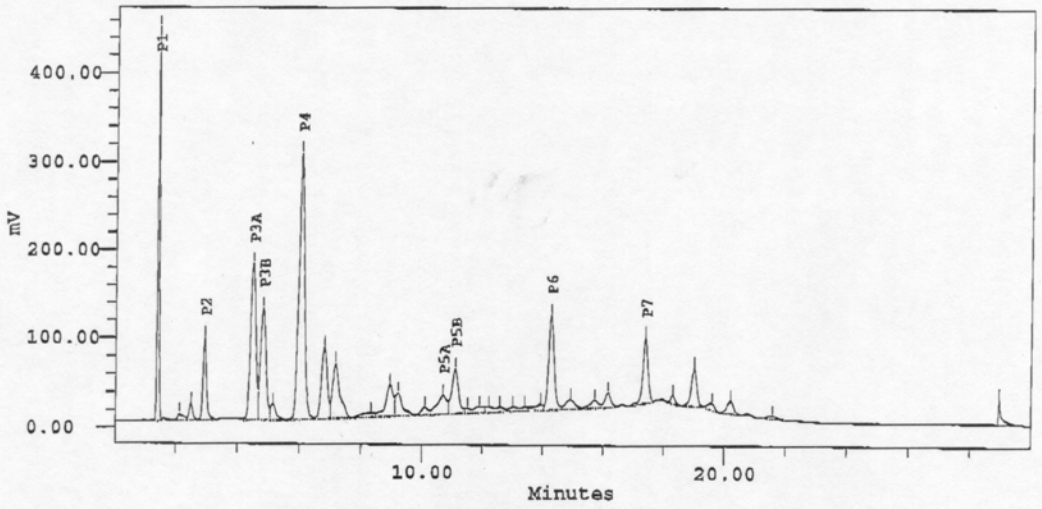



*Peak Results*

| # | Name | Ret Time (min) | Area (uV*sec) | Height (uV) | % Area | arearatio |
|---|---|---|---|---|---|---|
| 1 | P1 | 1.400 | 1722809 | 441791 | 8.71 | 0.437 |
| 2 | P2 | 2.933 | 754517 | 91547 | 3.81 | 0.191 |
| 3 | P3A | 4.467 | 2056681 | 175475 | 10.39 | 0.522 |
| 4 | P3B | 4.800 | 1563212 | 123704 | 7.90 | 0.397 |
| 5 | P3 GROUP | 4.800 | 3619894 | 299180 | 18.29 | 0.919 |
| 6 | P4 | 6.017 | 3941017 | 296614 | 19.91 | 1.000 |
| 7 | P5A | 10.683 | 477756 | 20855 | 2.41 | 0.121 |
| 8 | P5B | 11.083 | 789856 | 49612 | 3.99 | 0.200 |
| 9 | P5 GROUP | 11.083 | 1267613 | 70466 | 6.41 | 0.322 |
| 10 | P6 | 14.267 | 1335652 | 103897 | 6.75 | 0.339 |
| 11 | P7 | 17.417 | 808334 | 68871 | 4.08 | 0.205 |

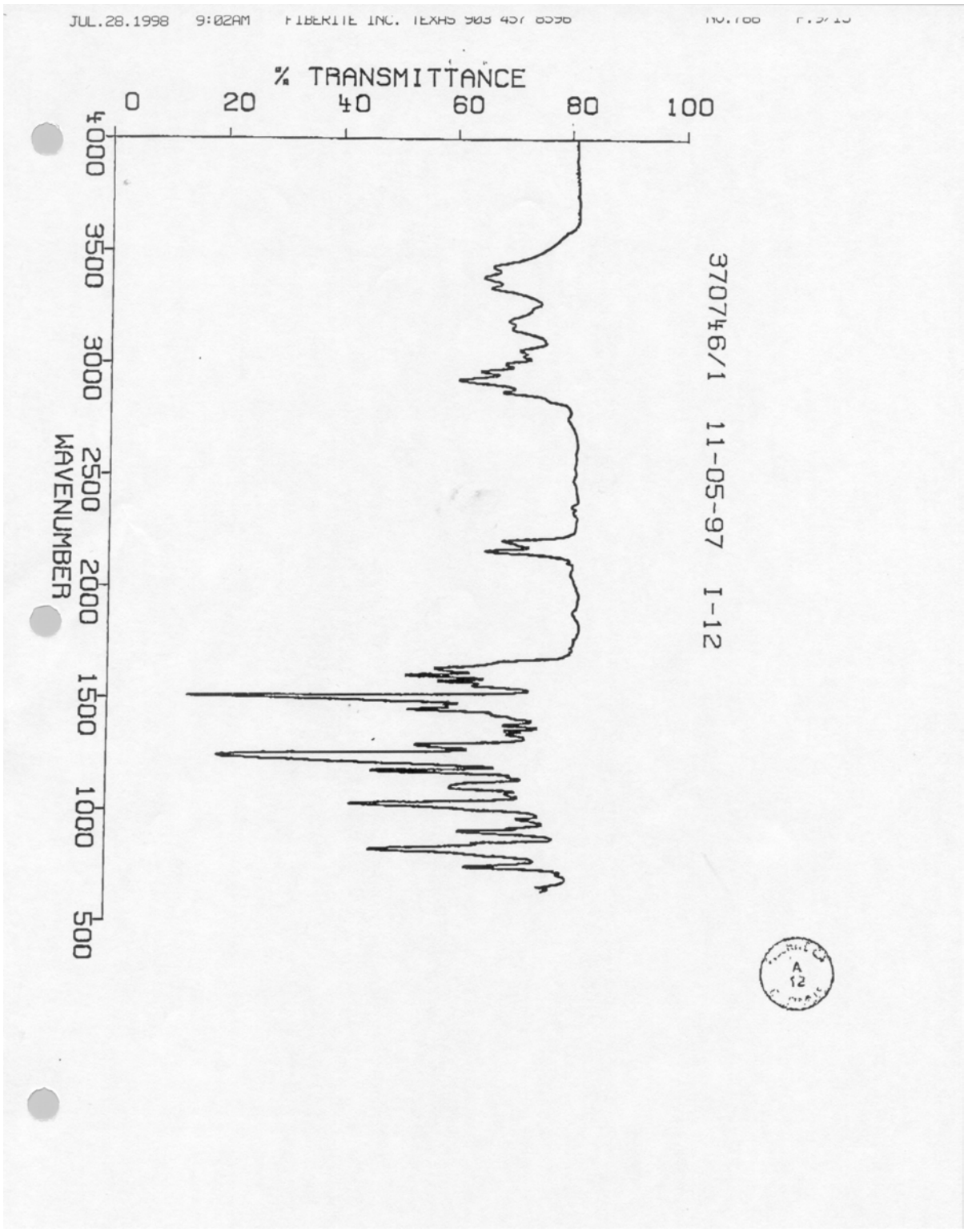
FIBERITE INC.
ANALYTICAL LABORATORY
GREENVILLE, TEXAS

| | | | |
|---|---|---|---|
| Project Name: | SYSTEM1 | Sample Type: | Unknown |
| Sample Name: | 370746/1 | Volume: | 10.00 |
| Vial: | 21 | Run Time: | 30.0 min |
| Injection: | 1 | Date Processed: | 11/05/97 11:58:17 AM |
| Channel: | SIM Ch1 | Dilution: | 1.00000 |
| Date Acquired: | 11/05/97 11:27:15 AM | Column_ID | 206294 |
| Scale Factor: | 1.00 | | |
| Acq Meth Set: | H1METHODSET | | |
| Processing Method: | H1METHOD | | |



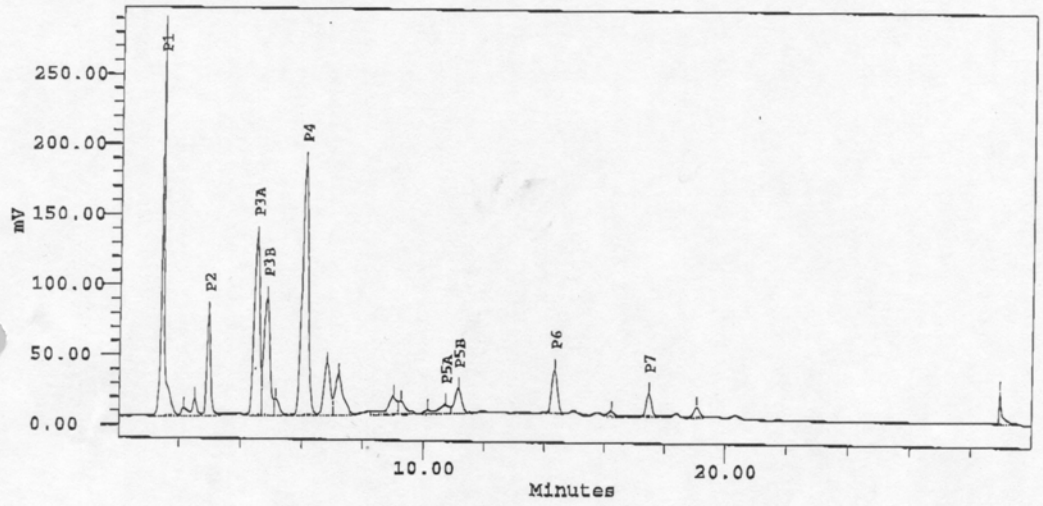

*Peak Results*

| # | Name | Ret Time (min) | Area (uV*sec) | Height (uV) | % Area | areararatio |
|---|---|---|---|---|---|---|
| 1 | P1 | 1.400 | 1730460 | 445063 | 8.60 | 0.436 |
| 2 | P2 | 2.933 | 759370 | 92533 | 3.78 | 0.191 |
| 3 | P3A | 4.500 | 2074451 | 176860 | 10.31 | 0.522 |
| 4 | P3 GROUP | 4.817 | 3648444 | 302183 | 18.14 | 0.919 |
| 5 | P3B | 4.817 | 1573993 | 125324 | 7.83 | 0.396 |
| 6 | P4 | 6.050 | 3970675 | 301429 | 19.74 | 1.000 |
| 7 | P5A | 10.700 | 494468 | 21259 | 2.46 | 0.125 |
| 8 | P5 GROUP | 11.100 | 1289742 | 71652 | 6.41 | 0.325 |
| 9 | P5B | 11.100 | 795274 | 50393 | 3.95 | 0.200 |
| 10 | P6 | 14.267 | 1366668 | 105991 | 6.79 | 0.344 |
| 11 | P7 | 17.400 | 856788 | 71717 | 4.26 | 0.216 |



FIBERITE INC.
ANALYTICAL LABORATORY
GREENVILLE, TEXAS

| | | | |
|---|---|---|---|
| Project Name: | SYSTEM1 | Sample Type: | Unknown |
| Sample Name: | 370748/1 | Volume: | 10.00 |
| Vial: | 7 | Run Time: | 30.0 min |
| Injection: | 3 | Date Processed: | 11/06/97 07:01:18 AM |
| Channel: | SIM Ch1 | Dilution: | 1.00000 |
| Date Acquired: | 11/06/97 06:23:16 AM | Column_ID | 206294 |
| Scale Factor: | 1.00 | | |
| Acq Meth Set: | H1METHODSET | | |
| Processing Method: | H1METHOD | | |

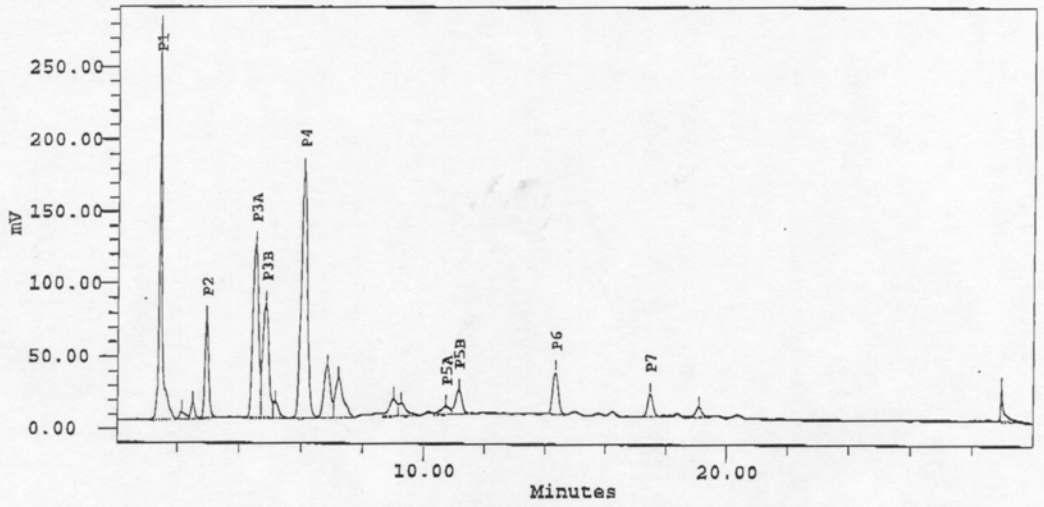



*Peak Results*

| # | Name | Ret Time (min) | Area (uV*sec) | Height (uV) | % Area | arearatio |
|---|---|---|---|---|---|---|
| 1 | P1 | 1.417 | 1773025 | 277807 | 15.64 | 0.673 |
| 2 | P2 | 2.933 | 671531 | 73840 | 5.92 | 0.255 |
| 3 | P3A | 4.500 | 1628838 | 127182 | 14.36 | 0.618 |
| 4 | P3 GROUP | 4.833 | 2824330 | 211179 | 24.91 | 1.071 |
| 5 | P3B | 4.833 | 1195492 | 83997 | 10.54 | 0.454 |
| 6 | P4 | 6.067 | 2635897 | 179602 | 23.24 | 1.000 |
| 7 | P5A | 10.717 | 160611 | 6906 | 1.42 | 0.061 |
| 8 | P5 GROUP | 11.150 | 491293 | 25105 | 4.33 | 0.186 |
| 9 | P5B | 11.150 | 330683 | 18198 | 2.92 | 0.125 |
| 10 | P6 | 14.333 | 418950 | 31238 | 3.69 | 0.159 |
| 11 | P7 | 17.467 | 204060 | 16664 | 1.80 | 0.077 |

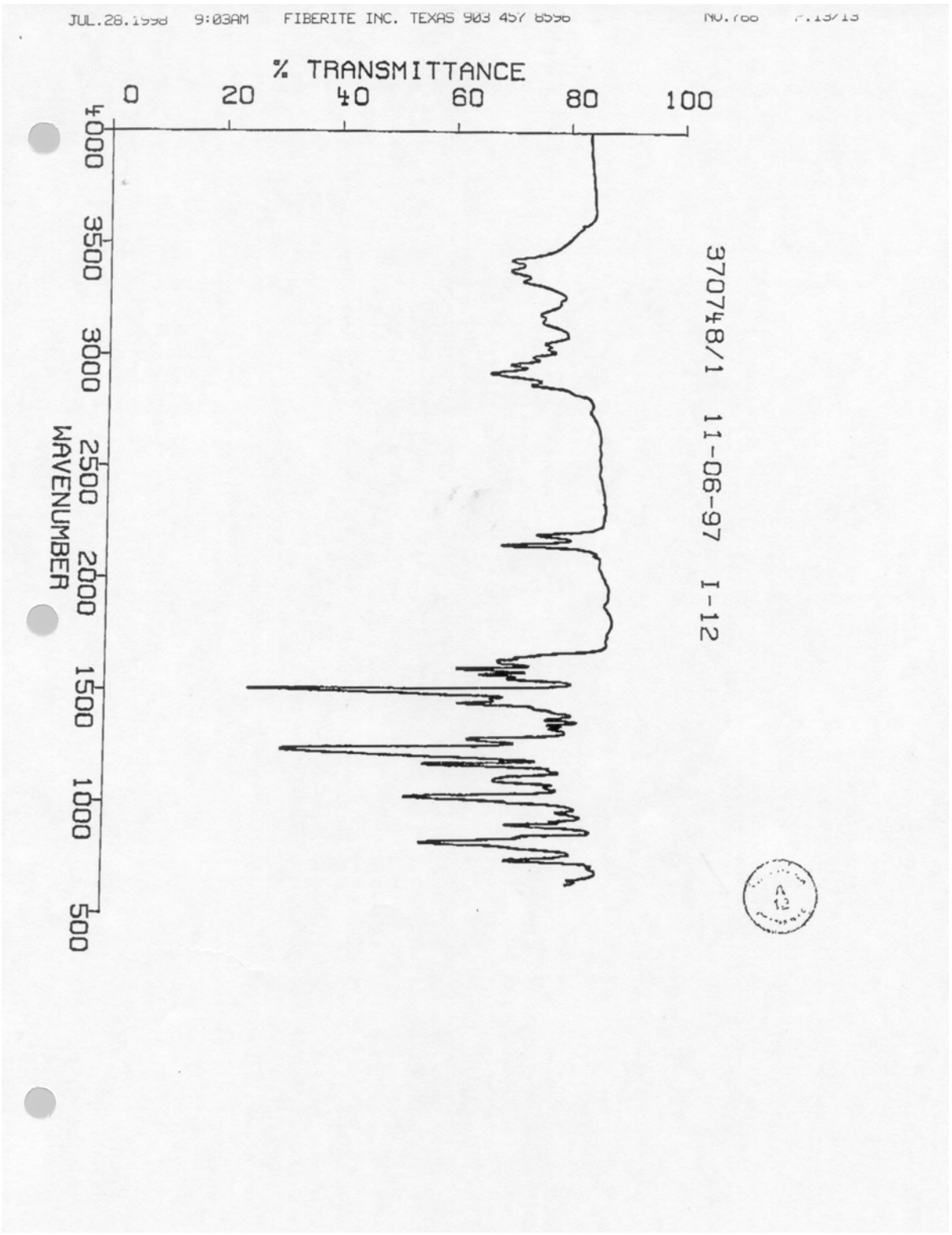
FIBERITE INC.
ANALYTICAL LABORATORY
GREENVILLE, TEXAS

| | | | |
|---|---|---|---|
| Project Name: | SYSTEM1 | Sample Type: | Unknown |
| Sample Name: | 370748/1 | Volume: | 10.00 |
| Vial: | 7 | Run Time: | 30.0 min |
| Injection: | 2 | Date Processed: | 11/06/97 06:55:22 AM |
| Channel: | SIM Ch1 | Dilution: | 1.00000 |
| Date Acquired: | 11/06/97 05:52:04 AM | Column_ID | 206294 |
| Scale Factor: | 1.00 | | |
| Acq Meth Set: | H1METHODSET | | |
| Processing Method: | H1METHOD | | |




*Peak Results*

| # | Name | Ret Time (min) | Area (uV*sec) | Height (uV) | % Area | arearatio |
|---|---|---|---|---|---|---|
| 1 | P1 | 1.417 | 1684244 | 272052 | 16.13 | 0.674 |
| 2 | P2 | 2.933 | 607660 | 69529 | 5.82 | 0.243 |
| 3 | P3A | 4.517 | 1529210 | 120410 | 14.65 | 0.612 |
| 4 | P3B | 4.850 | 1105854 | 79493 | 10.59 | 0.442 |
| 5 | P3 GROUP | 4.850 | 2635064 | 199903 | 25.24 | 1.054 |
| 6 | P4 | 6.067 | 2500458 | 172040 | 23.95 | 1.000 |
| 7 | P5A | 10.733 | 124679 | 5992 | 1.19 | 0.050 |
| 8 | P5B | 11.150 | 260249 | 16731 | 2.49 | 0.104 |
| 9 | P5 GROUP | 11.150 | 384928 | 22722 | 3.69 | 0.154 |
| 10 | P6 | 14.350 | 393076 | 29569 | 3.76 | 0.157 |
| 11 | P7 | 17.483 | 191268 | 15827 | 1.83 | 0.076 |



# APPENDIX B. DATES OF PANEL MANUFACTURE AND COPY OF FAA FORM 8130-3

1. UNITED STATES

2.

# FAA FORM 8130-3

**AIRWORTHINESS APPROVAL TAG**

U.S. Department of Transportation
**Federal Aviation Administration**

3. System Tracking Re

AGATE-2

4. Organization

CESSNA AIRCRAFT CO.

5. Work Order, Contract, or Invoice Number:

| 6. Item | 7. Description | 8. Part Number | 9. Eligibility * | 10. Quantity | 11. Serial/Batch Number | 12. Status/Work |
|---|---|---|---|---|---|---|
| 1. | CARBON EPOXY TEST PANELS | SEE ITEM #13 | TEST | 57 | N/A | COMPLETE |

13. Remarks

Conformity only: Ship to Wichita State University. This item contains the following part numbers (1 ea.):

| | | | | | | |
|---|---|---|---|---|---|---|
| BBJ11 | BBJ31 | BBJ13 | BBJ33 | BBU15 | BBK31 | BBW22 |
| BBJ12 | BBJ32 | BBJ14 | BBJ34 | BBU16 | BBN31 | BBZ21 |
| BBU11 | BBU31 | BBU13 | BBU33 | BBK12 | BBW31 | BBK32 |
| BBU12 | BBU32 | BBU14 | BBU34 | BBL11 | BBQ31 | BBL31 |
| BBJ21 | BBN11 | BBJ23 | BBN21 | BBU25 | BBJ15 | BBW32 |
| BBJ22 | BBK11 | BBJ24 | BBK21 | BBU35 | BBU17 | BBZ31 |
| BBU21 | BBW11 | BBU23 | BBW21 | BBK22 | BBW12 | BBN12 |
| BBU22 | BBQ11 | BBU24 | BBQ21 | BBL21 | BBZ11 | BBN22 |
| | | | | | | BBN32 |

Reviewed FAA Form 8130-9, Dated

*Limited life parts must be accompanied by maintenance history including total time/total cycles/time since new.*

14.

New ☒

Newly Overhauled ☐

Certifies that the new or newly overhauled part(s) identified above, except as otherwise specified in block 13 was (were) manufactured in accordance with FAA approved design data and airworthiness.

**NOTE:** In case of parts to be exported, the special reqirements of the importing country have been met.

19.

**Return to Service in Accordance with FAR 43.9**

Certifies that the work specified in block 13 (or attached) above was carried out in accordance with FAA airworthiness regulations and in respect to the work performed the part(s) is (are) approved for return to service.

| 15. Signature | 16. FAA Authorization No.: | 20. Authorized Signature: | 21. Certificate Number: |
|---|---|---|---|
| Maurice M. Linneburk | DMRCE 501529 | | |
| **17. Name** *(Typed or Printed):* | **18. Date:** | **22. Name** *(Typed or Printed)* | **23. Date:** |
| MAURICE M. LINNEBURK | 8-4-99 | | |