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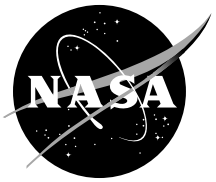

# Mechanical Property Allowables Generated for the Solid Rocket Booster Composite Nose Cap

*A.J. Hodge*
*Marshall Space Flight Center, Marshall Space Flight Center, Alabama*

***May 2000***

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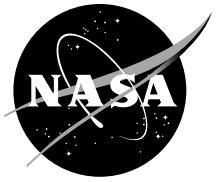

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National Aeronautics and
Space Administration

Marshall Space Flight Center • MSFC, Alabama 35812

***May 2000***

## Acknowledgements

Doug Wingard performed dynamic mechanical analyzer (DMA) and dynamic scanning calorimeter (DSC) testing to obtain valuable glass transition temperatures. Dawn Cross performed FTIR analysis on the epoxy resin. Nonmetallic Materials and Processes Group personnel performed all mechanical property testing.

## TRADEMARKS



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## LIST OF ACRONYMS AND SYMBOLS

| | |
|---|---|
| ASTM | American Society for Testing Materials |
| CAI | compression after impact |
| CNC | composite nose cap |
| DMA | dynamic mechanical analyzer |
| DNS | double-notch shear |
| DSC | dynamic scanning calorimeter |
| E | epoxy |
| ED20 | Structures, Mechanics, and Thermal Department |
| ED30 | Materials, Processes, and Manufacturing Department |
| FTIR | Fourier transform infrared spectroscopy |
| G | graphite |
| IHGF | Improved Hot Gas Facility |
| MCC | Marshall convergent coating |
| MSFC | Marshall Space Flight Center |
| MTS | Materials Test System |
| P1 | prototype |
| RH | relative humidity |
| SRB | solid rocket booster |
| SRI | Southern Research Institute |
| $T_g$ | glass transition temperature |
| TPS | thermal protection system |
| USBI | United Space Boosters, Inc. |

TECHNICAL MEMORANDUM

# MECHANICAL PROPERTY ALLOWABLES GENERATED FOR THE SOLID ROCKET BOOSTER COMPOSITE NOSE CAP

## 1. INTRODUCTION

The current Space Shuttle solid rocket booster (SRB) nose cap is a nonrecovered, thermal protection system (TPS) coated, metallic structure. United Space Boosters, Inc. (USBI) and Marshall Space Flight Center (MSFC) initiated a Space Shuttle upgrades project to develop a composite nose cap (CNC) as a replacement article for the SRB. Composite materials offer a strength-to-weight advantage over metallic structures. Additionally, the TPS, a potential debris hazard that adds weight without contributing strength, can be eliminated because of the thermal capabilities of a composite sandwich structure.

The CNC is composed of a sandwich construction. Two facesheets of Hexcel® AS4/3501–6 graphite (G)/epoxy (E) encapsulate a core of Scotch-Core™ SC350G syntactic foam. Significant mechanical testing was performed on the material used in the SRB CNC. The testing was based on requirements set by two MSFC Engineering Directorate Departments (Materials, Processes, and Manufacturing Department (ED30) and the Structures, Mechanics, and Thermal Department (ED20)) and USBI. The testing performed by ED30 provided A-basis allowables for stress analyses performed by ED20.

## 2. SPECIMEN PREPARATION

### 2.1 Materials and Processing

The materials selected for the SRB CNC were AS4/3501–6 8H harness fabric of 3K tows fabricated by Hexcel and Scotch Core SC350G syntactic foam. The nose cap was fabricated as a sandwich construction on a male tool with an inner and outer layer of the graphite/epoxy and a core composed of the syntactic foam. The sandwich was cocured in an autoclave for 4 hr at 375 °F and 85 psig pressure. The ramp rate was 2–3 °F per minute, and the cooling rate was 1–2 °F per minute.

Three lots of graphite/epoxy were evaluated. Acid digestion of the matrix material was performed on 6-, 8- and 10-ply laminates of lot 1. Procedure A (nitric acid digestion) of ASTM D 3171 was performed. The resulting fiber weight percents were 66.8, 69.1, and 68.2 for the 6-, 8-, and 10-ply laminates. The fiber volumes were 59.9, 62.7, and 61.6 percent. The results of the acid digestion tests were similar to theoretical values obtained utilizing the sample dimensions and the fabric aerial weight ($\approx$370 g/m$^2$). Future fiber volume and fiber weight data were obtained by utilizing the aerial weight, number of plies, and sample dimensions.

Fourier transform infrared spectroscopy (FTIR) was performed on the three lots of epoxy resin. No difference was detected among the three lots.

### 2.2 Test Specimen Geometry

The stress analysis model used lamina level properties. Lamina properties of the graphite/epoxy fabric were determined by four tests: tension, compression, in-plane shear, and interlaminar shear. Tension, shear, and flatwise compression were also performed on the core material. Table 1 outlines the tests performed and properties obtained. The graphite/epoxy test specimens were machined from flat panels fabricated by USBI personnel. The tensile and compression specimens were 6 plies of prepreg $(0)_6$; the in-plane shear specimens were 8 plies of a balanced, biaxial laminate $(\pm45)_{2S}$; and the interlaminar shear samples were 10 plies of prepreg $(0)_{10}$. The core material test specimens were machined from eight plies of the syntactic foam film. Test specimens were machined with diamond-end mills per the drawings in figure 1.

Table 1. Overview of the tests made on the samples.

| Test | Material | Standard | Properties Obtained |
|---|---|---|---|
| Tensile | Graphite/Epoxy | ASTM D 3039 | $\sigma_{11}$, $\sigma_{22}$, $E_{11}$, $E_{22}$, $\nu_{12}$, $\nu_{21}$ |
| In-plane shear | Graphite/Epoxy | ASTM D 3518 | $\tau_{12}$, $G_{12}$ |
| Compression | Graphite/Epoxy | ASTM D 695 | $\sigma_{c11}$, $\sigma_{c22}$, $E_{c21}$, $E_{c22}$ |
| Interlaminar shear | Graphite/Epoxy | ASTM D 3846 | $\tau_{13}$ |
| Edgewise tension | Core | ASTM D 638 | $\sigma_{11}$, $E_{11}$ |
| Flatwise compression | Core | ASTM D 365 | $\sigma_{33}$ |
| Shear punch | Core | ASTM D 732 | $\tau_{31}$ |

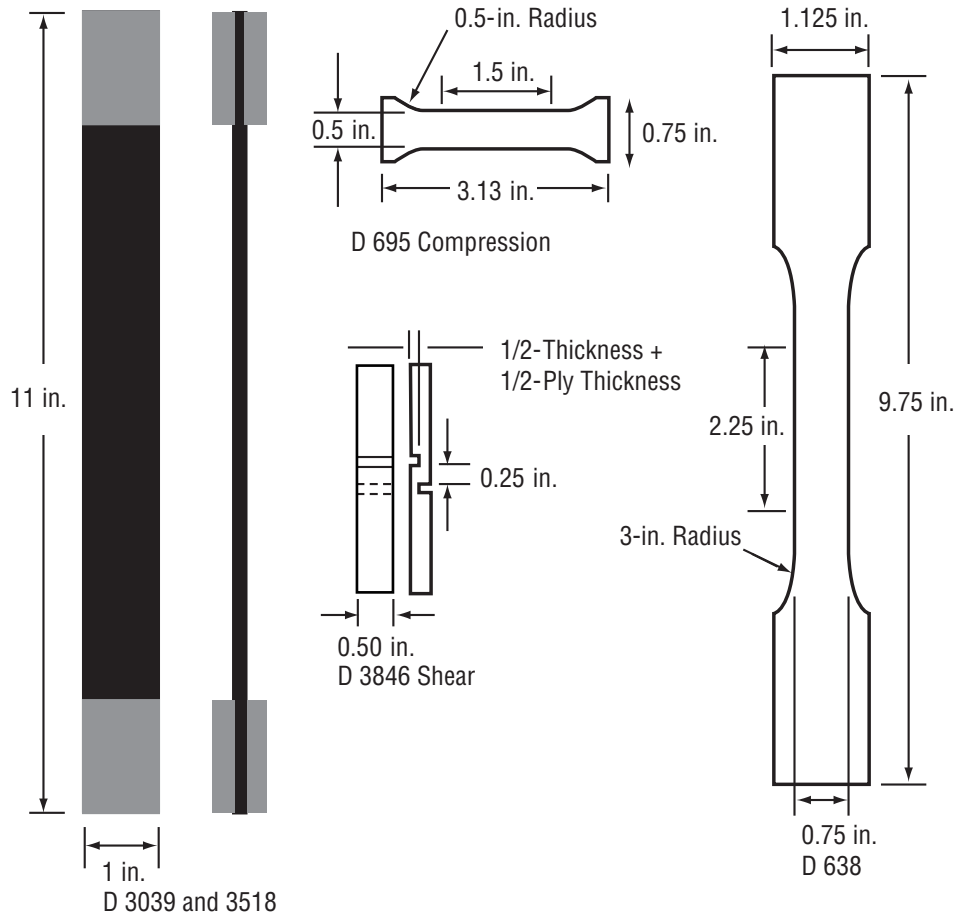


Figure 1. Test specimen geometry.

### 2.3 Moisture Conditioning

Hypalon® has been qualified for use as a moisture barrier for Marshall convergent coating (MCC)–1 insulation. Initially, Hypalon was to be used as a moisture barrier on the SRB CNC. As a verification of the effectiveness of Hypalon as a moisture barrier, a series of moisture conditioning tests were performed on the AS4/3501–6 material. Ten compression test specimens were cüated with four roller coats of Hypalon. Ten specimens were left bare as a control. The specimens were then placed in a humidity chamber at 92.5-percent relative humidity (RH) and 120 °F. Weight measurements were made daily for 2 wk. After 2 wk, the chamber was cooled to 85 °F for 1 wk. The Hypalon-coated specimens actually gained more weight than the uncoated specimens (fig. 2). However, the amount of moisture gained by the Hypalon was indistinguishable from the moisture gained by the composite. There were also portions of the coating that were below the minimum thickness requirement of 8 mils; thus, a second test series was run.

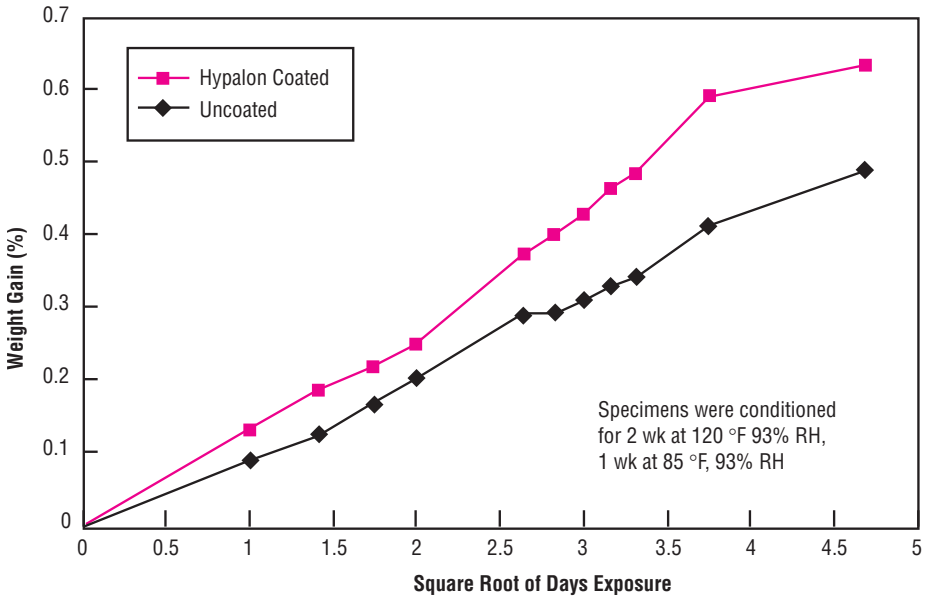


Figure 2. Weight gain of coated versus uncoated AS4/3501–6 composite coupons at 120 °F, 93-percent RH.

The next test series had 10 coated samples, 10 bare samples, and 1 thin film of Hypalon. This second test series was run at 160 °F and 93 percent RH. The Hypalon was applied in six brush coats that produced a minimum coating thickness of 19–21 mils. Using the rule of mixtures, the weight gain of the Hypalon film was subtracted from the weight gain of the Hypalon-coated specimens. This yielded the estimated weight gain of the composite underneath the Hypalon. The bare and coated composites exhibited similar weight gains (fig. 3). Thus, Hypalon was determined to be ineffective as a moisture barrier on low absorptivity materials such as graphite/epoxy.

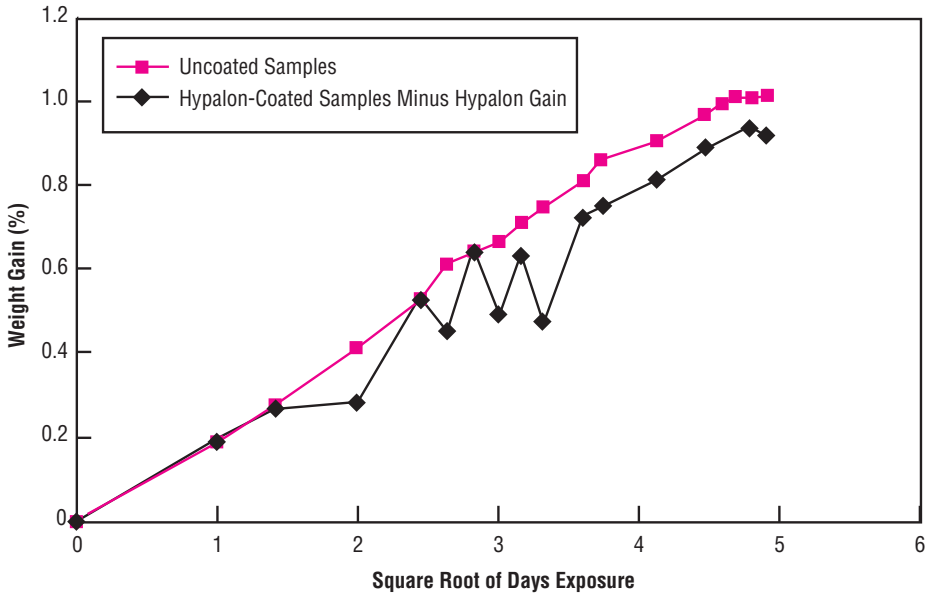


Figure 3. Weight gain of uncoated and Hypalon coated AS4/3501–6 at 160 °F, 93-percent RH neglecting the weight gain of the Hypalon.

The glass transition temperature ($T_g$) of the moisturized specimens was also evaluated. Unconditioned "ambient" samples had $T_g$ values of 386 and 380 °F obtained from the dynamic mechanical analyzer (DMA) and dynamic scanning calorimeter (DSC) thermal analysis equipment. Additional $T_g$ testing was conducted on specimens conditioned at 180 °F, 93-percent RH after drying for 24 hr at 250 °F. The initial "dry" $T_g$ was 398 °F, measured by DMA. The $T_g$ versus exposure time and $T_g$ versus percent weight gain were determined for a six-ply composite.The major loss in $T_g$ occurs in the first 10 days of exposure. The $T_g$ begins to plateau after ≈20 days of exposure. Figures 4 and 5 illustrate the results of the $T_g$ testing.

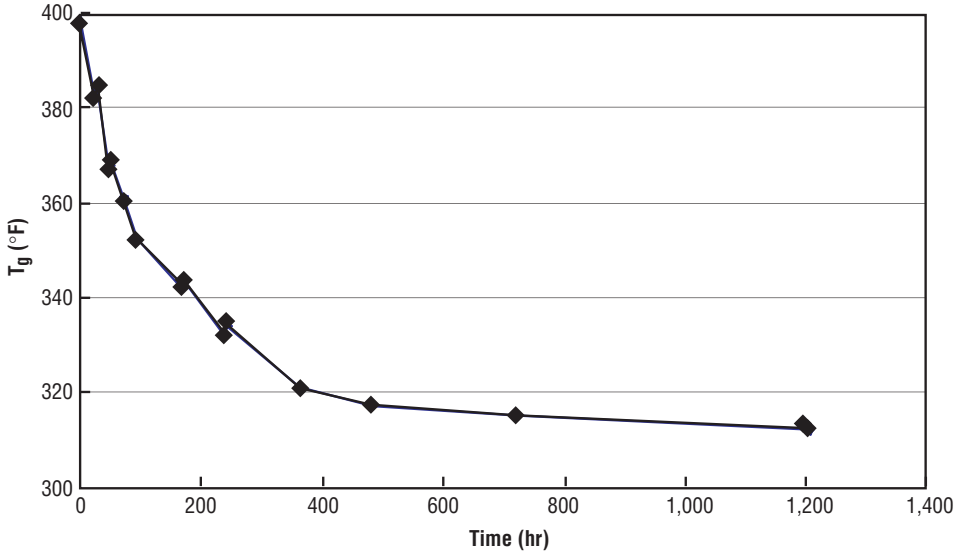


Figure 4. Drop in $T_g$ associated with exposure time at 180 °F 93-percent RH.

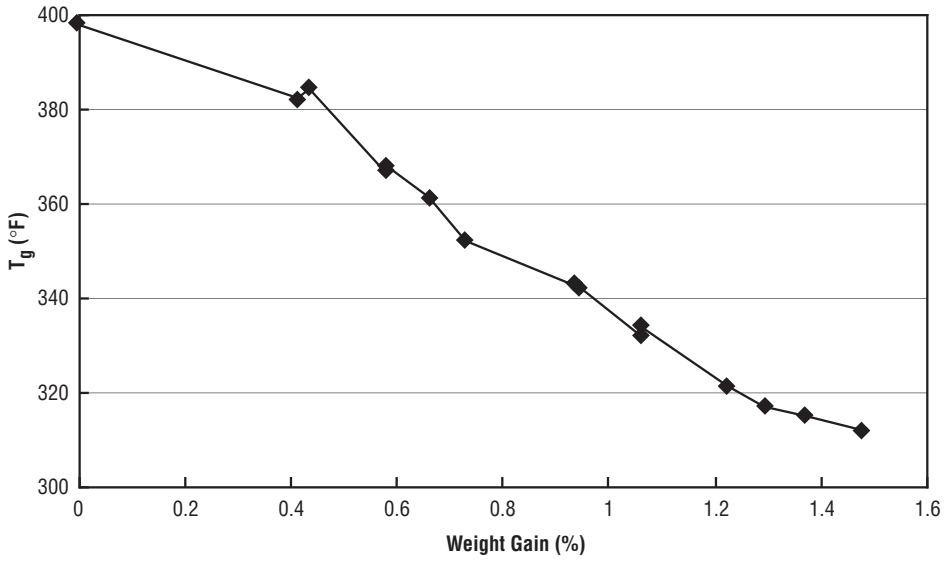


Figure 5. Drop in $T_g$ associated with moisture gain.

Because of the ineffectiveness of Hypalon as a moisture barrier, material properties had to be developed in the "wet" state. MIL–HDBK–17 and ASTM D 5229 recommend that a specimen be moisture conditioned to an equilibrium state before it is considered "saturated." Equilibrium is defined as a change in weight <0.01 percent in a 7-day period (24 hr, if diffusivity is known). There are no standard moisture conditioning methods. Data generated on 3501–6 in the MIL–HDBK–17 were conditioned for 30 days at 140 °F, 95-percent RH. Hercules generated wet properties on AS4/3501–6 by boiling in water for 24 hr. Cytec-Fiberite immersed AS4/934 (similar resin) in 165 °F water for 7 days. Based on the data generated on the nose cap material, none of these methods would have sufficient time to reach equilibrium.

The absorption of water into a graphite/epoxy material follows Fick's second law. The moisture equilibrium content is dependent solely on percent relative humidity. A change in temperature increases the diffusivity of the material. Thus, an increase in temperature at a constant humidity level only decreases the time required to reach equilibrium. The diffusivity was calculated at both 160 and 120 °F for 93-percent RH. Using the Arhenius relationship, diffusivity was estimated for 180 and 85 °F. The moisture gain due to a 6-mo exposure at 85 °F and 93-percent RH was then estimated. The corresponding time required at 180 °F to reach the same moisture level was also approximated (fig. 6). Assuming two-sided diffusion on a seven-ply laminate, 6-mo exposure at 93-percent RH and 85 °F would yield a 0.7-percent weight gain. One-sided absorption yields 0.3-percent weight gain. To obtain a 0.7-percent weight gain at 180 °F, a six-ply laminate would need to soak for 5 days. Eight- and ten-ply laminates would require conditioning for 9 and 14 days. A 10-day soak should result in moisture levels of 0.9-, 0.75-, and 0.6-percent weight gain for 6-, 8-, and 10-ply laminates, respectively. This is above the expected moisture gain in a seven-ply laminate on the beach when exposed to one-sided absorption. Thus, a 10-day soak of the test specimens at 180 °F and 93-percent RH should conservatively represent a 6-mo beach exposure. Subsequent conditioning at 180 °F, 93-percent RH indicated the estimated weight gains were reasonably accurate. Therefore, all AS4/3501–6 test coupons were conditioned at 180 °F, 93-percent RH for 10 days. To prevent moisture loss, specimens were tested within 8 hr of removal from the conditioning chamber.

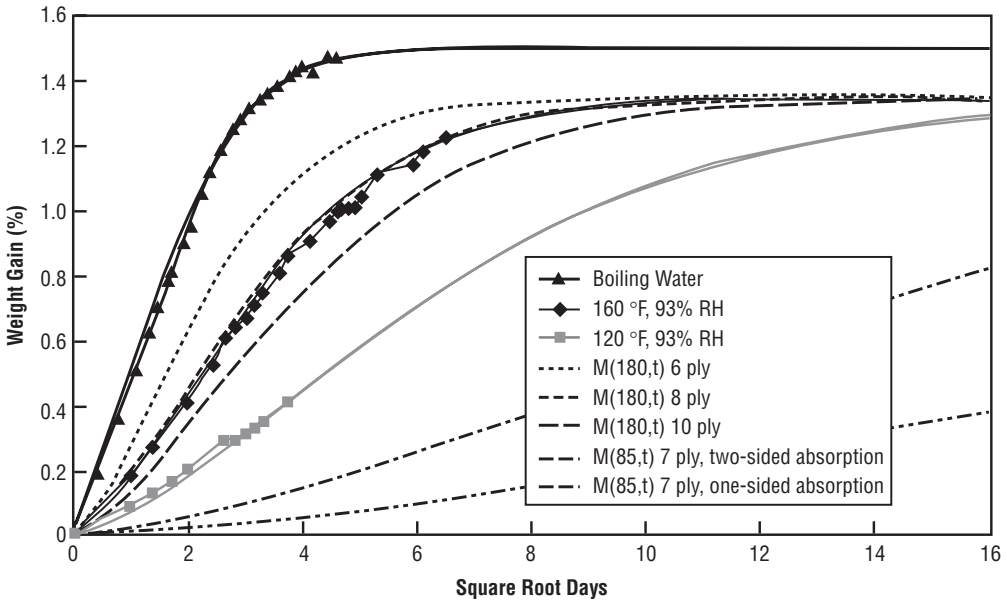


Figure 6. Comparison of moisture conditioning treatments on AS4/3501–6.

## 3. TEST METHODOLOGY

### 3.1 Thermal Profile

The CNC will experience a high heat load during ascent. The surface of the nose cap will continue to heat until booster separation. After separation the surface temperature decreases until the nose cap is ejected from the booster. Figure 7 represents the thermal history profile of the saturation point on the CNC. The nose cap must survive the ejection to successfully deploy the drogue chute. Thus, there are several thermal environments where the nose cap undergoes various structural and aerothermal loading. The lamina level mechanical properties were determined at the temperature of the outer ply at booster separation and nose cap ejection. Additionally, the properties were determined at the temperature of the inner facesheet at nose cap ejection. Thus, A-basis properties were determined for the graphite/epoxy lamina at room temperature, 240 °F (maximum temperature of the inner facesheet), 600 °F (maximum temperature of the outer surface), and 350 °F after heating to 600 °F (surface temperature at nose cap ejection). Additional testing was performed at 350 and 480 °F to establish property trends along the thermal profile. A-basis properties were determined for the syntactic foam core at three temperatures: (1) room temperature, (2) 480 °F (maximum core temperature), and (3) 350 °F (maximum core temperature at ejection).

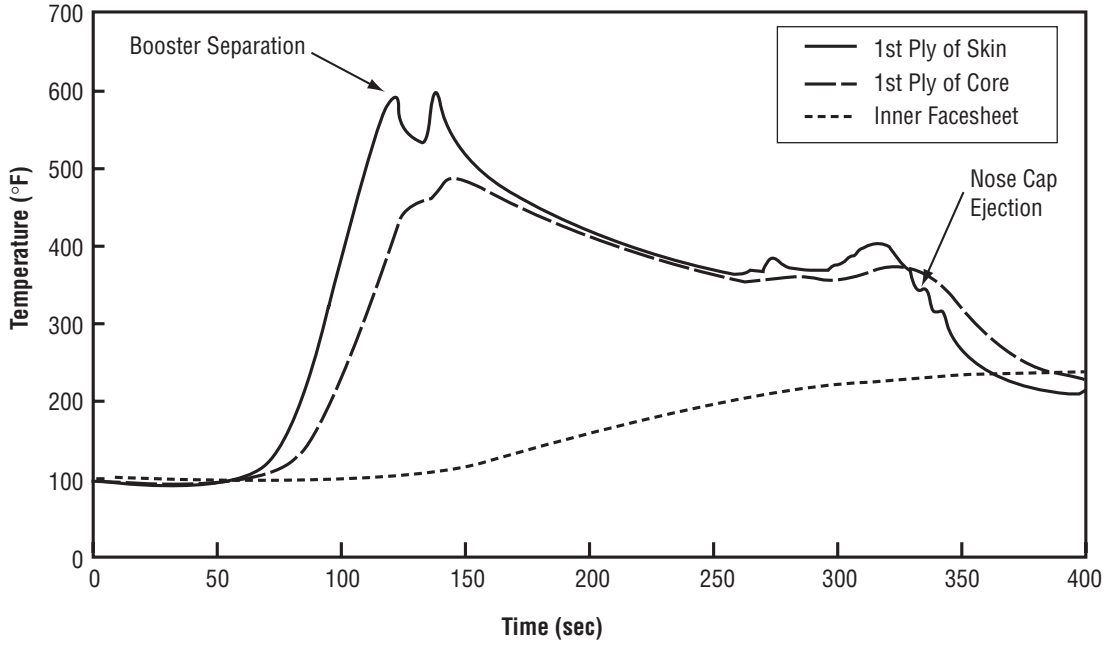


Figure 7. Thermal history of SRB CNC at the saturation point.

Typically, heating rates and hold times at temperature equilibrium are long. However, the properties of the moisture conditioned composite material would change with exposure time if allowed to bake at temperature. This would be most evident at 600 °F, which is well above the $T_g$. Therefore, the specimens were heated at the same rate as the thermal history profile of the SRB CNC. Exposure time was limited to the duration of the test which was typically <1 min. Specimens tested at the nose cap ejection temperature were rapidly heated to 600 °F, then cooled to 350 °F before loading commenced.

### 3.2 Lot-to-Lot and Panel-to-Panel Variability

To address concerns of potential variation between different lots of prepreg, three different lots were tested. In addition to examining lot-to-lot variability, processing variability was also addressed. Specimens from each lot came from at least four different panels that were laid up and cured at different times. Thus, specimens came from three different lots, each having four different panels. A-basis values were determined from 30 to 36 separate test specimens. Figure 8 shows the two-stage nested factorial used to determine lot-to-lot and panel-to-panel variability.

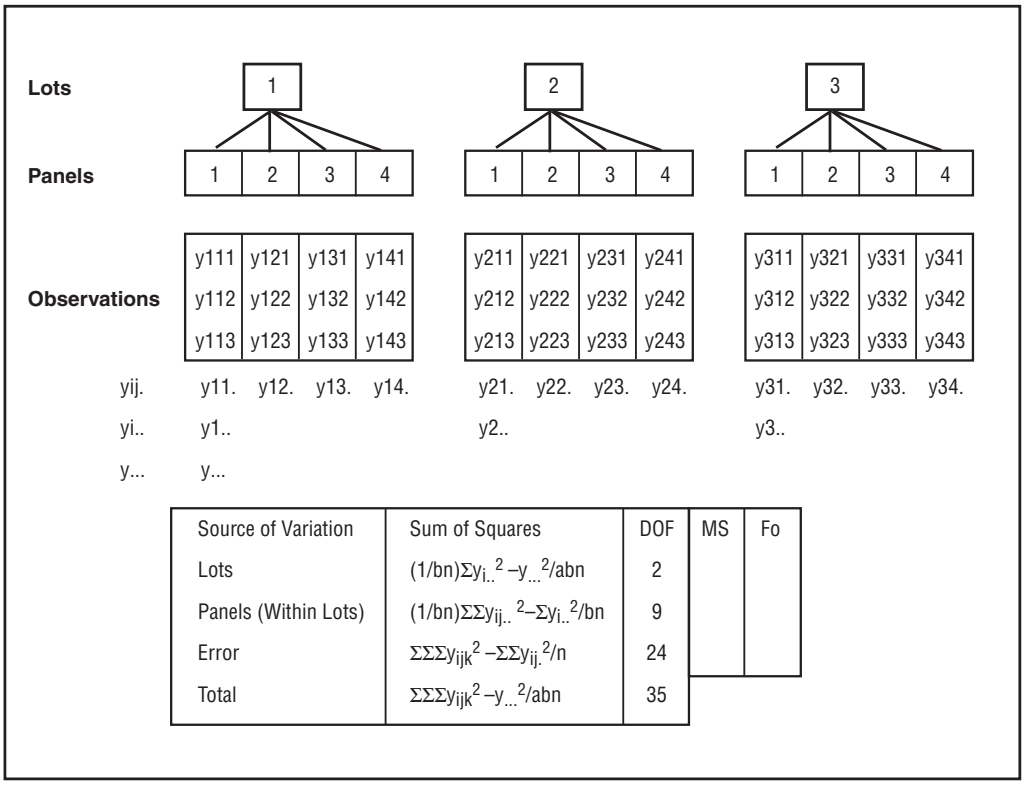


Figure 8. Two-stage nested factorial.

### 3.3 Tensile Testing

The American Society for Testing Material (ASTM) D 3039 tensile specimens were machined in both the warp and fill directions. Fiberglass tabs were bonded with EA 9394 paste adhesive prior to machining. After conditioning for 10 days in a humidity chamber at 180 °F, 93-percent RH, weight gains

were recorded. The specimens were tested on a Materials Test System (MTS) 880 test machine. Following the flight, thermal history profile complicated testing. The rapid heating rate of 10 °F/sec could not be obtained in a furnace. Thus, alternate heating methods were required. Two banks of quartz lamp infrared heaters were obtained from Research, Inc. Through use of a Dimension controller, different heating profiles were programmed and run. The six quartz lamp bulbs in each bank heated a 4-in. zone on the center of the test specimen. Figure 9 illustrates the tension test setup. Strain measurements were made with MTS extensometers. All load and strain data were stored digitally with MTS Testworks® software. The tensile test rate was 0.1 in./min.

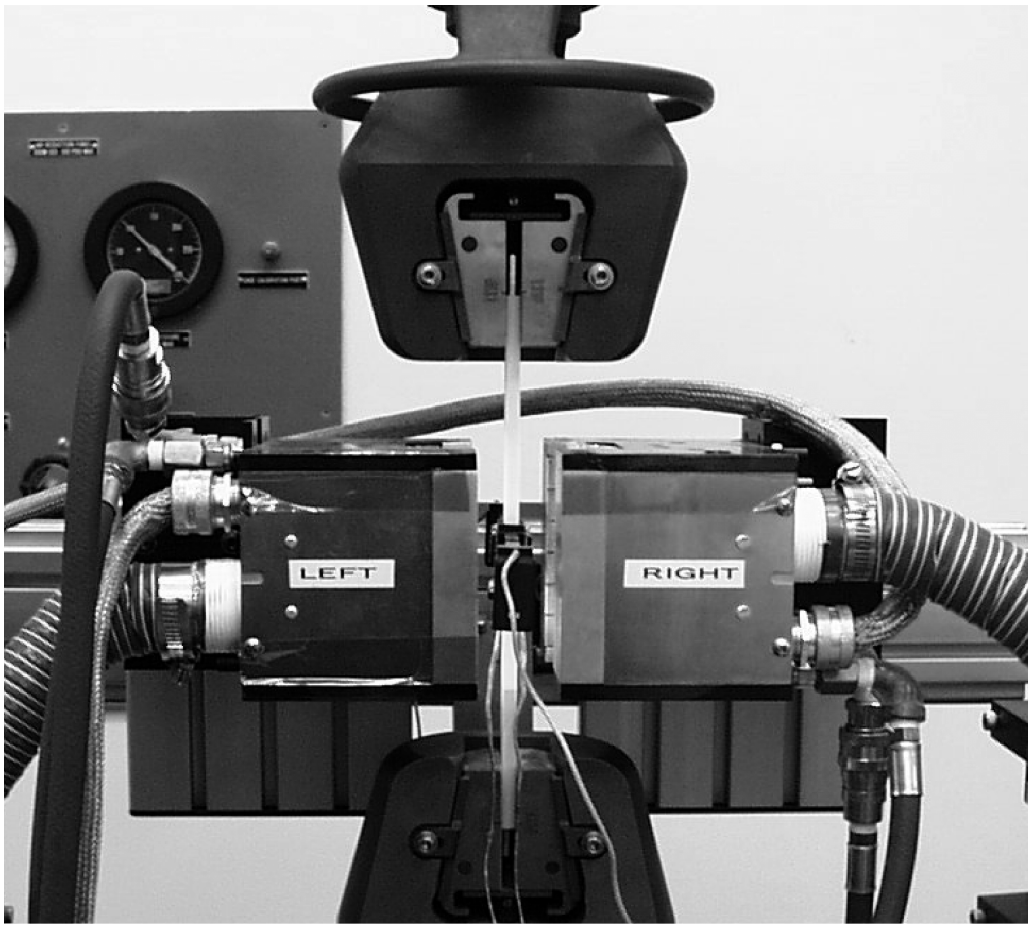


Figure 9. Tensile test with quartz lamp heaters.

### 3.4 In-Plane Shear Testing

The ASTM D 3518 in-plane shear test specimens were machined from an eight-ply ±45 laminate. The in-plane shear specimens were heated and tested similarly to the tensile specimens with a 0.2 in./min loading rate. In addition to axial strain, an Epsilon, Inc. quartz arm, transverse extensometer was used to determine transverse strain. The transverse strain was required to obtain Poisson's ratio. Shear modulus could then be calculated from the equation $G_{12}=E_{xx}/(2*(1+\nu_{12}))$. Modulus and Poisson's ratio were obtained in the initial linear portion of the stress-strain diagram.

### 3.5 Compression Testing

Compression test specimens were machined in both the warp and fill directions from the same six-ply panels as the tension specimens. A modified ASTM D 695 fixture was fabricated which helped prevent end brooming of the test specimen. The specimen was loaded with steel anvils machined to the same thickness as the test specimen. The strain was obtained by modifying an Instron averaging axial extensometer. Testing was performed on an Instron 1125 test machine at a 0.05-in./min loading rate. Strain and load data were recorded on Instron Series IX software.

To heat the specimen following the thermal history profile of the CNC, high-resistance heater strips were placed against the specimen. The heater strips were composed of nikrothal. Copper was coated on the entire strip except for a 1.5-in. gauge in the center. Therefore, only the gauge area was heated. Mica is used to electrically insulate both the test fixture and test specimen. Figure 10 illustrates the compression test setup. When high current from a direct current power supply was passed through the nikrothal strip, heat was generated in the uncoated portion of the strip. This current was controlled with a Hewlett Packard power supply. A small change in current produced a small change in temperature. Thus, the thermal history profile was followed by altering the current.

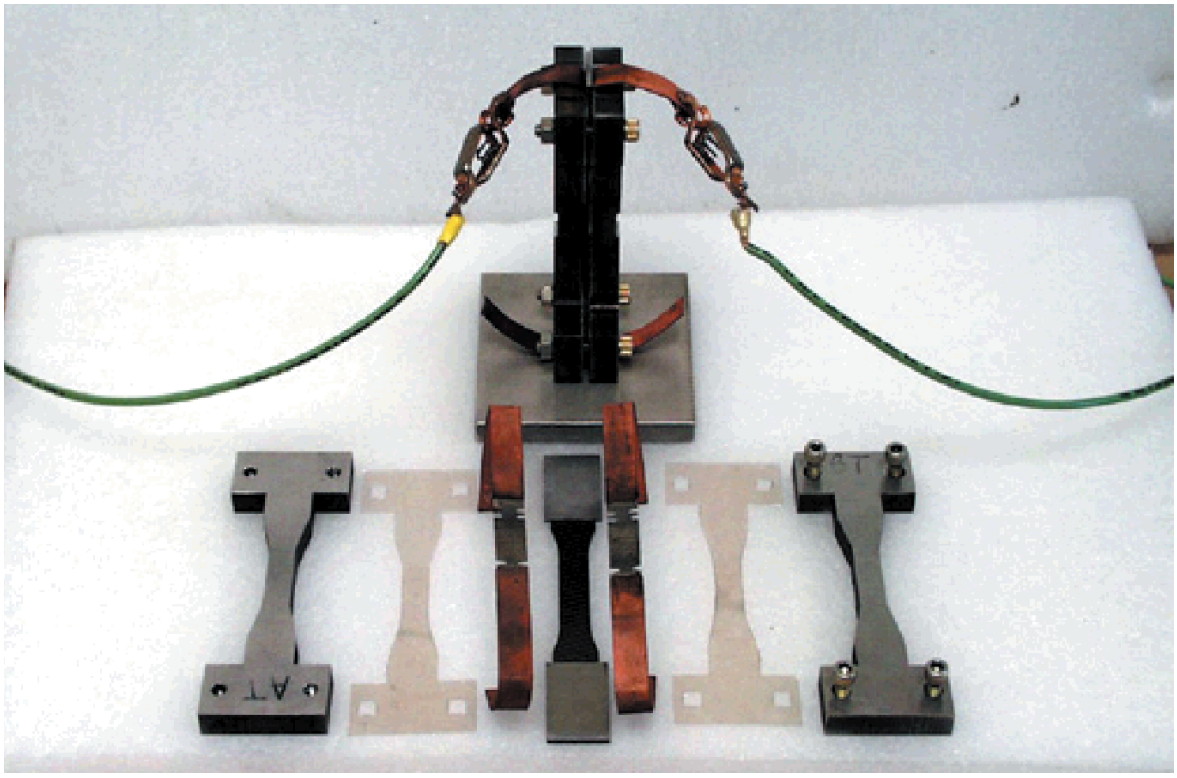

Figure 10. Compression test fixture with resistance heat strips.

### 3.6 Interlaminar Shear Testing

The ASTM D 3846 double-notch shear (DNS) specimens were machined from an eight-ply layup. Specimens were cut and tested in the warp direction. The DNS specimen is the same length and width as the compression specimen. This similar geometry allowed the DNS specimen to be tested in the same fixture as the compression specimen. The DNS specimen was also heated with the resistance strip heaters. The only data obtained from the DNS test were the failure loads. The failure load was divided by the area of the gauge section to obtain $\tau_{13}$.

### 3.7 Core Testing

Compression, shear, and tensile properties were obtained on the syntactic foam core. ASTM C 365 was used to obtain compression stress of the foam. A 1×1 in. square was crushed between two steel platens. Failure load was recorded for each specimen. Shear stress was obtained from an ASTM D 732 shear punch specimen. Again, only the failure load was obtained. MTS extensometers were used to obtain strain on the ASTM D 638 edgewise tensile specimens. Thus, modulus and stress were determined for the tensile specimens.

As the core specimens were not moisture conditioned, a rapid heat rate was not required for testing. Thus, the elevated temperature compression and shear specimens were heated in an oven. Tensile specimens were tested utilizing the quartz lamp heaters. A slower heating rate was used for the core specimens than for the graphite/epoxy specimens.

### 3.8 Sandwich Tensile Testing

Mechanical testing was performed on the sandwich structure as a verification of processing as well as the stress model. The sandwich was composed of an outer facesheet of AS4/3501–6, a core of eight plys of SC350G syntactic foam, and an inner facesheet of AS4/3501–6. The inner and outer facesheets were each a seven-ply laminate with an orientation of (0/90/45/0/–45/90/0). The sandwich panels were processed with the same cure conditions as the flat panels. Sandwich samples were tested at room temperature and 350 °F. The double-lap shear tests included a set at 480 °F.

ASTM D 638 tensile samples were machined from the sandwich panels. Room-temperature specimens were instrumented with strain gauges and tested in the same manner as the core tensile specimens. Elevated temperature tests required the quartz lamp heaters and extensometers, as illustrated in figure 9. Tensile specimens machined from the prototype (P1) nose cap had a small curvature. The P1 samples were tested with the same mechanical wedge grips as the flat panels. The failure modes indicated that the curvature had no effect on the test. Failure loads were similar to the flat panels. Open-hole tensile tests were also performed in accordance with NASA Reference Publication 1092. The specimens were 2 in. wide with a 0.25-in.-diameter hole in the center of the sample.

ASTM C 364 compression samples were originally planned for use in evaluation of the strength of the sandwich. However, the Northrop compression test fixture was utilized instead. Thus, the compression test results could be compared more directly with the open-hole compression test results. The Northrop fixture requires a sample that is 1×3 in. The sample was supported on the edges

and end-loaded. Panels that were exposed to the environment at Kennedy Space Center for 6 mo were also compression tested. Postbeach exposure samples had the same strength as the control samples at room temperature. However, a small reduction in strength was observed at 350 °F. Specimens that were exposed to 8.6 Btu/ft$^2$/sec for 34 sec and 4.5 Btu/ft$^2$/sec for 40 sec in the Improved Hot Gas Facility (IHGF) were also compression tested. Reductions in strength were observed at both room temperature and 350 °F. Open-hole compression specimens had the same dimensions as a compression specimen with the addition of a 0.25-in.-diameter hole in the center of the specimen. Open-hole compression specimens were tested in the same manner as the compression specimens. Compression specimens cut from the P1 had the same curvature as the tensile specimens. P1 compression strengths were similar to the flat panels.

Compression after impact (CAI) tests were performed on the sandwich material. Sandwich panels were cut into 4×6 in. samples. The samples were impacted with a falling dart with a 0.5-in. hemispherical tup. Impact energy levels included 5, 10, 20, and 30 ft-lb with a control set of samples that were not impacted. After impact, the samples were compression tested in the Boeing CAI test fixture. An increasing decline in strength was observed until the residual strength reached a minimum at the 20 ft-lb energy level (see fig. 25 in app. A).

Double- and single-lap shear tests were performed on the sandwich material in accordance with ASTM D 953 and MIL–HDBK–17–1e, respectively. Tests were performed in the 0° and 45° orientations at room temperature, 350 °F, and 480 °F. The sandwich test results are available in table 6. Detailed test results are available in table 8 of appendix B.

## 4. SOUTHERN RESEARCH INSTITUTE CORRELATION STUDY

To evaluate the MSFC High Temperature Test Facility, lot 1 AS4/3501–6/370–8H material was divided into two sets. Southern Research Institute (SRI) tested one set with MSFC testing the other set. Both sets were conditioned at 180 °F, 93-percent RH for 10 days prior to testing. Both facilities performed tension, compression, in-plane shear, and interlaminar shear tests at four different temperatures. A test readiness review was conducted to review the results of lot 1 testing. Test results correlated well between the two facilities. Some deviations in test results were observed at certain test conditions, and actions were taken to compare testing and results between the two facilities. MSFC performed additional tests with slight modifications to the test procedure to evaluate the discrepancies. Reevaluation of resulting data showed the MSFC test results to be valid. Tables 2–5 summarize the results of the correlation study, and also displays the results of the retests. Due to a "hot spot" generated on the first set of 240 °F tensile and in-plane shear specimens, the results from the retest will be used in the database. The other change in the test procedure was the use of a 1-in. extensometer rather than a 2-in. extensometer to minimize the temperature gradient across the test specimen.

Table 2. AS4/3501–6 8H lot 1 tensile.

Tensile Warp

| Temperature (°F) | | MSFC Stress (ksi) | MSFC Retest | SRI Stress | MSFC $E_{11}$ (Msi) | MSFC Retest | SRI $E_{11}$ |
|---|---|---|---|---|---|---|---|
| 75 | Average | 111.2 | – | 100.7 | 10.0 | – | 9.3 |
| | Std. Dev. | 3.4 | – | 3.7 | 0.4 | – | 0.6 |
| | N | 12 | – | 3 | 12 | – | 3 |
| 240 | Average | 93.1 | 106.0 | 90.4 | 8.6 | 9.6 | 8.3 |
| | Std. Dev. | 7.5 | 4.7 | 2.1 | 1.0 | 0.3 | 0.4 |
| | N | 5 | 6 | 4 | 5 | 6 | 4 |
| 550 | Average | 69.7 | 72.1** | – | 5.8 | 5.8** | – |
| | Std. Dev. | 4.7 | 3.1 | – | 0.8 | 0.3 | – |
| | N | 6 | 12 | – | 6 | 12 | – |
| 600 | Average | – | – | 63.1 | – | – | 3.4 |
| | Std. Dev. | – | – | 6.5 | – | – | 0.3 |
| | N | 91.8 | – | 5 | – | – | 6 |
| 350* | Average | 3.1 | 95.5** | 94.6 | 8.0 | 8.2** | 7.7 |
| | Std. Dev. | 6 | 8.9 | 2.6 | 0.5 | 1.0 | 0.8 |
| | N | | 21 | 3 | 6 | 15 | 3 |

**Lot 2

Tensile Fill

| Temperature (°F) | | MSFC Stress (ksi) | MSFC Retest | SRI Stress | MSFC $E_{22}$ (Msi) | MSFC Retest | SRI $E_{22}$ |
|---|---|---|---|---|---|---|---|
| 75 | Average | 106.2 | – | 103.2 | 9.7 | – | 9.2 |
| | Std. Dev. | 5.0 | – | 3.6 | 0.4 | – | 0.4 |
| | N | 6 | – | 6 | 6 | – | 6 |
| 240 | Average | 90.1 | 105.5 | – | 8.4 | 9.7 | – |
| | Std. Dev. | 6.7 | 3.4 | – | 0.8 | 0.5 | – |
| | N | 12 | 8 | – | 12 | 8 | – |
| 550 | Average | 64.4 | – | – | 5.7 | – | – |
| | Std. Dev. | 6.5 | – | – | 1.2 | – | – |
| | N | 11 | – | – | 12 | – | – |
| 350* | Average | 96.3 | – | – | 8.8 | – | – |
| | Std. Dev. | 6.0 | – | – | 0.5 | – | – |
| | N | 12 | – | – | 12 | – | – |

Table 3. AS4/3501–6 8H lot 1 compression.

Compression Warp

| Temperature (°F) | | MSFC Stress (ksi) | MSFC Retest | SRI Stress | MSFC $E_{11}$ (Msi) | MSFC Retest | SRI $E_{11}$ |
|---|---|---|---|---|---|---|---|
| 75 | Average | 78.2 | – | 76.4 | 8.4 | – | 9.0 |
| | Std. Dev. | 8.1 | – | 6.2 | 0.3 | – | 0.3 |
| | N | 6 | – | 7 | 6 | – | 7 |
| 240 | Average | 43.2 | 40.4 | 54.8 | 8.0 | 7.9 | 8.4 |
| | Std. Dev. | 6.9 | 5.0 | 5.5 | 0.9 | 0.6 | 0.3 |
| | N | 6 | 6 | 6 | 6 | 6 | 6 |
| 600 | Average | 3.7 | 3.7 | 5.3 | – | 2.3 | 6.6 |
| | Std. Dev. | 0.5 | 0.5 | 0.4 | – | 0.7 | 0.7 |
| | N | 6 | 6 | 6 | – | 6 | 6 |
| 350* | Average | 25.1 | – | 26.9 | 6.7 | – | 8.1 |
| | Std. Dev. | 3.1 | – | 2.3 | 0.7 | – | 0.4 |
| | N | 5 | – | 6 | 3 | – | 6 |

Compression Fill

| Temperature (°F) | | MSFC Stress (ksi) | MSFC Retest | SRI Stress | MSFC $E_{22}$ (Msi) | MSFC Retest | SRI $E_{22}$ |
|---|---|---|---|---|---|---|---|
| 75 | Average | 79.7 | – | 84.4 | 8.7 | – | 9.1 |
| | Std. Dev. | 4.4 | – | 7.1 | 1.0 | – | 0.2 |
| | N | 6 | – | 6 | 6 | – | 6 |
| 240 | Average | 39.5 | 40.2 | 55.3 | 8.3 | 7.6 | 8.7 |
| | Std. Dev. | 10.8 | 5.3 | 2.7 | 0.8 | 0.7 | 0.3 |
| | N | 6 | 6 | 6 | 6 | 6 | 6 |
| 600 | Average | 4.4 | 4.4 | 5.6 | – | 1.3 | 6.5 |
| | Std. Dev. | 0.2 | 0.2 | 0.5 | – | 0.7 | 0.5 |
| | N | 6 | 6 | 7 | – | 6 | 7 |
| 350* | Average | 24.1 | – | 29.3 | 7.9 | – | 8.1 |
| | Std. Dev. | 2.6 | – | 2.0 | 0.7 | – | 0.3 |
| | N | 4 | – | 3 | 4 | – | 3 |

Table 4. AS4/3501–6 8H lot 1 shear.

In-plane shear

| Temperature (°F) | | MSFC $\tau_{12}$ (ksi) | MSFC Retest | SRI $\tau_{12}$ | MSFC $E_{xx}$ (ksi) | MSFC Retest | SRI $E_{xx}$ | MSFC $G_{12}$ (ksi) | MSFC Retest | SRI $G_{12}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 75 | Average | 12.0 | – | 11.9 | 2720 | – | 2490 | 754 | – | 710 |
| | Std. Dev. | 0.2 | – | 0.5 | 151 | – | 120 | 41 | – | 40 |
| | N | 6 | – | 6 | 6 | – | 6 | 5 | – | 6 |
| 240 | Average | 6.2 | 7.9 | 7.7 | 517 | 1752 | 1590 | 144 | 467 | 440 |
| | Std. Dev. | 1.0 | 0.7 | 0.7 | 78 | 211 | 140 | 11 | 42 | 40 |
| | N | 6 | 6 | 5 | 6 | 6 | 4 | 5 | 6 | 4 |
| 550 | Average | 0.65 | 0.74 | – | 90 | 124 | – | 22 | 30 | – |
| | Std. Dev. | 0.06 | 0.12 | – | 7 | 19 | – | 2 | 6 | – |
| | N | 6 | 6 | – | 6 | 6 | – | 5 | 6 | – |
| 600 | Average | – | – | 0.65 | – | – | 81 | – | – | – |
| | Std. Dev. | – | – | 0.06 | – | – | 24 | – | – | – |
| | N | – | – | 5 | – | – | 5 | – | – | – |
| 350* | Average | 3.7 | 2.8 | 8.1 | 501 | 484 | 520 | 119 | 141 | – |
| | Std. Dev. | 0.5 | 0.7 | 0.8 | 149 | 197 | 28 | 39 | 48 | – |
| | N | 6 | 6 | 2 | 6 | 6 | 2 | 6 | 6 | – |

Table 5. AS4/3501–6 8H lot 1 DNS.

| Temperature (°F) | | MSFC $\tau_{13}$ (ksi) | SRI $\tau_{13}$ |
|---|---|---|---|
| 75 | Average | 6.8 | 5.2 |
| | Std. Dev. | 0.5 | 0.3 |
| | N | 6 | 6 |
| 240 | Average | 4.3 | 4.5 |
| | Std. Dev. | 0.6 | 0.5 |
| | N | 6 | 6 |
| 600 | Average | 0.20 | 0.21 |
| | Std. Dev. | 0.02 | 0.04 |
| | N | 5 | 5 |
| 350* | Average | 1.5 | 1.1 |
| | Std. Dev. | 0.3 | 0.1 |
| | N | 5 | 5 |

## 5. TEST RESULTS

After completion of the TRR, testing commenced on lots 2 and 3. The only major anomaly associated with subsequent testing was a high variability in tensile test results for lot 2. Large deviations in strength and modulus were observed between different panels tested under the same conditions. Failed specimens were dissected ply by ply. A high degree of fill misalignment was observed in the dissected specimens. This misalignment was also observed in the prepreg of lot 2. Some specimens had a misalignment as high as 6° on as many as half the plies. The misalignment had no apparent effect on compression or shear test specimens. However, the high-temperature tensile fill specimens were affected by the misalignment. Previous test results suggest that the warp and fill properties are the same when there is no misalignment.

A summary of lamina level testing with A-basis values is shown in table 6. The 350* designates refer to samples that were initially heated to 600 °F, then cooled to 350 °F. Test results that compare lots 1–3 and chart the properties versus temperature are available in appendix A. A detailed summary of the raw data is available in appendix B.

Table 6. Lamina level tests (AS/3501–6), core tests SC350G, and sandwich tests.

| Lamina Level Tests (AS4/3501–6) | | 75 °F | 75 °F | 240 °F | 240 °F | 350 °F* | 350 °F* | 550 °F | 550 °F | 350 °F | 480 °F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Orientation | Property | Average | A-Basis | Average | A-Basis | Average | A-Basis | Average | A-Basis | Average | Average |
| Warp | Tensile stress (ksi) | 111.6 | 98.0 | 110.6 | 97.3 | 93.9 | 61.6 | 74.8 | 54.1 | 100.5 | 74.6 |
| Fill | Tensile stress (ksi) | 104.6 | 75.6 | 102.8 | 68.4 | 80.2 | 26.8 | 57.3 | 17.2 | 84.4 | 71.7 |
| Warp | Compr. stress (ksi) | 82.9 | 59.8 | 38.9 | 23.9 | 22.6 | 10.2 | 4.2 | 2.3 | 12.5 | 5.2 |
| Fill | Compr. stress (ksi) | 82.3 | 65.4 | 40.9 | 25.4 | 22.7 | 11.4 | 4.3 | 3.1 | 11.6 | 5.7 |
| 45 | In-Plane shear (ksi) | 13.3 | 10.4 | 7.8 | 4.8 | 3.15** | 0.63** | 0.80 | 0.43 | 1.77 | 0.92 |
| Warp | Interlaminar shear (psi) | 7040 | 5131 | 4004 | 2904 | 1593 | 685 | 195 | 76 | 954 | 335 |
| Warp | Poisson's ratio | 0.06 | | | | | | | | | |
| Fill | Poisson's ratio | 0.07 | | | | | | | | | |

| Lamina Level Tests (AS4/3501–6) | | 75 °F | 75 °F | 240 °F | 240 °F | 350°F | 350 °F | 600 °F | 600 °F | 350 °F | 480 °F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Orientation | Property | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. | Average | Average |
| Warp | Tensile modulus (Msi) | 9.8 | 0.4 | 8.6 | 1.8 | 7.2 | 1.6 | 5.0 | 1.1 | 7.4 | 5.5 |
| Fill | Tensile modulus (Msi) | 9.7 | 0.4 | 7.9 | 1.9 | 6.3 | 2.5 | 4.3 | 1.7 | 7.2 | 6.6 |
| Warp | Compr. modulus (Msi) | 8.7 | 0.7 | 7.8 | 1.3 | 5.2 | 1.7 | 1.8 | 0.8 | 6.5 | 3.0 |
| Fill | Compr. modulus (Msi) | 8.7 | 0.6 | 8.0 | 1.2 | 4.6 | 1.0 | 1.8 | 0.7 | 6.1 | 2.9 |
| 45 | Shear modulus (ksi) | 730.5 | 56.0 | 467.5 | 84.3 | 113.2** | 75.8** | 48.0 | 22.2 | 61.6 | 44.2 |

| Core Tests (SC350G) | | 75 °F | 75 °F | 350 °F | 350 °F | 480 °F | 480 °F |
|---|---|---|---|---|---|---|---|
| Orientation | Property | Average | A-Basis | Average | A-Basis | Average | A-Basis |
| x | Tensile stress (psi) | 3678 | 2399 | 2470 | 1083 | 1202 | 489 |
| x | Tensile modulus (ksi) | 416 | – | 260 | – | 112 | – |
| z | Flatwise compr. (psi) | 9798 | 8351 | 6009 | 3791 | 1875 | 979 |
| zx | Shear punch (psi) | 4463 | 3395 | 2845 | 2234 | 763 | 654 |

| | | | | | | Prototype 1 | | Prototype 1 | |
|---|---|---|---|---|---|---|---|---|---|
| Sandwich Tensile Tests | | 75 °F | 75 °F | 350 °F | 350 °F | 75 °F | 75 °F | 350 °F | 350 °F |
| Orientation | Property | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. |
| 0 | Tensile Load (lb/in.) | 17093 | 442 | 15387 | 1788 | 16558 | 933 | 10985 | 2 tests |
| 45 | Tensile Load (lb/in.) | 11440 | 439 | 9353 | 1040 | | | | |
| 0 | Load/(W*e) (kips/in.) | 1726 | 51 | 1494 | 352 | 1622 | 73 | | |
| 45 | Load/(W*e) (kips/in.) | 1083 | 25 | 760 | 152 | | | | |
| 0 | Open hole (2"×0.25" Hole) (lb) | 21625 | 778 | 22225 | 980 | | | | |
| z | Flatwise tension (psi) | 2164 | 306 | 894 | 128 | | | | |

| | | | | | | Prototype 1 | | Prototype 1 | |
|---|---|---|---|---|---|---|---|---|---|
| Sandwich Compression Tests | | 75 °F | 75 °F | 350 °F | 350 °F | 75 °F | 75 °F | 350 °F | 350 °F |
| Orientation | Property | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. |
| 0 | Compr. Load (lb/in.) | 16955 | 1724 | 10386 | 1228 | 15163 | 2290 | 10430 | 2 tests |
| 45 | Compr. Load (lb/in.) | 14857 | 1387 | 8473 | 984 | | | | |
| 0 | Load/(W*e)(kips/in.) | 1552 | 87 | | | 1580 | 114 | | |
| 45 | Load/(W*e)(kips/in.) | 1055 | 47 | | | | | | |
| 0 | Post IHGF Comp (lb/in.) | 14824 | 1051 | 9585 | 1609 | | | | |
| 0 | Post beach Comp (lb/in.) | 16929 | 1312 | 8993 | 1008 | | | | |
| 0 | Open-Hole (1"×0.25" hole)(lb) | 10605 | 214 | 6665 | 362 | | | | |

| Double-Lap Shear (Bearing) | | 75 °F | 75 °F | 350 °F | 350 °F | 480 °F | 480 °F |
|---|---|---|---|---|---|---|---|
| Orientation | Property | Average | Std. Dev. | Average | Std. Dev. | Average | Std. Dev. |
| 0 | Ultimate bearing (lb) | 6514 | 267 | 3616 | 271 | 2093 | 370 |
| 0 | Load/disp (lb/in.) | 510408 | 91191 | | | | |
| 45 | Ultimate bearing (lb) | 6437 | 244 | 3503 | 301 | 2093 | 273 |
| 45 | Load/disp (lb/in.) | 425364 | 61545 | 54002 | 2006 | | |

| Single-Lap Shear (Bearing) | | 75 °F | 75 °F |
|---|---|---|---|
| Orientation | Property | Average | Std. Dev. |
| 0 | Ultimate bearing (lb) | 9208 | 719 |
| 45 | Ultimate bearing (lb) | 8597 | 245 |

| Compression After Impact | | 75 °F | 75 °F | 350 °F | 350 °F |
|---|---|---|---|---|---|
| Orientation | Property | Average | Std. Dev. | Average | Std. Dev. |
| 0 | Load (lb) 0 ft-lb | 68513 | 2302 | 31828 | 2761 |
| 0 | Load (lb) 10 ft-lb | 41477 | 2244 | 29056 | 2022 |
| 0 | Load (lb) 20 ft-lb | 33093 | 1473 | 23613 | 341 |
| 0 | Load (lb) 30 ft-lb | 32230 | 1236 | 24650 | 1541 |

* Flight profile
** Two lots

## 6. CONCLUSIONS

The test standards chosen produced satisfactory failure modes. The correlation study performed with SRI indicated that the test methodology was sound. The weight gains of the moisture conditioned test specimens matched the predicted weight gains. Therefore, the moisture absorption characteristics of the composite were adequately identified. Due to the conservative estimates of the beach environment, subsequent beach exposure panels gained less weight than the mechanical property test specimens. Thus, the moisture exposure of 10 days at 180 °F, 93-percent RH was sufficient. There was too much scatter in the data to conclude that every data set was within the same population. However, one-sided analysis of variation statistics suggested the three lots of material were within the same population in several of the data sets. Further statistical evaluation should be performed to determine lot-to-lot variability. A-basis allowables were generated for the two materials at each of the required temperature conditions.

## APPENDIX A—A COMPARISON OF LOTS 1–3 CHARTING THE PROPERTIES VERSUS TEMPERATURE

Table 7 and figures 11–24 show test results that compare lots 1–3 and chart the properties versus temperature.

Table 7. Various test results for lots 1–3.

**ASTM D 695 AS4/3501–6 8H**

| **Compression Warp** | | Lot 1 | Lot 2 | Lot 3 | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|---|---|---|
| Temperature (°F) | | Stress (ksi) | Stress (ksi) | Stress (ksi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) |
| 75 | Average | 78.2 | 85.7 | 79.9 | 8.4 | 9.0 | 8.2 |
| | Std. Dev. | 8.1 | 10.6 | 4.0 | 0.3 | 0.7 | 0.6 |
| | COV | 10.4 | 12.3 | 5.0 | 3.6 | 7.5 | 7.3 |
| | N | 6 | 11 | 12 | 6 | 8 | 12 |
| 240 | Average | 43.2 | 41.2 | 35.9 | 8.0 | 7.7 | 7.9 |
| | Std. Dev. | 6.9 | 4.8 | 4.0 | 0.9 | 0.9 | 1.9 |
| | COV | 15.9 | 11.7 | 11.0 | 11.0 | 11.6 | 23.5 |
| | N | 6 | 12 | 12 | 6 | 11 | 12 |
| 600 | Average | 3.7 | 3.8 | 4.8 | 2.3 | 1.2 | 2.0 |
| | Std. Dev. | 0.5 | 0.3 | 0.2 | 0.7 | 0.7 | 0.5 |
| | COV | 14.5 | 7.7 | 4.9 | 31.3 | 59.8 | 26.4 |
| | N | 6 | 12 | 12 | 6 | 11 | 12 |
| 350* | Average | 25.0 | 18.4 | 24.5 | 6.4 | 3.8 | 5.7 |
| | Std. Dev. | 2.7 | 4.0 | 1.6 | 0.8 | 1.9 | 0.8 |
| | COV | 10.6 | 21.7 | 6.7 | 12.6 | 49.4 | 14.5 |
| | N | 12 | 12 | 12 | 10 | 12 | 12 |
| 350 | Average | 12.5 | – | – | 6.5 | – | – |
| | Std. Dev. | 2.1 | – | – | 1.6 | – | – |
| | COV | 16.9 | – | – | 24.1 | – | – |
| | N | 8 | – | – | 8 | – | – |
| 480 | Average | 5.2 | – | – | 3.0 | – | – |
| | Std. Dev. | 0.3 | – | – | 0.5 | – | – |
| | COV | 6.6 | – | – | 17.7 | – | – |
| | N | 8 | – | – | 8 | – | – |

| **Compression Fill** | | Lot 1 | Lot 2 | Lot 3 | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|---|---|---|
| Temperature (°F) | | Stress (ksi) | Stress (ksi) | Stress (ksi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) |
| 75 | Average | 79.7 | 83.9 | 82.0 | 8.7 | 9.0 | 8.5 |
| | Std. Dev. | 4.4 | 5.9 | 5.5 | 1.1 | 0.3 | 0.5 |
| | COV | 5.6 | 7.0 | 6.7 | 12.2 | 3.5 | 5.7 |
| | N | 6 | 12 | 12 | 6 | 12 | 12 |
| 240 | Average | 39.5 | 44.9 | 37.3 | 8.3 | 8.4 | 7.8 |
| | Std. Dev. | 10.8 | 4.4 | 2.6 | 0.9 | 0.6 | 1.8 |
| | COV | 27.3 | 9.8 | 7.0 | 10.5 | 7.5 | 22.9 |
| | N | 6 | 12 | 12 | 6 | 12 | 12 |
| 600 | Average | 4.4 | 3.9 | 4.6 | 1.3 | 2.0 | 1.9 |
| | Std. Dev. | 0.2 | 0.3 | 0.2 | 0.7 | 0.7 | 0.6 |
| | COV | 5.1 | 6.7 | 4.8 | 55.1 | 33.8 | 32.2 |
| | N | 6 | 12 | 12 | 6 | 12 | 12 |
| 350* | Average | 23.9 | 18.4 | 25.9 | 4.2 | 4.9 | 4.5 |
| | Std. Dev. | 2.0 | 2.6 | 1.5 | 1.0 | 0.9 | 0.9 |
| | COV | 8.5 | 14.2 | 5.6 | 24.0 | 17.4 | 20.3 |
| | N | 12 | 12 | 12 | 10 | 12 | 12 |
| 350 | Average | 11.8 | – | – | 6.1 | – | – |
| | Std. Dev. | 1.1 | – | – | 1.5 | – | – |
| | COV | 9.4 | – | – | 25.0 | – | – |
| | N | 8 | – | – | 8 | – | – |
| 480 | Average | 5.7 | – | – | 2.9 | – | – |
| | Std. Dev. | 0.4 | – | – | 0.5 | – | – |
| | COV | 7.4 | – | – | 16.8 | – | – |
| | N | 8 | – | – | 8 | – | – |

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| **Tensile Warp** | | Lot 1 | Lot 2 | Lot 3 | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|---|---|---|
| Temperature (°F) | | Stress (ksi) | Stress (ksi) | Stress (ksi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) |
| 75 | Average | 111.2 | 112.6 | 110.9 | 10 | 9.8 | 9.6 |
| | Std. Dev. | 3.4 | 6.5 | 3.1 | 0.38 | 0.05 | 0.3 |
| | COV | 3.1 | 5.8 | 2.8 | 3.8 | 0.5 | 3.0 |
| | N | 12 | 12 | 12 | 12 | 12 | 11 |
| 240 | Average | 106.0 | 113.2 | 110.2 | 9.6 | 9.7 | 6.9 |
| | Std. Dev. | 4.7 | 3.12 | 3.3 | 0.3 | 1.3 | 1.4 |
| | COV | 4.4 | 2.8 | 3.0 | 3.1 | 13.4 | 20.2 |
| | N | 6 | 12 | 12 | 6 | 12 | 12 |
| 550 | Average | 69.7 | 72.1 | 80.2 | 5.8 | 5.8 | 3.9 |
| | Std. Dev. | 4.7 | 3.1 | 6.8 | 0.8 | 0.3 | 0.4 |
| | COV | 6.7 | 4.3 | 8.5 | 13.8 | 5.2 | 9.3 |
| | N | 6 | 12 | 12 | 6 | 12 | 12 |
| 350* | Average | 91.8 | 95.5 | 92.3 | 8 | 8.2 | 5.7 |
| | Std. Dev. | 3.1 | 8.9 | 18 | 0.5 | 1 | 1.1 |
| | COV | 3.4 | 9.3 | 19.5 | 6.3 | 12.2 | 19.3 |
| | N | 6 | 21 | 12 | 6 | 15 | 12 |
| 350 | Average | 100.5 | – | – | 7.4 | – | – |
| | Std. Dev. | 4.0 | – | – | 0.4 | – | – |
| | COV | 4.0 | – | – | 4.9 | – | – |
| | N | 8 | – | – | 8 | – | – |
| 480 | Average | 74.6 | – | – | 5.5 | – | – |
| | Std. Dev. | 7.0 | – | – | 0.8 | – | – |
| | COV | 9.4 | – | – | 13.8 | – | – |
| | N | 8 | – | – | 8 | – | – |

| **Tensile Fill** | | Lot 1 | Lot 2 | Lot 3 | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|---|---|---|
| Temperature (°F) | | Stress (ksi) | Stress (ksi) | Stress (ksi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) | $E_{11}$ (Msi) |
| 75 | Average | 106.2 | 102.9 | 105.5 | 9.7 | 9.7 | 9.6 |
| | Std. Dev. | 5 | 12 | 8.7 | 0.4 | 0.6 | 0.3 |
| | COV | 4.7 | 11.7 | 8.2 | 4.1 | 6.2 | 3.6 |
| | N | 6 | 12 | 12 | 6 | 12 | 12 |
| 240 | Average | 105.5 | 96.6 | 107.3 | 9.7 | 6.6 | 7.9 |
| | Std. Dev. | 3.4 | 13.5 | 10.2 | 0.5 | 1.4 | 1.9 |
| | COV | 3.2 | 14.0 | 9.5 | 5.2 | 21.2 | 23.9 |
| | N | 8 | 12 | 12 | 8 | 12 | 11 |
| 550 | Average | 64.4 | 50.9 | 57.3 | 5.7 | 4.1 | 2.5 |
| | Std. Dev. | 6.5 | 12.2 | 16.5 | 1.2 | 1.0 | 1.2 |
| | COV | 10.1 | 24.0 | 28.8 | 21.1 | 24.4 | 48.0 |
| | N | 11 | 12 | 12 | 12 | 12 | 9 |
| 350* | Average | 96.3 | 81.2 | 64.5 | 8.8 | 6.6 | 3.9 |
| | Std. Dev. | 6 | 14.5 | 13.9 | 0.5 | 1.8 | 1.5 |
| | COV | 6.2 | 17.9 | 21.6 | 5.7 | 27.3 | 38.5 |
| | N | 11 | 11 | 12 | 11 | 8 | 12 |
| 350 | Average | 84.4 | – | – | 7.19 | – | – |
| | Std. Dev. | 6.5 | – | – | 1.03 | – | – |
| | COV | 7.7 | – | – | 14.3 | – | – |
| | N | 8 | – | – | 8 | – | – |
| 480 | Average | 71.7 | – | – | 6.6 | – | – |
| | Std. Dev. | 8.5 | – | – | 1.0 | – | – |
| | COV | 11.9 | – | – | 15.8 | – | – |
| | N | 8 | – | – | 8 | – | – |

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| **In-Plane Shear** | | Lot 1 | Lot 2 | Lot 3 | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|---|---|---|
| Temperature (°F) | | $\tau_{12}$ (ksi) | $\tau_{12}$ (ksi) | $\tau_{12}$ (ksi) | $G_{12}$ (ksi) | $G_{12}$ (ksi) | $G_{12}$ (ksi) |
| 75 | Average | 12 | 13.4 | 13.8 | 754 | 770 | 683 |
| | Std. Dev. | 0.2 | 0.8 | 0.7 | 41 | 45 | 23 |
| | COV | 1.7 | 6.0 | 4.8 | 5.4 | 5.8 | 3.4 |
| | N | 6 | 12 | 12 | 5 | 11 | 12 |
| 240 | Average | 7.9 | 7.7 | 7.9 | 467 | 417 | 529 |
| | Std. Dev. | 0.7 | 0.9 | 1.2 | 42 | 75 | 81 |
| | COV | 8.9 | 11.7 | 15.8 | 9.0 | 18.0 | 15.2 |
| | N | 6 | 12 | 11 | 6 | 12 | 9 |
| 550 | Average | 0.69 | 0.79 | 0.93 | 26.4 | 40.0 | 76.1 |
| | Std. Dev. | 0.10 | 0.03 | 0.06 | 6.1 | 7.0 | 7.0 |
| | COV | 14.6 | 4.1 | 5.9 | 23.0 | 17.5 | 9.2 |
| | N | 12 | 12 | 12 | 11 | 12 | 12 |
| 350* | Average | 3.3 | 3.0 | 6.3 | 129.7 | 95 | 242 |
| | Std. Dev. | 0.7 | 0.8 | 0.6 | 43.2 | 21 | 59 |
| | COV | 21.2 | 26.7 | 9.9 | 33.3 | 22.1 | 24.6 |
| | N | 11 | 12 | 12 | 12 | 12 | 12 |
| 350 | Average | 1.8 | – | – | 62.6 | – | – |
| | Std. Dev. | 0.6 | – | – | 20.2 | – | – |
| | COV | 33.9 | – | – | 32.3 | – | – |
| | N | 7 | – | – | 7 | – | – |
| 480 | Average | 0.92 | – | – | 44.2 | – | – |
| | Std. Dev. | 0.03 | – | – | 3.7 | – | – |
| | COV | 3.7 | – | – | 8.4 | – | – |
| | N | 8 | – | – | 7 | – | – |

**ASTM D 3846 AS4/2501–6 8H**

| **Double Notch Shear** | | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|
| Temperature (°F) | | $\tau_{13}$ (ksi) | $\tau_{13}$ (ksi) | $\tau_{13}$ (ksi) |
| 75 | Average | 6.84 | 6.99 | 7.19 |
| | Std. Dev. | 0.47 | 0.57 | 0.62 |
| | COV | 6.8 | 8.1 | 8.7 |
| | N | 6 | 12 | 12 |
| 240 | Average | 4.29 | 3.83 | 4.03 |
| | Std. Dev. | 0.46 | 0.23 | 0.30 |
| | COV | 10.8 | 5.9 | 7.5 |
| | N | 6 | 12 | 12 |
| 600 | Average | 0.20 | 0.21 | 0.18 |
| | Std. Dev. | 0.02 | 0.03 | 0.05 |
| | COV | 9.9 | 13.5 | 27.0 |
| | N | 5 | 12 | 12 |
| 350* | Average | 1.46 | 1.74 | 1.50 |
| | Std. Dev. | 0.25 | 0.29 | 0.30 |
| | COV | 17.1 | 16.6 | 19.7 |
| | N | 5 | 12 | 12 |
| 350 | Average | 0.95 | – | – |
| | Std. Dev. | 0.07 | – | – |
| | COV | 6.8 | – | – |
| | N | 6 | – | – |
| 480 | Average | 0.34 | – | – |
| | Std. Dev. | 0.03 | – | – |
| | COV | 9.1 | – | – |
| | N | 6 | – | – |

**ASTM D 638 SC350G**

| **Tensile** | | Lot 1 | Lot 2 | Lot 3 | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|---|---|---|
| Temperature (°F) | | Stress (psi) | Stress (psi) | Stress (psi) | $E_{11}$ (ksi) | $E_{11}$ (ksi) | $E_{11}$ (ksi) |
| 75 | Average | 3,771 | 3,557 | 3,705 | 414 | 445 | 388 |
| | Std. Dev. | 386 | 438 | 467 | 13 | 12 | 11 |
| | COV | 10.2 | 12.3 | 12.6 | 3.2 | 2.7 | 2.8 |
| | N | 12 | 12 | 12 | 12 | 12 | 12 |
| 350 | Average | 2,563 | 2,561 | 2,287 | 334 | 283 | 164 |
| | Std. Dev. | 471 | 496 | 407 | 121 | 64 | 29 |
| | COV | 18.4 | 19.4 | 17.8 | 36.3 | 22.6 | 17.9 |
| | N | 12 | 12 | 12 | 6 | 12 | 12 |
| 480 | Average | 1,124 | 1,248 | 1,229 | 103 | 111 | 121 |
| | Std. Dev. | 199 | 267 | 242 | 17 | 21 | 21 |
| | COV | 17.7 | 21.4 | 19.7 | 16.2 | 18.6 | 17.3 |
| | N | 12 | 12 | 12 | 11 | 12 | 12 |

**ASTM C 365 SC350G**

| **Compression** | | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|
| Temperature (°F) | | Stress (ksi) | Stress (ksi) | Stress (ksi) |
| 75 | Average | 10.4 | 9.6 | 9.4 |
| | Std. Dev. | 0.3 | 0.3 | 0.2 |
| | COV | 2.7 | 2.9 | 2.4 |
| | N | 12 | 12 | 12 |
| 350 | Average | 6.7 | 5.8 | 5.5 |
| | Std. Dev. | 0.9 | 0.2 | 0.1 |
| | COV | 13.8 | 2.9 | 1.7 |
| | N | 12 | 12 | 12 |
| 480 | Average | 1.7 | 1.7 | 2.2 |
| | Std. Dev. | 0.05 | 0.2 | 0.3 |
| | COV | 2.9 | 9.3 | 11.8 |
| | N | 12 | 12 | 12 |

**ASTM D 732 SC350G**

| **Shear Punch** | | Lot 1 | Lot 2 | Lot 3 |
|---|---|---|---|---|
| Temperature (°F) | | Stress (psi) | Stress (psi) | Stress (psi) |
| 75 | Average | 4,709 | 4,542 | 4,136 |
| | Std. Dev. | 173 | 206 | 382 |
| | COV | 3.7 | 4.5 | 9.2 |
| | N | 12 | 12 | 12 |
| 350 | Average | 2,978 | 2,884 | 2,674 |
| | Std. Dev. | 115 | 141 | 218 |
| | COV | 3.9 | 4.9 | 8.1 |
| | N | 12 | 12 | 12 |
| 480 | Average | 739 | 760 | 790 |
| | Std. Dev. | 27 | 33 | 32 |
| | COV | 3.7 | 4.4 | 4.0 |
| | N | 12 | 12 | 12 |

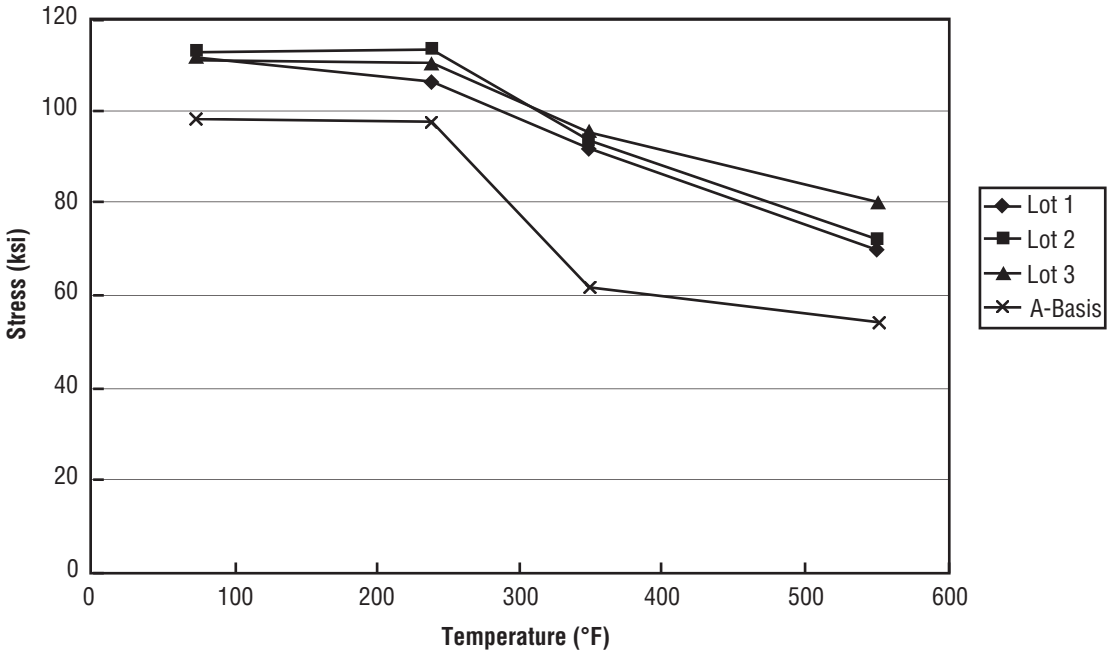


Figure 11. Tensile stress (warp).

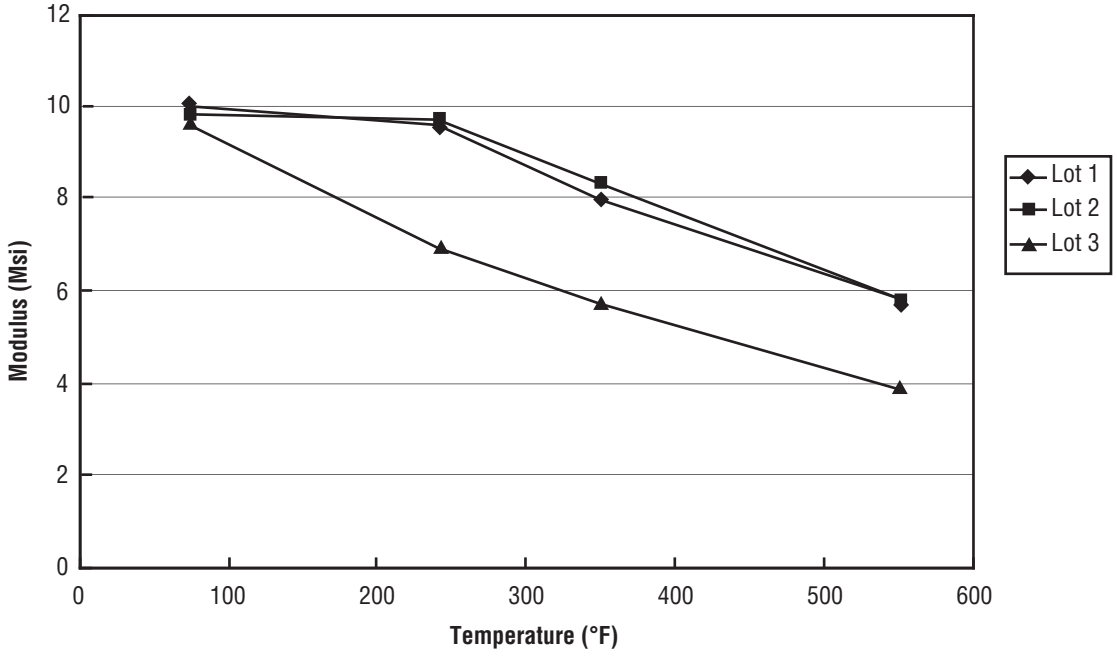


Figure 12. Tensile modulus (warp).

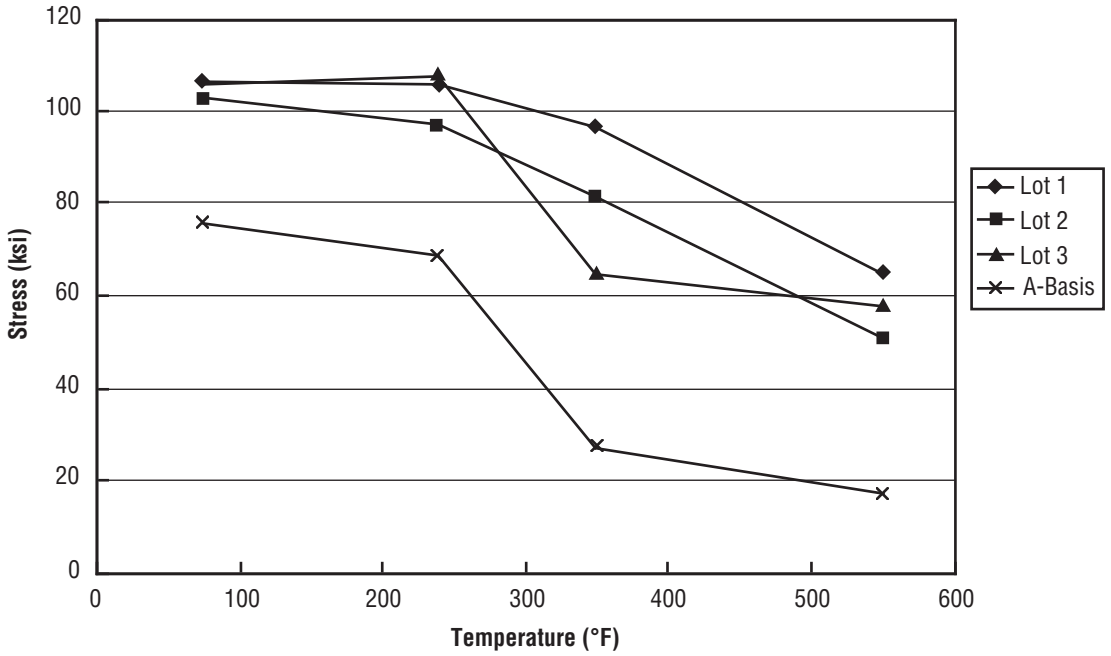


Figure 13. Tensile stress (fill).

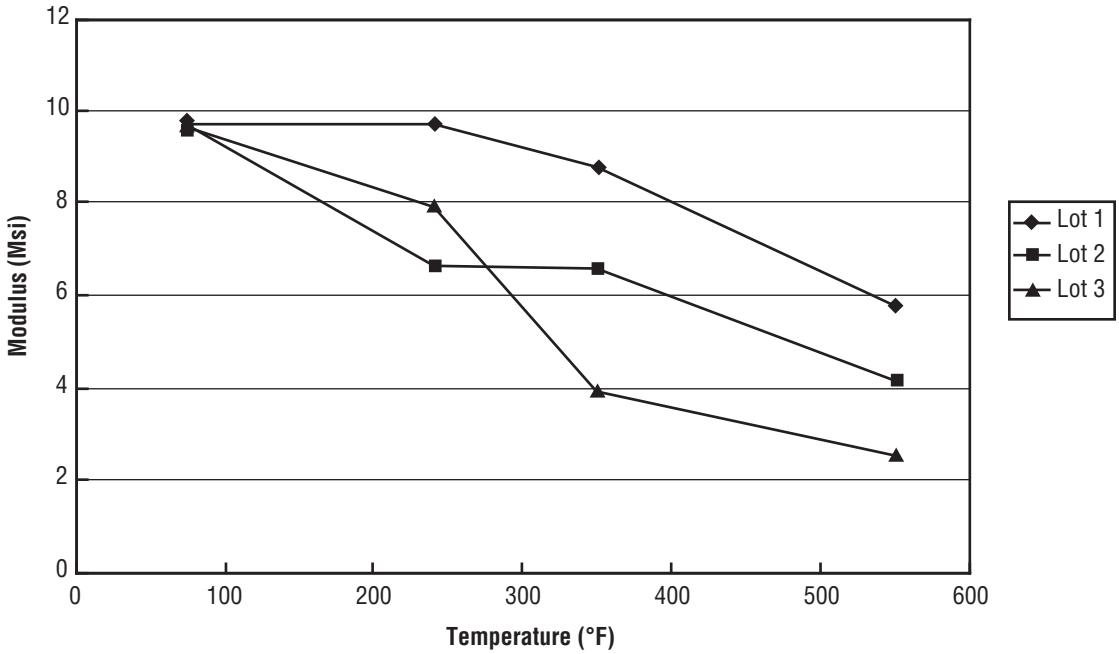


Figure 14. Tensile modulus (fill).

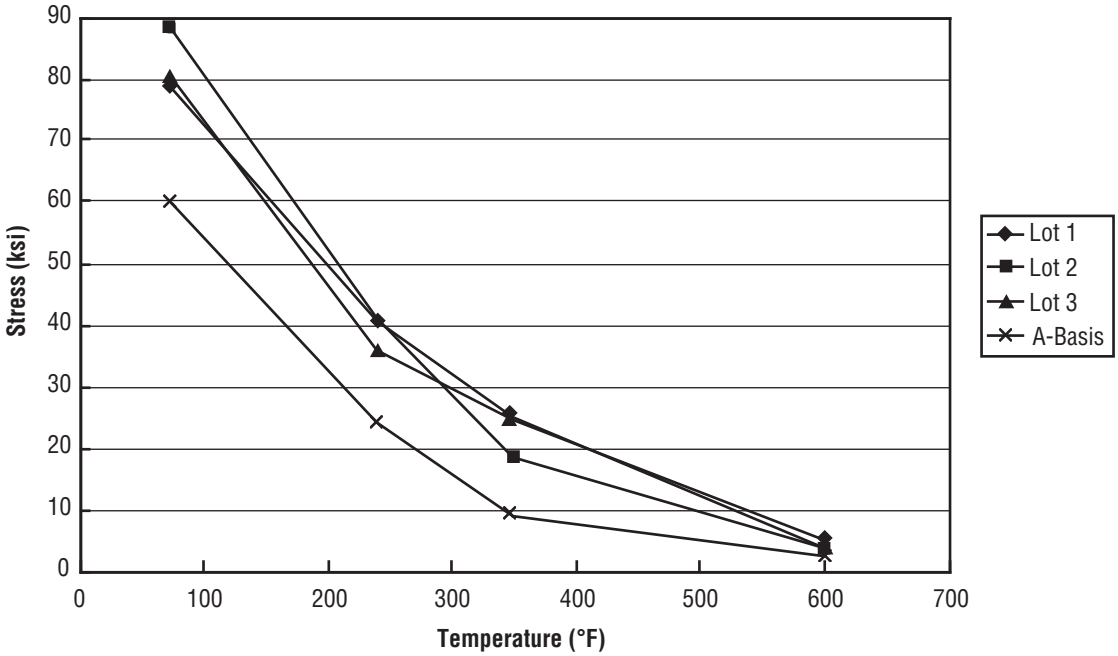


Figure 15. Compressive stress (warp).

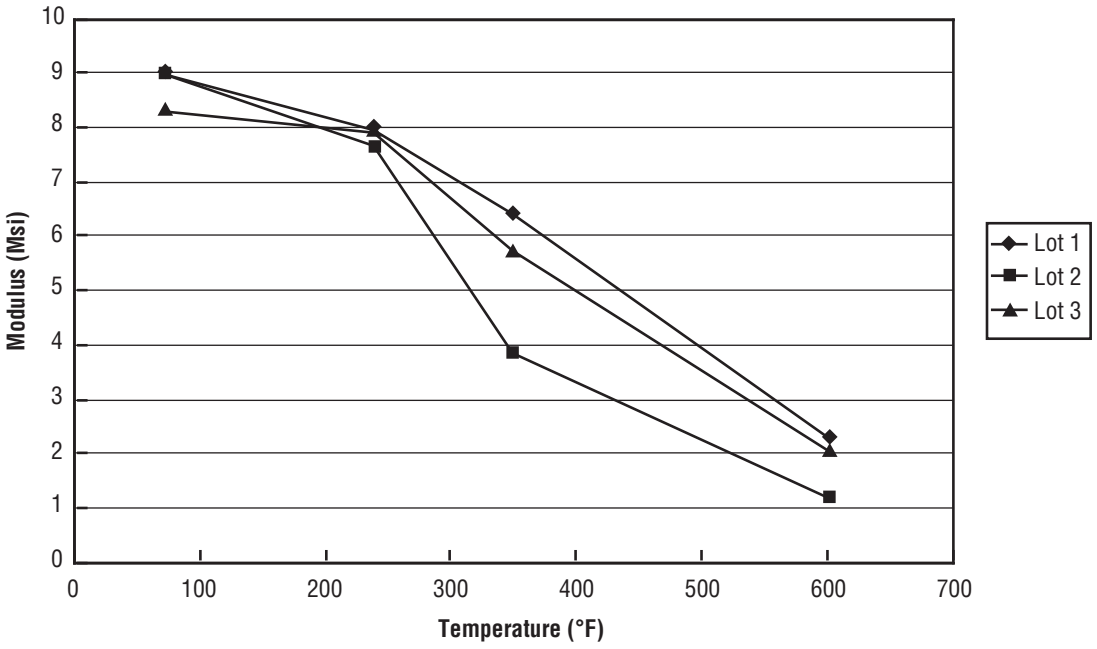


Figure 16. Compressive modulus (warp).

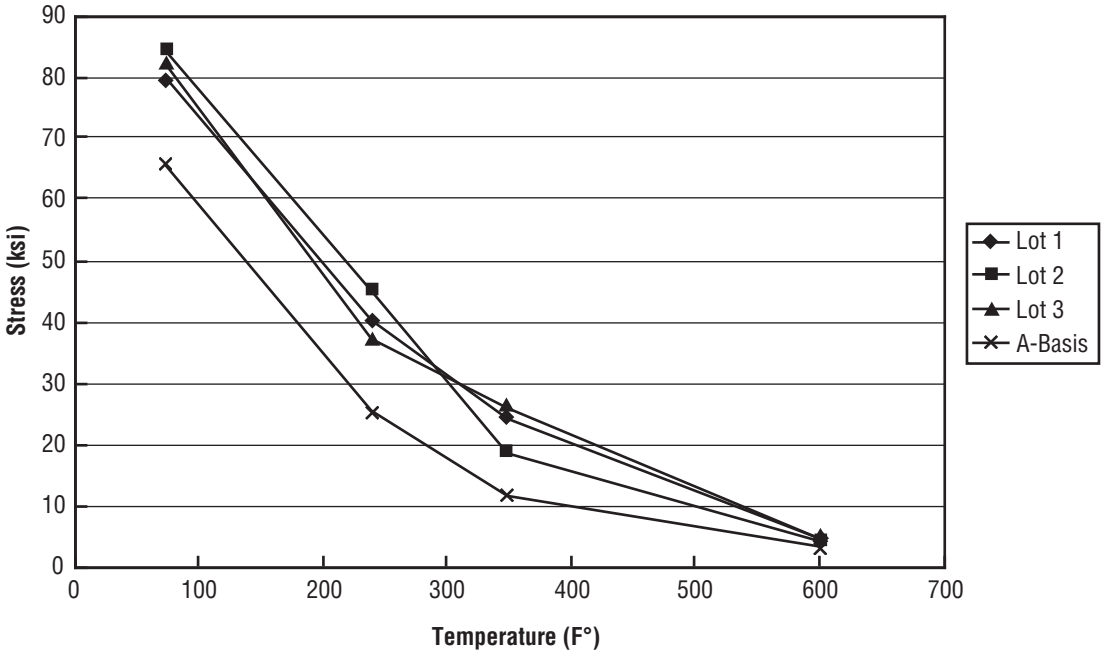


Figure 17. Compressive stress (fill).

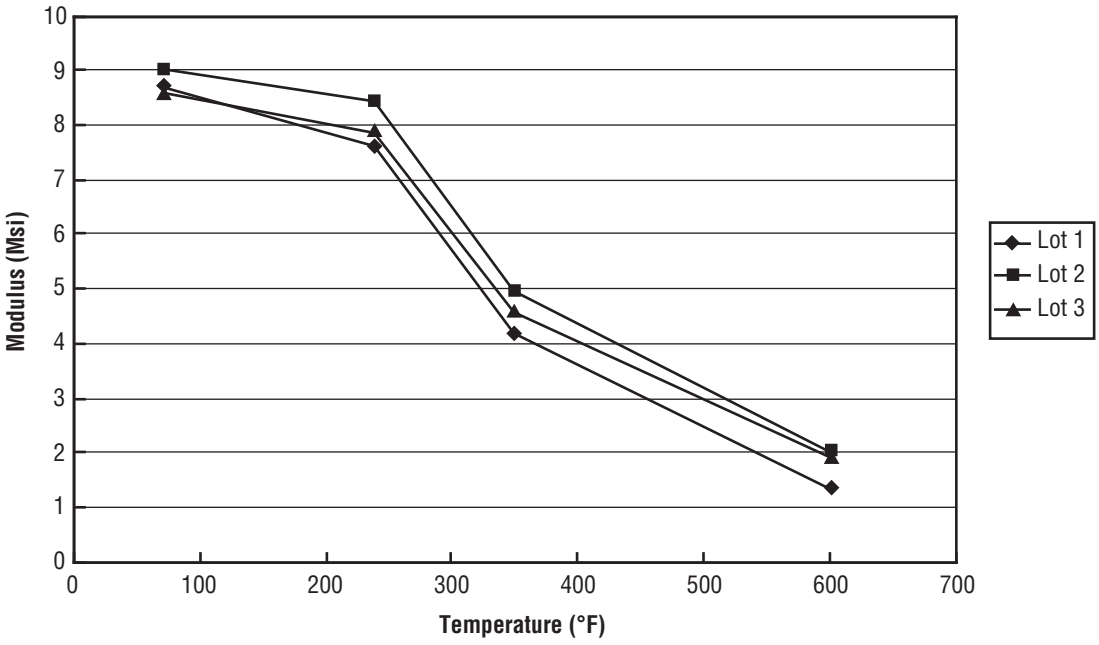


Figure 18. Compressive modulus (fill).

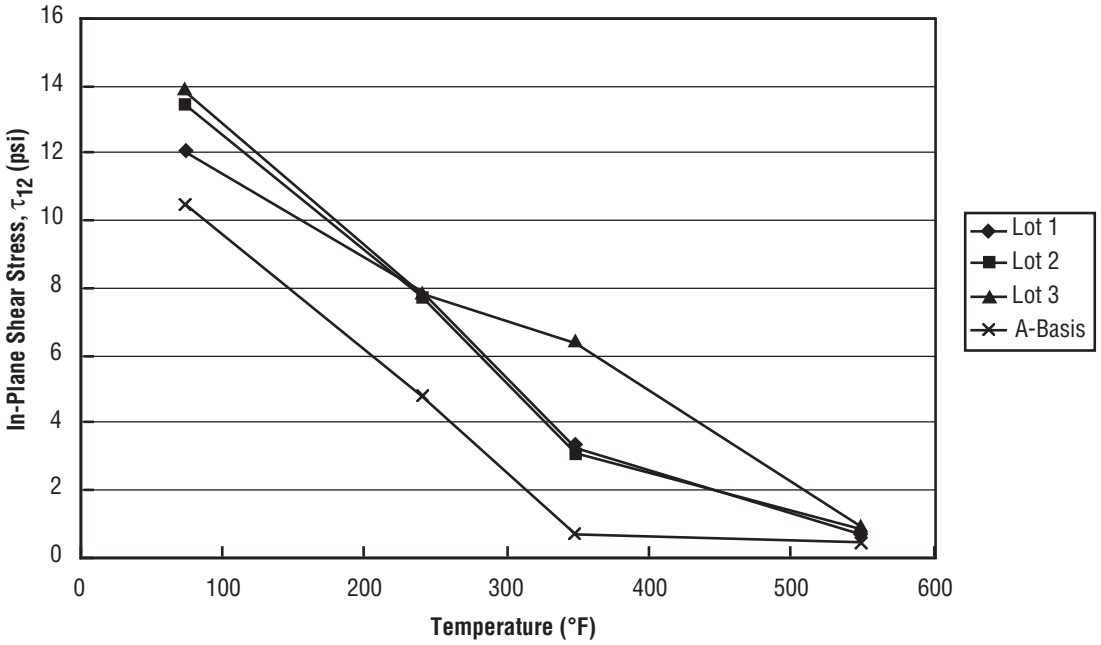


Figure 19. In-plane shear stress ($\tau_{12}$).

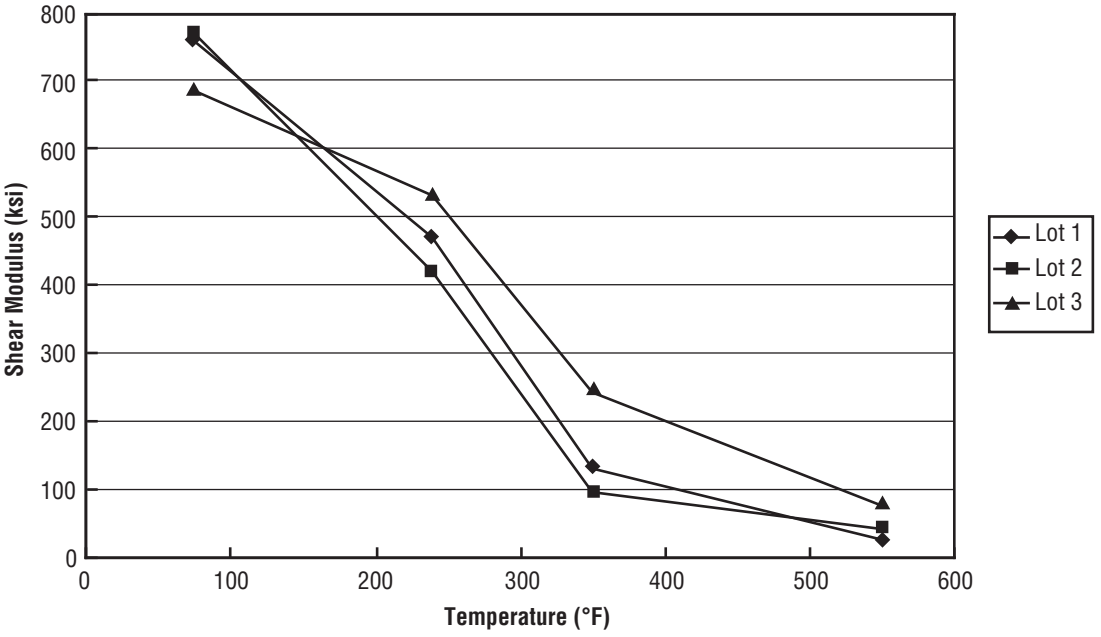


Figure 20. Shear modulus.

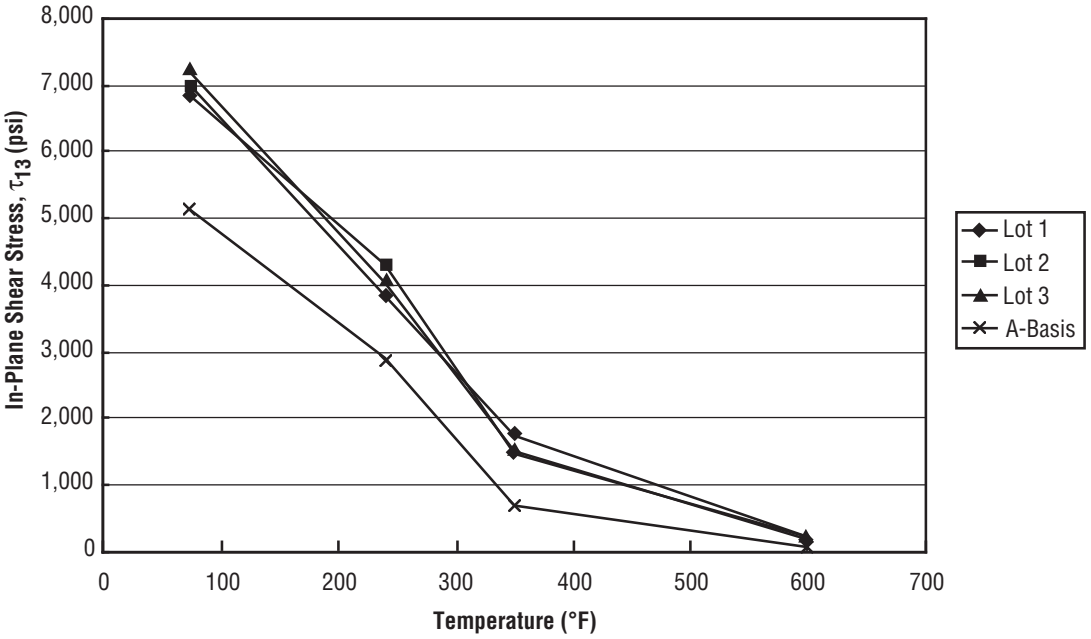


Figure 21. Double-notch shear ($\tau_{13}$).

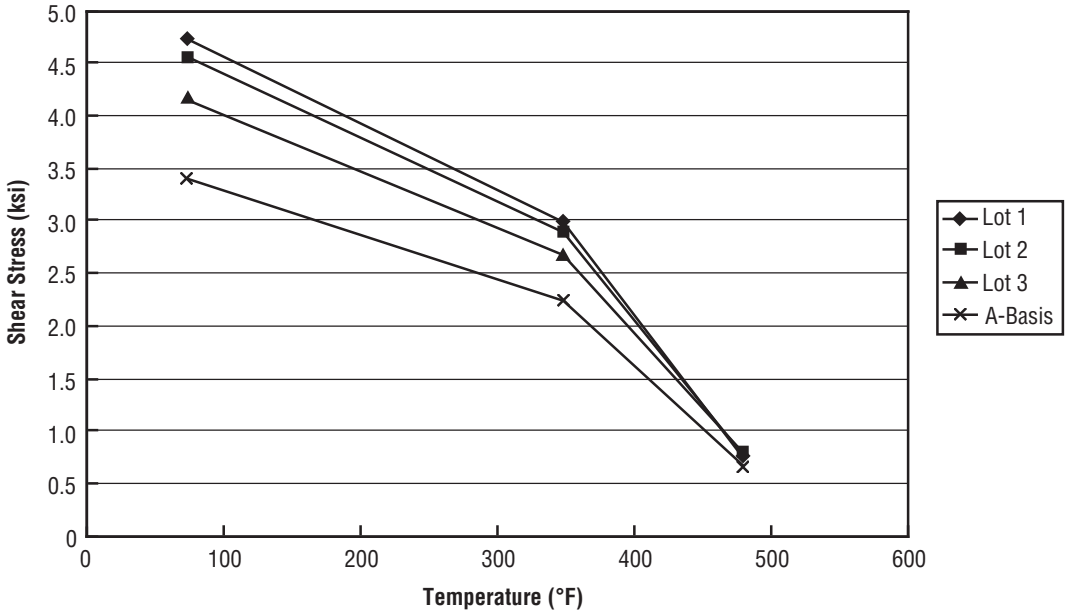


Figure 22. Foam shear.

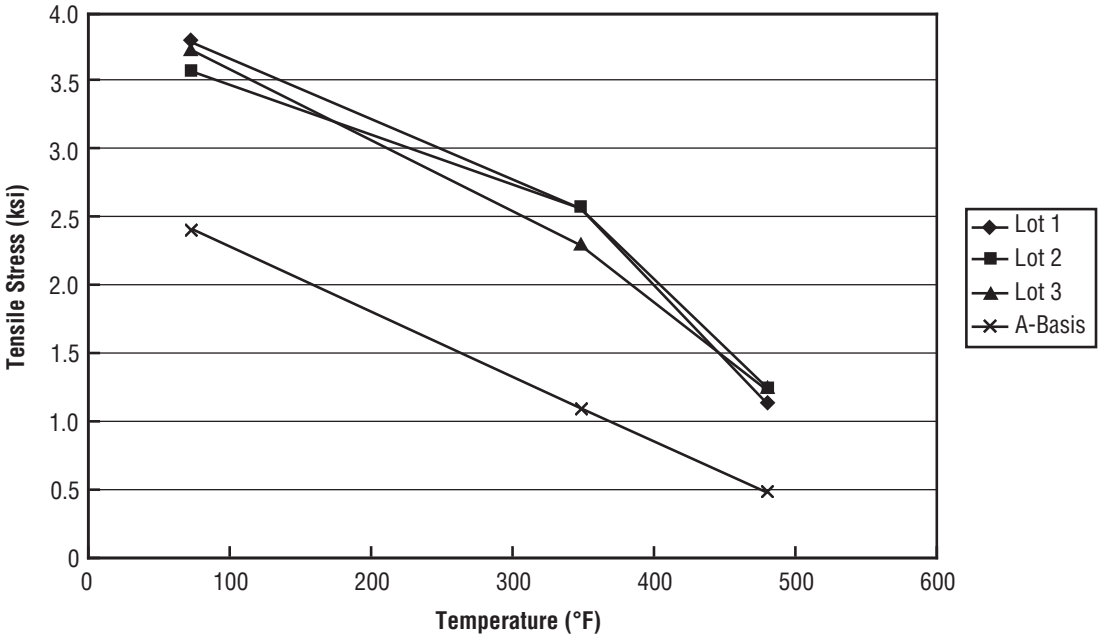


Figure 23. Foam edgewise tensile stress.

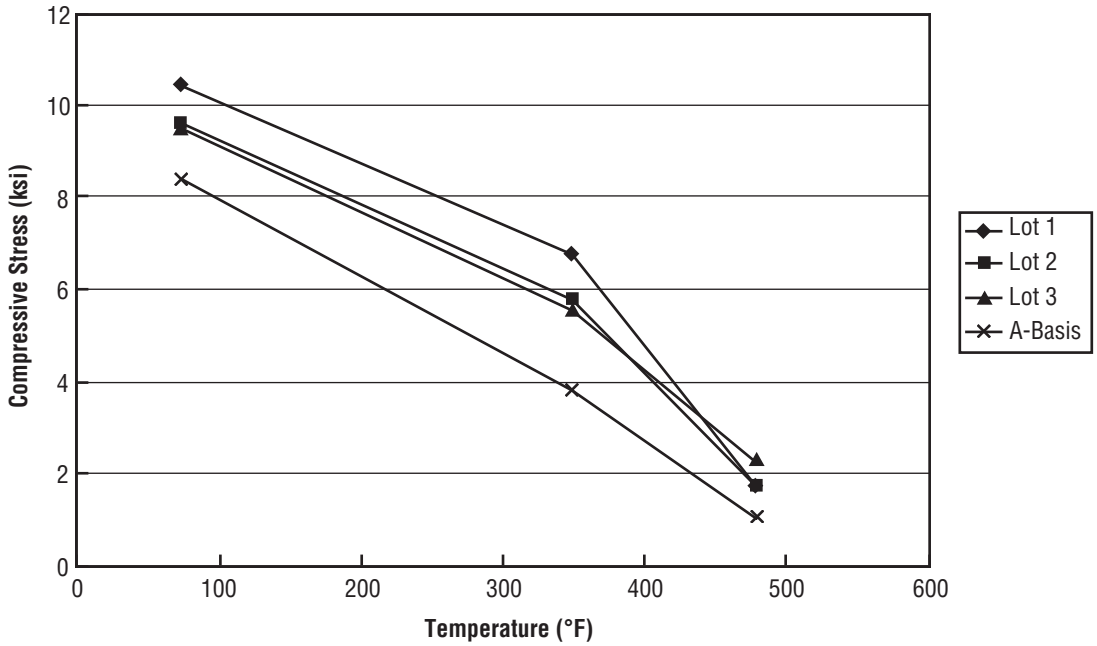


Figure 24. Foam compression.

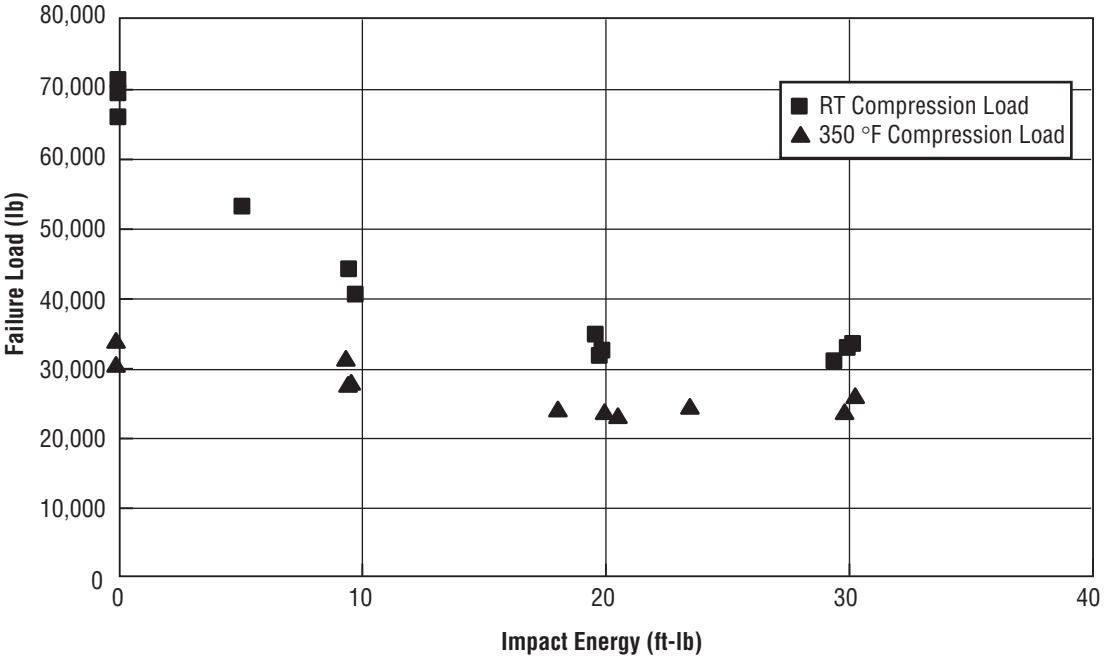


Figure 25. Boeing compression after impact strength at 75 and 350 °F.

## APPENDIX B—A DETAILED SUMMARY OF THE DATA

Table 8. Test result data in detail.

**Lot 1, Tensile Testing of AS4/3501–6 Lot 1, Warp, 75 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | $E_{11}$ (ext) (Msi) | $\nu_{12}$ (gauge) |
|---|---|---|---|---|---|---|---|
| CNC–001–103 | L1 | 1.001 | 0.085 | 0.92* | 107.7 | 10.3 | 0.06 |
| CNC–001–103 | L5 | 0.999 | 0.086 | 0.94* | 111.6 | 9.6 | 0.06 |
| CNC–001–103 | L8 | 0.998 | 0.085 | | 110.9 | 9.6 | 0.07 |
| Panel Average | | | 0.085 | 0.93* | 110.1 | 9.8 | 0.06 |
| CNC–001–101 | L1 | 0.995 | 0.087 | | 103.4 | 9.8 | 0.06 |
| CNC–001–101 | L7 | 0.998 | 0.085 | | 111.5 | 9.6 | 0.04 |
| CNC–001–101 | L9 | 1.001 | 0.087 | | 111.0 | 10.0 | 0.04 |
| Panel Average | | | 0.086 | | 108.6 | 9.8 | 0.05 |
| CNC–001–104 | L5 | 1.004 | 0.085 | | 114.9 | 9.9 | 0.05 |
| CNC–001–104 | L10 | 1.003 | 0.086 | | 113.9 | 9.9 | 0.06 |
| CNC–001–104 | L13 | 0.999 | 0.086 | | 114.1 | 9.8 | 0.07 |
| Panel Average | | | 0.085 | | 114.3 | 9.9 | 0.06 |
| CNC–001–102 | L13 | 1.001 | 0.087 | | 110.2 | 10.3 | 0.07 |
| CNC–001–102 | L2 | 1.005 | 0.087 | | 116.0 | 10.9 | 0.05 |
| CNC–001–102 | L9 | 1.001 | 0.088 | | 109.5 | 10.1 | 0.06 |
| Panel Average | | | 0.087 | | 111.9 | 10.4 | 0.06 |
| **Lot Average** | | | | | **111.2** | **10.0** | **0.06** |
| **Std. Dev.** | | | | | **3.4** | **0.38** | **0.01** |

* weight gain of witness sample

**Lot 1, Tensile Testing of AS4/3501–6, Warp, 240 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | $E_{11}$ (ext) (Msi) |
|---|---|---|---|---|---|---|
| 101B | 3 | 0.998 | 0.087 | 0.42 | 104.9 | 9.6 |
| 101C | 3 | 1.001 | 0.088 | 0.43 | 101.9 | 10.1 |
| 101C | 4 | 1.000 | 0.088 | 0.44 | 109.6 | 9.3 |
| 101B | 7 | 1.001 | 0.087 | 0.43 | 100.7 | 9.4 |
| 101C | 10 | 1.000 | 0.088 | 0.43 | 113.0 | 9.4 |
| 101B | 14 | 1.001 | 0.087 | 0.43 | 106.2 | 9.4 |
| **Average** | | | | **0.43** | **106.0** | **9.6** |
| **Std. Dev.** | | | | **0.00** | **4.7** | **0.3** |

**Lot 1, Tensile Testing of AS4/3501–6, Warp, 350 °F***

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Strain (in./in.) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CNC–001–101A | TL11 | 1.001 | 0.087 | 0.55 | 95.0 | 0.01190 | 8.2 |
| CNC–001–101A | TL9 | 0.998 | 0.087 | 0.55 | 94.2 | 0.01119 | 8.5 |
| CNC–001–102 | TL11 | 0.998 | 0.088 | 0.54 | 93.4 | 0.01134 | 8.5 |
| CNC–001–103 | LT9 | 1.000 | 0.087 | 0.41 | 89.0 | 0.01190 | 7.7 |
| CNC–001–104 | TL11 | 0.997 | 0.087 | 0.55 | 92.1 | 0.01390 | 7.3 |
| CNC–001–104 | TL9 | 1.001 | 0.087 | 0.49 | 87.3 | 0.01256 | 7.8 |
| **Lot Average** | | | **0.087** | **0.52** | **91.8** | **0.01213** | **8.0** |
| **Std. Dev.** | | | **0.001** | **0.06** | **3.1** | **0.00099** | **0.5** |

**Lot 1, Tensile Testing of AS4/3501–6, Warp, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Strain (in./in.) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CNC–001–101A | TL7 | 1.001 | 0.086 | 0.62 | 65.7 | 0.01273 | 5.4 |
| CNC–001–102 | TL3 | 0.993 | 0.088 | 0.55 | 72.9 | 0.01243 | 6.3 |
| CNC–001–102 | TL5 | 0.994 | 0.086 | 0.53 | 76.1 | 0.01036 | 7.0 |
| CNC–001–101 | LT5 | 0.997 | 0.087 | 0.43 | 64.5 | 0.01048 | 4.6 |
| CNC–001–103 | TL7 | 0.998 | 0.086 | 0.45 | 72.2 | 0.01174 | 6.3 |
| CNC–001–104 | TL7 | 0.998 | 0.085 | 0.56 | 66.7 | 0.01132 | 5.5 |
| **Lot Average** | | | **0.086** | **0.52** | **69.7** | **0.01151** | **5.8** |
| **Std. Dev.** | | | **0.001** | **0.07** | **4.7** | **0.00098** | **0.8** |

**Lot 1, Tensile Testing of AS4/3501–6, Warp, 350 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| 101B | 2 | 1.003 | 0.087 | 0.41 | 100.9 | 7.9 |
| 101B | 6 | 1.001 | 0.087 | 0.44 | 97.3 | 7.2 |
| 101B | 12 | 0.985 | 0.087 | 0.44 | 101.0 | 7.1 |
| 101B | 1 | 0.999 | 0.084 | 0.41 | 107.3 | 7.4 |
| 101C | 5 | 1.002 | 0.087 | 0.45 | 102.5 | 7.4 |
| 101C | 6 | 1.000 | 0.087 | 0.46 | 100.9 | 6.8 |
| 101C | 9 | 0.999 | 0.088 | 0.42 | 100.8 | 7.3 |
| 101C | 1 | 1.002 | 0.088 | 0.44 | 93.4 | 7.7 |
| **Average** | | | | **0.43** | **100.5** | **7.4** |
| **Std. Dev.** | | | | **0.02** | **4.0** | **0.4** |

**Lot 1, Tensile Testing of AS4/3501–6, Warp, 480 °F**

| Panel ID | Spec ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| 101B–015 | | 0.999 | 0.087 | 0.41 | 62.3 | 4.8 |
| 101B–010 | | 0.999 | 0.087 | 0.43 | 65.4 | 4.3 |
| 101B–011 | | 1.002 | 0.087 | 0.45 | 80.4 | 5.3 |
| 101B–004 | | 1.001 | 0.087 | 0.41 | 77.6 | 5.6 |
| 101C–002 | | 1.002 | 0.088 | 0.42 | 77.9 | 6.3 |
| 101C–007 | | 1.001 | 0.089 | 0.41 | 79.3 | 5.5 |
| 101C–008 | | 1.001 | 0.008 | 0.40 | 80.4 | 6.7 |
| 101C–011 | | 1.004 | 0.086 | 0.44 | 73.7 | 5.4 |
| **Average** | | | | **0.42** | **74.6** | **5.5** |
| **Std. Dev.** | | | | **0.02** | **7.0** | **0.8** |

**Lot 2, Tensile Testing of AS4/3501–6, Warp, 75 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Strain (in./in.) | Modulus (Msi) | $\nu_{12}$ (gauge) |
|---|---|---|---|---|---|---|---|---|
| CNC–001–108 | L8 | 1.001 | 0.086 | 0.50 | 112.8 | 0.01183 | 9.3 | 0.04 |
| CNC–001–108 | L4 | 1.000 | 0.086 | 0.47 | 118.1 | 0.01208 | 9.6 | 0.11 |
| CNC–001–108 | L12 | 1.003 | 0.084 | 0.50 | 122.3 | 0.01207 | 10.3 | 0.05 |
| Panel Average | | 1.001 | 0.085 | 0.49 | 117.7 | 0.01199 | 9.7 | 0.07 |
| CNC–001–107 | L7 | 1.000 | 0.085 | 0.50 | 117.7 | 0.01195 | 10.3 | 0.03 |
| CNC–001–107 | L3 | 0.997 | 0.086 | 0.50 | 114.7 | 0.01155 | 10.3 | 0.05 |
| CNC–001–107 | L11 | 1.000 | 0.086 | 0.50 | 111.6 | 0.01200 | 9.6 | 0.05 |
| Panel Average | | 0.999 | 0.086 | 0.50 | 114.7 | 0.01183 | 10.0 | 0.04 |
| CNC–001–106 | L6 | 1.005 | 0.088 | 0.57 | 108.1 | 0.01172 | 9.4 | |
| CNC–001–106 | L2 | 1.004 | 0.086 | 0.63 | 117.3 | 0.01214 | 9.8 | 0.11 |
| CNC–001–106 | L10 | 1.004 | 0.087 | 0.58 | 117.3 | 0.01263 | 9.4 | 0.06 |
| Panel Average | | 1.004 | 0.087 | 0.59 | 114.2 | 0.01216 | 9.5 | 0.09 |
| CNC–001–105 | L9 | 1.002 | 0.086 | 0.61 | 101.1 | 0.01031 | 9.7 | 0.06 |
| CNC–001–105 | L5 | 1.001 | 0.087 | 0.55 | 105.8 | 0.01112 | 9.6 | 0.03 |
| CNC–001–105 | L1 | 1.003 | 0.082 | 0.57 | 104.4 | 0.01166 | 10.7 | 0.11 |
| Panel Average | | 1.002 | 0.085 | 0.58 | 103.7 | 0.01103 | 10.0 | 0.07 |
| **Lot Average** | | | | **0.54** | **112.6** | **0.01175** | **9.8** | **0.06** |
| **Std. Dev.** | | | | **0.05** | **6.5** | **0.00059** | **0.5** | **0.03** |

**Lot 2, Tensile Testing of AS4/3501–6, Warp, 240 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (psi) | Modulus (psi) |
|---|---|---|---|---|---|---|
| CNC–001–105 | L6 | 1.00 | 0.09 | | 110.57 | 8.0 |
| CNC–001–105 | L2 | 1.00 | 0.08 | | 109.74 | 8.8 |
| CNC–001–105 | L10 | 1.00 | 0.09 | | 111.18 | 7.4 |
| Average | | | | | 110.50 | 8.1 |
| Std. Dev. | | | | | 0.73 | 0.7 |
| CNC–001–106 | L7 | 1.00 | 0.09 | | 117.47 | 9.4 |
| CNC–001–106 | L3 | 1.00 | 0.09 | | 113.31 | 9.0 |
| CNC–001–106 | L11 | 1.00 | 0.09 | | 108.58 | 11.2 |
| Average | | | | | 113.12 | 9.9 |
| Std. Dev. | | | | | 4.45 | 1.2 |
| CNC–001–107 | L12 | 1.00 | 0.09 | | 115.28 | 10.3 |
| CNC–001–107 | L4 | 1.00 | 0.09 | | 119.00 | 10.1 |
| CNC–001–107 | L8 | 1.00 | 0.09 | | 113.47 | 10.0 |
| Average | | | | | 115.91 | 10.1 |
| Std. Dev. | | | | | 2.82 | 0.2 |
| CNC–001–108 | L1 | 1.00 | 0.09 | | 112.84 | 9.9 |
| CNC–001–108 | L5 | 1.00 | 0.09 | | 111.80 | 10.8 |
| CNC–001–108 | L9 | 1.00 | 0.08 | | 115.22 | 11.7 |
| Average | | | | | 113.28 | 10.8 |
| Std. Dev. | | | | | 1.75 | 0.9 |
| **Lot Average** | | | | **0.48** | **113.20** | **9.7** |
| **Std. Dev.** | | | | | **3.12** | **1.3** |

**Lot 2, Tensile Testing of AS4/3501–6, Warp, 350 °F***

| Panel ID | Sample ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) | |
|---|---|---|---|---|---|---|---|
| CNC–001–105 | L3 | 1.004 | 0.086 | 0.53 | 94.1 | 6.9 | partial shear |
| CNC–001–105 | L7 | 1.007 | 0.087 | 0.47 | 89.2 | 8.9 | partial shear |
| CNC–001–105 | L11 | 1.004 | 0.087 | 0.49 | 81.3 | 6.9 | shear |
| Average | | | | 0.50 | 88.2 | 7.6 | |
| CNC–001–106 | L4 | 1.003 | 0.086 | 0.49 | 94.3 | | |
| CNC–001–106 | L8 | 1.000 | 0.086 | 0.52 | 99.4 | | |
| CNC–001–106 | L12 | 1.000 | 0.086 | 0.50 | 98.2 | | |
| Average | | | | 0.51 | 97.3 | | |
| CNC–001–107 | L1 | 1.003 | 0.081 | 0.45 | 110.4 | | |
| CNC–001–107 | L5 | 1.005 | 0.087 | 0.46 | 108.0 | | |
| CNC–001–107 | L9 | 0.999 | 0.087 | 0.46 | 108.0 | | |
| Average | | | | 0.46 | 108.8 | | |
| CNC–001–108 | L2 | 1.001 | 0.086 | 0.43 | 93.9 | 7.2 | |
| CNC–001–108 | L6 | 1.003 | 0.087 | 0.46 | 93.0 | 7.6 | partial shear |
| CNC–001–108 | L10 | 1.001 | 0.087 | 0.46 | 101.5 | 7.3 | |
| Average | | | | 0.45 | 96.2 | 7.4 | |
| **Average** | | | | **0.48** | **97.6** | **7.5** | |
| **Std. Dev.** | | | | **0.03** | **8.5** | **0.7** | |
| **COV** | | | | **6** | **8.7** | **9.7** | |

**Lot 2, Tensile Warp Retest, 350 °F***

| Panel ID | Sample ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–105 | L13 | 1.000 | 0.084 | 0.51 | 100.9 | 10.6 |
| CNC–001–105 | L14X | 1.003 | 0.085 | 0.50 | 97.5 | 8.6 |
| CNC–001–105 | L15X | 1.000 | 0.085 | 0.49 | 99.2 | 9.0 |
| Average | | | | 0.50 | 99.2 | 9.4 |
| CNC–001–106 | L13 | 1.001 | 0.085 | 0.50 | 101.2 | 9.2 |
| CNC–001–106 | L14X | 1.001 | 0.086 | 0.50 | 89.3 | 7.5 |
| CNC–001–106 | L15X | 1.000 | 0.086 | 0.51 | 93.5 | 8.5 |
| Average | | | | 0.50 | 94.6 | 8.4 |
| CNC–001–107 | L13 | 1.000 | 0.085 | 0.45 | 85.0 | 8.3 |
| CNC–001–107 | L14X | 1.001 | 0.085 | 0.45 | 72.7 | 7.5 |
| CNC–001–108 | L13 | 1.000 | 0.086 | 0.45 | 95.4 | 8.6 |
| **Average** | | | | **0.48** | **92.7** | **8.6** |
| **Std. Dev.** | | | | **0.03** | **9.2** | **0.9** |
| **COV** | | | | **6** | **10** | **11** |
| Average of all | | | | | 95.5 | 8.2 |
| Std. Dev. | | | | | 8.9 | 1.0 |

**Lot 2, Tensile Testing of AS4/3501–6, Warp, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (psi) | Modulus (psi) |
|---|---|---|---|---|---|---|
| CNC–001–105 | L4 | 1.00 | 0.09 | | 68.5 | 6.0 |
| CNC–001–105 | L8 | 1.00 | 0.09 | | 72.8 | 5.8 |
| CNC–001–105 | L12 | 1.00 | 0.09 | | 76.0 | 6.0 |
| Average | | | | | 72.5 | 5.9 |
| CNC–001–106 | L1 | 1.01 | 0.08 | | 74.4 | 6.1 |
| CNC–001–106 | L5 | 1.00 | 0.09 | | 66.4 | 6.3 |
| CNC–001–106 | L9 | 1.00 | 0.09 | | 68.1 | 5.4 |
| Average | | | | | 69.6 | 5.9 |
| CNC–001–107 | L2 | 1.00 | 0.08 | | 75.1 | 5.6 |
| CNC–001–107 | L6 | 1.00 | 0.09 | | 71.1 | 5.5 |
| CNC–001–107 | L10 | 1.00 | 0.09 | | 72.8 | 6.3 |
| Average | | | | | 73.0 | 5.8 |
| CNC–001–108 | L3 | 1.00 | 0.09 | | 75.8 | 5.7 |
| CNC–001–108 | L7 | 1.00 | 0.09 | | 72.1 | 5.8 |
| CNC–001–108 | L11 | 1.00 | 0.09 | | 71.4 | 5.6 |
| Average | | | | | 73.1 | 5.7 |
| **Average** | | | | | **72.1** | **5.8** |
| **Std. Dev.** | | | | | **3.1** | **0.3** |
| **COV** | | | | **0.53** | **4** | **5** |

**Lot 3, Tensile Testing of AS4/3501–6, Warp, 75 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) | $\nu_{12}$ (gauge) |
|---|---|---|---|---|---|---|---|
| CNC–001–109 | 4 | 0.090 | 1.001 | 0.39 | 116.0 | 9.1 | 0.07 |
| CNC–001–109 | 7 | 0.090 | 1.001 | 0.41 | 106.0 | 9.8 | 0.04 |
| CNC–001–109 | 13 | 0.089 | 1.002 | 0.39 | 107.5 | 9.7 | 0.05 |
| CNC–001–110 | 4 | 0.089 | 1.002 | 0.37 | 110.7 | 9.9 | 0.10 |
| CNC–001–110 | 5 | 0.089 | 0.999 | 0.37 | 111.7 | 9.3 | 0.04 |
| CNC–001–110 | 10 | 0.089 | 1.001 | 0.39 | 110.1 | | 0.07 |
| CNC–001–111 | 9 | 0.089 | 1.001 | 0.41 | 111.2 | 9.7 | 0.04 |
| CNC–001–111 | 10 | 0.090 | 1.001 | 0.41 | 112.9 | 9.3 | 0.05 |
| CNC–001–111 | 13 | 0.090 | 1.002 | 0.37 | 105.8 | 9.4 | 0.06 |
| CNC–001–112 | 5 | 0.089 | 1.001 | 0.42 | 111.9 | 9.4 | 0.06 |
| CNC–001–112 | 8 | 0.089 | 1.001 | 0.41 | 112.2 | 9.9 | 0.04 |
| CNC–001–112 | 12 | 0.089 | 1.003 | 0.45 | 114.6 | 9.8 | 0.04 |
| **Lot Average** | | | | **0.40** | **110.9** | **9.6** | **0.05** |
| **Std. Dev.** | | | | **0.02** | **3.1** | **0.3** | **0.02** |
| **COV** | | | | **6** | **3** | **3** | **31** |

**Lot 3, Tensile Testing of AS4/3501–6, Warp, 240 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–109 | 2 | 1.001 | 0.089 | 0.41 | 108.7 | 5.5 |
| CNC–001–109 | 9 | 1.002 | 0.090 | 0.44 | 108.9 | 5.8 |
| CNC–001–109 | 14 | 1.005 | 0.090 | 0.40 | 108.3 | 5.3 |
| CNC–001–110 | 2 | 1.001 | 0.087 | 0.38 | 113.8 | 8.6 |
| CNC–001–110 | 6 | 1.000 | 0.089 | 0.39 | 109.8 | 7.5 |
| CNC–001–110 | 11 | 0.995 | 0.089 | 0.40 | 108.5 | 7.8 |
| CNC–001–111 | 2 | 1.000 | 0.088 | 0.40 | 103.5 | 5.8 |
| CNC–001–111 | 11 | 0.998 | 0.089 | 0.40 | 111.0 | 5.7 |
| CNC–001–111 | 14 | 1.003 | 0.089 | 0.37 | 107.9 | 5.7 |
| CNC–001–112 | 14 | 1.000 | 0.089 | 0.43 | 115.0 | 8.2 |
| CNC–001–112 | 4 | 1.000 | 0.089 | 0.43 | 114.2 | 8.8 |
| CNC–001–112 | 7 | 1.002 | 0.088 | 0.44 | 112.9 | 8.4 |
| **Lot Average** | | | | **0.41** | **110.2** | **6.9** |
| **Std. Dev.** | | | | **0.02** | **3.3** | **1.4** |
| **COV** | | | | **5** | **3** | **20** |

**Lot 3, Tensile Testing of AS4/3501–6, Warp, 350 °F***

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–109 | 1 | 1.002 | 0.089 | 0.45 | 57.5 | 5.7 |
| CNC–001–109 | 5 | 1.001 | 0.090 | 0.43 | 82.4 | 5.5 |
| CNC–001–109 | 6 | 1.000 | 0.090 | 0.44 | 94.1 | 5.7 |
| CNC–001–110 | 7 | 1.001 | 0.089 | 0.41 | 78.2 | 3.9 |
| CNC–001–110 | 9 | 1.002 | 0.089 | 0.41 | 95.5 | 4.7 |
| CNC–001–110 | 12 | 1.001 | 0.090 | 0.39 | 76.3 | 5.1 |
| CNC–001–111 | 6 | 1.003 | 0.087 | 0.41 | 109.9 | 6.0 |
| CNC–001–111 | 1 | 1.003 | 0.087 | 0.40 | 107.1 | 6.4 |
| CNC–001–111 | 8 | 0.999 | 0.090 | 0.42 | 77.1 | 4.8 |
| CNC–001–112 | 1 | 1.002 | 0.086 | 0.44 | 102.2 | 7.0 |
| CNC–001–112 | 2 | 1.003 | 0.087 | 0.44 | 114.9 | 7.9 |
| CNC–001–112 | 9 | 0.999 | 0.089 | 0.44 | 112.6 | 6.1 |
| **Lot Average** | | | | **0.42** | **92.3** | **5.7** |
| **Std. Dev.** | | | | **0.02** | **18.0** | **1.1** |
| **COV** | | | | **4** | **19** | **19** |

**Lot 3, Tensile Testing of AS4/3501–6, Warp, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–109 | 3 | 1.003 | 0.089 | 0.38 | 60.2 | 3.3 |
| CNC–001–109 | 10 | 1.001 | 0.089 | 0.42 | 77.7 | 4.1 |
| CNC–001–109 | 15 | 1.003 | 0.089 | 0.42 | 83.7 | 3.8 |
| CNC–001–110 | 3 | 0.998 | 0.088 | 0.37 | 77.0 | 4.6 |
| CNC–001–110 | 8 | 1.000 | 0.088 | 0.40 | 80.9 | 3.8 |
| CNC–001–110 | 14 | 1.003 | 0.088 | 0.37 | 86.6 | 3.6 |
| CNC–001–111 | 3 | 1.001 | 0.088 | 0.39 | 83.0 | 3.7 |
| CNC–001–111 | 5 | 1.001 | 0.088 | 0.40 | 84.8 | 3.9 |
| CNC–001–111 | 12 | 1.001 | 0.089 | 0.39 | 82.3 | 3.7 |
| CNC–001–112 | 3 | 1.001 | 0.088 | 0.38 | 82.3 | 3.5 |
| CNC–001–112 | 10 | 1.001 | 0.089 | 0.42 | 81.7 | 4.4 |
| CNC–001–112 | 13 | 1.003 | 0.088 | 0.43 | 82.0 | 3.8 |
| **Lot Average** | | | | **0.40** | **80.2** | **3.9** |
| **Std. Dev.** | | | | **0.02** | **6.8** | **0.4** |
| **COV** | | | | **5** | **9** | **9** |

**Lot 1, Tensile Testing of AS4/3501–6, Fill, 75 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | $E_{11}$ (ext) (Msi) | $\nu_{12}$ (gauge) |
|---|---|---|---|---|---|---|---|
| CNC–001–102 | T4 | 0.998 | 0.086 | | 104.5 | 9.8 | 0.07 |
| CNC–001–102 | T10 | 1.003 | 0.087 | | 99.1 | 9.1 | 0.06 |
| CNC–001–102 | T11 | 1.000 | 0.087 | | 105.7 | 9.3 | 0.05 |
| CNC–001–103 | T2 | 1.002 | 0.087 | | 103.9 | 9.6 | 0.07 |
| CNC–001–103 | T5 | 1.002 | 0.087 | | 112.2 | 10.2 | 0.06 |
| CNC–001–103 | T6 | 1.002 | 0.088 | | 111.6 | 10.0 | 0.08 |
| Panel Average | | | 0.087 | | 109.2 | 9.9 | 0.07 |
| **Lot Average** | | | | | **106.2** | **9.7** | **0.07** |
| **Std. Dev.** | | | | | **5.0** | **0.40** | **0.01** |

**Lot 1, Tensile Testing of AS4/3501–6, Fill, 240 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| 101C | 1 | 1.001 | 0.086 | 0.43 | 103.9 | 8.9 |
| 101B | 3 | 1.002 | 0.086 | 0.42 | 107.8 | 10.2 |
| 101C | 6 | 1.001 | 0.087 | 0.43 | 105.1 | 9.0 |
| 101B | 7 | 1.000 | 0.087 | 0.43 | 108.7 | 9.4 |
| 101B | 8 | 1.000 | 0.087 | 0.42 | 108.9 | 10.0 |
| 101B | 14 | 1.001 | 0.086 | 0.43 | 107.4 | 9.5 |
| 101B | 15 | 1.002 | 0.087 | 0.46 | 99.4 | 10.0 |
| 101B | 16 | 1.001 | 0.087 | 0.42 | 102.5 | 10.3 |
| **Average** | | | | **0.43** | **105.5** | **9.7** |
| **Std. Dev.** | | | | **0.01** | **3.4** | **0.5** |

**Lot 1, Tensile Testing of AS4/3501–6, Lot 1, Fill, 350 °F***

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Strain (in./in.) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CNC–001–101A | TT1 | 0.999 | 0.083 | 0.60 | 103.9 | 0.01169 | 9.1 |
| CNC–001–101A | TT8 | 0.999 | 0.087 | 0.56 | 98.4 | 0.01106 | 9.2 |
| CNC–001–103 | TT9 | 1.001 | 0.086 | 0.43 | 102.2 | 0.01063 | 9.9 |
| CNC–001–103 | TT8 | 1.003 | 0.088 | 0.40 | 101.8 | 0.01223 | 8.8 |
| CNC–001–102 | TT5 | 0.997 | 0.085 | 0.45 | 87.5 | 0.01117 | 8.2 |
| CNC–001–102 | TT13 | 1.003 | 0.086 | 0.45 | 91.8 | 0.01121 | 8.3 |
| CNC–001–102 | TT9 | 1.001 | 0.087 | 0.48 | 90.3 | 0.01082 | 8.3 |
| CNC–001–104 | TT2 | 0.997 | 0.085 | 0.48 | 92.1 | 0.01075 | 8.6 |
| CNC–001–104 | TT3 | 0.996 | 0.085 | 0.50 | 101.1 | 0.01237 | 8.5 |
| CNC–001–104 | TT9 | 0.998 | 0.086 | 0.47 | 100.1 | 0.01136 | 9.1 |
| CNC–001–104 | TT8 | 1.000 | 0.087 | 0.50 | 89.6 | 0.01050 | 8.8 |
| **Lot Average** | | | **0.086** | **0.48** | **96.3** | **0.01125** | **8.8** |
| **Std. Dev.** | | | **0.001** | **0.06** | **6.0** | **0.00062** | **0.5** |

**Lot 1, Tensile Testing of AS4/3501–6, Fill, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Strain (in./in.) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CNC–001–101A | TT11 | 1.002 | 0.087 | 0.56 | 56.2 | 0.01684 | 3.5 |
| CNC–001–101A | TT7 | 1.000 | 0.085 | 0.59 | | 0.01540 | 7.5 |
| CNC–001–101A | TT3 | 1.002 | 0.087 | 0.67 | 55.0 | 0.01040 | 6.0 |
| CNC–001–101A | TT6 | 1.000 | 0.088 | 0.72 | 53.9 | 0.00944 | 6.9 |
| CNC–001–101 | TT8 | 1.000 | 0.087 | 0.41 | 67.0 | 0.01028 | 6.3 |
| CNC–001–102 | TT9 | 1.002 | 0.089 | 0.47 | 64.9 | 0.01684 | 4.8 |
| CNC–001–102 | TT1 | 1.002 | 0.088 | 0.52 | 67.3 | 0.01211 | 5.7 |
| CNC–001–103 | TT7 | 1.002 | 0.088 | 0.45 | 68.5 | 0.01223 | 6.4 |
| CNC–001–103 | TT1 | 1.000 | 0.084 | 0.43 | 71.4 | 0.01684 | 5.2 |
| CNC–001–103 | TT3 | 1.002 | 0.087 | 0.44 | 72.4 | 0.01238 | 6.1 |
| CNC–001–104 | TT7 | 1.000 | 0.087 | 0.53 | 66.6 | 0.01879 | 4.0 |
| CNC–001–104 | TT1 | 1.000 | 0.084 | 0.45 | 65.3 | 0.00961 | 6.5 |
| **Lot Average** | | | **0.087** | **0.52** | **64.4** | **0.01343** | **5.7** |
| **Std. Dev.** | | | **0.002** | **0.10** | **6.5** | **0.00332** | **1.2** |

**Lot 1, Tensile Testing of AS4/3501–6, Fill, 350 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| 101C | 4 | 1.001 | 0.085 | 0.40 | 77.4 | 7.7 |
| 101C | 2 | 1.001 | 0.086 | 0.39 | 81.5 | 6.4 |
| 101C | 3 | 1.000 | 0.086 | 0.40 | 80.7 | 5.8 |
| 101C | 7 | 1.000 | 0.086 | 0.44 | 78.2 | 7.8 |
| 101B | 10 | 1.000 | 0.086 | 0.40 | 91.4 | 8.3 |
| 101B | 12 | 1.000 | 0.085 | 0.39 | 81.5 | |
| 101B | 5 | 1.000 | 0.086 | 0.40 | 90.8 | 6.2 |
| 101B | 1 | 1.001 | 0.084 | 0.37 | 93.7 | 8.2 |
| **Average** | | | | **0.40** | **84.4** | **7.2** |
| **Std. Dev.** | | | | **0.02** | **6.5** | **1.0** |

**Lot 1, Tensile Testing of AS4/3501–6, Fill, 480 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| 101B | 11 | 1.000 | 0.087 | 0.39 | 69.0 | 8.2 |
| 101B | 4 | 1.000 | 0.087 | 0.39 | 82.4 | 7.7 |
| 101B | 6 | 1.001 | 0.087 | 0.40 | 79.0 | 6.4 |
| 101B | 9 | 1.002 | 0.088 | 0.42 | 77.6 | 6.1 |
| 101B | 2 | 1.000 | 0.086 | 0.41 | 78.3 | 6.2 |
| 101B | 13 | 1.001 | 0.087 | 0.39 | 62.2 | 7.5 |
| 101C | 5 | 1.000 | 0.088 | 0.40 | 63.0 | 5.5 |
| 101C | 8 | 1.001 | 0.087 | 0.45 | 62.2 | 5.4 |
| **Average** | | | | **0.41** | **71.7** | **6.6** |
| **Std. Dev.** | | | | **0.02** | **8.5** | **1.0** |

**Lot 2, Tensile Testing of AS4/3501–6, Fill, 75 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Strain (in./in.) | Modulus (Msi) | $\nu_{12}$ (gauge) |
|---|---|---|---|---|---|---|---|---|
| CNC–001–108 | T7 | 1.004 | 0.087 | 0.49 | 100.9 | 0.01195 | 9.2 | 0.06 |
| CNC–001–108 | T3 | 1.003 | 0.085 | 0.49 | 99.9 | 0.01164 | 9.6 | |
| CNC–001–108 | T11 | 1.005 | 0.087 | 0.49 | 120.2 | 0.01173 | 10.3 | |
| CNC–001–107 | T8 | 1.004 | 0.087 | 0.53 | 115.3 | 0.01153 | 10.0 | 0.07 |
| CNC–001–107 | T4 | 1.004 | 0.085 | 0.51 | 115.1 | 0.01128 | 10.1 | |
| CNC–001–107 | T12 | 1.000 | 0.086 | 0.56 | 98.2 | 0.01080 | 9.7 | 0.07 |
| CNC–001–106 | T9 | 1.002 | 0.085 | 0.58 | 81.9 | 0.00946 | 9.0 | |
| CNC–001–106 | T5 | 1.003 | 0.086 | 0.51 | 88.5 | 0.01007 | 8.7 | 0.04 |
| CNC–001–106 | T1 | 1.001 | 0.083 | 0.51 | 90.2 | 0.00901 | 10.6 | 0.03 |
| CNC–001–105 | T6 | 1.000 | 0.086 | 0.52 | 110.3 | 0.01113 | 10.2 | 0.05 |
| CNC–001–105 | T2 | 1.004 | 0.085 | 0.51 | 111.7 | 0.01120 | 9.8 | 0.05 |
| CNC–001–105 | T10 | 1.004 | 0.087 | 0.50 | 102.7 | 0.01098 | 9.3 | 0.09 |
| **Lot Average** | | | | **0.52** | **102.9** | **0.01090** | **9.7** | **0.06** |
| **Std. Dev.** | | | | **0.03** | **12.0** | **0.00092** | **0.6** | **0.02** |
| **COV** | | | | **6** | **12** | **8** | **6** | **30** |

**Lot 2, Tensile Testing of AS4/3501–6, Fill, 240 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–105 | T11 | 1.003 | 0.087 | | 91.3 | 5.0 |
| CNC–001–105 | T3 | 1.000 | 0.087 | | 106.3 | 8.2 |
| CNC–001–105 | T7 | 1.000 | 0.087 | | 104.3 | 7.4 |
| Average | | | | | 100.6 | 6.9 |
| CNC–001–106 | T10 | 1.004 | 0.087 | | 94.2 | 6.0 |
| CNC–001–106 | T2 | 1.003 | 0.087 | | 77.2 | 5.2 |
| CNC–001–106 | T6 | 1.001 | 0.087 | | 74.9 | 5.9 |
| Average | | | | | 82.1 | 5.7 |
| CNC–001–107 | T1 | 1.002 | 0.085 | | 108.8 | 7.9 |
| CNC–001–107 | T5 | 1.004 | 0.087 | | 103.4 | 7.4 |
| CNC–001–107 | T9 | 1.002 | 0.086 | | 115.2 | 7.3 |
| Average | | | | | 109.1 | 7.5 |
| CNC–001–108 | T12 | 1.003 | 0.087 | | 110.8 | 9.2 |
| CNC–001–108 | T4 | 1.004 | 0.088 | | 83.0 | 5.1 |
| CNC–001–108 | T8 | 1.003 | 0.087 | | 90.0 | 5.1 |
| Average | | | | | 94.6 | 6.5 |
| **Lot Average** | | | | **0.50%** | **96.6** | **6.6** |
| **Std. Dev.** | | | | | **13.5** | **1.4** |
| **COV** | | | | | **14** | **22** |

**Lot 2, Tensile Testing of AS4/3501–6, Fill, 350 °F***

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) | |
|---|---|---|---|---|---|---|---|
| CNC–001–105 | T4 | 1.001 | 0.086 | 0.45 | 100.8 | | tens/interlaminar |
| CNC–001–105 | T8 | 1.001 | 0.086 | 0.45 | 91.5 | 7.9 | tensile |
| CNC–001–105 | T12 | 1.003 | 0.087 | 0.45 | 82.6 | | shear |
| Panel Average | | 1.002 | 0.086 | 0.45 | 91.6 | 7.9 | |
| CNC–001–106 | T3 | 1.004 | 0.087 | 0.49 | 63.0 | 5.6 | shear |
| CNC–001–106 | T7 | 1.002 | 0.087 | 0.46 | 62.4 | 6.3 | shear |
| CNC–001–106 | T11 | 1.003 | 0.087 | 0.46 | 79.8 | 5.5 | tensile |
| Panel Average | | 1.003 | 0.087 | 0.47 | 68.4 | 5.8 | |
| CNC–001–107 | T2 | 1.003 | 0.086 | 0.46 | 109.2 | | tensile |
| CNC–001–107 | T6 | 0.998 | 0.086 | 0.44 | | | overheated |
| CNC–001–107 | T10 | 1.000 | 0.086 | 0.46 | 79.2 | 9.4 | tensile |
| Panel Average | | 1.000 | 0.086 | 0.45 | 94.2 | 9.4 | |
| CNC–001–108 | T1 | 1.002 | 0.078 | 0.43 | 75.4 | 8.4 | shear |
| CNC–001–108 | T5 | 1.001 | 0.087 | 0.45 | 71.3 | 3.9 | shear |
| CNC–001–108 | T9 | 1.004 | 0.087 | 0.49 | 77.9 | 5.7 | tens/interlaminar |
| Panel Average | | 1.002 | 0.084 | 0.46 | 74.8 | 6.0 | |
| **Lot Average** | | | | **0.46** | **81.2** | **6.6** | |
| **Std. Dev.** | | | | **0.02** | **14.5** | **1.8** | |
| **COV** | | | | **4** | **18** | **27** | |

**Lot 2, Tensile Testing of AS4/3501–6, Fill, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–105 | T5 | 1.000 | 0.086 | 0.46 | 61.3 | 5.0 |
| CNC–001–105 | T9 | 0.999 | 0.085 | 0.45 | 65.0 | 5.0 |
| CNC–001–105 | T13 | 1.002 | 0.085 | 0.48 | 49.1 | 4.0 |
| Average | | | | 0.46 | 58.4 | 4.7 |
| CNC–001–106 | T4 | 1.000 | 0.086 | 0.47 | 35.0 | 2.8 |
| CNC–001–106 | T8 | 0.999 | 0.085 | 0.48 | 36.4 | 2.7 |
| CNC–001–106 | T12 | 1.000 | 0.086 | 0.50 | 52.3 | 3.6 |
| Average | | | | 0.49 | 41.2 | 3.0 |
| CNC–001–107 | T3 | 1.000 | 0.084 | 0.46 | 69.2 | 6.0 |
| CNC–001–107 | T7 | 0.998 | 0.084 | 0.45 | 63.7 | 4.9 |
| CNC–001–107 | T11 | 0.998 | 0.085 | 0.47 | 38.6 | 3.4 |
| Average | | | | 0.46 | 57.2 | 4.8 |
| CNC–001–108 | T2 | 1.001 | 0.085 | 0.46 | 38.7 | 3.5 |
| CNC–001–108 | T6 | 1.001 | 0.085 | 0.46 | 44.7 | 4.1 |
| CNC–001–108 | T10 | 1.000 | 0.086 | 0.46 | 56.3 | 4.1 |
| Average | | | | 0.46 | 46.6 | 3.9 |
| **Lot Average** | | | | **0.47** | **50.9** | **4.1** |
| **Std. Dev.** | | | | **0.02** | **12.2** | **1.0** |
| **COV** | | | | **3** | **24** | **24** |

**Lot 3, Tensile Testing of AS4/3501–6, Fill, 75 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) | $\nu_{12}$ (gauge) |
|---|---|---|---|---|---|---|---|
| CNC–001–109 | 3 | 0.089 | 1.000 | 0.41 | 90.0 | 10.1 | |
| CNC–001–109 | 6 | 0.088 | 0.998 | 0.39 | 93.1 | 9.8 | 0.07 |
| CNC–001–109 | 10 | 0.089 | 1.001 | 0.40 | 94.6 | 9.9 | 0.09 |
| CNC–001–110 | 5 | 0.087 | 1.000 | 0.37 | 101.2 | 9.3 | 0.05 |
| CNC–001–110 | 13 | 0.087 | 1.002 | 0.46 | 111.5 | 9.8 | 0.07 |
| CNC–001–110 | 14 | 0.087 | 1.000 | 0.44 | 112.4 | 9.5 | 0.07 |
| CNC–001–111 | 2 | 0.089 | 1.002 | 0.39 | 109.1 | 9.4 | 0.08 |
| CNC–001–111 | 3 | 0.088 | 1.002 | 0.41 | 111.5 | 10.0 | 0.06 |
| CNC–001–111 | 4 | 0.089 | 1.001 | 0.41 | 112.6 | 9.2 | 0.12 |
| CNC–001–112 | 2 | 0.088 | 1.003 | 0.38 | 113.5 | 10.0 | 0.07 |
| CNC–001–112 | 7 | 0.088 | 1.003 | 0.37 | 112.6 | 9.4 | 0.07 |
| CNC–001–112 | 9 | 0.090 | 1.000 | 0.39 | 104.4 | 9.1 | 0.07 |
| **Lot Average** | | | | **0.40** | **105.5** | **9.6** | **0.07** |
| **Std. Dev.** | | | | **0.03** | **8.7** | **0.3** | **0.02** |
| **COV** | | | | **7** | **8** | **4** | **24** |

**Lot 3, Tensile Testing of AS4/3501–6, Fill, 240 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–109 | 1 | 0.996 | 0.088 | 0.41 | 91.7 | 8.9 |
| CNC–001–109 | 2 | 1.000 | 0.086 | 0.38 | 95.7 | 7.8 |
| CNC–001–109 | 9 | 1.000 | 0.086 | 0.42 | 93.6 | 8.7 |
| CNC–001–110 | 1 | 0.999 | 0.084 | 0.35 | 96.6 | |
| CNC–001–110 | 11 | 1.002 | 0.086 | 0.51 | 110.9 | 9.8 |
| CNC–001–110 | 12 | 1.000 | 0.086 | 0.47 | 106.1 | 10.5 |
| CNC–001–111 | 6 | 1.001 | 0.086 | 0.42 | 118.0 | 9.3 |
| CNC–001–111 | 7 | 1.000 | 0.087 | 0.40 | 118.7 | 5.5 |
| CNC–001–111 | 8 | 1.000 | 0.086 | 0.39 | 115.9 | 9.3 |
| CNC–001–112 | 4 | 1.000 | 0.086 | 0.39 | 109.6 | 5.7 |
| CNC–001–112 | 5 | 1.000 | 0.085 | 0.39 | 116.8 | 6.6 |
| CNC–001–112 | 13 | 1.003 | 0.084 | 0.48 | 113.8 | 5.1 |
| **Lot Average** | | | | **0.42** | **107.3** | **7.9** |
| **Std. Dev.** | | | | **0.05** | **10.2** | **1.9** |
| **COV** | | | | **11** | **10** | **24** |

**Lot 3, Tensile Testing of AS4/3501–6, Fill, 350 °F***

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–109 | 7 | 1.001 | 0.089 | 0.42 | 51.4 | 2.5 |
| CNC–001–109 | 8 | 1.002 | 0.090 | 0.43 | 64.3 | 4.0 |
| CNC–001–109 | 11 | 1.001 | 0.090 | 0.53 | 54.7 | 4.0 |
| CNC–001–110 | 2 | 1.002 | 0.089 | 0.38 | 60.6 | 3.0 |
| CNC–001–110 | 3 | 1.002 | 0.089 | 0.38 | 49.1 | 2.9 |
| CNC–001–110 | 9 | 1.002 | 0.089 | 0.39 | 61.3 | 3.6 |
| CNC–001–111 | 9 | 1.001 | 0.089 | 0.43 | 95.9 | 7.0 |
| CNC–001–111 | 11 | 1.001 | 0.089 | 0.51 | 63.5 | 3.1 |
| CNC–001–111 | 13 | 1.000 | 0.090 | 0.50 | 54.5 | 1.7 |
| CNC–001–112 | 3 | 1.002 | 0.088 | 0.40 | 64.3 | 4.1 |
| CNC–001–112 | 10 | 1.003 | 0.088 | 0.41 | 67.7 | 5.4 |
| CNC–001–112 | 11 | 1.003 | 0.088 | 0.54 | 86.9 | 5.8 |
| **Lot Average** | | | | **0.44** | **64.5** | **3.9** |
| **Std. Dev.** | | | | **0.06** | **13.9** | **1.5** |
| **COV** | | | | **14** | **22** | **39** |

**Lot 3, Tensile Testing of AS4/3501–6, Fill, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thickness (in.) | Wt. Gain (%) | Stress (ksi) | Modulus (Msi) |
|---|---|---|---|---|---|---|
| CNC–001–109 | 7 | 0.999 | 0.090 | 0.38 | 49.8 | |
| CNC–001–109 | 8 | 1.001 | 0.090 | 0.48 | 39.4 | |
| CNC–001–109 | 11 | 1.002 | 0.090 | 0.47 | 37.3 | |
| CNC–001–110 | 2 | 1.001 | 0.089 | 0.33 | 50.8 | 1.9 |
| CNC–001–110 | 3 | 1.003 | 0.089 | 0.33 | 46.7 | 1.5 |
| CNC–001–110 | 9 | 1.000 | 0.089 | 0.50 | 45.3 | 1.0 |
| CNC–001–111 | 9 | 1.000 | 0.083 | 0.36 | 88.8 | 4.4 |
| CNC–001–111 | 11 | 1.001 | 0.090 | 0.47 | 53.8 | 1.6 |
| CNC–001–111 | 13 | 1.001 | 0.086 | 0.48 | 52.1 | 2.3 |
| CNC–001–112 | 3 | 1.001 | 0.087 | 0.36 | 74.6 | 4.1 |
| CNC–001–112 | 10 | 1.004 | 0.088 | 0.47 | 74.7 | 2.7 |
| CNC–001–112 | 11 | 1.001 | 0.088 | 0.47 | 74.1 | 3.2 |
| **Lot Average** | | | | **0.43** | **57.3** | **2.5** |
| **Std. Dev.** | | | | **0.07** | **16.5** | **1.2** |
| **COV** | | | | **15** | **29** | **47** |

**Lot 1, Compression Testing of AS4/3501–6, Warp, 75 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CL–3 | 102 | 0.85 | 0.504 | 0.088 | 78.0 | 0.034 | 8.7 |
| CL–9 | 101 | 0.88 | 0.503 | 0.087 | 82.5 | 0.027 | 8.5 |
| CL–11 | 101A | 0.90 | 0.504 | 0.084 | 66.8 | 0.017 | 8.5 |
| CL–1 | 101 | 0.89 | 0.503 | 0.086 | 76.7 | 0.042 | 8.3 |
| CL–5 | 103 | 0.93 | 0.503 | 0.087 | 72.4 | 0.025 | 8.0 |
| CL–9 | 104 | 0.91 | 0.504 | 0.088 | 89.5 | 0.015 | 8.1 |
| **Average** | | **0.89** | **0.503** | **0.086** | **77.6** | **0.027** | **8.4** |
| **Std. Dev.** | | **0.03** | **0.001** | **0.002** | **7.9** | **0.010** | **0.3** |

**Lot 1, Compression Testing of AS4/3501–6, Fill, 75 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CT–1 | 101 | 0.89 | 0.500 | 0.086 | 85.7 | 0.028 | 7.5 |
| CT–5 | 103 | 0.92 | 0.502 | 0.087 | 77.0 | 0.010 | 8.9 |
| CT–3 | 102 | 0.87 | 0.504 | 0.088 | 75.7 | 0.036 | 7.2 |
| CT–9 | 101 | 0.88 | 0.501 | 0.085 | 77.3 | 0.016 | 9.4 |
| CT–9 | 104 | 0.91 | 0.504 | 0.086 | 85.0 | 0.010 | 9.5 |
| CT–11 | 101A | 0.93 | 0.504 | 0.085 | 77.4 | 0.120 | 9.6 |
| **Average** | | **0.90** | **0.502** | **0.086** | **79.7** | **0.037** | **8.7** |
| **Std. Dev.** | | **0.02** | **0.002** | **0.001** | **4.4** | **0.042** | **1.1** |

**Lot 1, Compression Testing of AS4/3501–6, Warp, 240 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L2 | 101C | 0.87 | 0.501 | 0.089 | 32.0 | 0.00547 | 7.5 |
| L4 | 101C | 0.88 | 0.501 | 0.088 | 38.0 | 0.01121 | 7.0 |
| L6 | 101C | 0.90 | 0.501 | 0.088 | 46.2 | 0.01591 | 8.1 |
| L8 | 101C | 0.89 | 0.501 | 0.089 | 43.3 | 0.01044 | 8.0 |
| L10 | 101C | 0.89 | 0.502 | 0.089 | 43.2 | 0.01858 | 8.4 |
| L13 | 101B | 0.81 | 0.504 | 0.082 | 39.6 | 0.00840 | 8.6 |
| **Average** | | **0.87** | **0.502** | **0.087** | **40.4** | **0.01167** | **7.9** |
| **Std. Dev.** | | **0.03** | **0.001** | **0.003** | **5.0** | **0.00483** | **0.6** |

**Lot 1, Compression Testing of AS4/3501–6, Fill, 240 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T1 | 101C | 0.94 | 0.502 | 0.088 | 43.5 | 0.01291 | 7.1 |
| T3 | 101C | 0.90 | 0.501 | 0.088 | 32.6 | 0.00530 | 6.4 |
| T5 | 101C | 0.90 | 0.502 | 0.088 | 38.1 | 0.00617 | 8.1 |
| T7 | 101C | 0.93 | 0.502 | 0.089 | 40.5 | 0.01674 | 8.0 |
| T9 | 101C | 0.95 | 0.502 | 0.089 | 38.4 | 0.00698 | 8.1 |
| T11 | 101C | 0.88 | 0.501 | 0.087 | 48.3 | 0.01509 | 7.9 |
| **Average** | | **0.87** | **0.501** | **0.088** | **40.2** | **0.01053** | **7.6** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.001** | **5.3** | **0.00498** | **0.7** |

**Lot 1, Compression Testing of AS4/3501–6, Warp, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) |
|---|---|---|---|---|---|---|
| LCL–002 | 101B | 0.97 | 0.501 | 0.084 | 26.8 | 0.0044 |
| LCL–003 | 101B | 0.99 | 0.501 | 0.084 | 26.0 | 0.0015 |
| LCL–007 | 101B | 0.99 | 0.503 | 0.085 | 27.1 | 0.0032 |
| LCL–008 | 101B | 0.99 | 0.502 | 0.085 | 26.1 | 0.0028 |
| LCL–009 | 101B | 1.01 | 0.502 | 0.085 | 19.6 | 0.0011 |
| **Average** | | **0.99** | **0.502** | **0.085** | **25.1** | **0.0026** |
| **Std. Dev.** | | **0.01** | **0.001** | **0.001** | **3.1** | **0.0013** |

**Lot 1, Compression Testing of AS4/3501–6, Fill, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thicknes (in.) | Stress (ksi) | Strain (%) |
|---|---|---|---|---|---|---|
| CT–3 | 101 | 0.87 | 0.502 | 0.086 | 24.0 | 0.0034 |
| CT–7 | 101A | 0.89 | 0.503 | 0.084 | 27.8 | 0.0040 |
| CT–11 | 104 | 0.88 | 0.503 | 0.087 | 22.3 | 0.0029 |
| CT–13 | 101A | 0.86 | 0.503 | 0.083 | 22.1 | 0.0028 |
| **Average** | | **0.88** | **0.503** | **0.085** | **24.1** | **0.0033** |
| **Std. Dev.** | | **0.01** | **0.000** | **0.002** | **2.6** | **0.0005** |

**Lot 1, Compression Testing of AS4/3501–6, Warp retest, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| LCL–002 | 101B | 0.97 | 0.501 | 0.084 | 26.8 | 0.0044 | 7.6 |
| LCL–003 | 101B | 0.99 | 0.501 | 0.084 | 26.0 | 0.0015 | 0.0 |
| LCL–007 | 101B | 0.99 | 0.503 | 0.085 | 27.1 | 0.0032 | 6.5 |
| LCL–008 | 101B | 0.99 | 0.502 | 0.085 | 26.1 | 0.0028 | 6.2 |
| LCL–009 | 101B | 1.01 | 0.502 | 0.085 | 19.6 | 0.0011 | 0.0 |
| L3 | 101C | 0.84 | 0.501 | 0.088 | 24.2 | 0.0110 | 5.8 |
| L10 | 101C | 0.81 | 0.502 | 0.088 | 24.1 | 0.0049 | 4.9 |
| L10 | 103 | 0.79 | 0.502 | 0.088 | 18.8 | 0.0083 | 5.8 |
| **Average** | | **0.92** | **0.502** | **0.086** | **24.1** | **0.0047** | **6.1** |
| **Std. Dev.** | | **0.09** | **0.001** | **0.002** | **3.2** | **0.0034** | **0.9** |

**Lot 1, Compression Testing of AS4/3501–6, Fill retest, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T13 | 101B | 0.75 | 0.503 | 0.082 | 24.2 | 0.0165 | 2.4 |
| T3 | 101C | 0.80 | 0.502 | 0.087 | 23.5 | 0.0088 | 4.4 |
| T7 | 101C | 0.79 | 0.502 | 0.087 | 22.1 | 0.0055 | 4.2 |
| T8 | 101C | 0.79 | 0.501 | 0.088 | 26.2 | 0.0081 | 5.2 |
| T10 | 101C | 0.77 | 0.502 | 0.088 | 25.6 | 0.0038 | 5.3 |
| T6 | 103 | 0.76 | 0.502 | 0.087 | 21.6 | 0.0127 | 3.9 |
| T11 | 103 | 0.78 | 0.502 | 0.087 | 24.0 | 0.0081 | 5.2 |
| T16 | 103 | 0.79 | 0.502 | 0.087 | 25.8 | 0.0092 | 2.8 |
| T22 | 103 | 0.78 | 0.502 | 0.087 | 21.7 | 0.0068 | 4.2 |
| T24 | 103 | 0.79 | 0.501 | 0.087 | 23.8 | 0.0061 | 3.9 |
| **Average** | | **0.78** | **0.502** | **0.086** | **23.9** | **0.0091** | **4.2** |
| **Std. Dev.** | | **0.02** | **0.000** | **0.002** | **1.7** | **0.0040** | **1.0** |

**Lot 1, Compression Testing of AS4/3501–6, Warp, 600 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L1 | 101C | 0.94 | 0.504 | 0.088 | 4.4 | 0.0033 | 1.9 |
| L3 | 101C | 0.90 | 0.503 | 0.084 | 3.0 | 0.0059 | 1.4 |
| L5 | 101C | 0.90 | 0.502 | 0.086 | 4.1 | 0.0022 | 2.0 |
| L7 | 101C | 0.93 | 0.503 | 0.084 | 3.1 | 0.0048 | 2.0 |
| L9 | 101C | 0.95 | 0.502 | 0.085 | 3.9 | 0.0043 | 3.1 |
| L11 | 101C | 0.88 | 0.503 | 0.085 | 3.9 | 0.0045 | 3.2 |
| **Average** | | **0.92** | **0.503** | **0.085** | **3.7** | **0.0042** | **2.3** |
| **Std. Dev.** | | **0.03** | **0.001** | **0.002** | **0.5** | **0.0012** | **0.7** |

**Lot 1, Compression Testing of AS4/3501–6, Fill, 600 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T2 | 101C | 0.87 | 0.502 | 0.086 | 4.6 | 0.0059 | 2.7 |
| T4 | 101C | 0.87 | 0.502 | 0.086 | 4.1 | 0.0063 | 0.8 |
| T6 | 101C | 0.87 | 0.503 | 0.087 | 4.3 | 0.0062 | 0.7 |
| T8 | 101C | 0.90 | 0.500 | 0.087 | 4.3 | 0.0067 | 1.3 |
| T10 | 101C | 0.89 | 0.503 | 0.083 | 4.7 | 0.0054 | 1.2 |
| T12 | 101B | 0.87 | 0.502 | 0.084 | 4.5 | 0.0087 | 1.3 |
| **Average** | | **0.88** | **0.502** | **0.085** | **4.4** | **0.0065** | **1.3** |
| **Std. Dev.** | | **0.01** | **0.001** | **0.002** | **0.2** | **0.0011** | **0.7** |

**Lot 1, Compression Testing of AS4/3501–6, Warp, 350 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L1 | 101C | 0.90 | 0.501 | 0.088 | 12.8 | 0.0012 | 7.2 |
| L5 | 101C | 0.89 | 0.502 | 0.088 | 17.0 | 0.0064 | 6.6 |
| L7 | 101C | 0.93 | 0.502 | 0.088 | 13.1 | 0.0077 | 8.8 |
| L9 | 101C | 0.95 | 0.502 | 0.089 | 13.1 | 0.0044 | 7.8 |
| L2 | 103 | 0.87 | 0.502 | 0.087 | 11.6 | 0.0028 | 4.1 |
| L4 | 103 | 0.87 | 0.502 | 0.086 | 11.0 | 0.0040 | 5.0 |
| L6 | 103 | 0.88 | 0.502 | 0.087 | 11.6 | 0.0098 | 6.8 |
| L8 | 103 | 0.88 | 0.502 | 0.087 | 10.0 | 0.0023 | 5.4 |
| **Average** | | **0.90** | **0.502** | **0.087** | **12.5** | **0.0048** | **6.5** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.001** | **2.1** | **0.0029** | **1.6** |

**Lot 1, Compression Testing of AS4/3501–6, Fill, 350 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T7 | 101B | 0.85 | 0.504 | 0.087 | 10.1 | 0.0031 | 5.5 |
| T9 | 101B | 0.87 | 0.503 | 0.086 | 12.5 | 0.0017 | 6.6 |
| T2 | 101C | 0.93 | 0.502 | 0.087 | 13.5 | 0.0053 | 8.0 |
| T6 | 101C | 0.94 | 0.502 | 0.088 | 13.1 | 0.0022 | 8.1 |
| T1 | 103 | 0.87 | 0.503 | 0.085 | 11.6 | 0.0022 | 4.0 |
| T15 | 103 | 0.85 | 0.502 | 0.087 | 10.9 | 0.0030 | 5.3 |
| T27 | 103 | 0.84 | 0.502 | 0.087 | 10.5 | 0.0034 | 4.5 |
| T31 | 103 | 0.74 | 0.501 | 0.082 | 10.7 | 0.0015 | 6.8 |
| **Average** | | **0.86** | **0.502** | **0.086** | **11.6** | **0.0028** | **6.1** |
| **Std. Dev.** | | **0.06** | **0.001** | **0.002** | **1.3** | **0.0012** | **1.5** |

**Lot 1, Compression Testing of AS4/3501–6, Warp, 480°F Longitudinal**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L2 | 101C | 0.85 | 0.502 | 0.088 | 5.7 | 0.0039 | 3.6 |
| L4 | 101C | 0.85 | 0.502 | 0.088 | 5.5 | 0.0013 | 3.7 |
| L6 | 101C | 0.87 | 0.502 | 0.088 | 5.1 | 0.0010 | 2.4 |
| L8 | 101C | 0.85 | 0.502 | 0.088 | 5.5 | 0.0030 | 3.5 |
| L12 | 103 | 0.82 | 0.502 | 0.087 | 4.8 | 0.0031 | 2.4 |
| L3 | 103 | 0.81 | 0.502 | 0.087 | 4.7 | 0.0028 | 3.1 |
| L56 | 103 | 0.80 | 0.502 | 0.086 | 5.1 | 0.0011 | 3.0 |
| L7 | 103 | 0.81 | 0.502 | 0.087 | 5.0 | 0.0013 | 2.5 |
| **Average** | | **0.83** | **0.502** | **0.087** | **5.2** | **0.0022** | **3.0** |
| **Std. Dev.** | | **0.02** | **0.000** | **0.001** | **0.3** | **0.0011** | **0.5** |

**Lot 1, Compression Testing of AS4/3501–6, Fill, 480 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T8 | 101B | 0.81 | 0.503 | 0.086 | 5.8 | 0.0005 | 2.5 |
| T10 | 101B | 0.82 | 0.503 | 0.086 | 6.2 | 0.0020 | 2.0 |
| T1 | 101C | 0.87 | 0.503 | 0.087 | 5.8 | 0.0047 | 2.8 |
| T5 | 101C | 0.89 | 0.502 | 0.087 | 6.1 | 0.0018 | 3.1 |
| T4 | 103 | 0.89 | 0.502 | 0.087 | 5.7 | 0.0022 | 3.5 |
| T10 | 103 | 0.82 | 0.503 | 0.087 | 4.9 | 0.0037 | 3.4 |
| T13 | 103 | 0.79 | 0.502 | 0.087 | 5.8 | 0.0031 | 2.9 |
| T29 | 103 | 0.78 | 0.503 | 0.088 | 5.4 | 0.0028 | 2.6 |
| **Average** | | **0.83** | **0.502** | **0.087** | **5.7** | **0.0026** | **2.9** |
| **Std. Dev.** | | **0.04** | **0.001** | **0.001** | **0.4** | **0.0013** | **0.5** |

**Lot 2, Compression Testing of AS4/3501–6, Warp, 75 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CL–006 | 105 | 0.89 | 0.499 | 0.084 | 85.2 | 0.0144** | 16.6 |
| CL–010 | 105 | 0.91 | 0.498 | 0.085 | 57.2 | 0.0144** | 29.7 |
| CL–005 | 106 | 0.94 | 0.500 | 0.083 | 88.8 | 0.0250 | 3.9 |
| CL–006 | 106 | 0.94 | 0.500 | 0.083 | 86.3 | 0.0090 | 8.2 |
| CL–011 | 106 | 0.93 | 0.500 | 0.083 | 98.1 | 0.0110 | 9.3 |
| CL2 | 107 | 0.86 | 0.501 | 0.082 | 93.1 | 0.0110 | 9.1 |
| CL6 | 107 | 0.87 | 0.501 | 0.084 | 88.7 | 0.0110 | 9.1 |
| CL13 | 107 | 0.83 | 0.501 | 0.080 | 88.9 | 0.0090 | 9.3 |
| CL3 | 108 | 0.87 | 0.500 | 0.082 | 92.4 | 0.0100 | 9.4 |
| CL5 | 108 | 0.87 | 0.500 | 0.083 | 93.5 | 0.0120 | 9.3 |
| CL13 | 108 | 0.81 | 0.501 | 0.077 | 84.0 | 0.0100 | 10.2 |
| *CL–009 | 106 | 0.91 | 0.500 | 0.085 | 88.8 | 0.0110 | 8.0 |
| *L3 | 107 | 0.84 | 0.500 | 0.084 | 85.7 | 0.0120 | 8.3 |
| *L8 | 108 | 0.81 | 0.501 | 0.080 | 68.8 | 0.0080 | 8.4 |
| **Average** | | **0.88** | **0.500** | **0.082** | **85.7** | **0.0116** | **10.6** |
| **Std. Dev.** | | **0.05** | **0.001** | **0.002** | **10.6** | **0.004** | **6.1** |

* These samples tested unsupported with finger tight torque.

** Using the averaging extensometer

**Lot 2, Compression Testing of AS4/3501–6, Warp, 240 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| LCL–002 | 105 | 0.93 | 0.498 | 0.084 | 46.5 | 0.0121 | 8.4 |
| LCL–004 | 105 | 0.92 | 0.499 | 0.083 | 32.0 | 0.0124 | 8.6 |
| LCL0–13 | 105 | 0.93 | 0.499 | 0.084 | 41.8 | 0.0134 | 7.8 |
| LCL–001 | 106 | 0.95 | 0.500 | 0.084 | 37.1 | 0.0102 | 7.4 |
| LCL–004 | 106 | 0.96 | 0.500 | 0.082 | 39.0 | 0.0083 | 6.8 |
| LCL–008 | 106 | 1.17 | 0.501 | 0.084 | 36.4 | 0.0148 | 6.6 |
| L5 | 107 | 0.89 | 0.500 | 0.084 | 37.6 | 0.0036 | 6.1 |
| L8 | 107 | 0.88 | 0.500 | 0.083 | 41.2 | 0.0078 | 7.4 |
| L12 | 107 | 0.87 | 0.501 | 0.082 | 47.6 | 0.0092 | 8.1 |
| L4 | 108 | 0.88 | 0.499 | 0.083 | 45.6 | *** | |
| L9 | 108 | 0.90 | 0.500 | 0.084 | 44.0 | 0.0084 | 8.7 |
| L11 | 108 | 0.91 | 0.500 | 0.083 | 45.2 | 0.0122 | 8.4 |
| **Average** | | **0.93** | **0.500** | **0.083** | **41.2** | **0.0102** | **7.7** |
| **Std. Dev.** | | **0.08** | **0.001** | **0.001** | **4.8** | **0.0032** | **0.9** |

*** Extensometer pins left (in.)

**Lot 2, Compression Testing of AS4/3501–6, Warp, 600 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CL–3 | 105 | 0.83 | 0.498 | 0.083 | 3.7 | 0.0206 | 1.1 |
| CL–5 | 105 | 0.81 | 0.499 | 0.083 | 3.8 | 0.0081 | 2.5 |
| CL–7 | 105 | 0.83 | 0.499 | 0.083 | 3.9 | 0.0111 | 1.4 |
| CL–3 | 106 | 0.85 | 0.500 | 0.083 | 4.0 | 0.0093 | 1.6 |
| CL–10 | 106 | 0.85 | 0.500 | 0.085 | 3.7 | 0.1086 | 0.5 |
| CL–13 | 106 | 0.86 | 0.500 | 0.085 | 3.5 | *** | |
| L1 | 107 | 0.79 | 0.500 | 0.083 | 3.9 | 0.0279 | 0.6 |
| L10 | 107 | 0.79 | 0.501 | 0.085 | 3.4 | 0.0164 | 0.4 |
| L14 | 107 | 0.78 | 0.501 | 0.084 | 4.4 | 0.0063 | 1.8 |
| L1 | 108 | 0.80 | 0.501 | 0.083 | 3.6 | 0.0387 | 0.6 |
| L6 | 108 | 0.79 | 0.500 | 0.084 | 3.4 | 0.0549 | 0.5 |
| L10 | 108 | 0.82 | 0.500 | 0.084 | 4.0 | 0.0411 | 1.9 |
| **Average** | | **0.82** | **0.500** | **0.084** | **3.8** | **0.0312** | **1.2** |
| **Std. Dev.** | | **0.03** | **0.001** | **0.001** | **0.3** | **0.0301** | **0.7** |

**Lot 2, Compression Testing of AS4/3501–6, Warp, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L1 | 105 | 0.83 | 0.501 | 0.086 | 16.0 | 0.01433 | 3.5 |
| L8 | 105 | 0.84 | 0.502 | 0.085 | 16.6 | 0.02725 | 0.6 |
| L11 | 105 | 0.84 | 0.502 | 0.085 | 15.7 | 0.01726 | 0.9 |
| L2 | 106 | 0.86 | 0.503 | 0.085 | 14.7 | 0.01076 | 3.9 |
| L7 | 106 | 0.87 | 0.502 | 0.085 | 12.0 | 0.00381 | 5.6 |
| L12 | 106 | 0.83 | 0.502 | 0.084 | 15.6 | 0.00729 | 4.7 |
| L4 | 107 | 0.79 | 0.503 | 0.085 | 20.9 | 0.01012 | 3.6 |
| L7 | 107 | 0.77 | 0.503 | 0.085 | 21.4 | 0.00907 | 5.4 |
| L9 | 107 | 0.78 | 0.503 | 0.085 | 21.5 | 0.01234 | 5.4 |
| L2 | 108 | 0.79 | 0.502 | 0.083 | 21.1 | 0.00892 | 2.2 |
| L7 | 108 | 0.79 | 0.502 | 0.084 | 26.4 | 0.00757 | 6.9 |
| L12 | 108 | 0.80 | 0.503 | 0.084 | 18.7 | 0.00976 | 3.5 |
| **Average** | | **0.82** | **0.502** | **0.084** | **18.4** | **0.01154** | **3.8** |
| **Std. Dev.** | | **0.03** | **0.001** | **0.001** | **4.0** | **0.00603** | **1.9** |

**Lot 2, Compression Testing of AS4/3501–6, Fill, 75 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| LCT–005 | 105 | 0.89 | 0.500 | 0.085 | 83.0 | 0.0100 | 8.7 |
| LCT–006 | 105 | 0.89 | 0.499 | 0.084 | 83.6 | 0.0100 | 9.1 |
| LCT–009 | 105 | 0.91 | 0.499 | 0.085 | 79.3 | 0.0100 | 8.5 |
| LCT–002 | 106 | 0.93 | 0.500 | 0.082 | 82.8 | 0.0090 | 9.3 |
| LCT–003 | 106 | 0.94 | 0.500 | 0.082 | 86.3 | 0.0110 | 8.6 |
| LCT–004 | 106 | 0.95 | 0.500 | 0.082 | 79.1 | 0.0100 | 9.1 |
| T2 | 107 | 0.88 | 0.501 | 0.085 | 82.7 | 0.0100 | 9.0 |
| T4 | 107 | 0.87 | 0.500 | 0.083 | 85.6 | 0.0110 | 8.7 |
| T13 | 107 | 0.82 | 0.500 | 0.079 | 72.7 | 0.0080 | 9.3 |
| T2 | 108 | 0.89 | 0.499 | 0.082 | 84.1 | 0.0110 | 9.4 |
| T8 | 108 | 0.89 | 0.499 | 0.084 | 93.2 | 0.0130 | 8.7 |
| T10 | 108 | 0.88 | 0.499 | 0.081 | 94.3 | 0.0110 | 9.4 |
| **Average** | | **0.89** | **0.500** | **0.083** | **83.9** | **0.0103** | **9.0** |
| **Std. Dev.** | | **0.04** | **0.001** | **0.002** | **5.9** | **0.0012** | **0.3** |

**Lot 2, Compression Testing of AS4/3501–6, Fill, 240 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| CT–2 | 105 | 0.92 | 0.499 | 0.084 | 47.4 | 0.0178 | 8.6 |
| CT–3 | 105 | 0.91 | 0.499 | 0.085 | 45.7 | 0.0157 | 8.1 |
| CT–7 | 105 | 0.93 | 0.500 | 0.085 | 42.5 | 0.0141 | 7.4 |
| CT–010 | 106 | 0.93 | 0.502 | 0.084 | 42.4 | 0.0318 | 7.8 |
| CT–011 | 106 | 0.91 | 0.502 | 0.083 | 36.2 | 0.0108 | 8.2 |
| CT–013 | 106 | 0.97 | 0.500 | 0.080 | 39.8 | 0.0060 | 9.2 |
| T1 | 107 | 0.84 | 0.502 | 0.084 | 44.5 | 0.0153 | 9.1 |
| T5 | 107 | 0.86 | 0.503 | 0.084 | 45.9 | 0.0062 | 7.9 |
| T8 | 107 | 0.88 | 0.520 | 0.084 | 43.4 | 0.0126 | 9.0 |
| T3 | 108 | 0.89 | 0.502 | 0.083 | 51.8 | 0.0048 | 8.5 |
| T9 | 108 | 0.90 | 0.510 | 0.083 | 49.7 | 0.0100 | 9.3 |
| T12 | 108 | 0.85 | 0.502 | 0.081 | 49.1 | 0.0128 | 7.9 |
| **Average** | | **0.90** | **0.503** | **0.083** | **44.9** | **0.0131** | **8.4** |
| **Std. Dev.** | | **0.04** | **0.006** | **0.001** | **4.4** | **0.0072** | **0.6** |

**Lot 2, Compression Testing of AS4/3501–6, Fill, 600 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T1 | 105 | 0.82 | 0.500 | 0.084 | 3.8 | 0.0027 | 2.4 |
| T11 | 105 | 0.81 | 0.501 | 0.085 | 3.8 | 0.0040 | 1.3 |
| T13 | 105 | 0.76 | 0.501 | 0.082 | 4.1 | 0.0009 | 1.3 |
| T5 | 106 | 0.83 | 0.502 | 0.084 | 3.4 | 0.0028 | 3.0 |
| T6 | 106 | 0.83 | 0.502 | 0.084 | 3.7 | 0.0024 | 2.7 |
| T8 | 106 | 0.82 | 0.500 | 0.083 | 4.0 | 0.0052 | 1.5 |
| T6 | 107 | 0.78 | 0.502 | 0.084 | 4.1 | 0.0044 | 1.0 |
| T10 | 107 | 0.80 | 0.503 | 0.084 | 3.9 | 0.0016 | 1.9 |
| T12 | 107 | 0.78 | 0.520 | 0.082 | 3.8 | 0.0026 | 1.4 |
| T1 | 108 | 0.81 | 0.502 | 0.083 | 4.5 | 0.0084 | 2.5 |
| T5 | 108 | 0.84 | 0.510 | 0.083 | 3.8 | 0.0017 | 2.8 |
| T11 | 108 | 0.79 | 0.502 | 0.082 | 4.2 | 0.0057 | 2.2 |
| **Average** | | **0.81** | **0.504** | **0.083** | **3.9** | **0.0035** | **2.0** |
| **Std. Dev.** | | **0.02** | **0.006** | **0.001** | **0.3** | **0.0021** | **0.7** |

**Lot 2, Compression Testing of AS4/3501–6, Fill, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T4 | 105 | 0.85 | 0.501 | 0.085 | 17.1 | 0.00906 | 4.8 |
| T10 | 105 | 0.95 | 0.502 | 0.086 | 20.0 | 0.00869 | 4.8 |
| T12 | 105 | 0.93 | 0.502 | 0.084 | 17.3 | 0.00505 | 5.5 |
| T1 | 106 | 0.98 | 0.503 | 0.085 | 13.6 | 0.00435 | 4.0 |
| T7 | 106 | 0.93 | 0.502 | 0.084 | 16.2 | 0.00561 | 4.2 |
| T9 | 106 | 0.88 | 0.503 | 0.084 | 15.1 | 0.00713 | 5.0 |
| T3 | 107 | 0.77 | 0.503 | 0.085 | 18.8 | 0.00456 | 3.6 |
| T9 | 107 | 0.77 | 0.503 | 0.085 | 22.3 | 0.00874 | 5.6 |
| T11 | 107 | 0.77 | 0.503 | 0.084 | 20.6 | 0.01031 | 6.0 |
| T6 | 108 | 0.79 | 0.503 | 0.084 | 19.6 | 0.00768 | 6.6 |
| T7 | 108 | 0.79 | 0.503 | 0.084 | 21.3 | 0.00864 | 4.5 |
| T13 | 108 | 0.77 | 0.503 | 0.081 | 18.9 | 0.00540 | 4.7 |
| **Average** | | **0.85** | **0.502** | **0.084** | **18.4** | **0.00710** | **4.9** |
| **Std. Dev.** | | **0.08** | **0.001** | **0.001** | **2.6** | **0.00203** | **0.9** |

**Lot 3, Compression Testing of AS4/3501–6, Warp, 75 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L2 | 109 | 0.89 | 0.502 | 0.088 | 85.8 | 0.0114 | 7.9 |
| L8 | 109 | 0.87 | 0.502 | 0.088 | 81.2 | 0.0102 | 8.4 |
| L12 | 109 | 0.83 | 0.502 | 0.089 | 78.2 | 0.0166 | 6.6 |
| L1 | 110 | 0.82 | 0.503 | 0.087 | 76.6 | 0.0101 | 8.4 |
| L7 | 110 | 0.83 | 0.503 | 0.086 | 72.8 | 0.0093 | 8.1 |
| L11 | 110 | 0.85 | 0.502 | 0.086 | 84.3 | 0.0110 | 8.7 |
| L4 | 111 | 0.84 | 0.502 | 0.087 | 82.0 | 0.0101 | 8.3 |
| L10 | 111 | 0.84 | 0.502 | 0.088 | 78.8 | 0.0099 | 8.4 |
| L12 | 111 | 0.80 | 0.502 | 0.085 | 81.6 | 0.0115 | 8.3 |
| L4 | 112 | 0.81 | 0.502 | 0.086 | 83.4 | 0.0109 | 9.0 |
| L9 | 112 | 0.84 | 0.502 | 0.087 | 74.0 | 0.0098 | 8.2 |
| L13 | 112 | 0.81 | 0.502 | 0.085 | 81.2 | 0.0121 | 8.7 |
| **Average** | | **0.84** | **0.502** | **0.087** | **80.0** | **0.0111** | **8.2** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.001** | **4.0** | **0.0019** | **0.6** |

**Lot 3, Compression Testing of AS4/3501–6, Fill, 75 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T2 | 109 | 0.85 | 0.502 | 0.088 | 82.6 | 0.01321 | 7.8 |
| T4 | 109 | 0.85 | 0.502 | 0.087 | 82.0 | 0.01176 | 8.1 |
| T6 | 109 | 0.85 | 0.503 | 0.087 | 87.9 | 0.01341 | 8.3 |
| T1 | 110 | 0.83 | 0.502 | 0.085 | 85.3 | 0.01089 | 9.1 |
| T3 | 110 | 0.84 | 0.502 | 0.086 | 84.9 | 0.01144 | 8.9 |
| T5 | 110 | 0.83 | 0.503 | 0.086 | 92.0 | 0.01174 | 8.9 |
| T2 | 111 | 0.84 | 0.503 | 0.085 | 73.1 | 0.00987 | 8.6 |
| T5 | 111 | 0.82 | 0.502 | 0.086 | 78.2 | 0.01164 | 8.7 |
| T14 | 111 | 0.78 | 0.501 | 0.083 | 78.2 | 0.01032 | 8.0 |
| T7 | 112 | 0.85 | 0.502 | 0.086 | 76.6 | 0.00917 | 8.6 |
| T9 | 112 | 0.85 | 0.502 | 0.086 | 85.6 | 0.01006 | 9.4 |
| T11 | 112 | 0.86 | 0.503 | 0.087 | 77.3 | 0.00972 | 8.2 |
| **Average** | | **0.84** | **0.502** | **0.086** | **82.0** | **0.0111** | **8.5** |
| **Std. Dev.** | | **0.02** | **0.001** | **0.001** | **5.5** | **0.0013** | **0.5** |

**Lot 3, Compression Testing of AS4/3501–6, Warp, 240 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L1 | 109 | 0.85 | 0.502 | 0.088 | 34.5 | 0.0055 | 9.8 |
| L3 | 109 | 0.90 | 0.502 | 0.088 | 34.1 | 0.0057 | 8.9 |
| L5 | 109 | 0.93 | 0.501 | 0.088 | 38.2 | 0.0089 | 9.3 |
| L5 | 110 | 0.86 | 0.502 | 0.085 | 35.0 | 0.0131 | 6.2 |
| L9 | 110 | 0.84 | 0.502 | 0.086 | 39.5 | 0.0152 | 4.9 |
| L13 | 110 | 0.79 | 0.502 | 0.081 | 38.5 | 0.0145 | 9.9 |
| L7 | 111 | 0.85 | 0.501 | 0.087 | 28.2 | 0.0074 | 5.8 |
| L9 | 111 | 0.86 | 0.502 | 0.088 | 39.8 | 0.0149 | 6.8 |
| L11 | 111 | 0.85 | 0.503 | 0.087 | 31.7 | 0.0103 | 7.8 |
| L6 | 112 | 0.83 | 0.502 | 0.086 | 33.2 | 0.0024 | 10.8 |
| L7 | 112 | 0.81 | 0.502 | 0.086 | 41.6 | 0.0074 | 7.5 |
| L11 | 112 | 0.84 | 0.502 | 0.086 | 36.3 | 0.0136 | 6.9 |
| **Average** | | **0.85** | **0.502** | **0.086** | **35.9** | **0.0099** | **7.9** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.002** | **3.9** | **0.0043** | **1.9** |

**Lot 3, Compression Testing of AS4/3501–6, Fill, 240 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T3 | 109 | 0.83 | 0.501 | 0.088 | 39.9 | 0.0077 | 9.1 |
| T11 | 109 | 0.82 | 0.501 | 0.087 | 38.9 | 0.0096 | 7.8 |
| T15 | 109 | 0.77 | 0.502 | 0.083 | 33.5 | 0.0101 | 8.2 |
| T7 | 110 | 0.79 | 0.502 | 0.085 | 37.5 | 0.0087 | 8.5 |
| T9 | 110 | 0.82 | 0.502 | 0.086 | 38.5 | 0.0086 | 7.1 |
| T11 | 110 | 0.83 | 0.501 | 0.087 | 35.3 | 0.0049 | 9.2 |
| T1 | 111 | 0.82 | 0.502 | 0.086 | 36.5 | 0.0076 | 7.0 |
| T4 | 111 | 0.81 | 0.502 | 0.084 | 33.7 | 0.0065 | 10.9 |
| T15 | 111 | 0.78 | 0.502 | 0.080 | 35.7 | 0.0067 | 9.5 |
| T8 | 112 | 0.84 | 0.501 | 0.086 | 41.5 | 0.0138 | 4.6 |
| T10 | 112 | 0.84 | 0.502 | 0.087 | 40.6 | 0.0129 | 6.5 |
| T12 | 112 | 0.86 | 0.502 | 0.087 | 36.3 | 0.0096 | 5.5 |
| **Average** | | **0.82** | **0.501** | **0.085** | **37.3** | **0.0089** | **7.8** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.002** | **2.6** | **0.0026** | **1.8** |

**Lot 3, Compression Testing of AS4/3501–6, Warp, 600 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L7 | 109 | 0.83 | 0.502 | 0.087 | 5.1 | 0.0028 | 1.5 |
| L9 | 109 | 0.81 | 0.502 | 0.089 | 4.8 | 0.0033 | 3.0 |
| L11 | 109 | 0.85 | 0.502 | 0.089 | 4.8 | 0.0022 | 2.7 |
| L8 | 110 | 0.80 | 0.502 | 0.086 | 4.6 | 0.0033 | 1.6 |
| L10 | 110 | 0.81 | 0.502 | 0.086 | 4.5 | 0.0064 | 1.9 |
| L12 | 110 | 0.79 | 0.502 | 0.084 | 5.0 | 0.0021 | 2.3 |
| L2 | 111 | 0.82 | 0.503 | 0.086 | 4.8 | 0.0053 | 2.3 |
| L8 | 111 | 0.86 | 0.502 | 0.088 | 4.6 | 0.0040 | 1.7 |
| L13 | 111 | 0.75 | 0.502 | 0.082 | 4.5 | 0.0024 | 2.3 |
| L1 | 112 | 0.84 | 0.503 | 0.087 | 4.5 | 0.0036 | 1.7 |
| L3 | 112 | 0.84 | 0.502 | 0.086 | 5.2 | 0.0038 | 1.2 |
| L5 | 112 | 0.84 | 0.502 | 0.086 | 4.8 | 0.0042 | 2.2 |
| **Average** | | **0.82** | **0.502** | **0.086** | **4.8** | **0.0036** | **2.0** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.002** | **0.2** | **0.0013** | **0.5** |

**Lot 3, Compression Testing of AS4/3501–6, Fill, 600 °F**

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T8 | 109 | 0.85 | 0.502 | 0.087 | 4.4 | 0.0043 | 1.3 |
| T10 | 109 | 0.82 | 0.501 | 0.086 | 4.6 | 0.0061 | 1.8 |
| T12 | 109 | 0.83 | 0.501 | 0.087 | 4.6 | 0.0033 | 2.6 |
| T2 | 110 | 0.80 | 0.502 | 0.086 | 4.8 | 0.0059 | 1.7 |
| T8 | 110 | 0.80 | 0.502 | 0.086 | 4.6 | 0.0032 | 2.5 |
| T13 | 110 | 0.79 | 0.502 | 0.086 | 4.6 | 0.0068 | 1.6 |
| T7 | 111 | 0.81 | 0.502 | 0.085 | 4.7 | 0.0041 | 1.7 |
| T9 | 111 | 0.80 | 0.502 | 0.085 | 4.8 | 0.0055 | 1.4 |
| T11 | 111 | 0.82 | 0.502 | 0.086 | 4.6 | 0.0048 | 2.3 |
| T6 | 112 | 0.81 | 0.502 | 0.086 | 5.0 | 0.0019 | 2.8 |
| T13 | 112 | 0.82 | 0.503 | 0.086 | 4.7 | 0.0038 | 2.2 |
| T15 | 112 | 0.75 | 0.501 | 0.082 | 4.1 | 0.0048 | 0.7 |
| **Average** | | **0.81** | **0.502** | **0.086** | **4.6** | **0.0045** | **1.9** |
| **Std. Dev.** | | **0.03** | **0.000** | **0.001** | **0.2** | **0.0014** | **0.6** |

**Lot 3, Compression Testing of AS4/3501–6, Warp, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| L6 | 109 | 0.79 | 0.501 | 0.086 | 26.6 | 0.0086 | 6.6 |
| L10 | 109 | 0.79 | 0.502 | 0.086 | 27.4 | 0.0079 | 5.6 |
| L13 | 109 | 0.77 | 0.502 | 0.086 | 23.0 | 0.0036 | 7.2 |
| L2 | 110 | 0.78 | 0.502 | 0.087 | 22.5 | 0.0105 | 4.8 |
| L4 | 110 | 0.77 | 0.502 | 0.087 | 25.6 | 0.0071 | 6.2 |
| L6 | 110 | 0.77 | 0.502 | 0.086 | 24.8 | 0.0117 | 5.4 |
| L1 | 111 | 0.75 | 0.502 | 0.086 | 24.1 | 0.0091 | 5.5 |
| L3 | 111 | 0.76 | 0.503 | 0.086 | 24.4 | 0.0108 | 4.8 |
| L5 | 111 | 0.79 | 0.503 | 0.087 | 25.7 | 0.0085 | 5.0 |
| L8 | 112 | 0.81 | 0.502 | 0.086 | 23.4 | 0.0081 | 5.0 |
| L10 | 112 | 0.79 | 0.502 | 0.089 | 21.9 | 0.0094 | 5.7 |
| L12 | 112 | 0.78 | 0.502 | 0.087 | 24.6 | 0.0106 | 6.8 |
| **Average** | | **0.78** | **0.502** | **0.086** | **24.5** | **0.0088** | **5.7** |
| **Std. Dev.** | | **0.02** | **0.000** | **0.001** | **1.6** | **0.0021** | **0.8** |

**Lot 3, Compression Testing of AS4/3501–6, Fill, 350 °F***

| Specimen ID | Panel Number | Wt. Gain (%) | Width (in.) | Thickness (in.) | Stress (ksi) | Strain (%) | Modulus (Msi) |
|---|---|---|---|---|---|---|---|
| T5 | 109 | 0.84 | 0.502 | 0.087 | 26.7 | 0.0046 | 5.6 |
| T9 | 109 | 0.84 | 0.502 | 0.087 | 26.0 | 0.0064 | 5.1 |
| T14 | 109 | 0.83 | 0.501 | 0.085 | 24.9 | 0.0039 | 5.9 |
| T6 | 110 | 0.82 | 0.502 | 0.085 | 27.4 | 0.0097 | 3.2 |
| T10 | 110 | 0.86 | 0.501 | 0.086 | 23.3 | 0.0101 | 3.8 |
| T15 | 110 | 0.79 | 0.502 | 0.081 | 24.2 | 0.0114 | 3.8 |
| T8 | 111 | 0.84 | 0.502 | 0.084 | 25.4 | 0.0145 | 5.0 |
| T10 | 111 | 0.84 | 0.501 | 0.085 | 27.7 | 0.0071 | 3.7 |
| T12 | 111 | 0.85 | 0.501 | 0.085 | 27.5 | 0.0134 | 3.8 |
| T1 | 112 | 0.85 | 0.502 | 0.086 | 25.9 | 0.0157 | 5.7 |
| T3 | 112 | 0.85 | 0.501 | 0.086 | 27.2 | 0.0115 | 4.8 |
| T5 | 112 | 0.83 | 0.501 | 0.086 | 24.6 | 0.0101 | 4.0 |
| **Average** | | **0.84** | **0.501** | **0.085** | **25.9** | **0.0099** | **4.5** |
| **Std. Dev.** | | **0.02** | **0.000** | **0.002** | **1.5** | **0.0038** | **0.9** |

**Lot 1, In-plane Shear Tests, 75 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (Msi) | $\tau_{12}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|
| CNC–002–103 | I10 | 1.004 | 0.114 | | 2.6 | 12.3 | |
| CNC–002–103 | I9 | 1.007 | 0.116 | | 2.6 | 11.9 | 706 |
| CNC–002–103 | I1 | 1.006 | 0.112 | | 3.0 | 12.0 | 789 |
| CNC–SRI–003 | I2 | 1.002 | 0.116 | | 2.6 | 11.9 | 748 |
| CNC–SRI–003 | I5 | 1.008 | 0.116 | | 2.8 | 12.1 | 816 |
| CNC–SRI–003 | I7 | 1.005 | 0.114 | | 2.8 | 12.0 | 739 |
| **Average** | | | | **0.74** | **2.7** | **12.0** | **754** |
| **Std. Dev.** | | | | **witness** | **0.2** | **0.2** | **41** |

**Lot 1, In-plane Shear Tests, 240 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\tau_{12}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|
| CNC–002–102A | 4R | 0.995 | 0.113 | 0.41 | 1749 | 7.7 | 512 |
| CNC–002–101B | 4R | 1.000 | 0.114 | 0.52 | 1425 | 9.1 | 429 |
| CNC–002–101B | 2R | 1.000 | 0.111 | 0.50 | 1873 | 7.4 | 450 |
| CNC–002–101C | 6H | 0.999 | 0.115 | 0.54 | 1845 | 7.0 | 429 |
| CNC–002–101C | 8H | 1.000 | 0.113 | 0.53 | 1603 | 8.0 | 460 |
| CNC–002–101D | 10 | 0.999 | 0.108 | 0.54 | 2017 | 8.0 | 526 |
| **Average** | | | | **0.50** | **1752** | **7.9** | **467** |
| **Std. Dev.** | | | | **0.05** | **211** | **0.7** | **42** |

**Lot 1, In-plane Shear Tests, 350 °F***

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\tau_{12}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|
| CNC–002–104 | I7 | 0.996 | 0.113 | 0.41 | 380 | 2.9 | 96 |
| CNC–002–103 | I5 | 1.001 | 0.113 | 0.38 | 776 | 3.7 | 117 |
| CNC–002–103 | I3 | 0.999 | 0.113 | 0.37 | 598 | 3.5 | 152 |
| CNC–002–101 | I9 | 1.002 | 0.113 | 0.43 | 374 | 4.0 | 83 |
| CNC–002–101 | I3 | 0.998 | 0.113 | 0.46 | 696 | 4.5 | 179 |
| CNC–002–101 | I1 | 1.002 | 0.113 | 0.43 | 396 | 3.6 | 85 |
| **Average** | | | | **0.41** | **537** | **3.7** | **119** |
| **Std. Dev.** | | | | **0.03** | **177** | **0.5** | **39** |

**Lot 1, In-plane Shear Tests, 350 °F***

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\tau_{12}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|
| CNC–002–102A | 5H | 1.000 | 0.113 | 0.41 | 291 | 1.7 | 75 |
| CNC–002–101B | 3R | 1.003 | 0.115 | 0.52 | 807 | 3.0 | 189 |
| CNC–002–101C | 2R | 1.002 | 0.111 | 0.54 | 580 | 2.3 | 137 |
| CNC–002–101C | 5H | 1.002 | 0.114 | 0.55 | 506 | 3.3 | 179 |
| CNC–002–101D | 6H | 1.000 | 0.113 | 0.55 | 284 | 3.7 | 93 |
| CNC–002–101D | 9H | 1.000 | 0.113 | 0.57 | 436 | 2.9 | 171 |
| **Average** | | | | **0.52** | **484** | **2.8** | **141** |
| **Std. Dev.** | | | | **0.06** | **197** | **0.7** | **48** |
| Overall Average | | | | | | 3.3 | 129.7 |
| Std. Dev. | | | | | | 0.7 | 43.2 |

**Lot 1, In-plane Shear Tests, 550 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\tau_{12}$ (psi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|
| CNC–002–104 | I3 | 0.998 | 0.113 | | | 718 | |
| CNC–002–104 | I5 | 0.999 | 0.112 | | 93 | 687 | 24 |
| CNC–002–102 | I3 | 0.998 | 0.111 | | 102 | 588 | 24 |
| CNC–002–102 | I5 | 1.000 | 0.111 | | 104 | 581 | 22 |
| CNC–002–101A | I3 | 1.000 | 0.114 | | 96 | 679 | 23 |
| CNC–002–101A | I5 | 0.998 | 0.113 | | 96 | 629 | 19 |
| **Average** | | | | **0.46** | **98** | **647** | **22** |
| **Std. Dev.** | | | | | **4** | **56** | **2** |

**Lot 1, In-plane Shear Tests 550 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\tau_{12}$ (psi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|
| CNC–002–102A | 8H | 0.999 | 0.111 | 0.41 | 99 | 556 | 22 |
| CNC–002–102A | 9H | 1.002 | 0.111 | 0.41 | 118 | 788 | 28 |
| CNC–002–101B | S1R | 1.002 | 0.107 | 0.46 | 136 | 743 | 31 |
| CNC–002–101B | 10 | 1.000 | 0.109 | 0.49 | 133 | 834 | 33 |
| CNC–002–101C | 10 | 0.999 | 0.109 | 0.54 | 149 | 866 | 40 |
| CNC–002–101D | 8H | 1.000 | 0.113 | 0.55 | 106 | 636 | 25 |
| **Average** | | | | **0.48** | **124** | **737** | **30** |
| **Std. Dev.** | | | | **0.06** | **19** | **120** | **6** |
| Overall Avg | | | | | | 692.0 | 26.4 |
| Std. Dev. | | | | | | 100.8 | 6.1 |

**Lot 1, In-plane Shear Tests, 350 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\nu_{xy}$ | $\tau_{12}$ (psi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| 102A | 2R | 1.001 | 0.112 | 0.35 | 1356 | 1.54 | 244 | 48 |
| 102A | 3R | 1.002 | 0.115 | 0.35 | 1255 | 1.83 | 262 | 46 |
| 101B | 8H | 1.001 | 0.116 | 0.44 | 1889 | 1.85 | 328 | 58 |
| 101B | 9H | 0.999 | 0.115 | 0.45 | 3337* | 2.27* | 584* | 89* |
| 101D | 2R | 0.999 | 0.114 | 0.46 | 2305 | 0.90 | 241 | 63 |
| 101D | 4R | 1.000 | 0.115 | 0.46 | 1109 | 1.16 | 153 | 35 |
| 101C | 3R | 1.001 | 0.116 | 0.45 | 1694 | 1.64 | 317 | 60 |
| 101C | 7H | 1.002 | 0.116 | 0.46 | 2754 | 0.88 | 348 | 93 |
| **Average** | | **1.001** | **0.115** | **0.43** | **1766** | **1.40** | **310** | **62** |
| **Std. Dev.** | | **0.001** | **0.001** | **0.05** | **598** | **0.42** | **127** | **20** |

**Lot 1, In-plane Shear Tests, 480 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $E_{xy}$ (ksi) | $\nu_{xy}$ | $\tau_{12}$ (psi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| 102A | 1R | 1.000 | 0.110 | 0.35 | 874 | 1.97 | 242 | 40.7 |
| 102A | 6H | 1.001 | 0.114 | 0.35 | 915 | 1.79 | 242 | 43.4 |
| 101B | 6H | 1.003 | 0.116 | 0.43 | 933 | 0.68 | 168 | 50.2 |
| 101B | 7H | 0.998 | 0.116 | 0.42 | 907 | 1.10 | 181 | 43.0 |
| 101C | 1R | 1.001 | 0.111 | 0.45 | 994 | 1.45 | 238 | 48.5 |
| 101C | 4R | 1.000 | 0.116 | 0.48 | 918 | 1.03 | 172 | 42.4 |
| 101D | 3R | 1.003 | 0.115 | 0.48 | 937 | | | |
| 101D | 5H | 1.000 | 0.116 | 0.48 | 917 | 1.27 | 186 | 40.9 |
| **Average** | | **1.001** | **0.114** | **0.43** | **924** | **1.33** | **204** | **44.2** |
| **Std. Dev.** | | **0.002** | **0.002** | **0.06** | **34** | **0.45** | **35** | **3.7** |

**Lot 2, In-Plane Shear, 75 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002–105 | 3r | 1.001 | 0.113 | | 13.6 | 0.86 | 2600 | 698 |
| CNC–002–105 | 1r | 1.001 | 0.108 | | 13.9 | 0.81 | 2610 | 722 |
| CNC–002–105 | 9h | 1.003 | 0.112 | | 14.7 | 0.78 | 2975 | 835 |
| CNC–002–105a | s1r | 1.000 | 0.109 | | 12.9 | 0.80 | 2918 | 809 |
| CNC–002–105a | s9h | 1.000 | 0.113 | | 11.7 | 0.83 | 2801 | 766 |
| CNC–002–106 | 4r | 1.000 | 0.114 | | 14.0 | 0.84 | 2909 | 790 |
| CNC–002–106 | 2r | 1.003 | 0.112 | | 14.1 | 0.75 | 2947 | 842 |
| CNC–002–106 | 10x | 1.002 | 0.110 | | 14.1 | 0.66 | 2579 | 777 |
| CNC–002–107 | 7h | 1.000 | 0.115 | | 12.7 | | | |
| CNC–002–107 | 4r | 1.001 | 0.115 | | 12.5 | 0.72 | 2547 | 741 |
| CNC–002–108 | 9h | 1.001 | 0.111 | | 13.4 | 0.85 | 2658 | 717 |
| CNC–002–108 | 7h | 1.002 | 0.114 | | 13.3 | 0.74 | 2671 | 768 |
| **Average** | | | | **0.45%** | **13.4** | **0.79** | **2762** | **770** |
| **Std. Dev.** | | | | | **0.8** | **0.06** | **166** | **45** |

**Lot 2, In-Plane Shear, 240 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002–105A | S2R | 1.000 | 0.112 | | 7.8 | 0.780 | 1253 | 352 |
| CNC–002–105 | 5H | 1.001 | 0.114 | | 8.3 | 0.828 | 2120 | 580 |
| CNC–002–105 | 7H | 1.001 | 0.115 | | 9.2 | 0.954 | 2027 | 518 |
| CNC–002–106 | 7H | 1.001 | 0.111 | | 8.4 | 0.978 | 1756 | 444 |
| CNC–002–106 | 9H | 1.000 | 0.111 | | 7.5 | 0.917 | 1592 | 415 |
| CNC–002–107 | 2R | 1.002 | 0.113 | | 8.0 | 0.939 | 1710 | 441 |
| CNC–002–107 | 6H | 1.000 | 0.115 | | 6.8 | 0.727 | 1245 | 360 |
| CNC–002–107 | 10X | 1.000 | 0.113 | | 6.7 | 0.839 | 1271 | 346 |
| CNC–002–108 | 8H | 1.000 | 0.114 | | 6.6 | 0.650 | 1186 | 359 |
| CNC–002–108 | 1R | 1.001 | 0.110 | | 8.7 | 0.418 | 1106 | 390 |
| CNC–002–108 | 3R | 1.000 | 0.114 | | 7.0 | 0.822 | 1405 | 385 |
| **Average** | | | | **0.43%** | **7.7** | **0.805** | **1515** | **417** |
| **Std. Dev.** | | | | | **0.9** | **0.163** | **349** | **75** |

**Lot 2, In-Plane Shear, 350 °F***

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| COC–002–108 | 2R | 1.000 | 0.113 | | 3.2 | 0.542 | 342 | 111 |
| COC–002–108 | 5H | 1.001 | 0.115 | | 2.7 | 0.778 | 239 | 67 |
| COC–002–108 | 6H | 1.001 | 0.115 | | 4.0 | 0.524 | 306 | 100 |
| COC–002–107 | 9H | 0.998 | 0.113 | | 2.4 | 0.635 | 238 | 73 |
| COC–002–106 | 8H | 0.995 | 0.113 | | 3.0 | 0.593 | 273 | 86 |
| COC–002–106 | 3R | 1.010 | 0.113 | | 4.6 | 0.914 | 440 | 115 |
| COC–002–106 | 1R | 1.000 | 0.105 | | 4.1 | 0.903 | 506 | 133 |
| COC–002–105 | 6H | 1.000 | 0.112 | | 2.6 | 0.493 | 238 | 80 |
| COC–002–105 | 4R | 1.000 | 0.112 | | 2.8 | 0.610 | 369 | 115 |
| COC–002–105A | S10 | 1.000 | 0.109 | | 2.1 | 0.342 | 222 | 83 |
| COC–002–105A | S3R | 1.000 | 0.112 | | 1.9 | 1.052 | 352 | 86 |
| **Average** | | | | | **3.0** | **0.672** | **320** | **95** |
| **Std. Dev.** | | | | | **0.8** | **0.214** | **92** | **21** |

**Lot 2, In-Plane Shear, 550 °F**

| Panel ID | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (psi) | $\nu_{xy}$ | Exx (ksi) | G12 (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002–105 | 2R | 1.000 | 0.113 | 0.46 | 800 | 1.06 | 190 | 46 |
| CNC–002–105 | 8H | 1.005 | 0.112 | 0.48 | 787 | 1.06 | 220 | 53 |
| CNC–002–105 | 10X | 1.003 | 0.110 | 0.45 | 803 | 1.00 | 124 | 31 |
| CNC–002–105A | S5H | 1.000 | 0.116 | 0.42 | 787 | 0.98 | 127 | 32 |
| CNC–002–105A | S6H | 0.997 | 0.116 | 0.41 | 758 | 0.87 | 134 | 36 |
| CNC–002–105A | S8H | 1.002 | 0.115 | 0.42 | 831 | 1.43 | 191 | 39 |
| CNC–002–106 | 5H | 0.999 | 0.113 | 0.41 | 808 | 1.45 | 208 | 43 |
| CNC–002–106 | 6H | 1.000 | 0.111 | 0.39 | 823 | 0.92 | 168 | 44 |
| CNC–002–107 | 1R | 1.000 | 0.111 | 0.39 | 805 | 0.75 | 135 | 38 |
| CNC–002–107 | 3R | 1.002 | 0.114 | 0.43 | 731 | 0.92 | 128 | 33 |
| CNC–002–108 | 4R | 0.998 | 0.113 | 0.40 | 736 | 1.12 | 193 | 46 |
| CNC–002–108 | 10X | 0.999 | 0.108 | 0.41 | 799 | 1.05 | 150 | 37 |
| **Average** | | | | **0.42** | **789** | **1.05** | **164** | **40** |
| **Std. Dev.** | | | | **0.03** | **32** | **0.21** | **35** | **7** |

**Lot 3, In-Plane Shear, 75 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002 | 109–005 | 1.001 | 0.119 | 0.34 | 12.6 | 0.78 | 2471 | 693 |
| CNC–002 | 109–007 | 1.001 | 0.117 | 0.34 | 13.3 | 0.81 | 2556 | 706 |
| CNC–002 | 109A–003 | 0.997 | 0.116 | 0.34 | 14.1 | 0.80 | 2439 | 677 |
| CNC–002 | 109A–009 | 1.000 | 0.115 | 0.34 | 14.1 | 0.78 | 2398 | 675 |
| CNC–002 | 110–002 | 1.002 | 0.115 | 0.36 | 13.2 | 0.89 | 2768 | 731 |
| CNC–002 | 110–005 | 1.001 | 0.116 | 0.34 | 13.4 | 0.78 | 2311 | 649 |
| CNC–002 | 110–009 | 1.000 | 0.116 | 0.36 | 13.2 | 0.79 | 2405 | 670 |
| CNC–002 | 111–004 | 1.001 | 0.116 | 0.36 | 14.1 | 0.77 | 2385 | 676 |
| CNC–002 | 111–010 | 1.002 | 0.114 | 0.35 | 14.0 | 0.79 | 2397 | 670 |
| CNC–002 | 112–002 | 1.002 | 0.113 | 0.35 | 14.9 | 0.88 | 2676 | 712 |
| CNC–002 | 112–006 | 1.001 | 0.117 | 0.34 | 14.3 | 0.85 | 2472 | 668 |
| CNC–002 | 112–007 | 1.001 | 0.116 | 0.34 | 14.5 | 0.83 | 2436 | 665 |
| **Average** | | | | | **13.8** | **0.81** | **2477** | **683** |
| **Std. Dev.** | | | | | **0.6** | **0.04** | **137** | **22** |

**Lot 3, In-Plane Shear, 240 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002 | 109–004 | 1.000 | 0.119 | 0.37 | 7.87 | 1.22 | 2090 | 470 |
| CNC–002 | 109–009 | 0.999 | 0.116 | 0.37 | 8.84 | 0.91 | 2129 | 558 |
| CNC–002 | 109–001 | 1.000 | 0.113 | 0.34 | 9.15 | 0.95 | 2460 | 630 |
| CNC–002 | 109A–005 | 1.001 | 0.117 | 0.37 | 8.42 | 0.83 | 1691 | 462 |
| CNC–002 | 109A–007 | 1.002 | 0.117 | 0.36 | 7.79 | 0.69 | 1286 | 381 |
| CNC–002 | 110–007 | 1.001 | 0.117 | 0.37 | 6.66 | 1.37 | 2616 | 552 |
| CNC–002 | 110–010 | 1.001 | 0.113 | 0.39 | | No Test | | |
| CNC–002 | 111–006 | 1.001 | 0.118 | 0.37 | 5.96* | * overheated | | |
| CNC–002 | 111–007 | 1.000 | 0.117 | 0.37 | 9.63 | 1.26 | 2806 | 620 |
| CNC–002 | 111–008 | 1.000 | 0.116 | 0.36 | 8.02 | 0.99 | 2283 | 573 |
| CNC–002 | 112–010 | 1.001 | 0.114 | 0.37 | 6.23 | 1.39 | 2454 | 513 |
| CNC–002 | 112–005 | 1.000 | 0.117 | 0.36 | | No Test | | |
| **Average** | | | | **0.37** | **8.1** | **1.07** | **2216** | **529** |
| **Std. Dev.** | | | | **0.01** | **1.0** | **0.25** | **504** | **76** |

**Lot 3, In-Plane Shear, 350 °F***

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002 | 109–005 | 1.001 | 0.119 | 0.34 | 12.6 | 0.78 | 2471 | 693 |
| CNC–002 | 109–007 | 1.001 | 0.117 | 0.34 | 13.3 | 0.81 | 2556 | 706 |
| CNC–002 | 109A–003 | 0.997 | 0.116 | 0.34 | 14.1 | 0.80 | 2439 | 677 |
| CNC–002 | 109A–009 | 1.000 | 0.115 | 0.34 | 14.1 | 0.78 | 2398 | 675 |
| CNC–002 | 110–002 | 1.002 | 0.115 | 0.36 | 13.2 | 0.89 | 2768 | 731 |
| CNC–002 | 110–005 | 1.001 | 0.116 | 0.34 | 13.4 | 0.78 | 2311 | 649 |
| CNC–002 | 110–009 | 1.000 | 0.116 | 0.36 | 13.2 | 0.79 | 2405 | 670 |
| CNC–002 | 111–004 | 1.001 | 0.116 | 0.36 | 14.1 | 0.77 | 2385 | 676 |
| CNC–002 | 111–010 | 1.002 | 0.114 | 0.35 | 14.0 | 0.79 | 2397 | 670 |
| CNC–002 | 112–002 | 1.002 | 0.113 | 0.35 | 14.9 | 0.88 | 2676 | 712 |
| CNC–002 | 112–006 | 1.001 | 0.117 | 0.34 | 14.3 | 0.85 | 2472 | 668 |
| CNC–002 | 112–007 | 1.001 | 0.116 | 0.34 | 14.5 | 0.83 | 2436 | 665 |
| **Average** | | | | **0.35** | **13.8** | **0.81** | **2477** | **683** |
| **Std. Dev.** | | | | **0.01** | **0.6** | **0.04** | **137** | **22** |

**Lot 3, In-Plane Shear, 550 °F**

| Panel | Spec. ID | Width (in.) | Thick. (in.) | Wt. Gain (%) | $\tau_{12}$ (ksi) | $\nu_{xy}$ | $E_{xx}$ (ksi) | $G_{12}$ (ksi) |
|---|---|---|---|---|---|---|---|---|
| CNC–002 | 109–006 | 1.000 | 0.116 | 0.36 | 0.79 | 0.67 | 116 | 86 |
| CNC–002 | 109–008 | 1.000 | 0.116 | 0.36 | 0.85 | 0.99 | 156 | 79 |
| CNC–002 | 109A–001 | 1.000 | 0.109 | 0.33 | 0.97 | 1.10 | 178 | 81 |
| CNC–002 | 109A–004 | 1.000 | 0.117 | 0.34 | 0.94 | 0.84 | 122 | 73 |
| CNC–002 | 109A–008 | 1.000 | 0.116 | 0.37 | 0.96 | 1.02 | 131 | 64 |
| CNC–002 | 110–004 | 1.000 | 0.113 | 0.37 | 0.96 | 0.89 | 134 | 75 |
| CNC–002 | 110–006 | 1.002 | 0.114 | 0.33 | 0.94 | 0.99 | 134 | 68 |
| CNC–002 | 111–001 | 1.000 | 0.111 | 0.33 | 0.98 | 0.92 | 150 | 81 |
| CNC–002 | 111–005 | 1.000 | 0.115 | 0.36 | 0.96 | 1.04 | 154 | 74 |
| CNC–002 | 112–001 | 1.001 | 0.109 | 0.33 | 0.96 | 1.54 | 268 | 87 |
| CNC–002 | 112–004 | 1.000 | 0.114 | 0.34 | 0.95 | 0.94 | 133 | 70 |
| CNC–002 | 112–009 | 1.000 | 0.113 | 0.35 | 0.94 | 0.87 | 130 | 74 |
| **Average** | | | | **0.35** | **0.93** | **0.99** | **154** | **76** |
| **Std. Dev.** | | | | **0.02** | **0.05** | **0.21** | **41** | **7** |

**Lot 1, Double Notch Shear, 72 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–103 | R1 | 0.68 | 6650 |
| CNC–003–104 | R5 | 0.73 | 6098 |
| CNC–003–101A | R5 | 0.72 | 7259 |
| CNC–003–101 | R3 | 0.70 | 6611 |
| CNC–003–103 | R3 | 0.72 | 7294 |
| CNC–003–101 | R1 | 0.67 | 7114 |
| **Average** | | **0.70** | **6838** |
| **Std. Dev.** | | **0.02** | **468** |

**Lot 1, Double Notch Shear, 240 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–101A | H5 | 0.75 | 3789 |
| CNC–003–104 | H5 | 0.74 | 4923 |
| CNC–003–101 | H7 | 0.73 | 3582 |
| CNC–003–101 | H3 | 0.73 | 4447 |
| CNC–003–101A | H3 | 0.72 | 4587 |
| CNC–003–104 | H3 | 0.72 | 4433 |
| **Average** | | **0.73** | **4294** |
| **Std. Dev.** | | **0.01** | **463** |

**Lot 1, Double Notch Shear, 350 °F***

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–103 | H3 | 0.73 | 1853 |
| CNC–003–101 | H5 | 0.72 | 1358 |
| CNC–003–103 | H5 | 0.73 | |
| CNC–003–101 | H9 | 0.72 | 1638 |
| CNC–003–104 | H9 | 0.73 | 1162 |
| CNC–003–101A | H9 | 0.72 | 1293 |
| **Average** | | **0.72** | **1461** |
| **Std. Dev.** | | **0.00** | **250** |

**Lot 1, Double Notch Shear, 600 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–101 | R9 | 0.71 | 182 |
| CNC–003–103 | R9 | 0.72 | 223 |
| CNC–003–104 | R9 | 0.72 | 211 |
| CNC–003–103 | R7 | 0.73 | 222 |
| CNC–003–104 | R7 | 0.72 | 177 |
| CNC–003–101A | R7 | 0.72 | |
| **Average** | | **0.72** | **203** |
| **Std. Dev.** | | **0.00** | **20** |

**Lot 1, Double Notch Shear, 350 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| 104 | R1–4 | 0.63 | 882 |
| 101A | R3–1A | 0.67 | 1024 |
| 104 | R3–4 | 0.66 | 927 |
| 101 | R5–1 | 0.66 | 1046 |
| 103 | R5–3 | 0.67 | 921 |
| 101 | R7–1 | 0.67 | 925 |
| **Average** | | **0.66** | **954** |
| **Std. Dev.** | | **0.02** | **65** |

**Lot 1, Double Notch Shear, 480 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| 104 | H7–4 | 0.67 | 312 |
| 101A | H7–1A | 0.67 | 302 |
| 103 | H7–3 | 0.66 | 333 |
| 104 | H1–4 | 0.64 | 323 |
| 101A | R9–1A | 0.67 | 356 |
| 101A | R1–1A | 0.67 | 385 |
| **Average** | | **0.66** | **335** |
| **Std. Dev.** | | **0.01** | **31** |

**Lot 2, Double Notch Shear, 72 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–105 | L1 | 0.64 | 6192 |
| CNC–003–105 | L11 | 0.68 | 6535 |
| CNC–003–105 | L16 | 0.76 | 6775 |
| Average | | 0.69 | 6501 |
| CNC–003–106 | 17 | 0.71 | 6932 |
| CNC–003–106 | 1 | 0.65 | 6251 |
| CNC–003–106 | 7 | 0.74 | 7436 |
| Average | | 0.70 | 6873 |
| CNC–003–107 | 9 | 0.78 | 7876 |
| CNC–003–107 | 19 | 0.77 | 7263 |
| CNC–003–107 | 4 | 0.70 | 7279 |
| Average | | 0.75 | 7473 |
| CNC–003–108 | 2 | 0.67 | 7316 |
| CNC–003–108 | 13 | 0.67 | 7654 |
| CNC–003–108 | 20 | 0.67 | 6360 |
| Average | | 0.67 | 7110 |
| **Lot Average** | | **0.70** | **6989** |
| **Std. Dev.** | | **0.05** | **566** |

**Lot 2, Double Notch Shear, 240 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–105 | L13 | 0.64 | 4235 |
| CNC–003–105 | L2 | 0.61 | 3843 |
| CNC–003–105 | L9 | 0.65 | 3850 |
| Average | | 0.63 | 3976 |
| CNC–003–106 | 2 | 0.61 | 3740 |
| CNC–003–106 | 19 | 0.65 | 3855 |
| CNC–003–106 | 9 | 0.65 | 4097 |
| Average | | 0.64 | 3897 |
| CNC–003–107 | 2 | 0.70 | 3677 |
| CNC–003–107 | 14 | 0.67 | 3783 |
| CNC–003–107 | 18 | 0.70 | 4119 |
| Average | | 0.69 | 3860 |
| CNC–003–108 | 4 | 0.70 | 3596 |
| CNC–003–108 | 6 | 0.71 | 3702 |
| CNC–003–108 | 12 | 0.64 | 3466 |
| Average | | 0.68 | 3588 |
| **Lot Average** | | **0.66** | **3830** |
| **Std. Dev.** | | **0.03** | **225** |

**Lot 2, Double Notch Shear, 350 °F***

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–105 | L3 | 0.59 | 2011 |
| CNC–003–105 | L6 | 0.63 | 1920 |
| CNC–003–105 | L18 | 0.61 | 1920 |
| Average | | 0.61 | 1950 |
| CNC–003–106 | 3 | 0.61 | 2171 |
| CNC–003–106 | 6 | 0.61 | 1981 |
| CNC–003–106 | 11 | 0.59 | 1583 |
| Average | | 0.60 | 1912 |
| CNC–003–107 | 1 | 0.62 | 1780 |
| CNC–003–107 | 12 | 0.61 | 1381 |
| CNC–003–107 | 20 | 0.61 | 1178 |
| Average | | 0.61 | 1446 |
| CNC–003–108 | 1 | 0.61 | 1616 |
| CNC–003–108 | 8 | 0.63 | 1791 |
| CNC–003–108 | 15 | 0.64 | 1538 |
| Average | | 0.63 | 1648 |
| **Lot Average** | | **0.61** | **1739** |
| **Std. Dev.** | | **0.02** | **288** |

**Lot 2, Double Notch Shear, 600 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–105 | L5 | 0.64 | 204 |
| CNC–003–105 | L10 | 0.64 | 252 |
| CNC–003–105 | L20 | 0.63 | 190 |
| Average | | 0.64 | 215 |
| CNC–003–106 | 4 | 0.65 | 251 |
| CNC–003–106 | 12 | 0.59 | 166 |
| CNC–003–106 | 20 | 0.63 | 179 |
| Average | | 0.62 | 199 |
| CNC–003–107 | 5 | 0.67 | 226 |
| CNC–003–107 | 10 | 0.65 | 217 |
| CNC–003–107 | 17 | 0.67 | 209 |
| Average | | 0.66 | 217 |
| CNC–003–108 | 5 | 0.66 | 176 |
| CNC–003–108 | 9 | 0.65 | 204 |
| CNC–003–108 | 16 | 0.66 | 221 |
| Average | | 0.65 | 200 |
| **Lot Average** | | **0.64** | **208** |
| **Std. Dev.** | | **0.02** | **28** |

**Lot 3, Double Notch Shear, 72 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–109 | L10 | 0.64 | 7136 |
| CNC–003–109 | L15 | 0.64 | 6370 |
| CNC–003–109 | L19 | 0.63 | 7349 |
| CNC–003–110 | L3 | 0.62 | 7472 |
| CNC–003–110 | L13 | 0.61 | 7986 |
| CNC–003–110 | L18 | 0.67 | 8238 |
| CNC–003–111 | L5 | 0.74 | 7335 |
| CNC–003–111 | L11 | 0.66 | 7249 |
| CNC–003–111 | L17 | 0.78 | 6290 |
| CNC–003–112 | L9 | 0.65 | 8121 |
| CNC–003–112 | L14 | 0.67 | 5851 |
| CNC–003–112 | L20 | 0.60 | 6921 |
| **Lot Average** | | **0.66** | **7193** |
| **Std. Dev.** | | **0.05** | **743** |

**Lot 3, Double Notch Shear, 240 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–109 | L1 | 0.60 | 4042 |
| CNC–003–109 | L6 | 0.63 | 3674 |
| CNC–003–109 | L11 | 0.60 | 4277 |
| CNC–003–110 | L2 | 0.61 | 4084 |
| CNC–003–110 | L7 | 0.63 | 4166 |
| CNC–003–110 | L12 | 0.59 | 4416 |
| CNC–003–111 | L4 | 0.70 | 3519 |
| CNC–003–111 | L9 | 0.70 | 3987 |
| CNC–003–111 | L14 | 0.72 | 3554 |
| CNC–003–112 | L5 | 0.61 | 4419 |
| CNC–003–112 | L10 | 0.58 | 4123 |
| CNC–003–112 | L15 | 0.60 | 4135 |
| **Lot Average** | | **0.63** | **4033** |
| **Std. Dev.** | | **0.05** | **304** |

**Lot 3, Double Notch Shear, 350 °F***

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–109 | L3 | 0.59 | 1748 |
| CNC–003–109 | L12 | 0.61 | 1870 |
| CNC–003–109 | L20 | 0.62 | 1514 |
| CNC–003–110 | L9 | 0.67 | 1414 |
| CNC–003–110 | L16 | 0.64 | 1140 |
| CNC–003–110 | L19 | 0.62 | 1367 |
| CNC–003–111 | L1 | 0.71 | 1647 |
| CNC–003–111 | L7 | 0.73 | 1367 |
| CNC–003–111 | L20 | 0.76 | 988 |
| CNC–003–112 | L2 | 0.59 | 1536 |
| CNC–003–112 | L7 | 0.62 | 1615 |
| CNC–003–112 | L18 | 0.66 | 1804 |
| **Lot Average** | | **0.65** | **1501** |
| **Std. Dev.** | | **0.06** | **263** |

**Lot 3, Double Notch Shear, 600 °F**

| Panel ID | Spec. | Wt. Gain (%) | $\tau_{13}$ (psi) |
|---|---|---|---|
| CNC–003–109 | L5 | 0.67 | 98 |
| CNC–003–109 | L9 | 0.68 | 140 |
| CNC–003–109 | L16 | 0.66 | 207 |
| CNC–003–110 | L4 | 0.66 | 119 |
| CNC–003–110 | L8 | 0.65 | 162 |
| CNC–003–110 | L17 | 0.64 | 184 |
| CNC–003–111 | L6 | 0.71 | 233 |
| CNC–003–111 | L13 | 0.70 | 202 |
| CNC–003–111 | L18 | 0.73 | 136 |
| CNC–003–112 | L4 | 0.62 | 186 |
| CNC–003–112 | L11 | 0.59 | 259 |
| CNC–003–112 | L16 | 0.61 | 210 |
| **Lot Average** | | **0.66** | **178** |
| **Std. Dev.** | | **0.04** | **48** |

**Lot 1, Edgewise Tension, SC350 Syntactic Core, ASTM D 638**

| Panel ID (73 °F) | Specimen | Stress (psi) | Modulus (ksi) | Specimen (350 °F) | Stress (psi) | Modulus (ksi) | Specimen (480 °F) | Stress (psi) | Modulus (ksi) |
|---|---|---|---|---|---|---|---|---|---|
| CNC-003-101 | R2 | 3749 | 404 | LT8 | 1779 | 218 | LT6 | 912 | 87 |
| CNC-003-101 | R7 | 3628 | 393 | TT13 | 2839 | 241 | LT9 | 813 | 74 |
| CNC-003-101 | R9 | 3291 | 445 | TT16 | 2356 | 237 | LT12 | 1218 | 111 |
| Panel Average | | 3556 | 414 | | 2324 | 232 | | 981 | 91 |
| CNC-003-103 | R1 | 4206 | 426 | LT7 | 3410 | 170 | LT2 | 1732 | 248 |
| CNC-003-103 | R5 | 4221 | 421 | TT10 | 2195 | 362 | TT5 | 1018 | 95 |
| CNC-003-103 | TT3 | 2922 | 418 | TT14 | 1874 | 304 | TT8 | 856 | 87 |
| Panel Average | | 3783 | 422 | | 2493 | 279 | | 1202 | 143 |
| CNC-004-103 | T2R | 4256 | 415 | T3R | 2392 | 337 | T3H | 1218 | 113 |
| CNC-004-103 | T6R | 3661 | 410 | T2H | 2792 | 407 | T15H | 1134 | 128 |
| CNC-004-103 | T74 | 3787 | 406 | T4H | 2765 | 305 | T14H | 1396 | 126 |
| Panel Average | | 3901 | 410 | | 2650 | 350 | | 1249 | 123 |
| CNC-003-104 | R8 | 3810 | 412 | LT5 | 2883 | 601 | LT6 | 1364 | 108 |
| CNC-003-104 | R12 | 3789 | 407 | TT13 | 2951 | 490 | TT8 | 1264 | 105 |
| CNC-003-104 | R16 | 3929 | 407 | TT15 | 2522 | 334 | TT10 | 1167 | 101 |
| Panel Average | | 3843 | 409 | | 2785 | 475 | | 1265 | 104 |
| **Lot Average** | | **3771** | **414** | **Lot Average** | **2563** | **334** | **Lot Average** | **1174** | **115** |
| **Std. Dev.** | | **386** | **13** | **Std. Dev.** | **471** | **121** | **Std. Dev.** | **258** | **45** |

**Lot 2, Edgewise Tension, SC350 Syntactic Core, ASTM D 638**

| Panel ID (73 °F) | Specimen | Stress (psi) | Modulus (ksi) | Specimen (350 °F) | Stress (psi) | Modulus (ksi) | Specimen (480 °F) | Stress (psi) | Modulus (ksi) |
|---|---|---|---|---|---|---|---|---|---|
| CNC-003-105 | T3R | 3851 | 443 | T13 | 2966 | 303 | T6 | 1499 | 150.3 |
| CNC-003-105 | T5R | 3550 | 458 | T15 | 2691 | 210 | T11 | 1299 | 105.6 |
| CNC-003-105 | T7R | 4044 | 450 | T3 | 3604 | 260 | T10 | 1429 | 109.9 |
| | | | | | | | T1 | 1544 | 134.4 |
| Panel Average | | 3815 | 450 | | 3087 | 258 | | 1443 | 125.1 |
| CNC-004-106 | T1R | 2780 | 422 | T10 | 2189 | 349 | T16 | 1298 | 113.5 |
| CNC-004-106 | T3R | 3514 | 446 | T12 | 2706 | 260 | T15 | 1399 | 95.3 |
| CNC-004-106 | T5R | 2891 | 440 | T3 | 1970 | 283 | T5 | 1132 | 112.2 |
| CNC-004-106 | T6R | 2415 | 443 | T17 | 3342 | 235 | T8 | 1208 | 89.3 |
| Panel Average | | 2900 | 438 | | 2552 | 282 | | 1259 | 102.6 |
| CNC-003-107 | T1R | 4243 | 430 | T13 | 2575 | 227 | T12 | 1490 | 116.7 |
| CNC-003-107 | T3R | 3198 | 445 | T16 | 2401 | 256 | T3 | 1587 | 140.4 |
| CNC-003-107 | T5R | 3619 | 438 | T9 | 3150 | 239 | T5 | 1285 | 104.1 |
| CNC-003-107 | T6R | 3513 | 458 | T7 | 3155 | 286 | T8 | 1266 | 129.4 |
| Panel Average | | 3643 | 443 | | 2820 | 252 | | 1407 | 122.7 |
| CNC-003-108 | T1R | 3735 | 465 | T1 | 2371 | 299 | T8 | 893 | 85.7 |
| CNC-003-108 | T2R | 3842 | 457 | T10 | 2098 | 448 | T5 | 843 | 77.1 |
| CNC-003-108 | T5R | 3412 | 447 | T11 | 2010 | 263 | T2 | 821 | 123.7 |
| CNC-003-108 | T7R | 3191 | 457 | T13 | 2133 | 374 | T14 | 851 | 72.6 |
| Panel Average | | 3545 | 457 | | 2153 | 346 | | 852 | 89.8 |
| **Lot Average** | | **3453** | **447** | **Lot Average** | **2624** | **286** | **Lot Average** | **1240** | **110.0** |
| **Std. Dev.** | | **492** | **12** | **Std. Dev.** | **520** | **63** | **Std. Dev.** | **262** | **22.4** |

**Lot 3, Edgewise Tension, SC350 Syntactic Core, ASTM D 638**

| Panel ID (73 °F) | Specimen | Stress (psi) | Modulus (ksi) | Specimen (350 °F) | Stress (psi) | Modulus (ksi) | Specimen (480 °F) | Stress (psi) | Modulus (ksi) |
|---|---|---|---|---|---|---|---|---|---|
| CNC-003-109 | 2 | 3725 | 381 | 1 | 1515 | 128 | 6 | 1126 | 115 |
| CNC-003-109 | 9 | 3601 | 398 | 3 | 2541 | 157 | 7 | 1017 | 92 |
| CNC-003-109 | 12 | 3817 | 381 | 5 | 2210 | 125 | 8 | 1022 | 92 |
| Panel Average | | 3715 | 387 | | 2088 | 137 | | 1055 | 100 |
| CNC-003-110 | 1 | 4107 | 405 | 2 | 2439 | 185 | 3 | 1730 | 139 |
| CNC-003-110 | 10 | 2921 | 382 | 9 | 2854 | 187 | 6 | 1527 | 139 |
| CNC-003-110 | 11 | 3758 | 405 | 13 | 2490 | 190 | 7 | 1504 | 156 |
| Panel Average | | 3595 | 398 | | 2594 | 187 | | 1587 | 145 |
| CNC-003-111 | 6 | 2845 | 387 | 4 | 2224 | 162 | 2 | 1133 | 117 |
| CNC-003-111 | 9 | 3598 | 386 | 7 | 1838 | 138 | 8 | 953 | 94 |
| CNC-003-111 | 12 | 3493 | 374 | 13 | 1688 | 125 | 10 | 1027 | 110 |
| Panel Average | | 3312 | 383 | | 1917 | 142 | | 1038 | 107 |
| CNC-003-112 | 2 | 4013 | 376 | 8 | 2589 | 184 | 3 | 1227 | 135 |
| CNC-003-112 | 5 | 4373 | 397 | 9 | 2543 | 180 | 4 | 1186 | 124 |
| CNC-003-112 | 12 | 4212 | 385 | 13 | 2513 | 211 | 10 | 1294 | 133 |
| Panel Average | | 4199 | 386 | | 2549 | 192 | | 1236 | 131 |
| **Lot Average** | | **3705** | **388** | **Lot Average** | **2287** | **164** | **Lot Average** | **1229** | **121** |
| **Std. Dev.** | | **467** | **11** | **Std. Dev.** | **407** | **29** | **Std. Dev.** | **242** | **21** |

**Lot 1, SC350 Syntactic Core, ASTM C 273 Core Shear**

| Panel ID (73 °F) | Specimen | Stress (psi) | Specimen (350 °F) | Stress (psi) | Specimen (480 °F) | Stress (psi) |
|---|---|---|---|---|---|---|
| CNC-003-101 | 2 | 4703 | 1 | 2868 | 5 | 751 |
| CNC-003-101 | 15 | 4591 | 16 | 2961 | 7 | 761 |
| CNC-003-101 | 20 | 4384 | 19 | 2953 | 12 | 750 |
| CNC-003-101 | 24 | 4499 | 6 | 2823 | 17 | 750 |
| Panel Average | | 4544 | Panel Average | 2901 | Panel Average | 753 |
| CNC-003-102 | 1 | 5043 | 8 | 3157 | 5 | 764 |
| CNC-003-102 | 4 | 4693 | 9 | 3179 | 7 | 779 |
| CNC-003-102 | 12 | 4848 | 10 | 3060 | 16 | 686 |
| CNC-003-102 | 19 | 4852 | 15 | 3025 | 18 | 719 |
| Panel Average | | 4859 | Panel Average | 3105 | Panel Average | 737 |
| CNC-004-103 | X8 | 4632 | X3 | 3031 | X6 | 697 |
| CNC-004-103 | X9 | 4753 | X11 | 2934 | X24 | 738 |
| CNC-004-103 | X10 | 4710 | X12 | 2882 | X25 | 739 |
| CNC-004-103 | X17 | 4798 | X21 | 2866 | X23 | 736 |
| Panel Average | | 4723 | Panel Average | 2928 | Panel Average | 727 |
| **Lot Average** | | **4709** | **Lot Average** | **2978** | **Lot Average** | **739** |
| **Std. Dev.** | | **173** | **Std. Dev.** | **115** | **St. Dev.** | **27** |

**Lot 2, SC350 Syntactic Core, ASTM C 273 Core Shear**

| Panel ID (73 °F) | Specimen | Stress (psi) | Specimen (350 °F) | Stress (psi) | Specimen (480 °F) | Stress (psi) |
|---|---|---|---|---|---|---|
| CNC-004-105 | 13 | 4685 | 15 | 2922 | 14 | 743 |
| CNC-004-105 | 16 | 4503 | 21 | 2892 | 18 | 755 |
| CNC-004-105 | 19 | 4561 | 25 | 2893 | 20 | 731 |
| CNC-004-105 | 35 | 4377 | 38 | 2747 | 26 | 727 |
| Panel Average | | 4532 | Panel Average | 2864 | Panel Average | 739 |
| CNC-004-106 | 3 | 4575 | 5 | 2934 | 8 | 754 |
| CNC-004-106 | 11 | 4267 | 17 | 2602 | 20 | 718 |
| CNC-004-106 | 23 | 4552 | 32 | 2768 | 22 | 782 |
| CNC-004-106 | 39 | 4804 | 36 | 2897 | 37 | 723 |
| Panel Average | | 4550 | Panel Average | 2800 | Panel Average | 744 |
| CNC-003-108 | 2 | 4470 | 11 | 2848 | 1 | 799 |
| CNC-003-108 | 6 | 4919 | 15 | 3043 | 9 | 797 |
| CNC-003-108 | 10 | 4602 | 16 | 2899 | 12 | 769 |
| CNC-003-108 | 23 | 4194 | 24 | 3162 | 20 | 818 |
| Panel Average | | 4546 | Panel Average | 2988 | Panel Average | 796 |
| **Lot Average** | | **4542** | **Lot Average** | **2884** | **Lot Average** | **760** |
| **Std. Dev.** | | **206** | **Std. Dev.** | **141** | **Std. Dev.** | **33** |

**Lot 3, SC350 Syntactic Core, ASTM C 273 Core Shear**

| Panel ID (73 °F) | Specimen | Stress (psi) | Specimen (350 °F) | Stress (psi) | Specimen (480 °F) | Stress (psi) |
|---|---|---|---|---|---|---|
| CNC-003-109 | 1 | 3802 | 2 | 2469 | 3 | 789 |
| CNC-003-109 | 4 | 4671 | 12 | 2725 | 6 | 803 |
| CNC-003-109 | 7 | 3599 | 9 | 2741 | 8 | 800 |
| Panel Average | | 4024 | Panel Average | 2645 | Panel Average | 797 |
| CNC-003-110 | 1 | 3946 | 2 | 2694 | 3 | 759 |
| CNC-003-110 | 4 | 3888 | 5 | 2122 | 6 | 797 |
| CNC-003-110 | 7 | 3633 | 9 | 2727 | 8 | 766 |
| Panel Average | | 3822 | Panel Average | 2514 | Panel Average | 774 |
| CNC-003-111 | 1 | 4577 | 2 | 2665 | 3 | 769 |
| CNC-003-111 | 4 | 4022 | 5 | 2534 | 6 | 741 |
| CNC-003-111 | 7 | 4622 | 9 | 2914 | 8 | 780 |
| Panel Average | | 4407 | Panel Average | 2704 | Panel Average | 763 |
| CNC-003-112 | 1 | 4278 | 2 | 2736 | 3 | 808 |
| CNC-003-112 | 4 | 4455 | 5 | 2889 | 6 | 867 |
| CNC-003-112 | 7 | 4142 | 9 | 2867 | 8 | 795 |
| Panel Average | | 4292 | Panel Average | 2831 | Panel Average | 823 |
| **Lot Average** | | **4136** | **Lot Average** | **2674** | **Lot Average** | **790** |
| **Std. Dev.** | | **382** | **Std. Dev.** | **218** | **Std. Dev.** | **32** |

**Lot 1, SC350 Syntactic Core, ASTM C365 Flatwise Compression**

| Panel ID (73 °F) | Specimen | Stress (ksi) | Specimen (350 °F) | Stress (ksi) | Specimen (480 °F) | Stress (ksi) |
|---|---|---|---|---|---|---|
| CNC-003-102 | C1 | 9.9 | C4 | 5.9 | C7 | 1.7 |
| CNC-003-102 | C2 | 10.2 | C5 | 5.5 | C8 | 1.7 |
| CNC-003-102 | C3 | 10.3 | C6 | 5.6 | C9 | 1.6 |
| Panel Average | | 10.1 | Panel Average | 5.7 | Panel Average | 1.7 |
| CNC-004-101 | C1 | 10.0 | C4 | 8.5 | C7 | 1.8 |
| CNC-004-101 | C2 | 10.5 | C5 | 7.7 | C8 | 1.7 |
| CNC-004-101 | C3 | 10.1 | C6 | 7.3 | C9 | 1.7 |
| Panel Average | | 10.2 | Panel Average | 7.8 | Panel Average | 1.7 |
| CNC-004-102 | C1 | 10.5 | C4 | 7.4 | C7 | 1.7 |
| CNC-004-102 | C2 | 10.6 | C5 | 7.1 | C8 | 1.7 |
| CNC-004-102 | C3 | 10.4 | C6 | 7.0 | C9 | 1.6 |
| Panel Average | | 10.5 | Panel Average | 7.2 | Panel Average | 1.7 |
| CNC-004-104 | C1 | 10.7 | C4 | 6.2 | C7 | 1.7 |
| CNC-004-104 | C2 | 10.6 | C5 | 6.3 | C8 | 1.7 |
| CNC-004-104 | C3 | 10.7 | C6 | 6.1 | C9 | 1.7 |
| Panel Average | | 10.7 | Panel Average | 6.2 | Panel Average | 1.7 |
| **Lot Average** | | **10.4** | **Lot Average** | **6.8** | **Lot Average** | **1.7** |
| **Std. Dev.** | | **0.28** | **Std. Dev.** | **0.93** | **Std. Dev.** | **0.05** |

**Lot 2, SC350 Syntactic Core, ASTM C365 Flatwise Compression**

| Panel ID (73 °F) | Specimen | Stress (ksi) | Specimen (350 °F) | Stress (ksi) | Specimen (480 °F) | Stress (ksi) |
|---|---|---|---|---|---|---|
| CNC-004-105 | C1 | 9.3 | C3 | 5.7 | C5 | 2.0 |
| CNC-004-105 | C2 | 9.5 | C6 | 6.0 | C7 | 1.9 |
| CNC-004-105 | C3 | 9.5 | C8 | 6.2 | C9 | 1.9 |
| Panel Average | | 9.4 | Panel Average | 6.0 | Panel Average | 2.0 |
| CNC-004-106 | C6 | 9.6 | C2 | 5.8 | C1 | 1.7 |
| CNC-004-106 | C9 | 9.5 | C5 | 5.7 | C4 | 1.6 |
| CNC-004-106 | C18 | 8.9 | C7 | 5.6 | C8 | 1.6 |
| Panel Average | | 9.3 | Panel Average | 5.7 | Panel Average | 1.6 |
| CNC-004-107 | C5 | 9.8 | C1 | 5.8 | C4 | 1.7 |
| CNC-004-107 | C7 | 9.9 | C2 | 5.8 | C6 | 1.6 |
| CNC-004-107 | C8 | 9.9 | C3 | 5.7 | C9 | 1.6 |
| Panel Average | | 9.9 | Panel Average | 5.7 | Panel Average | 1.7 |
| CNC-004-108 | C5 | 9.8 | C2 | 5.7 | C1 | 1.6 |
| CNC-004-108 | C6 | 9.7 | C3 | 5.6 | C4 | 1.5 |
| CNC-004-108 | C9 | 9.6 | C8 | 5.7 | C18 | 1.8 |
| Panel Average | | 9.7 | Panel Average | 5.7 | Panel Average | 1.6 |
| **Lot Average** | | **9.6** | **Lot Average** | **5.8** | **Lot Average** | **1.7** |
| **Std. Dev.** | | **0.28** | **Std. Dev.** | **0.17** | **Std. Dev.** | **0.16** |

**Lot 3, SC350 Syntactic Core, ASTM C365 Flatwise Compression**

| Panel ID (73 °F) | Specimen | Stress (ksi) | Specimen (350 °F) | Stress (ksi) | Specimen (480 °F) | Stress (ksi) |
|---|---|---|---|---|---|---|
| CNC-004-109 | C2 | 9.4 | C3 | 5.6 | C5 | 1.8 |
| CNC-004-109 | C6 | 9.5 | C4 | 5.5 | C8 | 1.9 |
| CNC-004-109 | C17 | 9.7 | C10 | 5.6 | C9 | 1.9 |
| Panel Average | | 9.5 | Panel Average | 5.6 | Panel Average | 1.9 |
| CNC-004-110 | C7 | 9.7 | C1 | 5.5 | C2 | 2.0 |
| CNC-004-110 | C8 | 9.8 | C6 | 5.5 | C5 | 2.2 |
| CNC-004-110 | C20 | 9.7 | C18 | 5.6 | C19 | 2.1 |
| Panel Average | | 9.7 | Panel Average | 5.5 | Panel Average | 2.1 |
| CNC-004-111 | C1 | 9.1 | C7 | 5.4 | C3 | 2.3 |
| CNC-004-111 | C8 | 9.2 | C19 | 5.5 | C6 | 2.3 |
| CNC-004-111 | C18 | 9.3 | C20 | 5.6 | C10 | 2.5 |
| Panel Average | | 9.2 | Panel Average | 5.5 | Panel Average | 2.4 |
| CNC-004-112 | C4 | 9.4 | C2 | 5.7 | C1 | 2.6 |
| CNC-004-112 | C8 | 9.3 | C9 | 5.4 | C5 | 2.4 |
| CNC-004-112 | C18 | 9.1 | C10 | 5.5 | C19 | 2.5 |
| Panel Average | | 9.3 | Panel Average | 5.6 | Panel Average | 2.5 |
| **Lot Average** | | **9.4** | **Lot Average** | **5.5** | **Lot Average** | **2.2** |
| **Std. Dev.** | | **0.23** | **Std. Dev.** | **0.09** | **Std. Dev.** | **0.26** |

**Sandwich Tensile, 0° Orientation, RT**

| Sample ID | Width (in.) | Thickness (in.) | Failure Load (lb) | Modulus (psi) | Load/Width (lb/in.) | Load/(w*e) (lb/in.) |
|---|---|---|---|---|---|---|
| 101–0–004 | 0.757 | 0.497 | 13014 | 3429804 | 17191 | 1702898 |
| 104–0–002 | 0.756 | 0.468 | 13009 | 3667120 | 17219 | 1716212 |
| 104–0–003 | 0.753 | 0.461 | 12304 | 3552874 | 16350 | 1637875 |
| 104–0–004 | 0.754 | 0.497 | 13503 | 3568009 | 17920 | 1771516 |
| 105–0–002 | 0.753 | 0.497 | 12593 | 3471012 | 16724 | 1723358 |
| 105–0–004 | 0.753 | 0.488 | 12974 | 3511563 | 17230 | 1713643 |
| 106–0–002 | 0.754 | 0.500 | 12778 | 3419733 | 16947 | 1709867 |
| 106–0–003 | 0.752 | 0.496 | 13064 | 3498891 | 17372 | 1735450 |
| 106–0–004 | 0.751 | 0.481 | 12676 | 3797304 | 16878 | 1826503 |
| **Average** | **0.754** | **0.487** | **12879** | **3546257** | **17093** | **1726369** |
| **Std. Dev.** | **0.002** | **0.014** | **341** | **120845** | **442** | **51328** |
| **COV** | **0.24** | **2.90** | **2.65** | **3.41** | **2.58** | **2.97** |

**Sandwich Tensile, 45° Orientation RT**

| Sample ID | Width (in.) | Thickness (in.) | Failure Load (lb) | Modulus (psi) | Load/Width (lb/in.) | Load/(w*e) (lb/in.) |
|---|---|---|---|---|---|---|
| 102–45–001 | 0.755 | 0.440 | 8948 | 2487896 | 11852 | 1094674 |
| 102–45–003 | 0.757 | 0.443 | 8298 | 2365328 | 10969 | 1047840 |
| 103–45–004 | 0.752 | 0.504 | 8174 | 2113245 | 10870 | 1065076 |
| 104–45–002 | 0.754 | 0.495 | 9009 | 2159283 | 11949 | 1068845 |
| 104–45–003 | 0.751 | 0.495 | 8982 | 2216761 | 11961 | 1097297 |
| 105–45–001 | 0.751 | 0.490 | 8485 | 2239293 | 11298 | 1097254 |
| 105–45–004 | 0.754 | 0.490 | 8867 | 2310426 | 11767 | 1132109 |
| 106–45–001 | 0.755 | 0.470 | 8427 | 2290242 | 11168 | 1075268 |
| 106–45–004 | 0.750 | 0.477 | 8345 | 2232825 | 11127 | 1065058 |
| **Average** | **0.753** | **0.478** | **8615** | **2268367** | **11440** | **1082602** |
| **Std. Dev.** | **0.002** | **0.023** | **333** | **112125** | **439** | **25233** |
| **COV** | **0.29** | **4.84** | **3.86** | **4.94** | **3.84** | **2.33** |

**Prototype 1 Sandwich Tensile Test Data, RT**

| Sample ID | Width (in.) | Thickness (in.) | Failure Load (lb) | Load/Strain (lb/in./in.) | Load/Width (lb/in.) | Load/(w*e) (lb/in.) |
|---|---|---|---|---|---|---|
| P1–2 | 0.753 | 0.499 | 13598 | 1265308 | 18059 | 1680356 |
| P1–5 | 0.753 | 0.511 | 12128 | 1217557 | 16117 | 1618016 |
| P1–6 | 0.753 | | 12424 | 1291994 | 16499 | 1715796 |
| P1–7 | 0.753 | 0.501 | 11618 | 1227986 | 15429 | 1630792 |
| P1–10 | 0.754 | 0.496 | 12108 | 1185712 | 16069 | 1573606 |
| P1–3 | 0.753 | 0.497 | 12935 | 1138491 | 17178 | 1511940 |
| **Average** | **0.753** | **0.501** | **12468** | **1221175** | **16558** | **1621751** |
| **Std. Dev.** | **0.000** | **0.006** | **702** | **54985** | **933** | **73145** |

**Sandwich Tensile, 45° Orientation, 350 °F**

| Sample ID | Width (in.) | Thickness (in.) | Failure Load (lb) | Load/Strain (lb/in./in.) | Load/Width (lb/in.) | Load/(w*e) (lb/in.) |
|---|---|---|---|---|---|---|
| 101–45–3 | 0.752 | 0.471 | 8106 | 554423 | 10779 | 737265 |
| 101–45–4 | 0.753 | 0.470 | 6737 | 466663 | 8947 | 619739 |
| 102–45–2 | 0.752 | 0.450 | 6548 | 528952 | 8707 | 703394 |
| 102–45–4 | 0.753 | 0.453 | 6955 | 797607 | 9236 | 1059239 |
| 103–45–1 | 0.753 | 0.511 | 6968 | 534739 | 9254 | 710145 |
| 103–45–3 | 0.753 | 0.511 | 5687 | 439417 | 7552 | 583554 |
| 105–45–2 | 0.754 | 0.493 | 7362 | 661386 | 9764 | 877170 |
| 105–45–3 | 0.753 | 0.492 | 7972 | 594771 | 10587 | 789868 |
| **Average** | **0.753** | **0.481** | **7042** | **572245** | **9353** | **760047** |
| **Std. Dev.** | **0.001** | **0.024** | **782** | **114412** | **1040** | **151741** |

**Sandwich Tensile, 0° Orientation, 350 °F**

| Sample ID | Width (in.) | Thickness (in.) | Failure Load (lb) | Load/Strain (lb/in./in.) | Load/Width (lb/in.) | Load/(w*e) (lb/in.) |
|---|---|---|---|---|---|---|
| 103–0–1 | 0.752 | 0.501 | 10449 | 851560 | 13895 | 1132394 |
| 103–0–3 | 0.752 | 0.502 | 9812 | 837100 | 13048 | 1113165 |
| 103–0–4 | 0.754 | 0.509 | 11301 | 1523266 | 14988 | 2020246 |
| 104–0–1 | 0.752 | | 10705 | 1045805 | 14235 | 1390698 |
| 105–0–1 | 0.752 | 0.504 | 12609 | 1422213 | 16767 | 1891240 |
| 105–0–3 | 0.752 | 0.493 | 13226 | 1170846 | 17588 | 1556976 |
| 106–0–1 | 0.753 | 0.510 | 12943 | 1019407 | 17189 | 1353794 |
| **Average** | **0.752** | **0.503** | **11578** | **1124314** | **15387** | **1494073** |
| **Std. Dev.** | **0.001** | **0.006** | **1346** | **265872** | **1788** | **352331** |

**Sandwich Open Hole Tensile, 0° Orientation, RT**

| Specimen ID | Thickness (in.) | Width (in.) | Load (lb) | Load/W (lb/in.) |
|---|---|---|---|---|
| 003–101 | 0.5400 | 2.0020 | 21770 | 10874 |
| 001–102 | 0.5335 | 2.0000 | 22120 | 11060 |
| 006–104 | 0.4925 | 2.0000 | 22280 | 11140 |
| 006–102 | 0.4480 | 2.0010 | 22270 | 11129 |
| 002–101 | 0.5445 | 2.0000 | 19990 | 9995 |
| 006–103 | 0.5065 | 2.0005 | 21490 | 10742 |
| 001–103 | 0.5075 | 2.0000 | 21080 | 10540 |
| 004–104 | 0.4915 | 2.0000 | 22000 | 11000 |
| **Average** | | | **21625** | **10810** |
| **Std. Dev.** | | | **778** | **388** |
| **COV** | | | **3.6** | **3.6** |

**Sandwich Open Hole Tensile, 0° Orientation, 350 °F**

| Specimen ID | Thickness (in.) | Width (in.) | Load (lb) | Load/W (lb/in.) |
|---|---|---|---|---|
| 004–101 | 0.5435 | 2.0025 | 21310 | 10642 |
| 001–101 | 0.5415 | 1.9700 | 20920 | 10619 |
| 003–102 | 0.4655 | 2.0000 | 21800 | 10900 |
| 002–102 | 0.4925 | 2.0000 | 23470 | 11735 |
| 002–103 | 0.4795 | 2.0010 | 22890 | 11439 |
| 007–103 | 0.5070 | 2.0010 | 21400 | 10695 |
| 001–104 | 0.4740 | 2.0020 | 22770 | 11374 |
| 007–104 | 0.4945 | 2.0015 | 23240 | 11611 |
| **Average** | | | **22225** | **11127** |
| **Std. Dev.** | | | **980** | **462** |
| **COV** | | | **4.4** | **4.2** |

**Sandwich Edgewise Compression, 0° Orientation, RT**

| Sample ID | Load/Strain (lb/in./in.) | Load (lb) |
|---|---|---|
| 102–0–3 | | 14747 |
| 104–0–1 | 1640106 | 18911 |
| 104–0–4 | 1586622 | 17301 |
| 105–0–1 | 1506313 | 14323 |
| 105–0–2 | 1613693 | 18469 |
| 104–0–2 | 1390522 | 16112 |
| 106–0–4 | 1645158 | 16115 |
| 106–0–2 | 1498876 | 18880 |
| 102–0–4 | 1532672 | 17736 |
| **Average** | **1551745** | **16955** |
| **Std. Dev.** | **86853** | **1724** |
| **COV** | **5.6** | **10.2** |

**Sandwich Edgewise Compression, 45° Orientation, RT**

| Sample ID | Load/Strain (lb/in./in.) | Load (lb) |
|---|---|---|
| 106–45–? | 993763 | 15919 |
| 106–45–4 | 1096642 | 15299 |
| 103–45–4 | | 12755 |
| 104–45–4 | | 13813 |
| 105–45–2 | 1101670 | 16112 |
| 102–45–3 | 1021147 | 16288 |
| 104–45–4 | 1063715 | 13813 |
| **Average** | **1055388** | **14857** |
| **Std. Dev.** | **47126** | **1387** |
| **COV** | **4.5** | **9.3** |

**Sandwich Edgewise Compression, 0° Orientation, 350 °F**

| Sample ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/Width (lb/in.) |
|---|---|---|---|---|
| 005–102–0–002 | 0.487 | 1.002 | 9909 | 9889 |
| 005–101–0–002 | 0.476 | 1.001 | 9857 | 9847 |
| 005–105–0–003 | 0.495 | 1.001 | 10414 | 10404 |
| 005–103–0–004 | 0.485 | 1.000 | 9161 | 9161 |
| 005–102–0–001 | 0.474 | 1.001 | 12452 | 12440 |
| 005–103–0–002 | 0.504 | 1.000 | 9150 | 9150 |
| 005–101–0–004 | 0.514 | 1.002 | 12062 | 12038 |
| 005–105–0–004 | 0.501 | 1.000 | 10163 | 10163 |
| **Average** | | | **10396** | **10386** |
| **Std. Dev.** | | | **1234** | **1228** |

**Sandwich Edgewise Compression, 45° Orientation, 350 °F**

| Sample ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) |
|---|---|---|---|---|
| 005–102–45–001 | 0.504 | 1.002 | 9959 | 9939 |
| 005–102–45–004 | 0.458 | 1.001 | 8344 | 8336 |
| 005–101–45–004 | 0.476 | 1.000 | 8060 | 8060 |
| 005–105–45–004 | 0.489 | 1.000 | 9611 | 9611 |
| 005–103–45–001 | 0.494 | 1.003 | 7918 | 7894 |
| 005–103–45–002 | 0.502 | 1.001 | 7767 | 7759 |
| 005–101–45–002 | 0.475 | 1.000 | 7091 | 7091 |
| 005–105–45–003 | 0.490 | 1.002 | 9113 | 9095 |
| **Average** | | | **8483** | **8473** |
| **Std. Dev.** | | | **987** | **984** |

**Prototype Edgewise Compression, RT**

| Sample ID | Width (in.) | Thickness (in.) | Failure Load (lb) | Load/W (lb/in.) | Load/Strain (lb/in./in.) |
|---|---|---|---|---|---|
| Proto1 | 1.004 | 0.499 | 13875 | 13820 | 1590813 |
| Proto3 | 0.997 | 0.486 | 15967 | 16015 | 1630209 |
| Proto4 | 1.001 | 0.507 | 16884 | 16867 | 1435746 |
| Proto6 | 0.999 | 0.492 | 11810 | 11822 | 1733069 |
| Proto7 | 0.999 | 0.492 | 17277 | 17294 | 1509699 |
| **Average** | **1.000** | **0.495** | **15163** | **15164** | **1579907** |
| **Std. Dev.** | **0.003** | **0.008** | **2290** | **2299** | **113819** |
| **COV** | **0.3** | **1.6** | **15.1** | **15.2** | **7.2** |

**Prototype Edgewise Compression, 350 °F**

| | | | | | |
|---|---|---|---|---|---|
| P1–350 | 0.498 | 1.002 | 10374 | 20831 | |
| P2–350 | 0.503 | 1.003 | 10486 | 20847 | |

**Sandwich Edgewise Compression, 0° Orientation, RT, Post 6–Mo Beach Exposure**

| Specimen ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) | Exposure | Coating |
|---|---|---|---|---|---|---|
| 007–107A–1 | 0.497 | 1.007 | 16416 | 16302 | Post beach | Hypalon |
| 007–107A–2 | 0.495 | 1.003 | 17643 | 17590 | Post beach | Hypalon |
| 007–107A–5 | 0.489 | 1.006 | 18956 | 18843 | Post beach | Hypalon |
| 007–114A–1 | 0.497 | 1.003 | 16109 | 16061 | Post beach | Hypalon |
| 007–114A–3 | 0.499 | 1.012 | 19176 | 18949 | Post beach | Hypalon |
| 007–114A–4 | 0.498 | 1.003 | 15757 | 15710 | Post beach | Hypalon |
| 007–111B–4 | 0.493 | 1.006 | 17742 | 17636 | Post beach | None |
| 007–111B–5 | 0.492 | 1.004 | 18070 | 17998 | Post beach | None |
| 007–111B–6 | 0.484 | 1.007 | 17294 | 17174 | Post beach | None |
| 007–112B–1 | 0.492 | 1.004 | 16353 | 16288 | Post beach | None |
| 007–112B–2 | 0.491 | 1.002 | 15923 | 15891 | Post beach | None |
| 007–112B–5 | 0.490 | 1.004 | 14768 | 14709 | Post beach | None |
| **Average** | | | **17017** | **16929** | | |
| **Std. Dev.** | | | **1348** | **1312** | | |
| **COV** | | | **7.9** | **7.7** | | |
| **Ratio Hypalon Strength Over Bare** | | | | **1.04** | | |

**Sandwich Edgewise Compression, 0° Orientation, 350 °F, Post 6–Mo Beach Exposure**

| Specimen ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) | Exposure | Coating |
|---|---|---|---|---|---|---|
| 007–114A–2 | 0.497 | 1.005 | 9926 | 9877 | Post beach | Hypalon |
| 007–114A–5 | 0.498 | 1.005 | 9731 | 9683 | Post beach | Hypalon |
| 007–114A–6 | 0.497 | 1.003 | 10191 | 10161 | Post beach | Hypalon |
| 007–107A–3 | 0.492 | 1.001 | 8413 | 8405 | Post beach | Hypalon |
| 007–107A–4 | 0.488 | 1.003 | 7031 | 7010 | Post beach | Hypalon |
| 007–107A–6 | 0.495 | 1.003 | 9250 | 9222 | Post beach | Hypalon |
| 007–111B–1 | 0.490 | 1.005 | 9674 | 9626 | Post beach | None |
| 007–111B–2 | 0.488 | 1.004 | 10079 | 10039 | Post beach | None |
| 007–111B–3 | 0.488 | 1.001 | 8344 | 8336 | Post beach | None |
| 007–112B–3 | 0.493 | 1.008 | 8497 | 8430 | Post beach | None |
| 007–112B–4 | 0.496 | 1.003 | 9492 | 9464 | Post beach | None |
| 007–112B–6 | 0.494 | 1.004 | 7699 | 7668 | Post beach | None |
| **Average** | | | **9027** | **8993** | | |
| **Std. Dev.** | | | **1015** | **1008** | | |
| **COV** | | | **11.2** | **11.2** | | |
| **Ratio Hypalon Strength Over Bare** | | | **1.01** | **1.01** | | |

**Sandwich Edgewise Compression, 0° Orientation, RT, Post Hot Gas Test**

| Specimen ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) | Exposure | Coating |
|---|---|---|---|---|---|---|
| 007–122A–1 | 0.509 | 1.002 | 15016 | 14986 | Post IHGF | Hypalon |
| 007–122A–2 | 0.512 | 1.000 | 15299 | 15299 | Post IHGF | Hypalon |
| 007–112B–4 | 0.532 | 1.001 | 13713 | 13699 | Post IHGF | Hypalon |
| 007–112B–3 | 0.530 | 1.001 | 15368 | 15353 | Post IHGF | Hypalon |
| 007–104B–3 | 0.462 | 0.998 | 12976 | 13002 | Post IHGF | None |
| 007–104B–4 | 0.462 | 0.999 | 14716 | 14731 | Post IHGF | None |
| 007–120B–5 | 0.487 | 1.000 | 16416 | 16416 | Post IHGF | None |
| 007–120B–6 | 0.487 | 0.999 | 15089 | 15104 | Post IHGF | None |
| **Average** | | | **14824** | **14824** | | |
| **Std. Dev.** | | | **1057** | **1051** | | |
| **COV** | | | **7.1** | **7.1** | | |
| **Ratio Hypalon Strength Over Bare** | | | | **1.00** | | |

**Sandwich Edgewise Compression, 0° Orientation, RT, Effect of Delam on First Ply**

| | | | | | | |
|---|---|---|---|---|---|---|
| 007–120B–1 | 0.477 | 0.999 | 14461 | 14475 | Post IHGF | None |
| 007–120B–2 | 0.475 | 1.009 | 14937 | 14804 | Post IHGF | None |

**Sandwich Edgewise Compression, 0° Orientation, 350 °F, Post Hot Gas Test**

| Specimen ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) | Exposure | Coating |
|---|---|---|---|---|---|---|
| 007–104B–1 | 0.464 | 1.000 | 8695 | 8695 | Post IHGF | None |
| 007–104B–2 | 0.463 | 1.004 | 9760 | 9721 | Post IHGF | None |
| 007–122A–3 | 0.513 | 1.003 | 10284 | 10253 | Post IHGF | Hypalon |
| 007–122A–4 | 0.511 | 1.005 | 9812 | 9763 | Post IHGF | Hypalon |
| 007–112B–1 | 0.544 | 0.996 | 11221 | 11266 | Post IHGF | Hypalon |
| 007–112B–2 | 0.541 | 1.000 | 11914 | 11914 | Post IHGF | Hypalon |
| 007–120B–3 | 0.491 | 1.000 | 7813 | 7813 | Post IHGF | None |
| 007–120B–4 | 0.489 | 1.000 | 7254 | 7254 | Post IHGF | None |
| **Average** | | | **9594** | **9585** | | |
| **Std. Dev.** | | | **1605** | **1609** | | |
| **COV** | | | **16.7** | **16.8** | | |
| **Ratio Hypalon Strength Over Bare** | | | | **1.29** | | |

**Open Hole Compression, 0° Orientation, RT**

| Specimen ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) |
|---|---|---|---|---|
| 101–001 | 0.548 | 1.000 | 11056 | 11056 |
| 101–004 | 0.545 | 1.001 | 10491 | 10481 |
| 102–005 | 0.520 | 1.000 | 10536 | 10536 |
| 102–006 | 0.514 | 1.001 | 10780 | 10769 |
| 103–007 | 0.493 | 1.002 | 10480 | 10459 |
| 103–008 | 0.493 | 1.003 | 10594 | 10562 |
| 104–004 | 0.465 | 1.004 | 10491 | 10449 |
| 104–006 | 0.473 | 1.000 | 10408 | 10408 |
| **Average** | | | **10605** | **10590** |
| **Std. Dev.** | | | **214** | **219** |
| **COV** | | | **2.0** | **2.1** |

**Open Hole Compression, 0° Orientation, 350 °F**

| Specimen ID | Thickness (in.) | Width (in.) | Failure Load (lb) | Load/W (lb/in.) |
|---|---|---|---|---|
| 101–002 | 0.546 | 1.002 | 6889 | 6875 |
| 101–005 | 0.547 | 1.005 | 6493 | 6461 |
| 102–003 | 0.531 | 1.000 | 6668 | 6668 |
| 102–004 | 0.524 | 1.002 | 6679 | 6666 |
| 103–005 | 0.486 | 1.003 | 6548 | 6528 |
| 103–003 | 0.473 | 1.001 | 6017 | 6011 |
| 104–005 | 0.468 | 1.002 | 6727 | 6714 |
| 104–007 | 0.476 | 1.002 | 7299 | 7284 |
| **Average** | | | **6665** | **6651** |
| **Std. Dev.** | | | **362** | **362** |
| **COV** | | | **5.4** | **5.4** |

**Sandwich Flatwise Tensile, ASTM C 297, RT**

| Panel ID | Sample ID | Width (in.) | Width (in.) | Thickness (in.) | Load (lb) | Stress (psi) |
|---|---|---|---|---|---|---|
| 006–102 | FWT–001 | 1.996 | 1.993 | 0.548 | 9780 | 2459 |
| 006–102 | FWT–002 | 1.997 | 1.995 | 0.462 | 9303 | 2335 |
| 006–102 | FWT–004 | 1.986 | 1.996 | 0.534 | 9507 | 2398 |
| 006–102 | FWT–005 | 1.996 | 1.995 | 0.529 | 9614 | 2414 |
| 006–102 | FWT–009 | 1.995 | 1.996 | 0.538 | 9892 | 2484 |
| 006–102 | FWT–010 | 1.994 | 1.995 | 0.543 | 8159 | 2051 |
| 006–103 | FWT–004 | 1.996 | 1.997 | 0.488 | 8097 | 2031 |
| 006–103 | FWT–006 | 1.997 | 1.996 | 0.502 | 8444 | 2118 |
| 006–103 | FWT–008 | 1.997 | 1.995 | 0.488 | 7892 | 1981 |
| 006–103 | FWT–010 | 1.997 | 1.996 | 0.477 | 6680 | 1676 |
| 006–103 | FWT–011 | 1.997 | 1.994 | 0.504 | 8228 | 2066 |
| 006–104 | FWT–001 | 1.995 | 1.995 | 0.490 | 6336 | 1592 |
| 006–104 | FWT–002 | 1.996 | 1.994 | 0.488 | 8193 | 2059 |
| 006–104 | FWT–003 | 1.994 | 1.995 | 0.491 | 10890 | 2738 |
| 006–104 | FWT–005 | 1.998 | 1.994 | 0.499 | 9234 | 2318 |
| 006–104 | FWT–006 | 1.992 | 1.984 | 0.497 | 7546 | 1909 |
| **Average** | | | | | **8612** | **2164** |
| **Std. Dev.** | | | | | **1218** | **306** |
| **A–Basis** | | | | | | **1104** |

**Sandwich Flatwise Tensile, ASTM C 297, 350 °F**

| Panel ID | Sample ID | Width (in.) | Width (in.) | Thickness (in.) | Load (lb) | Stress (psi) |
|---|---|---|---|---|---|---|
| 006–101 | FWT–010 | 1.987 | 1.995 | 0.534 | 3022 | 762 |
| 006–102 | FWT–002 | 1.994 | 1.986 | 0.532 | 3540 | 894 |
| 006–102 | FWT–006 | 1.997 | 1.992 | 0.512 | 3612 | 908 |
| 006–102 | FWT–011 | 1.997 | 1.997 | 0.544 | 4013 | 1006 |
| 006–103 | FWT–001 | 1.996 | 1.996 | 0.453 | 2558 | 642 |
| 006–103 | FWT–009 | 1.997 | 1.998 | 0.487 | 3920 | 982 |
| 006–104 | FWT–004 | 1.998 | 1.994 | 0.484 | 3876 | 973 |
| 006–104 | FWT–011 | 1.994 | 1.986 | 0.490 | 3893 | 983 |
| **Average** | | | | | **3554** | **894** |
| **Std. Dev.** | | | | | **513** | **128** |

**Compression After Impact, Tested at RT**

| Panel ID | Sample ID | Impact E (ft-lb) | Failure Load (lb) |
|---|---|---|---|
| CAI–0–006 | 101–004 | 0.0 | 65995 |
| CAI–0–006 | 102–004 | 0.0 | 69035 |
| CAI–0–006 | 101–006 | 0.0 | 70510 |
| CAI–0–006 | 104–004 | 5.1 | 52956 |
| CAI–0–006 | 103–001 | 9.7 | 40163 |
| CAI–0–006 | 102–002 | 9.7 | 40201 |
| CAI–0–006 | 103–003 | 9.5 | 44068 |
| CAI–0–006 | 102–001 | 19.6 | 34724 |
| CAI–0–006 | 103–006 | 19.8 | 31860 |
| CAI–0–006 | 103–005 | 19.9 | 32694 |
| CAI–0–006 | 104–001 | 29.4 | 30812 |
| CAI–0–006 | 104–003 | 30.1 | 33080 |
| CAI–0–006 | 104–002 | 29.9 | 32797 |

**Compression After Impact, Tested at 350 °F**

| Panel ID | Sample ID | Impact E (ft-lb) | Failure Load (lb) |
|---|---|---|---|
| CAI–0–006 | 102–006 | 0.0 | 33780 |
| CAI–0–006 | 102–005 | 0.0 | 29875 |
| CAI–0–006 | 101–001 | 9.7 | 27972 |
| CAI–0–006 | 103–004 | 9.5 | 27807 |
| CAI–0–006 | 103–002 | 9.4 | 31388 |
| CAI–0–006 | 102–003 | 18.1 | 23970 |
| CAI–0–006 | 101–002 | 20.0 | 23578 |
| CAI–0–006 | 101–005 | 20.4 | 23291 |
| CAI–0–006 | 104–006 | 23.5 | 24408 |
| CAI–0–006 | 104–005 | 30.3 | 25739 |
| CAI–0–006 | 101–003 | 29.9 | 23560 |

**Sandwich Double-Lap Shear Bearing Test, 0° Orientation, RT**

| Sample ID | Load at 4% (lb) | Max Load (lb) | Inflection Point (lb) | Load/Disp (lb/in.) |
|---|---|---|---|---|
| 106–0–1 | 5200 | 6358 | 5500 | 531703 |
| 103–0–3 | 5300 | 6666 | 5700 | 686328 |
| 104–0–2 | 4600 | 6639 | 5100 | 438216 |
| 102–0–2 | 4200 | 6892 | 5600 | 422076 |
| 101–0–2 | | 6157 | 5200 | |
| 103–0–2 | 4400 | 6150 | 5000 | 452715 |
| 105–0–1 | 5400 | 6557 | 5500 | 551972 |
| 102–0–1 | 4700 | 6690 | 5000 | 489842 |
| **Average** | **4829** | **6514** | **5325** | **510408** |
| **Std. Dev.** | **472** | **267** | **282** | **91191** |
| **COV** | **9.8** | **4.1** | **5.3** | **17.9** |

**Sandwich Double-Lap Shear Bearing Test, 45° Orientation, RT**

| Sample ID | Load at 4% (lb) | Max Load (lb) | Inflection Point (lb) | Load/Disp (lb/in.) |
|---|---|---|---|---|
| 105–45–3 | 4400 | 6437 | 5900 | 422055 |
| 104–45–3 | 4100 | 6737 | 5500 | 425018 |
| 106–45–2 | 5400 | 6647 | 6200 | 553614 |
| 102–45–2 | 3600 | 6330 | 5900 | 363489 |
| 106–45–1 | 4100 | 6352 | 5900 | 420216 |
| 105–45–1 | 4000 | 6557 | 5900 | 377145 |
| **Average** | **4267** | **6510** | **5883** | **426923** |
| **Std. Dev.** | **612** | **164** | **223** | **67267** |

**Sandwich Double-Lap Shear Bearing, RT**
**0° Orientation**

| Sample ID | Bearing Load (lb) |
|---|---|
| 104–0–3 | 4059 |
| 105–0–3 | 3566 |
| 101–0–3 | 3437 |
| 105–0–3 | 3650 |
| 103–0–1 | 3366 |
| **Average** | **3616** |
| **Std. Dev.** | **271** |

**Sandwich Double-Lap Shear Bearing, RT**
**45° Orientation**

| Sample ID | Bearing Load (lb) |
|---|---|
| 45–3–5101 | 3290 |
| 45–3–5102 | 3592 |
| 45–3–5103 | 3798 |
| 45–2–5105 | 3780 |
| 45–1–5103 | 3637 |
| 45–4–5102 | 3399 |
| 45–4–5105 | 3635 |
| 45–4–5101 | 2895 |
| **Average** | **3503** |
| **Std. Dev.** | **301** |

**Sandwich Double-Lap Shear Bearing, 480 °F,**
**0° Orientation**

| Sample ID | Bearing Load (lb) |
|---|---|
| 005–102–001 | 1991 |
| 005–106–001 | 2784 |
| 005–101–002 | 1722 |
| 005–103–002 | 1777 |
| 005–103A–002 | 2372 |
| 005–106–002 | 2041 |
| 005–104–001 | 1965 |
| **Average** | **2093** |
| **Std. Dev.** | **370** |

**Sandwich Double-Lap Shear Bearing, 480 °F,**
**45° Orientation**

| Sample ID | Bearing Load (lb) |
|---|---|
| 005–103–002 | 2000 |
| 005–101–002 | 1998 |
| 005–101–001 | 1782 |
| 005–104–001 | 1990 |
| 005–104–004 | 1765 |
| 005–106–004 | 2412 |
| 005–106–003 | 2375 |
| 005–106–001 | 2420 |
| **Average** | **2093** |
| **Std. dev** | **273** |

**Sandwich Single-Lap Shear Bearing, 0° Orientation**

| Test Temp | Sample ID | Hole End Thickness | Grip End Thickness | Build–Up From 0.4590 | Doubled Thickness | Max Load (lbf) | Bearing Stress (psi) |
|---|---|---|---|---|---|---|---|
| Ambient | 001–104 | 0.4835 | 0.4715 | 0.0125 | 0.9430 | 8699 | 71967 |
| | 002–104 | 0.4795 | 0.4930 | 0.0340 | 0.9860 | 9716 | 81051 |
| * | 001–105 | 0.4900 | 0.5020 | 0.0430 | 1.0040 | 7657 | 62506 |
| * | 003–105 | 0.4915 | 0.4995 | 0.0405 | 0.9990 | 7147 | 58165 |
| | **Average** | **0.4815** | **0.4823** | **0.0233** | **0.9645** | **9208** | **76509** |
| | **Std. Dev.** | **0.0028** | **0.0152** | **0.0152** | **0.0304** | **719** | **6423** |
| *These samples were tested with different bolts and are not included in the averages. | | | | | | | |
| 350 °F | 001–103 | 0.5125 | 0.4835 | 0.0245 | 0.9670 | 8018 | 62580 |
| | 002–103 | 0.5125 | 0.4860 | 0.0270 | 0.9720 | 8196 | 63969 |
| | 003–104 | 0.4965 | 0.4845 | 0.0255 | 0.9690 | 8851 | 71307 |
| | **Average** | **0.5072** | **0.4847** | **0.0257** | **0.9693** | **8355** | **65952** |
| | **Std. Dev.** | **0.0092** | **0.0013** | **0.0013** | **0.0025** | **439** | **4690** |

**Sandwich Single-Lap Shear Bearing, 45° Orientation**

| Test Temp | Sample ID | Hole End Thickness | Grip End Thickness | Build–Up From 0.4590 | Doubled Thickness | Max Load (lbf) | Bearing Stress (psi) |
|---|---|---|---|---|---|---|---|
| Ambient | 003–102 | 0.4960 | 0.4650 | 0.0060 | 0.930 | 7908 | 63774 |
| | 001–104 | 0.4865 | 0.4895 | 0.0305 | 0.979 | 8366 | 68785 |
| | 004–104 | 0.4720 | 0.4950 | 0.0360 | 0.990 | 8916 | 75559 |
| | 003–105 | 0.4945 | 0.4940 | 0.0350 | 0.988 | 8657 | 70026 |
| | 003–106 | 0.4955 | 0.4880 | 0.0290 | 0.976 | 8450 | 68214 |
| | **Average** | **0.4871** | **0.4916** | **0.0326** | **0.9833** | **8597** | **70646** |
| | **Std. Dev.** | **0.0109** | **0.0034** | **0.0034** | **0.0068** | **245** | **3362** |
| 350° | 002–104 | 0.4860 | 0.4990 | 0.0400 | 0.998 | 7785 | 64074 |
| | 003–104 | 0.4830 | 0.4865 | 0.0275 | 0.973 | 6416 | 53135 |
| | 001–106 | 0.5130 | 0.4820 | 0.0230 | 0.964 | 7359 | 57380 |
| | **Average** | **0.4940** | **0.4892** | **0.0302** | **0.9783** | **7187** | **58196** |
| | **Std. Dev.** | **0.0165** | **0.0088** | **0.0088** | **0.0176** | **701** | **5515** |

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Mechanical property characterization was performed on AS4/3501–6 graphite/epoxy and SC350G syntactic foam for the SRB Composite Nose Cap Shuttle Upgrades Project. Lamina level properties for the graphite/epoxy were determined at room temperature, 240 °F, 350 °F, 480 °F, 600 °F, and 350 °F after a cycle to 600 °F. Graphite/epoxy samples were moisture conditioned prior to testing. The syntactic foam material was tested at room temperature, 350 °F, and 480 °F. A high-temperature test facility was developed at MSFC. Testing was performed with quartz lamp heaters and high resistance heater strips. The thermal history profile of the nose cap was simulated in order to test materials at various times during launch. A correlation study was performed with Southern Research Institute to confirm the test methodology and validity of test results. A-basis allowables were generated from the results of testing on three lots of material.

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