



WICHITA STATE
UNIVERSITY
NATIONAL INSTITUTE
FOR AVIATION RESEARCH

Report No: CAM-RP-2019-057 Rev -
Report Date: July 16, 2025



Hexcel Hexply® 8552S AS4 GP 3k 8HS fabric with 38% RC Qualification Material Property Data Report

NCAMP Project Number: NPN 021801

NCAMP Test Report Number: CAM-RP-2019-057 Rev -

Report Date: July 16th, 2025

Testing Facility:

National Institute for Aviation Research
Wichita State University
1845 N. Fairmount
Wichita, KS 67260-0093

Test Panel Fabrication Facility:

Spirit AeroSystems
3801 S Oliver St.
Wichita, KS, 67210

Distribution Statement A. Approved for public release; distribution is unlimited.



Prepared by:

Michelle Man

Reviewed by:

Royal Lovingfoss

Approved by: *See form 289-3*

Ric Abbott (NCAMP AER)

REVISIONS:

Rev	By	Date	Pages Revised or Added
-	Michelle Man	3/16/2022	Document Initial Release
-	Michelle Man	7/16/2025	Quasi references to OHC1 and FHC1 was removed.

TABLE OF CONTENTS

1.	Introduction.....	7
1.1	Scope	7
1.2	Symbols Used	8
1.3	NIAR–Specimen Naming Format	10
1.4	References	11
1.5	Methodology	12
1.5.1	Process Definition.....	12
1.5.2	Specimen & Testing Details	13
1.5.2.1	Tabbing	13
1.5.2.2	Specimen Dimensions & Test Configuration	13
1.5.2.3	Specimen Strain Device Used	14
1.5.3	Test Matrix.....	15
1.5.4	Cured Laminate Physical Testing	19
1.5.5	Environmental Conditioning.....	20
1.5.6	Non-ambient Testing	21
1.5.7	Fluid Sensitivity Screening	22
1.5.8	Normalization Procedures	24
1.5.9	Inspection Verification	24
1.5.10	Material Pedigree Information	24
2.	Test Results.....	25
2.1	Lamina Level Test Summary	25
2.2	Laminate Level Test Summary	26
2.3	Individual Test Summaries	27
2.3.1	Warp Tension Properties (WT)	27
2.3.2	Fill Tension Properties (FT)	28
2.3.3	Warp Compression Properties (WC)	29
2.3.4	Fill Compression Properties (FC)	30
2.3.5	In-Plane Shear Properties (IPS)	31
2.3.6	“25/50/25” Unnotched Tension 1 Properties (UNT1)	32
2.3.7	“10/80/10” Unnotched Tension 2 Properties (UNT2)	33
2.3.8	“40/20/40” Unnotched Tension 3 Properties (UNT3)	34
2.3.9	“25/50/25” Unnotched Compression 1 Properties (UNC1)	35
2.3.10	“10/80/10” Unnotched Compression 2 Properties (UNC2)	36
2.3.11	“40/20/40” Unnotched Compression 3 Properties (UNC3)	37
2.3.12	Lamina Short-Beam Strength Properties (SBS)	38
2.3.13	Laminate Short-Beam Strength Properties (SBS1)	39
2.3.14	“25/50/25” Open-Hole Tension 1 Properties (OHT1)	40
2.3.15	“10/80/10” Open-Hole Tension 2 Properties (OHT2)	41
2.3.16	“40/20/40” Open-Hole Tension 3 Properties (OHT3)	42
2.3.17	“25/50/25” Filled-Hole Tension 1 Properties (FHT1)	43
2.3.18	“10/80/10” Filled-Hole Tension 2 Properties (FHT2)	44
2.3.19	“40/20/40” Filled-Hole Tension 3 Properties (FHT3)	45
2.3.20	Laminate Open-Hole Compression 1 Properties (OHC1)	46
2.3.21	“10/80/10” Open-Hole Compression 2 Properties (OHC2)	47

2.3.22	"40/20/40" Open-Hole Compression 3 Properties (OHC3)	48
2.3.23	Laminate Filled-Hole Compression 1 Properties (FHC1)	49
2.3.24	"10/80/10" Filled-Hole Compression 2 Properties (FHC2)	50
2.3.25	"40/20/40" Filled-Hole Compression 3 Properties (FHC3)	51
2.3.26	"25/50/25" Single-Shear Bearing 1 Properties (SSB1)	52
2.3.27	"10/80/10" Single-Shear Bearing 2 Properties (SSB2)	53
2.3.28	"40/20/40" Single-Shear Bearing 3 Properties (SSB3)	54
2.3.29	"25/50/25" Compression After Impact 1 Properties (CAI1)	55
2.3.30	Interlaminar Tension Properties (ILT)	56
3.	Individual Test Charts	57
3.1	Warp Tension Properties (WT)	58
3.2	Fill Tension Properties (FT)	59
3.3	Warp Compression Properties (WC)	60
3.4	Fill Compression Properties (FC)	61
3.5	In-Plane Shear Properties (IPS)	62
3.6	"25/50/25" Unnotched Tension 1 Properties (UNT1)	64
3.7	"10/80/10" Unnotched Tension 2 Properties (UNT2)	65
3.8	"40/20/40" Unnotched Tension 3 Properties (UNT3)	66
3.9	"25/50/25" Unnotched Compression 1 Properties (UNC1)	67
3.10	"10/80/10" Unnotched Compression 2 Properties (UNC2)	68
3.11	"40/20/40" Unnotched Compression 3 Properties (UNC3)	69
3.12	Lamina Short-Beam Strength Properties (SBS)	70
3.13	Laminate Short-Beam Strength Properties (SBS1)	70
3.14	"25/50/25" Open-Hole Tension 1 Properties (OHT1)	71
3.15	"10/80/10" Open-Hole Tension 2 Properties (OHT2)	71
3.16	"40/20/40" Open-Hole Tension 3 Properties (OHT3)	72
3.17	"25/50/25" Filled-Hole Tension 1 Properties (FHT1)	72
3.18	"10/80/10" Filled-Hole Tension 2 Properties (FHT2)	73
3.19	"40/20/40" Filled-Hole Tension 3 Properties (FHT3)	73
3.20	Laminate Open-Hole Compression 1 Properties (OHC1)	74
3.21	"10/80/10" Open-Hole Compression 2 Properties (OHC2)	74
3.22	"40/20/40" Open-Hole Compression 3 Properties (OHC3)	75
3.23	Laminate Filled-Hole Compression 1 Properties (FHC1)	75
3.24	"10/80/10" Filled-Hole Compression 2 Properties (FHC2)	76
3.25	"40/20/40" Filled-Hole Compression 3 Properties (FHC3)	76
3.26	"25/50/25" Single-Shear Bearing 1 Properties (SSB1)	77
3.27	"10/80/10" Single-Shear Bearing 2 Properties (SSB2)	78
3.28	"40/20/40" Single-Shear Bearing 3 Properties (SSB3)	79
3.29	"25/50/25" Compression After Impact 1 Properties (CAI1)	80
3.30	Interlaminar Tension Properties (ILT)	81
4.	Raw Data	82
4.1	Warp Tension Properties (WT)	82
4.2	Fill Tension Properties (FT)	88
4.3	Warp Compression Properties (WC)	94
4.4	Fill Compression Properties (FC)	102
4.5	In-Plane Shear Properties (IPS)	110

4.6	"25/50/25" Unnotched Tension 1 Properties (UNT1)	119
4.7	"10/80/10" Unnotched Tension 2 Properties (UNT2)	125
4.8	"40/20/40" Unnotched Tension 3 Properties (UNT3)	131
4.9	"25/50/25" Unnotched Compression 1 Properties (UNC1)	137
4.10	"10/80/10" Unnotched Compression 2 Properties (UNC2)	141
4.11	"40/20/40" Unnotched Compression 3 Properties (UNC3)	145
4.12	Lamina Short-Beam Strength Properties (SBS)	149
4.13	Laminate Short-Beam Strength Properties (SBS1)	157
4.14	"25/50/25" Open-Hole Tension 1 Properties (OHT1)	161
4.15	"10/80/10" Open-Hole Tension 2 Properties (OHT2)	167
4.16	"40/20/40" Open-Hole Tension 3 Properties (OHT3)	173
4.17	"25/50/25" Filled-Hole Tension 1 Properties (FHT1)	179
4.18	"10/80/10" Filled-Hole Tension 2 Properties (FHT2)	185
4.19	"40/20/40" Filled-Hole Tension 3 Properties (FHT3)	191
4.20	Laminate Open-Hole Compression 1 Properties (OHC1)	197
4.21	"10/80/10" Open-Hole Compression 2 Properties (OHC2)	201
4.22	"40/20/40" Open-Hole Compression 3 Properties (OHC3)	205
4.23	Laminate Filled-Hole Compression 1 Properties (FHC1)	209
4.24	"10/80/10" Filled-Hole Compression 2 Properties (FHC2)	213
4.25	"40/20/40" Filled-Hole Compression 3 Properties (FHC3)	217
4.26	"25/50/25" Single-Shear Bearing 1 Properties (SSB1)	221
4.27	"10/80/10" Single-Shear Bearing 2 Properties (SSB2)	225
4.28	"40/20/40" Single-Shear Bearing 3 Properties (SSB3)	229
4.29	"25/50/25" Compression After Impact 1 Properties (CAI1)	233
4.30	Interlaminar Tension Properties (ILT)	235
5.	Additional Compression After Impact Data	241
6.	Stress vs. Strain Curve	242
6.1	Warp Tension Properties (WT)	242
6.2	Warp Compression Properties (WC)	244
6.3	Fill Tension Properties (FT)	246
6.4	Fill Compression Properties (FC)	248
6.5	In-Plane Shear Properties (IPS)	250
6.6	"25/50/25" Unnotched Tension 1 Properties (UNT1)	252
6.7	"25/50/25" Unnotched Compression 1 Properties (UNC1)	254
7.	Fluid Sensitivity Comparison	255
7.1	Room Temperature Test Data	255
7.2	Elevated Temperature Test Data	258
7.3	Load Displacement Curves	261
8.	Moisture Conditioning Charts	265
8.1	Longitudinal Tension - Thinner Panel	265
8.2	Short-Beam Strength - Thicker Panel	266
9.	DMA Results	267
9.1	Dry DMA Data	267
9.2	Wet DMA Data	269
10.	Deviations	270

List of Tables

Table 1-1: Lamina Level Test Matrix	15
Table 1-2: Laminate Level Test Matrix	17
Table 1-3: Physical Testing Matrix	19
Table 1-4: Fluid Sensitivity Screening	23
Table 2-1: Lamina Summary Data	25
Table 2-2: Laminate Summary Data.....	26

List of Figures

Figure 1-1: Naming Format	10
Figure 1-2: Specimen Selection Methodology.....	12
Figure 1-3: Specimen Traceability Line	12

1. Introduction

1.1 Scope

The test methods and results described in this document are intended to provide basic composite properties essential to most methods of analysis and are consistent with CMH-17 Vol 1—Composite Materials Handbook for Polymer Matrix Composites. This report contains material property data of common usefulness to wide range of projects. The lamina and laminate material property data have been generated with NCAMP oversight in accordance with NSP 100 NCAMP Standard Operating Procedures; the test panels and test specimens have been inspected by NCAMP Authorized Inspection Representatives (AIR) and the testing has been witnessed by NCAMP Authorized Engineering Representatives (AER). However, the data may not fulfill all the needs of any specific company's program; specific properties, environments, laminate architecture, and loading situations may require additional testing.

The use of NCAMP material and process specifications does not guarantee material or structural performance. Material users should be actively involved in evaluating material performance and quality including, but not limited to, performing regular purchaser quality control tests, performing periodic equivalency/additional testing, participating in material change management activities, conducting statistical process control, and conducting regular supplier audits.

The applicability of NCAMP material property data, material allowables, and specifications must be evaluated on a case-by-case basis by aircraft companies and certifying agencies. NCAMP assumes no liability whatsoever, expressed or implied, related to the use of the material property data, material allowables, and specifications.

This report contains material property data only. Statistical analysis of the data including the calculations of b-basis values is given in a separate report, Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC Material Allowables Qualification Statistical Analysis Report NCP-RP-2019-013 Rev - . The qualification material was procured to NCAMP Material Specification NMS 128/4 Revision -, dated May 07, 2018. The qualification test panels were cured in accordance with NCAMP Process Specification NPS 81228 Revision B dated April 14, 2011 with Baseline "M" Cure Cycle. The NCAMP Test Plan NTP 1528Q1 was used for this qualification program.

Part fabricators that wish to utilize the material property data, allowables, and specifications may be able to do so by demonstrating the capability to reproduce the original material properties; a process known as equivalency. More information about this equivalency process including the test statistics and its limitations can be found in Section 6 of DOT/FAA/AR-03/19 and Section 8.4.1 of CMH-17 Vol 1. The applicability of equivalency process must be evaluated on program-by-program basis by the applicant and certifying agency. The applicant and certifying agency must agree that the equivalency test plan along with the equivalency process described in Section 6 of DOT/FAA/AR-03/19 and Section 8.4.1 of CMH-17 Vol 1 are adequate for the given

program.

Aircraft companies should not use the data published in this report without specifying NCAMP Material Specification NMS 128/4. NMS 128/4 may have additional requirements that are listed in its prepreg process control document (PCD), fiber specification, fiber PCD, and other raw material specifications and PCDs which impose essential quality controls on the raw materials and raw material manufacturing equipment and processes. *Aircraft companies and certifying agencies should assume that the material property data published in this report is not applicable when the material is not procured to NMS 128/4.* NMS 128/4 is a free, publicly available, non-proprietary aerospace industry material specification.

The data in this report is intended for general distribution to the public, either freely or at a price that does not exceed the cost of reproduction (e.g. printing) and distribution (e.g. postage).

1.2 Symbols Used

ν_{12}^t	major Poisson's ratio, tension
$\mu\epsilon$	micro-strain
E_1^c	compressive modulus, longitudinal / warp direction
E_1^t	tensile modulus, longitudinal / warp direction
E_2^c	compressive modulus, transverse / fill direction
E_2^t	tensile modulus, transverse / fill direction
F_1^{cu}	ultimate compressive strength, longitudinal / warp direction
F_1^{tu}	ultimate tensile strength, longitudinal / warp direction
F_2^{cu}	ultimate compressive strength, transverse / fill direction
F_2^{tu}	ultimate tensile strength, transverse / fill direction
ν_{12}^c	major Poisson's Ratio, compression
ν_{21}^c	minor Poisson's Ratio, compression
F_{12}^{su}	in-plane shear ultimate peak strength
F_{12}^{smax}	in-plane shear peak strength before 5% strain
$F_{12}^{s5\% \text{ strain}}$	in-plane shear strength at 5% strain
$F_{12}^{s0.2\%}$	in-plane shear strength at 0.2% offset
G_{12}^s	in-plane shear modulus

Superscripts

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

Subscripts

1	axis; longitudinal / warp direction (parallel to warp direction of reinforcement)
2	axis; transverse / fill direction (parallel to fill direction of reinforcement)
12	in-plane

Acronyms and Definitions

ASTM	American Society for Testing and Materials
B – Basis	95% lower confidence limit on the tenth population percentile
CV	Coefficient of variation
CTD	cold temperature dry
CPT	cured ply thickness
ETD	elevated temperature dry
ETW	elevated temperature wet
Gr/Ep	graphite/epoxy
norm	normalized
RTD	room temperature dry
SACMA	Suppliers of Advanced Composite Materials Association
SRM	SACMA Recommended Method
Tply	thickness divided by the number of plies provides the thickness average per specimen
wet	specimen with an “equilibrium” moisture content
T, RH	temperature, relative humidity

1.3 NIAR–Specimen Naming Format

NIAR NCAMP— Hexcel 8552 Test Coupon Naming Format

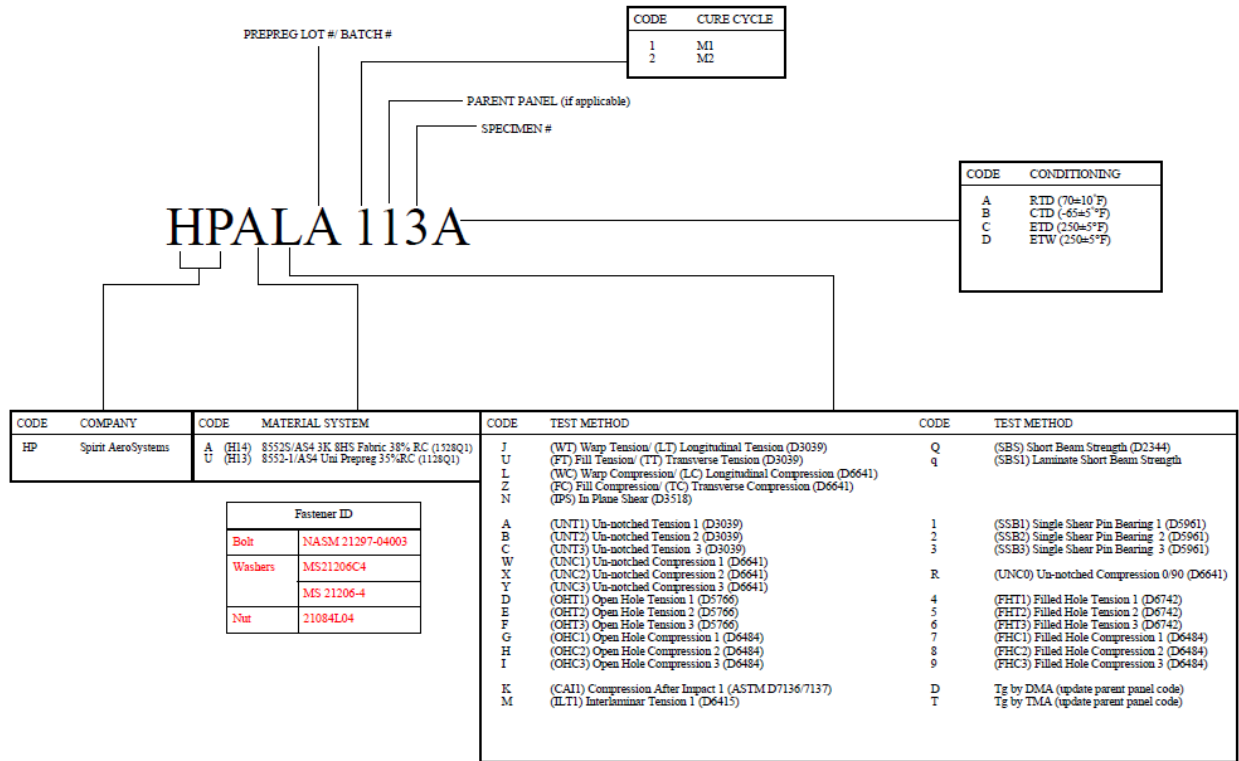


Figure 1-1: Naming Format

1.4 References

ASTM Standards

All testing was in accordance with nationally recognized standards, methods and procedures. Specific mechanical property test methods applicable to the test program in this document include:

- ASTM D2344/D2344M-00(2006) – Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
- ASTM D3039/D3039M-08 – Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials
- ASTM D3518/D3518M-94(2007) – Standard Test Method for In-Plane Shear Response of Polymer Matrix Composite Materials by Tensile Test of a $\pm 45^\circ$ Laminate In-Plane Shear Strength and Modulus
- ASTM D5766/D5766M-11 – Standard Test Method for Open Hole Tensile Strength of Polymer Matrix Composite Laminates
- ASTM D5961/D5961M-10 – Standard Test Method for Bearing Response of Polymer Matrix Composite Laminates
- ASTM D6415-06ae1 – Standard Test Method for Measuring the Curved Beam Strength of a Fiber-Reinforced Polymer-Matrix Composite
- ASTM D6484/D6484M-09 – Standard Test Method for Open-Hole Compressive Strength of Polymer Matrix Composite Laminates
- ASTM D6641/D6641M-09 – Standard Test Method for Determining the Compressive Properties of Polymer Matrix Composite Laminates Using a Combined Loading Compression (CLC) Test Fixture
- ASTM D6742/D6742M-07 – Standard Practice for Filled-Hole Tension and Compression Testing of Polymer Matrix Composite Laminates
- ASTM D7028-07e1 – Standard Test Method for Glass Transition Temperature (DMA Tg) of Polymer Matrix Composites by Dynamic Mechanical Analysis (DMA)
- ASTM D7136/D7136M-07 – Standard Test Method for Measuring the Damage Resistance of a Fiber-Reinforced Polymer Matrix Composite to a Drop-Weight Impact Event
- ASTM D7137/D7137M-07 – Standard Test Method for Compressive Residual Strength Properties of Damaged Polymer Matrix Composite Plates

1.5 Methodology

1.5.1 Process Definition

For each combination of test, batch and condition, the specimens were selected from minimum two separate panels cured separately as shown in Figure 1-2 unless otherwise specified.

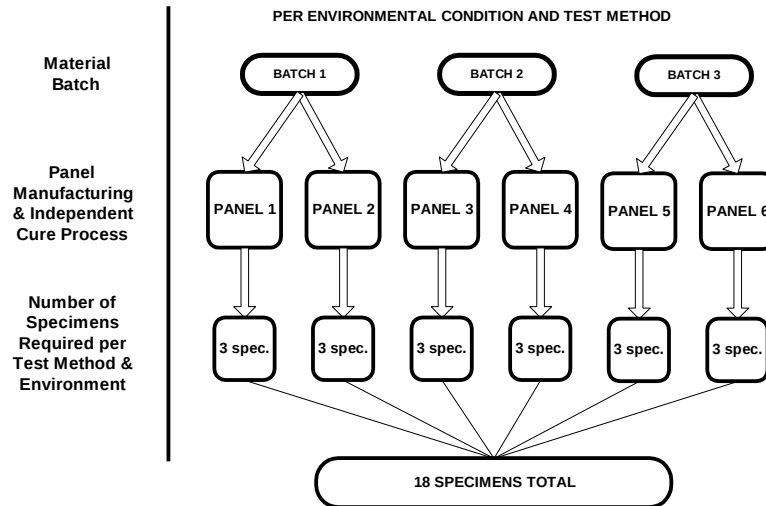


Figure 1-2: Specimen Selection Methodology

All panels were fabricated in accordance with NCAMP Process Specification 81228 “M” Cure Cycle.

In order to facilitate individual specimen trace ability, individual specimen numbering and/or skewed lines were written or drawn across each sub-panel as shown in Figure 1-3.

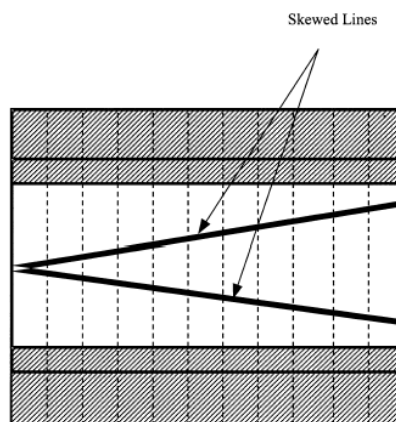


Figure 1-3: Specimen Traceability Line

1.5.2 Specimen & Testing Details

1.5.2.1 Tabbings

No tabs were used for this program.

1.5.2.2 Specimen Dimensions & Test Configuration

For SBS specimens, a span of 4T was used where T was the average thickness of the coupons within the same bag.

Caul plate was used during panel fabrication.

For filled-hole tension tests, the fasteners were installed to 85±5 in-lb. For filled-hole compression and bearing tests, the fasteners were installed to 30±5 in-lb. Fasteners were installed after moisture conditioning.

Unless otherwise specified, a tolerance of ±5°F applied to all temperature conditions specified in this document.

For filled-hole and bearing tests, the hole diameter was 0.25 in -0.000 +0.003 in. The following fasteners were used:

- 1) NASM 21297-04004 bolts with NASM 21084 nuts and MS21206 washers for FHT and FHC
- 2) NASM 21297-04016 bolts with MS 21084 nuts and MS21206 washers for SSB

For bearing tests, procedures and fixtures are in accordance with ASTM D5961 procedure C. Typical fixture thickness is 0.805".

1.5.2.3 Specimen Strain Device Used

Uniaxial gages were used on:

All of CTD Tension specimens except Warp Tension specimens.

Two of RTD Tension specimens except Warp Tension for obtaining full stress strain curves.

All conditions of combined loading compression specimens.

Two of RTD Open Hole Compression specimens for detecting buckling.

One of CAI specimen for balancing.

Biaxial gages were used on:

All conditions of IPS specimens.

All of CTD Warp Tension specimens.

Two of RTD Warp Tension specimens for obtaining full stress strain curves.

Uniaxial Extensometers were used on:

All of RTD and ETW Tension specimens except Warp Tension specimens.

Biaxial Extensometers were used on:

All of RTD and ETW Warp Tension specimens.

1.5.3 Test Matrix

The tables below show the lay-ups and test matrices used for lamina and laminate level testing.

Layup (warp direction) (5)	Test Type and Direction	Property	Number of Batches x Number of Panels x Number of Test Specimens			
			Test Temperature/Moisture Condition			
			CTD	RTD	ETD	ETW
[0] _{4S}	ASTM D3039 Warp Tension	Strength, Modulus, and Poisson's Ratio	3x2x3	3x2x3 (4)		3x2x3
[0] _{4S}	ASTM D6641 Warp Compression	Strength and Modulus	3x2x3	3x2x3 (1) (4)	1x2x3	3x2x3 (3)
[90] _{4S}	ASTM D3039 Fill Tension	Strength and Modulus	3x2x3	3x2x3 (4)		3x2x3
[90] _{4S}	ASTM D6641 Fill Compression	Strength and Modulus	3x2x3	3x2x3 (1) (4)	1x2x3	3x2x3 (3)
[45/-45] _{2S}	ASTM D3518 In- Plane Shear (2)	Strength and Modulus	3x2x3	3x2x3 (4)		3x2x3
[0] ₁₈	ASTM D2344 Short Beam	Strength	3x2x3	3x2x3	1x2x3	3x2x3

Table 1-1: Lamina Level Test Matrix

- Note 1:** Back-to-back strain gages are needed on the first two specimens of each environment. If no buckling is observed, the remaining modulus specimens will require a strain gage on one side of the specimens only. An appropriate extensometer may be used in place of the strain gage.
- Note 2:** Gripped (tab) length is 1.5±0.5" on each end of the 10" long specimen. Once the samples have reached the 5% strain level, the actuator/crosshead displacement rate can be increased by four times the initial rate. Continue testing at the higher strain rate until ultimate failure is observed.
- Note 3:** If strain gage is used for modulus measurement, a separate un-gaged specimen must be used for strength measurement; because the strain gage and its protective coating may prevent moisture absorption in the gage area.
- Note 4:** At least two specimens must be gaged to obtain full stress-strain curve to failure. An appropriate extensometer may be used in place of the strain gage for the remaining specimens.
- Note 5:** "S" denotes symmetry with respect to warp face; alternate warp face up and warp face down in accordance with Figure 1 of NPS 81228 to avoid panel warpage.

Table 1-2 below summarizes the laminate level tests carried out. The layup angles 0°, 45°, -45°, and 90° refer to the orientation of the warp/longitudinal fiber direction. The

laminate stacking sequences in this program are not specific to any design. Therefore, careful consideration should be given to the validity of properties derived from this program based on the design specific laminates in a structure to be certified.

In the case of the fabric materials, certain laminates, such as the quasi isotropic layup, have an unequal number of $+45^\circ$ and -45° plies. While such lay-ups are mid-plane symmetric, there exists the possibility of differences in warp and fill modulus values leading to a slight deviation from perfect balanced – i.e. the A_{16} and A_{26} terms in the in plane stiffness matrix are nonzero. Again, the effect on in plane stiffness and strength properties is expected to be minimal and if anything will yield slightly conservative results.

Table 1-2 also emphasizes those properties and test condition combinations believed to constitute the worst case, which in general is cold dry for tension and hot wet for compression and other matrix dominated properties.

(%0°/%±45°/%90°) Actual Test Type	Test Type and Layout (5)	Property	Number of Batches x Number of Panels x Number of Test Specimens		
			Test Temperature/Moisture Condition		
			CTD	RTD	ETW
(25/50/25 - QI) UNT1	ASTM D3039 Un-notched Tension [45/0/-45/90]S	Strength & modulus	3x2x3	3x2x3 (7)	3x2x3
(10/80/10) UNT2	ASTM D3039 Un-notched Tension [45/-45/90/45/-45]S	Strength & modulus	3x2x3	3x2x3 (7)	3x2x3
(40/20/40) UNT3	ASTM D3039 Un-notched Tension [0/90/45/0/90]S	Strength & modulus	3x2x3	3x2x3 (7)	3x2x3
(25/50/25 - QI) UNC1	ASTM D6641 Un-notched Compression [45/0/-45/90]S	Strength & modulus		3x2x3 (4&7)	3x2x3 (6)
(10/80/10) UNC2	ASTM D6641 Un-notched Compression [45/-45/90/45/-45]S	Strength & modulus		3x2x3 (4&7)	3x2x3 (6)
(40/20/40) UNC3	ASTM D6641 Un-notched Compression [0/90/45/0/90]S	Strength & modulus		3x2x3 (4&7)	3x2x3 (6)
(25/50/25 - QI) SBS1	ASTM D2344 Short Beam [45/0/-45/90/-45/90]S (specimens may be taken from panels of similar layout)	Strength		3x2x3	3x2x3
(25/50/25 - QI) OHT1	ASTM D5766 Open Hole Tension (1) [45/0/-45/90]S	Strength	3x2x3	3x2x3	3x2x3
(10/80/10) OHT2	ASTM D5766 Open Hole Tension (1) [45/-45/90/45/-45]S	Strength	3x2x3	3x2x3	3x2x3
(40/20/40) OHT3	ASTM D5766 Open Hole Tension (1) [0/90/45/0/90]S	Strength	3x2x3	3x2x3	3x2x3
(25/50/25 - QI) FHT1	ASTM D6742 Filled Hole Tension (2) [45/0/-45/90]S	Strength	3x2x3	3x2x3	3x2x3
(10/80/10) FHT2	ASTM D6742 Filled Hole Tension (2) [45/-45/90/45/-45]S	Strength	3x2x3	3x2x3	3x2x3
(40/20/40) FHT3	ASTM D6742 Filled Hole Tension (2) [0/90/45/0/90]S	Strength	3x2x3	3x2x3	3x2x3
(25/50/25 - QI) OHC1	ASTM D6484 Open Hole Compression (1) [45/0/-45/90/-45/90]S	Strength		3x2x3 (4)	3x2x3
(10/80/10) OHC2	ASTM D6484 Open Hole Compression (1) [45/-45/90/45/-45]S	Strength		3x2x3 (4)	3x2x3
(40/20/40) OHC3	ASTM D6484 Open Hole Compression (1) [0/90/45/0/90]S	Strength		3x2x3 (4)	3x2x3
(25/50/25 - QI) FHC1	ASTM D6742 Filled Hole Compression (2) [45/0/-45/90/-45/90]S	Strength		3x2x3	3x2x3
(10/80/10) FHC2	ASTM D6742 Filled Hole Compression (2) [45/-45/90/45/-45]S	Strength		3x2x3	3x2x3
(40/20/40) FHC3	ASTM D6742 Filled Hole Compression (2) [0/90/45/0/90]S	Strength		3x2x3	3x2x3
(25/50/25 - QI) SSB1	ASTM D5961 Single Shear Bearing (3) [45/0/-45/90]S	Strength & Deformation		3x2x3	3x2x3
(10/80/10) SSB2	ASTM D5961 Single Shear Bearing (3) [45/-45/90/-45/45]S	Strength & Deformation		3x2x3	3x2x3
(40/20/40) SSB3	ASTM D5961 Single Shear Bearing (3) [0/90/45/90/0]S	Strength & Deformation		3x2x3	3x2x3
(50/0/50) ILT	ASTM D6415 Interlaminar Tension [0]11	Strength	1x1x6	1x1x6	1x1x6
(25/50/25 - QI) CAI1	ASTM D7136 & D7137 Compression After Impact (1500 in.lb/in) (8) [45/0/-45/90/-45/90]S	Strength		1x1x6	

Table 1-2: Laminate Level Test Matrix

- Note 1:** Open-hole test configuration: 0.25" hole diameter, 1.5" width.
- Note 2:** Filled-hole test configuration: 0.25" hole diameter, see section 1.5.2.2 for fastener callout, 1.5" width.
- Note 3:** Single-shear bearing test configuration: 0.25" hole diameter, 1.5" width, see section 1.5.2.2 for fastener callout, $e/D=3$, ASTM D5961-17 Procedure C.
- Note 4:** Back-to-back strain gages needed on the first two specimens of each environment. If no buckling is observed, the remaining modulus specimens will require strain gage on one side of the specimens only. Appropriate extensometer may be used in place of the strain gage.
- Note 5:** Loading direction is generally along the 0-degree direction
- Note 6:** If strain gage is used for modulus measurement, a separate un-gaged specimen must be used for strength measurement, because the strain gage and its protective coating may prevent moisture absorption in the gage area.
- Note 7:** At least two specimens must be gaged to obtain full stress-strain curve to failure. An appropriate extensometer may be used in place of the strain gage for the remaining specimens.
- Note 8:** Back-to-back strain gages on two locations (a total of four strain gages) are needed on the first specimen. The specimen should be equivalent to the test specimens in terms of material, layup, and geometry, shall be un-damaged. Alternatively, an instrumented metallic plate, equivalent in thickness to the test specimens to within ± 0.25 mm [± 0.010 in.], may be used.

1.5.4 Cured Laminate Physical Testing

The properties in Table 1-3 were determined for each panel used for test coupons with the exception of Tg by DMA which were conducted on one laminate per batch from each oven cure conducted where that batch is present. The tests were performed by the National Institute for Aviation Research (NIAR) Composites Laboratory under the supervision of NCAMP.

Property	Condition/Method (Note 1)	Min Replicates per panel
Cured Ply Thickness	ASTM D3171-15	All data from mechanical test specimens
Laminate Density	ASTM D792-13	3
Fiber Volume, % by Volume	ASTM D3171-15 (Note 2)	3
Resin Content, % by Weight	ASTM D3171-15 (Note 2)	3
Void Content, % by Volume	ASTM D3171-15	3
Ultrasonic Through Transmission, C-Scan	MIL-HDBK-787A (Note 3)	1
Glass Transition Temperature, Tg by DMA flexural loading	Dry and Wet – ASTM D7028	1 Dry, 1 Wet (Note 4)
Glass Transition Temperature, Tg by TMA (alternate option)	Dry and Wet – HSP-T2 Rev 1 (Note 5)	1 Dry, 1 Wet (Note 4)

Table 1-3: Physical Testing Matrix

Note 1: Where the applicable standard allows variations in specimen form or test method, the specific parameters to be used will be specified in the test work instructions and reported in the final test report.

Note 2: Method II

Note 3: Five MHz is preferred for solid laminates. Panels with anomaly should be segregated. Microscopy images may be taken from questionable areas. NCAMP must be involved in the review of all C-scans.

Note 4: Minimum total of 24 dry and 24 wet for each material system.

Note 5: HSP-T2 Revision 1 is a Hexcel non-proprietary test method standard which may be obtained from NCAMP or Hexcel. HSP-T2 is similar but not equivalent to ASTM E2092. Data for TMA is not presented in this report but is an alternate test method for obtaining material Tg.

1.5.5 Environmental Conditioning

The following tests were performed by the NIAR Composites Laboratory under the supervision of NCAMP.

CTD = -65±5°F, dry

RTD = 70±10°F, dry

ETD = 250±5°F, dry

ETW = 250±5°F, wet

Within each test method and test environment, the failure mode was evaluated immediately after each test by an NCAMP staff engineer or NCAMP AER. All tested specimens were digitally photographed after each test in order to pictorially document failure modes.

For dry testing, specimens were dried at 160°F±5°F for 120-130 hours. After drying, specimens were kept in a desiccator until mechanical testing. Alternatively, the specimens may have been left ambient laboratory condition for a maximum of 14 days until mechanical testing (no drying was required if specimens were tested within 14 days from the date they were cured). Ambient laboratory condition is defined as 70°F±10°F. Since moisture absorption and desorption rate for epoxy is very slow at ambient temperature, there was no requirement to maintain relative humidity levels.

For wet conditioning, specimens were dried at 160°F±5°F for 120-130 hours before being conditioned to equilibrium at 160°F±5°F and 85% ± 5% RH. Effective moisture equilibrium was achieved when the average moisture content of the traveler specimen changed by less than 0.02% for two consecutive readings which are 7 ±0.5 days apart and may be expressed by:

$$\frac{W_i - W_{i-1}}{W_b} < 0.0002$$

Where:

W_i = weight at current time

W_{i-1} = weight at previous time

W_b = baseline weight prior to conditioning

When representative specimens could not be measured to determine the moisture content (due to size, fastener and tab effects), traveler coupons of at least 1" by 1" by specimen thickness and weighing at least 15 grams were used to establish weight gain measurements. If the specimens or traveler coupons pass the criteria for two consecutive readings which are 7 ±0.5 days apart, the specimens were kept in the environmental chamber for up to an additional 60 days. Alternatively, the specimens

may have been removed from the environmental chamber and placed in a sealed plastic bag along with a moist cotton towel for a maximum of 14 days until mechanical testing. Strain-gaged specimens were removed from the controlled environment for a maximum of 2 hours for application of gages in ambient laboratory conditions.

1.5.6 Non-ambient Testing

The chamber was of adequate size so that all test fixtures and load frame grips were contained within the chamber. For elevated temperature testing, the temperature chamber, test fixture, and grips were preheated to the specified temperature. Each specimen was heated to the required test temperature as verified by a thermocouple in direct contact with and taped to the specimen gage section. The heat-up time of the specimen did not exceed 5 minutes, unless otherwise specified in individual test summary sheets. The test was started 5^{+1}_{-0} minutes after the specimen reached the test temperature. During the test, the temperature, as measured on the specimen, was within $\pm 5^{\circ}\text{F}$ of the required test temperature.

For subzero temperature testing, each specimen was cooled to the required test temperature as verified by a thermocouple in direct contact with and taped to the specimen gage section. The test started 5^{+1}_{-0} minutes after the specimen reached the test temperature. During the test, the temperature, as measured on the specimen, was within $\pm 5^{\circ}\text{F}$ of the required test temperature.

For wet specimens, the moisture loss was determined by subjecting representative specimens to the same amount of time required to heat-up and fail the specimens. For filled-hole or bearing specimens, fasteners were removed prior to conducting moisture loss measurements. For tabbed specimens, representative coupons without tabs and having the same number of plies were used to conduct the moisture loss measurements. A minimum of one specimen or representative coupon was used to measure the moisture loss for every combination of test temperature and stacking sequence.

1.5.7 Fluid Sensitivity Screening

Table 1-4 lists the requirements for fluid sensitivity screening, which requires ASTM D2344 Short Beam Strength testing on $[0^\circ]_{18}$ lamina level specimens dried at $160^\circ\text{F} \pm 5^\circ\text{F}$ for 120-130 hours before being subjected to the conditions indicated, five replicates per fluid and one cure cycle. Specimens were cleaned with a dry towel prior to the tests. In addition to short beam strength, load versus displacement curves were plotted to aid in the identification of matrix/resin softening. Since load versus displacement curves are influenced by test machine and fixture compliance, all the tests were performed with the identical machine and fixture, through a single setup. Experience suggests that for the vast majority of epoxy resins, water is the fluid with the most deleterious effect on properties. Should screening tests for fluid sensitivity indicate this to be the case, further testing of this type might be unnecessary since exposure to water moisture to equilibrium level is an inherent part of the multi batch allowables test program. However, users must evaluate the applicability of the exposure conditions and time on case-by-case basis. For example, the exposure condition for jet fuel may not fully represent the condition of integral fuel tanks.

<u>Extended Contact:</u>	Exposure	Test Condition	Code
100 Low Lead Aviation Fuel (ASTM D910)	90 days min. @ 70°F±10°F	70°F	FS11RT
	90 days min. @ 70°F±10°F	250°F	FS11ET
ASTM D1655 Jet A Fuel (other jet fuel may be used but its type must be reported)	90 days min. @ 70°F±10°F	70°F	FS12RT
	90 days min. @ 70°F±10°F	250°F	FS12ET
MIL-PRF-5606 Hydraulic Oil	90 days min. @ 70°F±10°F	70°F	FS13RT
	90 days min. @ 70°F±10°F	250°F	FS13ET
MIL-PRF-83282 Hydraulic Oil	90 days min. @ 70°F±10°F	70°F	FS14RT
	90 days min. @ 70°F±10°F	250°F	FS14ET
MIL-PRF-7808 Engine Oil	90 days min. @ 70°F±10°F	70°F	FS15RT
	90 days min. @ 70°F±10°F	250°F	FS15ET
MIL-PRF-23699, Class STD Engine Oil	90 days min. @ 70°F±10°F	70°F	FS16RT
	90 days min. @ 70°F±10°F	250°F	FS16ET
Sea Water (ASTM D1141 or equiv.)	90 days min. @ 70°F±10°F	70°F	FS17RT
	90 days min. @ 70°F±10°F	250°F	FS17ET
Skydrol LD-4 (SAE AS1241, Type IV, Class 1)	90 days min. @ 70°F±10°F	70°F	FS18RT
	90 days min. @ 70°F±10°F	250°F	FS18ET
50% Water with 50% Skydrol LD-4 (SAE AS1241, Type IV, Class 1)	90 days min. @ 70°F±10°F	70°F	FS19RT
	90 days min. @ 70°F±10°F	250°F	FS19ET
<u>Short Duration Contact:</u>			
MEK washing fluid. ASTM D740	90 minutes min. @ 70°F±10°F	70°F	FS21RT
	90 minutes min. @ 70°F±10°F	250°F	FS21ET
Polypropylene Glycol Deicer (Type I) SAE AMS 1424	90 minutes min. @ 70°F±10°F	70°F	FS22RT
	90 minutes min. @ 70°F±10°F	250°F	FS22ET
Isopropyl Alcohol Deicing Agent (TT-I-735)	48±4 hours @70°F±10°F	70°F	FS23RT
	48±4 hours @70°F±10°F	250°F	FS23ET
<u>Control Tests:</u>			
Distilled Water	90 days min. at 70°F±10°F	70°F	FS31RT
	90 days min. at 70°F±10°F	250°F	FS31ET
Dry	Dried per section 1.5.5	70°F	FS32RT
	Dried per section 1.5.5	250°F	FS32ET
85% Relative Humidity	Per section 1.5.5	70°F	FS33RT
	Per section 1.5.5	250°F	FS33ET

Table 1-4: Fluid Sensitivity Screening

1.5.8 Normalization Procedures

Most lamina level tension and compression strength and modulus properties, and all laminate level properties were normalized according to nominal cured ply thickness. Lamina level properties that were not normalized include 90° tensile strength and modulus (unidirectional only), 90° compressive strength and modulus (unidirectional only), in-plane shear strength and modulus, Poisson's ratio, SBS, and ILT. After normalizing, data scatter reduced or remained the same. If data scatter increased significantly after normalizing, the reason was investigated. Wherever properties are normalized, both measured and normalized data were reported.

The theoretically cured ply thickness of 0.0150 inches has been used as the nominal cured ply thickness (CPT) for normalization purpose. The following normalization formula was used:

$$\text{Normalized Value} = \text{Measured Value} \times \text{Measured CPT} / \text{Nominal CPT}$$

1.5.9 Inspection Verification

The 3-batch qualification panels have been fabricated according to the requirements of the test plan and conformed by an NCAMP AIR. The test specimens and test setup have also been conformed by an NCAMP AIR.

Testing was witnessed by NCAMP. Witnessing was delegated to an AER. Mechanical testing was carried out at the National Institute for Aviation Research, Wichita State University.

1.5.10 Material Pedigree Information

The PMC Data Collection Template includes the material pedigree information required, such as material and batch information, as well as panel fabrication record, environmental conditioning, test equipment, and test procedures.

2. Test Results

2.1 Lamina Level Test Summary

Prepreg Material: Hexcel Hexply® 8552S AS4 GP 3k 8HS		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC Lamina Properties Summary						
Material Specification:	NMS 128/4							
Process Specification:	NPS 81228							
Fabric:	Hexcel AS4 GP 3k 8HS	Resin:	Hexcel 8552S					
Tg(dry):	384.1°F	Tg(wet):	301.6°F					
		Tg METHOD:	ASTM D7028					
Date of fiber manufacture		Sep-17 to Dec-17	Date of testing	Jul-18 to Oct-19				
Date of resin manufacture		Feb-18	Date of data submittal	Jan-20				
Date of prepreg manufacture		Feb-18						
Date of composite manufacture		Jun-18 to Sep-18						
LAMINA MECHANICAL PROPERTY SUMMARY Data reported as: Normalized & Measured (Normalized by CPT=0.015 inch)								
Properties	-65/D Mean		70F/D Mean		250F/D Mean		250F/W Mean	
	Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured
F ₁ ^{tu} [ksi]	120.8	122.9	139.4	144.8			140.1	134.0
E ₁ ^t [Msi]	9.699	9.861	9.431	9.833			9.461	9.047
ν ₁₂ ^t		0.0602		0.0525				0.0469
F ₂ ^{tu} [ksi]	109.5	110.7	121.7	123.6			119.0	116.0
E ₂ ^t [Msi]	9.088	9.201	8.865	9.006			8.931	8.699
F ₁ ^{cu} [ksi]	145.2	140.4	120.9	126.1	91.25	91.09	69.61	68.34
E ₁ ^c [Msi]	8.905	8.603	8.888	9.324	8.767	8.752	8.628	8.878
F ₂ ^{cu} [ksi]	121.6	117.6	109.9	111.5	86.16	85.21	64.24	62.52
E ₂ ^c [Msi]	8.542	8.260	8.340	8.561	8.251	8.159	8.154	8.002
F ₁₂ ^{s0.2%} [ksi]		11.09		8.083				3.028
F ₁₂ ^{s5%strain} [ksi]				13.33				5.149
F ₁₂ ^{smax} [ksi]		16.18						
G ₁₂ ^s [Msi]		0.8552		0.7296				0.2885
SBS [ksi]		14.02		11.97		8.210		5.901

Table 2-1: Lamina Summary Data

2.2 Laminate Level Test Summary

Prepreg Material: Hexcel Hexply® 8552S AS4 GP 3k 8HS		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Laminate Properties Summary			
Material Specification: NMS 128/4							
Process Specification: NPS 81228							
Fabric: Hexcel AS4 GP 3k 8HS		Resin:	Hexcel 8552S				
Tg(dry):	384.1°F	Tg(wet):	301.6°F	Tg METHOD:	ASTM D7028		
Date of fiber manufacture		Sep-17 to Dec-17		Date of testing			
Date of resin manufacture		Feb-18		Date of data submittal			
Date of prepreg manufacture		Feb-18		Jul-18 to Oct-19			
Date of composite manufacture		Jun-18 to Sep-18		Jan-20			
LAMINATE MECHANICAL PROPERTY SUMMARY							
Data reported as: Normalized & Measured							
(Normalized by CPT=0.015 inch)							
Layup		25/50/25 (Quasi)		10/80/10 (Soft)		40/20/40 (Hard)	
Properties	Test Condition ¹	Normalized	Measured	Normalized	Measured	Normalized	Measured
OHT Strength [ksi]	CTD	41.38	40.94	40.45	39.57	50.12	49.27
	RTD	45.73	45.73	40.06	40.18	58.85	58.61
	ETW	50.70	48.92	29.76	28.48	65.89	63.19
OHC Strength ⁴ [ksi]	RTD	50.04	50.19	38.78	39.15	57.57	57.58
	ETW	31.85	31.36	22.89	22.56	33.38	33.27
UNT Strength [ksi]	CTD	82.56	84.21	51.94	52.68	100.9	100.8
	RTD	90.93	95.56	53.58	55.89	117.2	122.0
	ETW	87.75	84.47	44.48	43.18	116.8	113.4
UNT Modulus [Msi]	CTD	6.924	7.063	4.736	4.802	8.535	8.525
	RTD	6.643	6.982	4.394	4.588	8.303	8.642
	ETW	6.157	5.928	3.448	3.349	8.062	7.817
UNC Strength [ksi]	RTD	91.68	96.48	55.76	59.51	93.71	98.40
	ETW	53.12	55.21	30.11	31.59	59.85	61.77
UNC Modulus [Msi]	RTD	6.328	6.673	4.226	4.511	7.867	8.262
	ETW	5.705	5.460	3.382	3.306	7.627	7.289
FHT Strength [ksi]	CTD	44.06	43.58	44.05	42.88	50.11	49.23
	RTD	48.02	47.81	43.17	43.24	55.85	55.41
	ETW	50.39	48.06	32.21	30.80	58.24	55.50
FHC Strength ⁴ [ksi]	RTD	85.23	85.41	-- ⁽²⁾	-- ⁽²⁾	88.69	89.30
	ETW	49.74	49.31	-- ⁽²⁾	-- ⁽²⁾	56.34	56.55
SBS1 Strength ⁴ [ksi]	RTD		9.953				
	ETW		5.043				
SSB Initial Peak Strength [ksi]	RTD		112.6				107.6
	ETW		88.13				78.42
SSB 2% Offset Strength [ksi]	RTD	105.4	111.0	108.6	113.7	101.6	107.2
	ETW	86.84	87.60	86.86	87.84	75.91	75.78
SSB Ultimate Strength [ksi]	RTD	129.2	136.0	132.3	138.6	119.7	126.3
	ETW	94.99	95.17	97.75	98.89	86.62	86.52
CBS ³ [lb]	CTD		346.5				
	RTD		352.3				
	ETW		115.7				
ILT ³ [ksi]	CTD		11.84				
	RTD		11.96				
	ETW		3.876				
CAI Strength [ksi]	RTD	34.01	34.19				

¹Test Condition: CTD is -65F/D; RTD is 70F/D; ETW is 250F/D and ETW is 250F/W

²Values for FHC data is not reported because FHC values are greater than or equal to UNC values. In such scenarios, NCAMP and CMH17 do not recommend the use of FHC values for design. UNC values are recommended for use instead.

³ The actual layup for ILT is [0]11, (100/0/0).

⁴Layup for SBS1, OHC1, and FHC1 is [45/0/-45/90/-45/90]S

Table 2-2: Laminate Summary Data

2.3 Individual Test Summaries

2.3.1 Warp Tension Properties (WT)

Material:		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Tension, 1-axis Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0]4S			
Resin content:	35.1 % wt	Comp. density:		1.577 g/cc			
Fiber volume:	57.2 % vol						
Ply count:	8						
Test method:	ASTM D3039-17	Modulus calculation:		1000-3000 microstrain			
Normalized by:	0.0150	in. CPT					
		CTD		RTD		ETW	
Test Temperature [°F]	-65		70		250		
Moisture Conditioning	Dry		Dry		Equilibrium		
Equilibrium at T, RH					160F,85%		
Source code	HPAJX XXXB		HPAJX XXXA		HPAJX XXXD		
	Normalized	Measured	Normalized	Measured	Normalized	Measured	
F_1^w [ksi]	Mean	120.8	122.9	139.4	144.8	140.1	134.0
	Minimum	113.5	111.0	125.5	130.0	124.6	119.6
	Maximum	127.2	138.0	145.2	155.7	150.4	145.0
	C.V.(%)	3.856	6.274	3.808	5.488	4.923	5.820
	No. Specimens	19		19		18	
	No. Prepreg Lots	3		3		3	
E_1^t [Msi]	Mean	9.699	9.861	9.431	9.833	9.461	9.047
	Minimum	9.487	9.354	9.322	9.115	9.295	8.521
	Maximum	9.985	10.55	9.694	10.42	9.598	9.341
	C.V.(%)	1.399	4.052	0.9721	4.089	0.8910	2.076
	No. Specimens	19		18		18	
	No. Prepreg Lots	3		3		3	
ν_{12}^e	Mean		0.0602		0.0525		0.0469
	Minimum		0.0482		0.0471		0.0355
	Maximum		0.0679		0.0570		0.0544
	C.V.(%)		8.597		5.221		10.60
	No. Specimens	18		18		16	
	No. Prepreg Lots	3		3		3	

2.3.2 Fill Tension Properties (FT)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Tension, 2-axis Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [90]4S							
Resin content:	37.5 % wt	Comp. density:	1.560 g/cc						
Fiber volume:	54.5 % vol								
Ply count:	8								
Test method:	ASTM D3039-17	Modulus calculation:	1000-3000 microstrain						
Normalized by:	0.0150	in. CPT							
	CTD	RTD	ETW						
Test Temperature [°F]	-65	70	250						
Moisture Conditioning	Dry	Dry	Equilibrium						
Equilibrium at T, RH			160F,85%						
Source code	HPAUX XXXB	HPAUX XXXA	HPAUX XXXD						
	Normalized	Measured	Normalized	Measured	Normalized	Measured			
F₂^{tu} [ksi]	Mean	109.5	110.7	121.7	123.6	119.0	116.0		
	Minimum	94.30	93.27	116.5	116.9	109.8	107.1		
	Maximum	124.1	124.5	135.7	135.5	130.8	129.2		
	C.V.(%)	6.871	7.243	4.328	4.916	4.889	5.832		
	No. Specimens	20		18		18			
	No. Prepreg Lots	3		3		3			
E₂^t [Msi]	Mean	9.088	9.201	8.865	9.006	8.931	8.699		
	Minimum	8.856	8.934	8.586	8.451	8.698	8.432		
	Maximum	9.291	9.640	8.968	9.509	9.115	8.980		
	C.V.(%)	1.170	2.353	1.103	3.494	1.166	1.940		
	No. Specimens	18		18		19			
	No. Prepreg Lots	3		3		3			

2.3.3 Warp Compression Properties (WC)

Material:		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Compression, 1-axis Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0]4S					
Resin content:	36.8 % wt	Comp. density:		1.570 g/cc					
Fiber volume:	55.4 % vol								
Ply count:	8								
Test method:	ASTM D6641-16ε1	Modulus calculation:		1000-3000 microstrain					
Normalized by:	0.0150	in. CPT							
		CTD		RTD		ETD		ETW	
Test Temperature [°F]			-65	70		250		250	
Moisture Conditioning			Dry	Dry		Dry		Equilibrium	
Equilibrium at T, RH								160F,85%	
Source code			HPALX XXXB	HPALX XXXA		HPALX XXXC		HPALX XXXD	
		Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured
F₁^{cu} [ksi]	Mean	145.2	140.4	120.9	126.1	91.25	91.09	69.61	68.34
	Minimum	139.4	133.1	111.4	120.2	86.76	84.21	58.46	57.66
	Maximum	157.0	145.9	126.5	134.5	99.08	96.47	79.41	77.81
	C.V.(%)	3.303	2.958	3.929	3.415	5.133	5.970	8.234	7.906
	No. Specimens	15		18		6		21	
	No. Prepreg Lots	3		3		1		3	
E₁^c [Msi]	Mean	8.905	8.603	8.888	9.324	8.767	8.752	8.628	8.878
	Minimum	8.744	8.119	8.631	8.445	8.623	8.420	8.463	7.732
	Maximum	9.204	9.116	9.230	10.49	8.902	9.208	8.988	9.789
	C.V.(%)	1.470	2.412	1.941	6.306	1.248	3.478	1.343	6.445
	No. Specimens	18		18		6		18	
	No. Prepreg Lots	3		3		1		3	

2.3.4 Fill Compression Properties (FC)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Compression, 2-axis Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [90]4S							
Resin content:	36.0 % wt	Comp. density: 1.569 g/cc							
Fiber volume:	56.1 % vol								
Ply count:	8								
Test method:	ASTM D6641-16ε1	Modulus calculation: 1000-3000 microstrain							
Normalized by:	0.0150	in. CPT							
		CTD	RTD	ETD	ETW				
Test Temperature [°F]		-65	70	250	250				
Moisture Conditioning		Dry	Dry	Dry	Equilibrium				
Equilibrium at T, RH					160F,85%				
Source code		HPAZX XXXB	HPAZX XXXA	HPAZX XXXC	HPAZX XXXD				
		Normalized	Measured	Normalized	Measured	Normalized	Measured		
F₂^{cu} [ksi]	Mean	121.6	117.6	109.9	111.5	86.16	85.21	64.24	62.52
	Minimum	111.1	108.0	102.0	103.2	83.15	80.97	53.93	52.03
	Maximum	131.2	126.6	115.7	121.6	89.01	91.44	71.33	69.94
	C.V.(%)	5.003	4.671	3.691	4.589	2.476	4.343	8.192	8.459
	No. Specimens	18		18		6		18	
	No. Prepreg Lots	3		3		1		3	
E₂^c [Msi]	Mean	8.542	8.260	8.340	8.561	8.251	8.159	8.154	8.002
	Minimum	8.281	7.928	8.219	8.084	8.199	7.988	7.808	7.665
	Maximum	8.746	8.518	8.579	9.318	8.327	8.763	8.401	8.284
	C.V.(%)	1.433	2.109	1.120	4.315	0.5765	3.641	1.926	2.342
	No. Specimens	18		18		6		18	
	No. Prepreg Lots	3		3		1		3	

2.3.5 In-Plane Shear Properties (IPS)

Material:		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		In-Plane Shear Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/-45]2S			
Resin content:	34.7 % wt	Comp. density:		1.581 g/cc			
Fiber volume:	57.7 % vol						
Ply count:	8						
Test method:	ASTM D3518-18	Modulus calculation:		2000-6000 microstrain			
Normalized by:	NA						
		CTD		RTD		ETW	
Test Temperature [°F]	-65	70		250			
Moisture Conditioning	Dry	Dry		Equilibrium			
Equilibrium at T, RH				160F,85%			
Source code	HPANX XXXB	HPANX XXXA		HPANX XXXD			
	Normalized	Measured	Normalized	Measured	Normalized	Measured	
$F_{12}^{s0.2\%}$ [ksi]	Mean	11.09	8.083	3.028			
	Minimum	10.57	7.697	2.895			
	Maximum	12.22	8.728	3.181			
	C.V.(%)	4.114	3.921	3.026			
	No. Specimens	18	19	18			
	No. Prepreg Lots	3	3	3			
$F_{12}^{s5\%strain}$ [ksi]	Mean		13.33	5.149			
	Minimum		12.88	4.940			
	Maximum		13.76	5.443			
	C.V.(%)		1.653	2.896			
	No. Specimens		19	18			
	No. Prepreg Lots		3	3			
F_{12}^{smax} [ksi]	Mean	16.18					
	Minimum	15.43					
	Maximum	17.10					
	C.V.(%)	3.198					
	No. Specimens	18					
	No. Prepreg Lots	3					
G_{12}^s [Msi]	Mean	0.8552	0.7296	0.2885			
	Minimum	0.8039	0.6832	0.2777			
	Maximum	0.9776	0.8130	0.3030			
	C.V.(%)	5.813	5.368	2.684			
	No. Specimens	18	19	18			
	No. Prepreg Lots	3	3	3			

2.3.6 “25/50/25” Unnotched Tension 1 Properties (UNT1)

Material:Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Resin content:34.1 % wt

Fiber volume:58.3 % vol

Ply count:8

Comp. density:1.583 g/cc

Test method:ASTM D3039-17

Normalized by:0.0150

in. CPT

Unnotched Tension 1

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

[45/0/-45/90]S

		CTD	RTD	ETW		
Test Temperature [°F]		-65	70	250		
Moisture Conditioning		Dry	Dry	Equilibrium		
Equilibrium at T, RH				160F,85%		
Source code		HPAAX XXXB	HPAAX XXXA	HPAAX XXXD		
		Normalized	Measured	Normalized	Measured	
Mean		82.56	84.21	90.93	95.56	87.7584.47
Minimum		76.18	74.68	85.37	86.95	83.1280.71
Maximum		86.59	92.91	97.53	105.8	91.8589.20
UNT1 Strength [ksi] C.V.(%)		3.538	5.011	3.493	5.174	3.2493.173
No. Specimens		18		18		18
No. Prepreg Lots		3		3		3
Mean		6.924	7.063	6.643	6.982	6.1575.928
Minimum		6.711	6.801	6.490	6.575	5.9995.682
Maximum		7.157	7.790	6.760	7.412	6.2846.174
UNT1 Modulus [Msi] C.V.(%)		1.399	4.329	1.269	4.078	1.0422.151
No. Specimens		18		18		18
No. Prepreg Lots		3		3		3

2.3.7 “10/80/10” Unnotched Tension 2 Properties (UNT2)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Unnotched Tension 2 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/-45/90/45/-45]S	
Resin content: 34.7 % wt	Comp. density: 1.581 g/cc		
Fiber volume: 57.7 % vol			
Ply count: 10			
Test method: ASTM D3039-17	Modulus calculation: 1000-3000 microstrain		
Normalized by: 0.0150	in. CPT		
	CTD	RTD	ETW
Test Temperature [°F]	-65	70	250
Moisture Conditioning	Dry	Dry	Equilibrium
Equilibrium at T, RH			160F,85%
Source code	HPABX XXXB	HPABX XXXA	HPABX XXXD
	Normalized	Measured	Normalized
Mean	51.94	52.68	53.58
Minimum	48.63	47.89	51.11
Maximum	56.22	59.32	55.95
UNT2 Strength [ksi] C.V.(%)	4.538	7.135	3.297
No. Specimens	18	19	18
No. Prepreg Lots	3	3	3
Mean	4.736	4.802	4.394
Minimum	4.569	4.463	4.071
Maximum	4.863	5.348	4.630
UNT2 Modulus [Msi] C.V.(%)	1.796	5.160	2.651
No. Specimens	18	19	18
No. Prepreg Lots	3	3	3

2.3.8 “40/20/40” Unnotched Tension 3 Properties (UNT3)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Unnotched Tension 3 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0/90/45/0/90]S	
Resin content: 35.2 % wt	Comp. density: 1.580 g/cc		
Fiber volume: 57.2 % vol			
Ply count: 10			
Test method: ASTM D3039-17	Modulus calculation: 1000-3000 microstrain		
Normalized by: 0.0150 in. CPT			
	CTD	RTD	ETW
Test Temperature [°F]	-65	70	250
Moisture Conditioning	Dry	Dry	Equilibrium
Equilibrium at T, RH			160F,85%
Source code	HPACX XXXB	HPACX XXXA	HPACX XXXD
	Normalized	Measured	Normalized
Mean	100.9	100.8	117.2
Minimum	90.91	88.82	109.4
Maximum	110.3	114.8	124.5
UNT3 Strength [ksi] C.V.(%)	6.130	8.112	3.600
No. Specimens	18	18	16
No. Prepreg Lots	3	3	3
Mean	8.535	8.525	8.303
Minimum	8.331	8.079	8.112
Maximum	8.791	9.310	8.485
UNT3 Modulus [Msi] C.V.(%)	1.331	4.301	1.410
No. Specimens	18	18	20
No. Prepreg Lots	3	3	3

2.3.9 “25/50/25” Unnotched Compression 1 Properties (UNC1)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Unnotched Compression 1 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/0/-45/90]S			
Resin content:	37.1 % wt	Comp. density:		1.571 g/cc	
Fiber volume:	55.2 % vol				
Ply count:	8				
Test method:	ASTM D6641-16ε1	Modulus calculation: 1000-3000 microstrain			
Normalized by:	0.0150	in. CPT			
		RTD		ETW	
Test Temperature [°F]		70		250	
Moisture Conditioning		Dry		Equilibrium	
Equilibrium at T, RH				160F,85%	
Source code		HPAWX XXXA		HPAWX XXXD	
		Normalized	Measured	Normalized	Measured
UNC1 Strength [ksi]	Mean	91.68	96.48	53.12	55.21
	Minimum	77.59	86.99	46.89	49.38
	Maximum	101.3	106.2	57.06	59.80
	C.V.(%)	6.459	4.295	5.934	5.520
	No. Specimens	18		21	
	No. Prepreg Lots	3		3	
UNC1 Modulus [Msi]	Mean	6.328	6.673	5.705	5.460
	Minimum	6.162	6.155	5.408	5.034
	Maximum	6.474	7.513	5.984	5.839
	C.V.(%)	1.688	5.072	3.307	4.630
	No. Specimens	18		18	
	No. Prepreg Lots	3		3	

2.3.10 "10/80/10" Unnotched Compression 2 Properties (UNC2)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Unnotched Compression 2 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/-45/90/45/-45]S		
Resin content: 36.9 % wt	Comp. density: 1.570 g/cc			
Fiber volume: 55.4 % vol				
Ply count: 10				
Test method: ASTM D6641-16e1	Modulus calculation: 1000-3000 microstrain			
Normalized by: 0.0150	in. CPT			
	RTD	ETW		
Test Temperature [°F]	70	250		
Moisture Conditioning	Dry	Equilibrium		
Equilibrium at T, RH		160F,85%		
Source code	HPAXX XXXA	HPAXX XXXD		
	Normalized	Measured	Normalized	Measured
Mean	55.76	59.51	30.11	31.59
Minimum	50.70	53.11	26.58	29.21
Maximum	60.39	63.23	33.34	34.35
UNC2 Strength [ksi] C.V.(%)	3.769	3.915	5.704	4.696
No. Specimens	18		21	
No. Prepreg Lots	3		3	
Mean	4.226	4.511	3.382	3.306
Minimum	4.023	4.116	3.154	3.008
Maximum	4.383	4.754	3.706	3.692
UNC2 Modulus [Msi] C.V.(%)	2.664	3.556	4.631	6.166
No. Specimens	18		18	
No. Prepreg Lots	3		3	

2.3.11 “40/20/40” Unnotched Compression 3 Properties (UNC3)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Unnotched Compression 3 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0/90/45/0/90]S	
Resin content:	37.0 % wt	Comp. density:	1.571 g/cc
Fiber volume:	55.3 % vol		
Ply count:	10		
Test method: ASTM D6641-16e1		Modulus calculation: 1000-3000 microstrain	
Normalized by:	0.0150	in. CPT	
	RTD	ETW	
Test Temperature [°F]	70	250	
Moisture Conditioning	Dry	Equilibrium	
Equilibrium at T, RH		160F,85%	
Source code	HPAYX XXXA	HPAYX XXXD	
	Normalized	Measured	Normalized
			Measured
UNC3 Strength [ksi]			
Mean	93.71	98.40	59.85 61.77
Minimum	86.29	89.59	46.38 52.83
Maximum	104.9	113.6	69.82 67.90
C.V.(%)	4.562	6.576	10.18 6.599
No. Specimens	18	23	
No. Prepreg Lots	3	3	
UNC3 Modulus [Msi]			
Mean	7.867	8.262	7.627 7.289
Minimum	7.394	7.587	7.348 6.863
Maximum	8.095	9.116	7.823 7.747
C.V.(%)	2.253	5.309	1.658 3.690
No. Specimens	18	18	
No. Prepreg Lots	3	3	

2.3.12 Lamina Short-Beam Strength Properties (SBS)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC				Short-Beam Strength Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0]18					
Resin content: 34.1 % wt		Comp. density: 1.584 g/cc							
Fiber volume: 58.3 % vol									
Ply count: 18									
Test method: ASTM D2344-16									
Normalized by: NA									
		CTD		RTD		ETD		ETW	
Test Temperature [°F]		-65		70		250		250	
Moisture Conditioning		Dry		Dry		Dry		Equilibrium	
Equilibrium at T, RH								160F, 85%	
Source code		HPAQX XXXB		HPAQX XXXA		HPAQX XXXC		HPAQX XXXD	
		Normalized	Measured	Normalized	Measured	Normalized	Measured	Normalized	Measured
SBS [ksi]	Mean	14.02		11.97		8.210		5.901	
	Minimum	12.07		10.58		7.959		5.330	
	Maximum	15.71		12.50		8.643		6.370	
	C.V.(%)	7.894		4.367		3.264		5.012	
	No. Specimens	18		18		6		18	
No. Prepreg Lots		3		3		1		3	

2.3.13 Laminate Short-Beam Strength Properties (SBS1)

Material:		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Laminate Short-Beam Strength Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/0/-45/90/45/90]S			
Resin content:	see OHC1	Comp. density:	see OHC1				
Fiber volume:	see OHC1						
Ply count:	12						
Test method:	ASTM D2344-16						
Normalized by:	NA						
		RTD	ETW				
Test Temperature [°F]		70	250				
Moisture Conditioning		Dry	Equilibrium				
Equilibrium at T, RH			160F,85%				
Source code		HPAqX XXXA	HPAqX XXXD				
	Normalized	Measured	Normalized	Measured			
SBS1 Strength [ksi]	Mean	9.953		5.043			
	Minimum	9.073		4.774			
	Maximum	11.03		5.261			
	C.V.(%)	5.370		3.279			
	No. Specimens	18		18			
	No. Prepreg Lots	3		3			

2.3.14 “25/50/25” Open-Hole Tension 1 Properties (OHT1)

Material:

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Resin content:

38.0 % wt

Fiber volume:

54.1 % vol

Ply count:

8

Test method:

ASTM D5766-11(2018)

Normalized by:

0.0150

in. CPT

Comp. density:

1.564 g/cc

Open-Hole Tension 1

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

[45/0/-45/90]S

	CTD		RTD		ETW			
Test Temperature [°F]	-65		70		250			
Moisture Conditioning	Dry		Dry		Equilibrium			
Equilibrium at T, RH					160F,85%			
Source code	HPADX XXXB		HPADX XXXA		HPADX XXXD			
	Normalized	Measured	Normalized	Measured	Normalized	Measured		
Mean	41.38	40.94	45.65	45.38	50.70	48.92		
Minimum	37.36	36.83	41.92	40.47	47.15	45.47		
Maximum	44.82	48.30	48.36	50.85	54.51	52.23		
OHT1 Strength [ksi] C.V.(%)	4.777	8.050	3.442	6.051	3.934	3.808		
No. Specimens	18		18		18			
No. Prepreg Lots	3		3		3			

2.3.15 “10/80/10” Open-Hole Tension 2 Properties (OHT2)

Material:

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Resin content:

37.5 % wt

Fiber volume:

54.7 % vol

Ply count:

10

Test method:

ASTM D5766-11(2018)

Normalized by:

0.0150

in. CPT

CTD

-65

Dry

HPAEX XXXB

Normalized

40.45

39.57

38.40

36.99

42.41

43.89

3.001

4.379

18

3

RTD

70

Dry

HPAEX XXXA

Normalized

40.06

40.18

38.30

38.53

42.47

42.07

2.801

3.096

18

3

ETW

250

Equilibrium

160F,85%

HPAEX XXXD

Normalized

29.76

28.48

28.59

27.13

31.45

29.98

2.420

2.482

18

3

Open-Hole Tension 2

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

[45/-45/90/45/-45]S

Mean	40.45	39.57	40.06	40.18	29.76	28.48		
Minimum	38.40	36.99	38.30	38.53	28.59	27.13		
Maximum	42.41	43.89	42.47	42.07	31.45	29.98		
OHT2 Strength [ksi] C.V.(%)	3.001	4.379	2.801	3.096	2.420	2.482		
No. Specimens	18		18		18			
No. Prepreg Lots	3		3		3			

2.3.16 “40/20/40” Open-Hole Tension 3 Properties (OHT3)

Material:

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Resin content:

37.7 % wt

Fiber volume:

54.5 % vol

Ply count:

10

Test method:

ASTM D5766-11(2018)

Normalized by:

0.0150

in. CPT

Comp. density:

1.566 g/cc

Open-Hole Tension 3

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

[0/90/45/0/90]S

	CTD		RTD		ETW			
Test Temperature [°F]	-65		70		250			
Moisture Conditioning	Dry		Dry		Equilibrium			
Equilibrium at T, RH					160F,85%			
Source code	HPAFX XXXB		HPAFX XXXA		HPAFX XXXD			
	Normalized	Measured	Normalized	Measured	Normalized	Measured		
Mean	50.12	49.27	58.85	58.61	65.89	63.19		
Minimum	45.56	42.85	52.80	49.72	60.66	56.96		
Maximum	56.43	61.03	62.67	67.53	68.80	66.21		
OHT3 Strength [ksi] C.V.(%)	5.866	9.243	4.609	8.996	2.918	3.248		
No. Specimens	18		18		18			
No. Prepreg Lots	3		3		3			

2.3.17 “25/50/25” Filled-Hole Tension 1 Properties (FHT1)

Material:

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Resin content:

38.1 % wt

Fiber volume:

54.0 % vol

Ply count:

8

Test method:

ASTM D6742-17

Normalized by:

0.0150

in. CPT

Comp. density:

1.560 g/cc

Filled-Hole Tension 1

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

[45/0/-45/90]S

	CTD		RTD		ETW			
Test Temperature [°F]	-65		70		250			
Moisture Conditioning	Dry		Dry		Equilibrium			
Equilibrium at T, RH					160F,85%			
Source code	HPA4X XXXB		HPA4X XXXA		HPA4X XXXD			
	Normalized	Measured	Normalized	Measured	Normalized	Measured		
Mean	44.06	43.58	48.02	47.81	50.39	48.06		
Minimum	40.02	40.26	43.46	43.55	48.18	45.91		
Maximum	48.56	47.78	52.04	53.48	53.68	50.77		
FHT1 Strength [ksi] C.V.(%)	5.901	5.417	4.264	5.879	3.891	3.220		
No. Specimens	18		18		18			
No. Prepreg Lots	3		3		3			

2.3.18 "10/80/10" Filled-Hole Tension 2 Properties (FHT2)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC				Filled-Hole Tension 2 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/-45/90/45/-45]S			
Resin content: 38.0 % wt		Comp. density: 1.567 g/cc					
Fiber volume: 54.3 % vol							
Ply count: 10							
Test method: ASTM D6742-17							
Normalized by: 0.0150 in. CPT							
		CTD		RTD		ETW	
Test Temperature [°F]		-65		70		250	
Moisture Conditioning		Dry		Dry		Equilibrium	
Equilibrium at T, RH						160F,85%	
Source code		HPA5X XXXB		HPA5X XXXA		HPA5X XXXD	
		Normalized		Normalized		Normalized	
		Measured		Measured		Measured	
Mean		44.05 42.88		43.17 43.24		32.21 30.80	
Minimum		42.52 39.81		41.33 40.49		30.87 29.24	
Maximum		46.95 47.23		44.66 46.00		33.63 32.19	
FHT2 Strength [ksi] C.V.(%)		2.322 4.867		1.977 3.781		2.318 2.366	
No. Specimens		18		18		18	
No. Prepreg Lots		3		3		3	

2.3.19 “40/20/40” Filled-Hole Tension 3 Properties (FHT3)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC				Filled-Hole Tension 3 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0/90/45/0/90]S					
Resin content: 37.7 % wt		Comp. density: 1.561 g/cc							
Fiber volume: 54.4 % vol									
Ply count: 10									
Test method: ASTM D6742-17									
Normalized by: 0.0150 in. CPT									
		CTD		RTD		ETW			
Test Temperature [°F]		-65		70		250			
Moisture Conditioning		Dry		Dry		Equilibrium			
Equilibrium at T, RH						160F,85%			
Source code		HPA6X XXXB		HPA6X XXXA		HPA6X XXXD			
		Normalized		Measured		Normalized		Measured	
Mean		50.11 49.23		55.85 55.41		58.24 55.50			
Minimum		46.22 45.07		48.59 46.07		53.74 51.86			
Maximum		53.85 56.86		60.25 59.66		63.40 60.04			
FHT3 Strength [ksi] C.V.(%)		4.413 6.313		4.743 5.811		4.202 4.312			
No. Specimens		18		18		18			
No. Prepreg Lots		3		3		3			

2.3.20 Laminate Open-Hole Compression 1 Properties (OHC1)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Open-Hole Compression 1 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/0/-45/90/-45/90]S	
Resin content:	38.8 % wt	Comp. density:	1.560 g/cc
Fiber volume:	53.3 % vol		
Ply count:	12		
Test method: ASTM D6484-14			
Normalized by: 0.0150 in. CPT			
	RTD	ETW	
Test Temperature [°F]	70	250	
Moisture Conditioning	Dry	Equilibrium	
Equilibrium at T, RH		160F,85%	
Source code	HPAGX XXXA	HPAGX XXXD	
	Normalized	Measured	Normalized
Mean	50.04	50.19	31.85
Minimum	46.29	47.43	29.97
Maximum	52.32	55.35	33.37
OHC1 Strength [ksi] C.V.(%)	3.530	3.930	2.699
No. Specimens	18		18
No. Prepreg Lots	3		3

2.3.21 “10/80/10” Open-Hole Compression 2 Properties (OHC2)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Open-Hole Compression 2 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/-45/90/45/-45]S			
Resin content:	39.8 % wt	Comp. density:		1.553 g/cc	
Fiber volume:	52.3 % vol				
Ply count:	10				
Test method: ASTM D6484-14					
Normalized by: 0.0150 in. CPT					
		RTD		ETW	
Test Temperature [°F]	70	250			
Moisture Conditioning	Dry	Equilibrium			
Equilibrium at T, RH		160F,85%			
Source code	HPAHX XXXA	HPAHX XXXD			
	Normalized	Measured	Normalized	Measured	
Mean	38.78	39.15	22.89	22.56	
Minimum	36.46	37.33	20.76	21.23	
Maximum	41.08	41.56	25.53	25.55	
OHC2 Strength [ksi] C.V.(%)	3.799	3.249	4.964	5.019	
No. Specimens	18		18		
No. Prepreg Lots	3		3		

2.3.22 “40/20/40” Open-Hole Compression 3 Properties (OHC3)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Open-Hole Compression 3 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0/90/45/0/90]S	
Resin content:	37.4 % wt	Comp. density:	1.565 g/cc
Fiber volume:	54.8 % vol		
Ply count:	10		
Test method: ASTM D6484-14			
Normalized by: 0.0150 in. CPT			
	RTD	ETW	
Test Temperature [°F]	70	250	
Moisture Conditioning	Dry	Equilibrium	
Equilibrium at T, RH		160F,85%	
Source code	HPAIX XXXA	HPAIX XXXD	
	Normalized	Measured	Normalized
Mean	57.57	57.58	33.38
Minimum	51.68	52.56	30.75
Maximum	62.55	62.81	34.86
OHC3 Strength [ksj] C.V.(%)	4.857	5.134	3.942
No. Specimens	18		18
No. Prepreg Lots	3		3

2.3.23 Laminate Filled-Hole Compression 1 Properties (FHC1)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Filled-Hole Compression 1 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/0/-45/90/-45/90]S	
Resin content:	38.5 % wt	Comp. density:	1.556 g/cc
Fiber volume:	53.5 % vol		
Ply count:	12		
Test method: ASTM D6742-17			
Normalized by: 0.0150 in. CPT			
	RTD	ETW	
Test Temperature [°F]	70	250	
Moisture Conditioning	Dry	Equilibrium	
Equilibrium at T, RH		160F,85%	
Source code	HPA7X XXXA	HPA7X XXXD	
	Normalized	Measured	Normalized
			Measured
Mean	85.23	85.41	49.74
Minimum	77.51	79.38	45.67
Maximum	94.19	90.93	54.64
FHC1 Strength [ksi] C.V.(%)	6.086	3.742	5.378
			2.684
No. Specimens	18		18
No. Prepreg Lots	3		3

2.3.24 “10/80/10” Filled-Hole Compression 2 Properties (FHC2)

Data reported for reference only. FHC2 values are equal to or greater than UNC2 values, therefore CMH17 and NCAMP recommend the use of UNC2 values for design purposes.

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Filled-Hole Compression 2 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/-45/90/45/-45]S	
Resin content:	38.4 % wt	Comp. density:	1.557 g/cc
Fiber volume:	53.6 % vol		
Ply count:	10		
Test method:	ASTM D6742-17		
Normalized by:	0.0150	in. CPT	
	RTD 70 Dry		ETW 250 Equilibrium 160F,85%
Test Temperature [°F]			
Moisture Conditioning			
Equilibrium at T, RH			
Source code	HPA8X XXXA		HPA8X XXXD
	Normalized	Measured	Normalized Measured
Mean	57.39	57.77	31.44 31.34
Minimum	51.93	55.31	27.62 28.48
Maximum	60.48	60.22	35.20 35.80
FHC2 Strength [ksi] C.V.(%)	3.561	2.320	6.230 5.145
No. Specimens	19		18
No. Prepreg Lots	3		3

2.3.25 “40/20/40” Filled-Hole Compression 3 Properties (FHC3)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Filled-Hole Compression 3 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0/90/45/0/90]S	
Resin content:	39.1 % wt	Comp. density:	1.579 g/cc
Fiber volume:	53.6 % vol		
Ply count:	10		
Test method: ASTM D6742-17			
Normalized by: 0.0150 in. CPT			
	RTD	ETW	
Test Temperature [°F]	70	250	
Moisture Conditioning	Dry	Equilibrium	
Equilibrium at T, RH		160F,85%	
Source code	HPA9X XXXA	HPA9X XXXD	
	Normalized	Measured	Normalized Measured
Mean	88.69	89.30	56.34 56.55
Minimum	74.45	79.87	51.25 52.62
Maximum	98.45	95.96	61.42 60.32
FHC3 Strength [ksi] C.V.(%)	5.942	4.105	5.714 3.409
No. Specimens	19	18	
No. Prepreg Lots	3	3	

2.3.26 "25/50/25" Single-Shear Bearing 1 Properties (SSB1)

Material:		Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Single-Shear Bearing 1 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/0/-45/90]S			
Resin content:	37.6 % wt	Comp. density:		1.562 g/cc			
Fiber volume:	54.5 % vol						
Ply count:	8						
Test method:	ASTM D5961-17						
Normalized by:	0.0150	in. CPT					
		RTD		ETW			
Test Temperature [°F]	70		250				
Moisture Conditioning	Dry		Equilibrium				
Equilibrium at T, RH			160F,85%				
Source code	HPA1X XXXA		HPA1X XXXD				
	Normalized	Measured	Normalized	Measured			
SSB1 Initial Peak Strength [ksi]	Mean	112.6		88.13			
	Minimum	104.5		85.33			
	Maximum	121.7		90.25			
	C.V.(%)	5.455		2.871			
	No. Specimens	6		3			
	No. Prepreg Lots	2		3			
SSB1 2% Offset Strength [ksi]	Mean	105.4	111.0	86.84	87.60		
	Minimum	92.35	91.30	71.15	68.76		
	Maximum	117.5	123.7	97.81	97.97		
	C.V.(%)	7.580	6.959	7.698	9.332		
	No. Specimens	18		16			
	No. Prepreg Lots	3		3			
SSB1 Ultimate Strength [ksi]	Mean	129.2	136.0	94.99	95.17		
	Minimum	119.6	121.0	83.26	78.97		
	Maximum	149.7	149.8	110.2	109.3		
	C.V.(%)	5.763	5.622	6.785	8.400		
	No. Specimens	18		19			
	No. Prepreg Lots	3		3			

Initial Peak reported for reference only.

2.3.27 "10/80/10" Single-Shear Bearing 2 Properties (SSB2)

Material:

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Resin content:

36.9 % wt

Fiber volume:

55.3 % vol

Ply count:

10

Test method:

ASTM D5961-17

Normalized by:

0.0150

in. CPT

RTD

ETW

Test Temperature [°F]

70

250

Moisture Conditioning

Dry

Equilibrium

Equilibrium at T, RH

160F,85%

Source code

HPA2X XXXA

HPA2X XXXD

Normalized

Measured

Normalized

Measured

SSB2 2% Offset Strength [ksi]

Mean

108.6

113.7

86.86

87.84

Minimum

99.59

102.2

78.01

80.99

Maximum

119.1

122.0

93.53

97.63

C.V.(%)

5.784

4.579

5.063

4.505

No. Specimens

18

18

No. Prepreg Lots

3

3

SSB2 Ultimate Strength [ksi]

Mean

132.3

138.6

97.75

98.89

Minimum

119.6

129.4

91.27

88.09

Maximum

142.5

146.3

103.7

104.5

C.V.(%)

4.429

4.012

3.725

4.002

No. Specimens

18

18

No. Prepreg Lots

3

3

Single-Shear Bearing 2

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

[45/-45/90/45/-45]S

2.3.28 “40/20/40” Single-Shear Bearing 3 Properties (SSB3)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Single-Shear Bearing 3 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0/90/45/0/90]S	
Resin content: 38.2 % wt	Comp. density: 1.559 g/cc		
Fiber volume: 53.8 % vol			
Ply count: 10			
Test method: ASTM D5961-17			
Normalized by: 0.0150 in. CPT			
	RTD	ETW	
Test Temperature [°F]	70	250	
Moisture Conditioning	Dry	Equilibrium	
Equilibrium at T, RH		160F, 85%	
Source code	HPA3X XXXA	HPA3X XXXD	
	Normalized	Measured	Normalized
SSB3 Initial Peak Strength [ksi]			
Mean	107.6	78.42	
Minimum	105.8	71.91	
Maximum	110.8	85.39	
C.V.(%)	2.159	5.625	
No. Specimens	4	12	
No. Prepreg Lots	3	3	
SSB3 2% Offset Strength [ksi]			
Mean	101.6	75.91	75.78
Minimum	93.60	67.76	70.21
Maximum	110.2	83.41	82.87
C.V.(%)	4.871	4.800	4.704
No. Specimens	18	18	
No. Prepreg Lots	3	3	
SSB3 Ultimate Strength [ksi]			
Mean	119.7	86.62	86.52
Minimum	107.9	81.62	81.04
Maximum	130.9	91.98	93.45
C.V.(%)	5.187	2.957	4.086
No. Specimens	18	18	
No. Prepreg Lots	3	3	

Initial Peak reported for reference only.

2.3.29 “25/50/25” Compression After Impact 1 Properties (CAI1)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Compression After Impact 1 Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [45/0/-45/90/45/90]S				
Resin content:	35.5 % wt	Comp. density:	1.572 g/cc			
Fiber volume:	56.7 % vol					
Ply count:	12					
Test method: ASTM D7136-15/D7137-17						
Normalized by: 0.0150 in. CPT						
		RTD				
Test Temperature [°F]	70					
Moisture Conditioning	Dry					
Equilibrium at T, RH						
Source code	HPAKX XXXA					
	Normalized	Measured				
Mean	34.01	34.19				
Minimum	33.37	33.17				
Maximum	34.72	35.70				
CAI1 Strength [ksi] C.V.(%)	1.691	2.643				
No. Specimens	6					
No. Prepreg Lots	1					

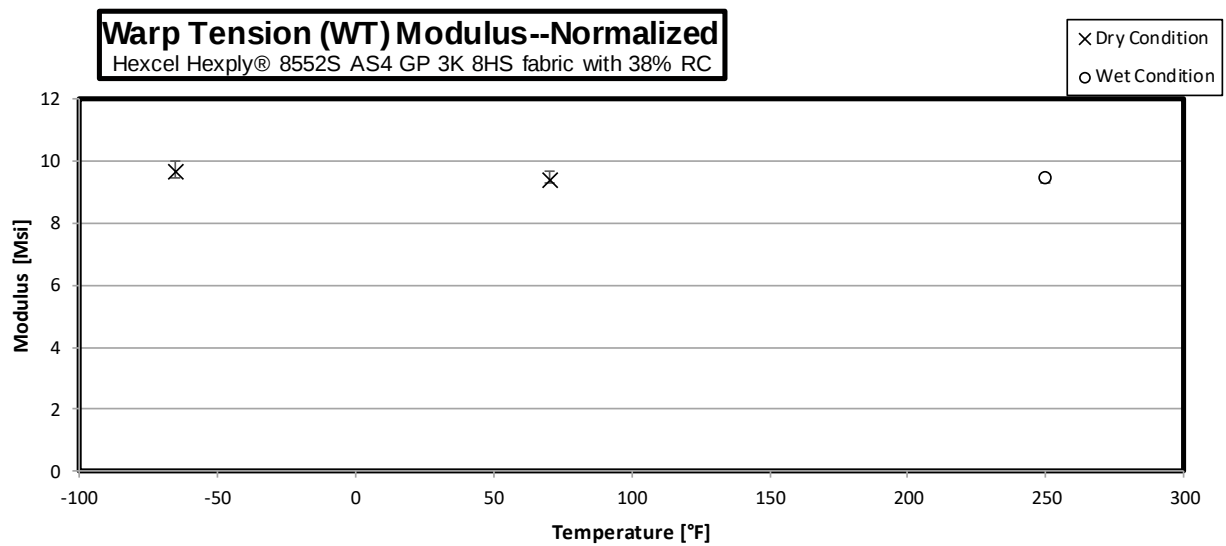
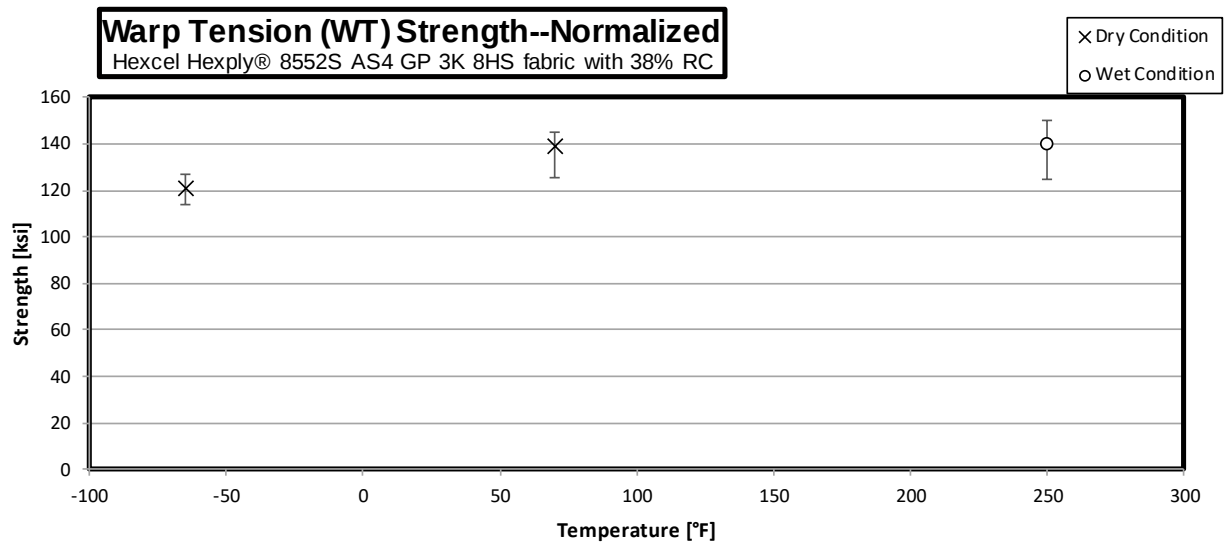
2.3.30 Interlaminar Tension Properties (ILT)

Material: Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC		Interlaminar Tension Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC [0]11	
Resin content: 38.0 % wt	Comp. density: 1.562 g/cc		
Fiber volume: 54.1 % vol			
Ply count: 11			
Test method: ASTM D6415-06a(2013)			
Normalized by: NA			
	CTD	RTD	ETW
Test Temperature [°F]	-65	70	250
Moisture Conditioning	Dry	Dry	Equilibrium
Equilibrium at T, RH			160F,85%
Source code	HPAMX XXXB	HPAMX XXXA	HPAMX XXXD
	Normalized	Measured	Normalized
Mean		346.5	352.3
Minimum		330.9	341.5
Maximum		358.3	378.7
C.V.(%)		3.151	4.141
CBS [lb]			
No. Specimens	6	6	6
No. Prepreg Lots	1	1	1
Mean	11.84	11.96	3.876
Minimum	11.28	11.61	3.340
Maximum	12.46	12.86	4.520
C.V.(%)	3.655	4.087	11.24
ILT [ksi]			
No. Specimens	6	6	6
No. Prepreg Lots	1	1	1

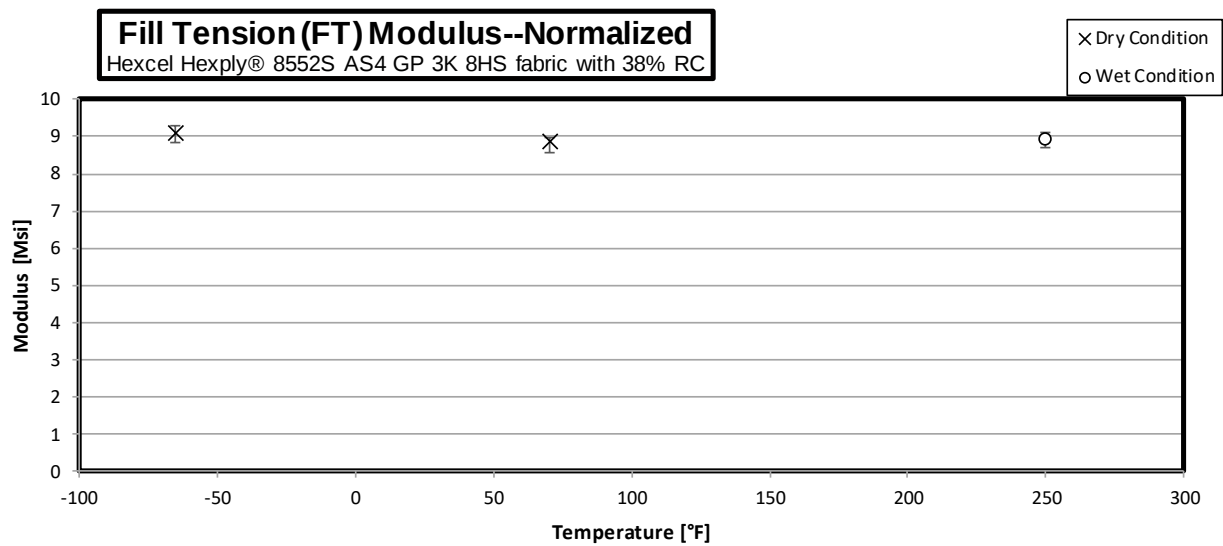
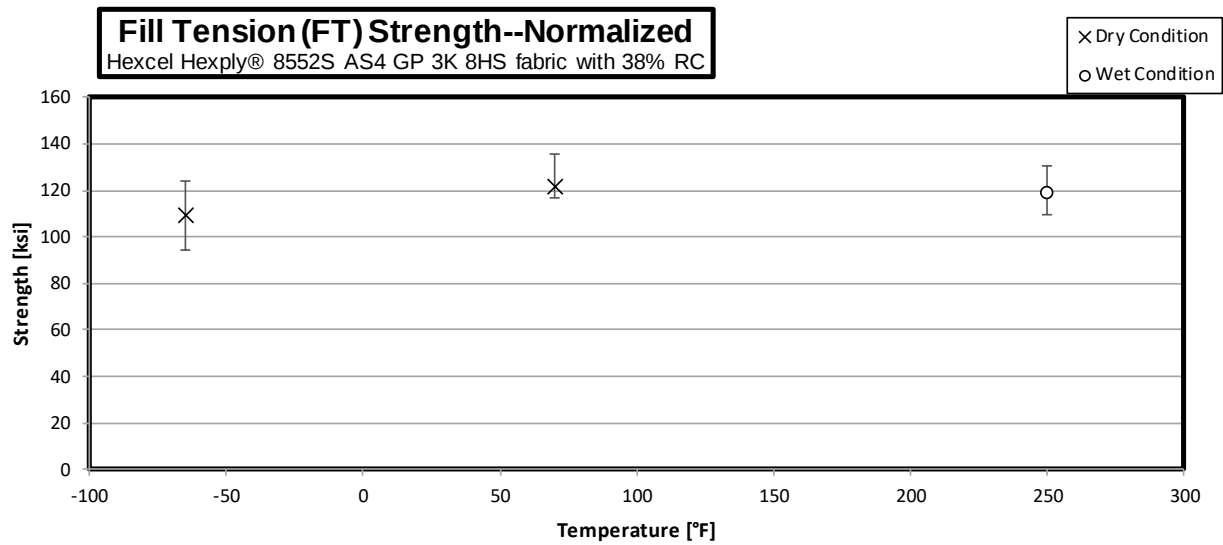
3. Individual Test Charts

These charts combine all three batches of data and plot the minimum and maximum modulus and strength range based on the test temperature.

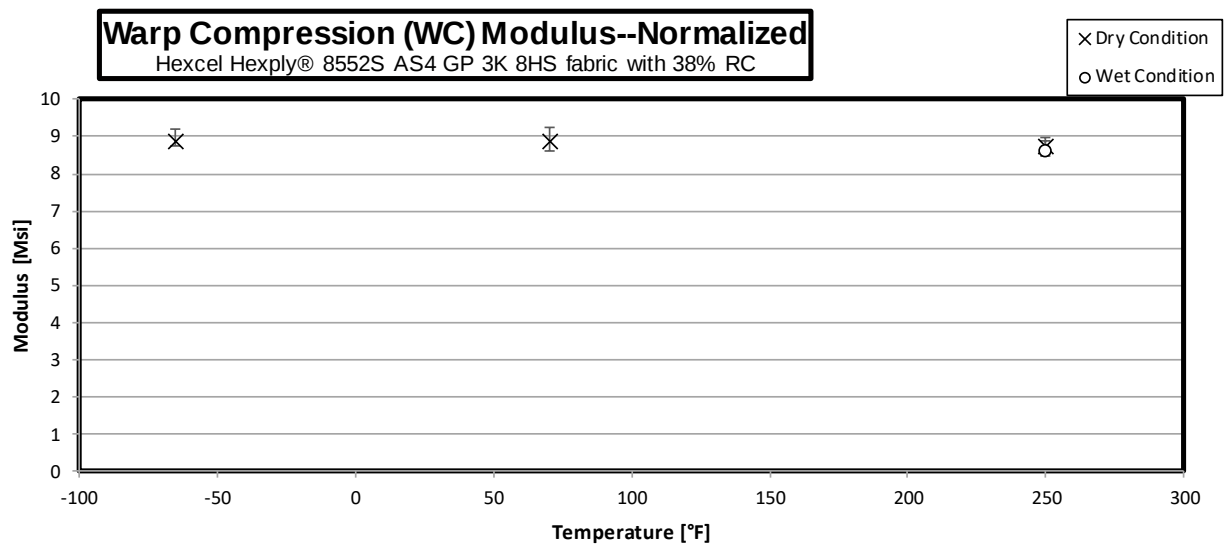
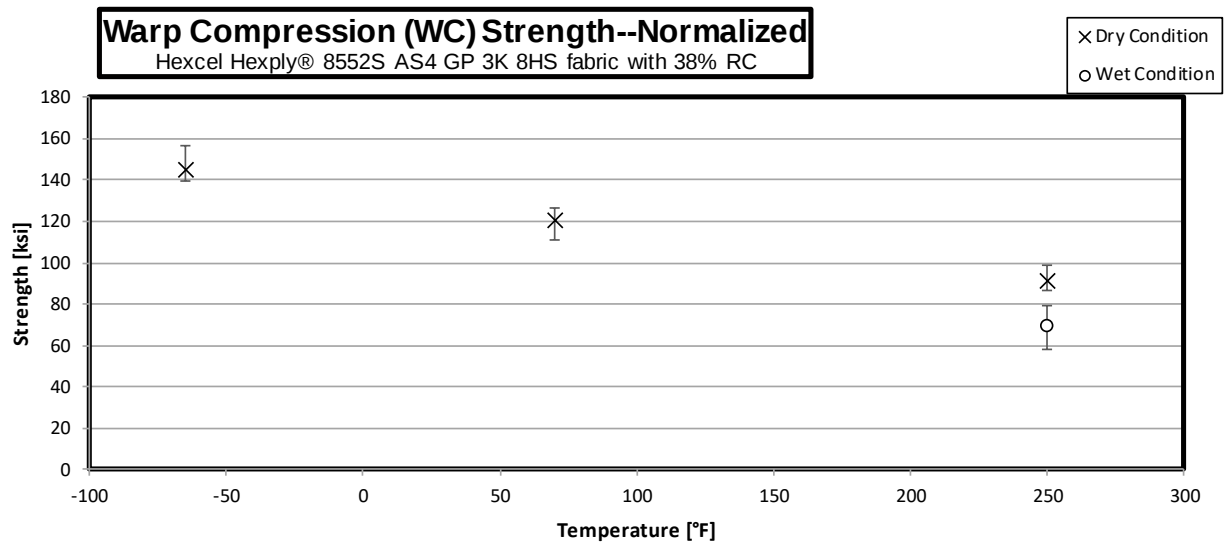
3.1 Warp Tension Properties (WT)



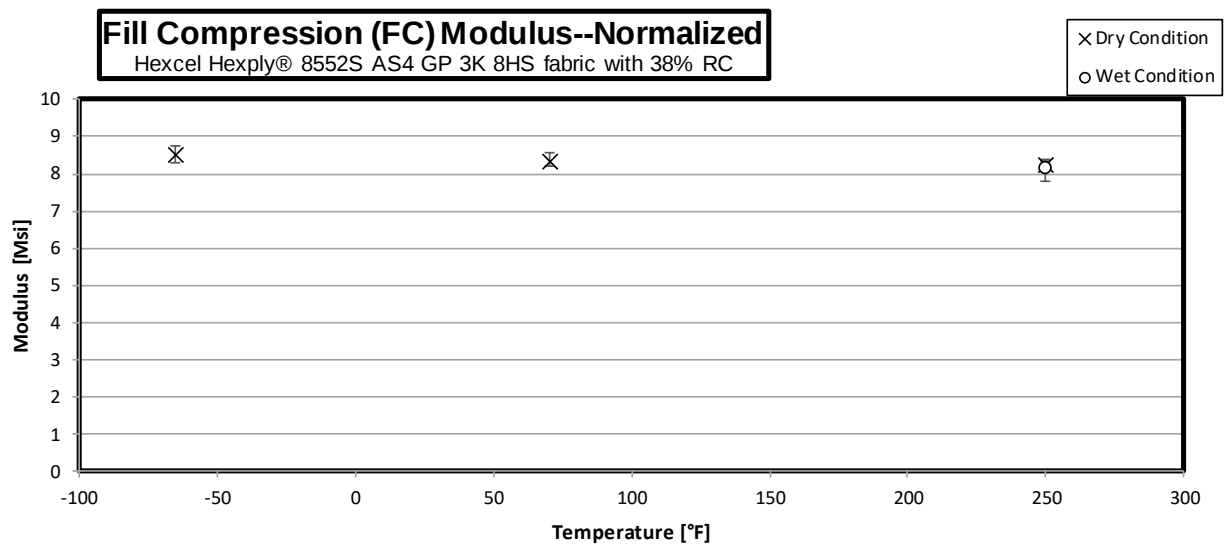
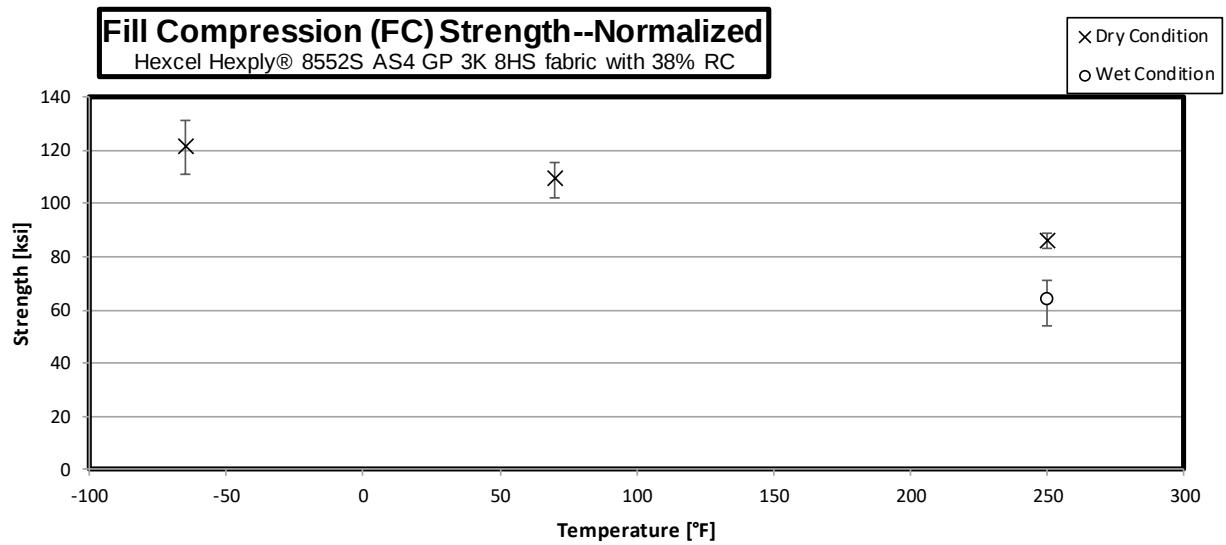
3.2 Fill Tension Properties (FT)



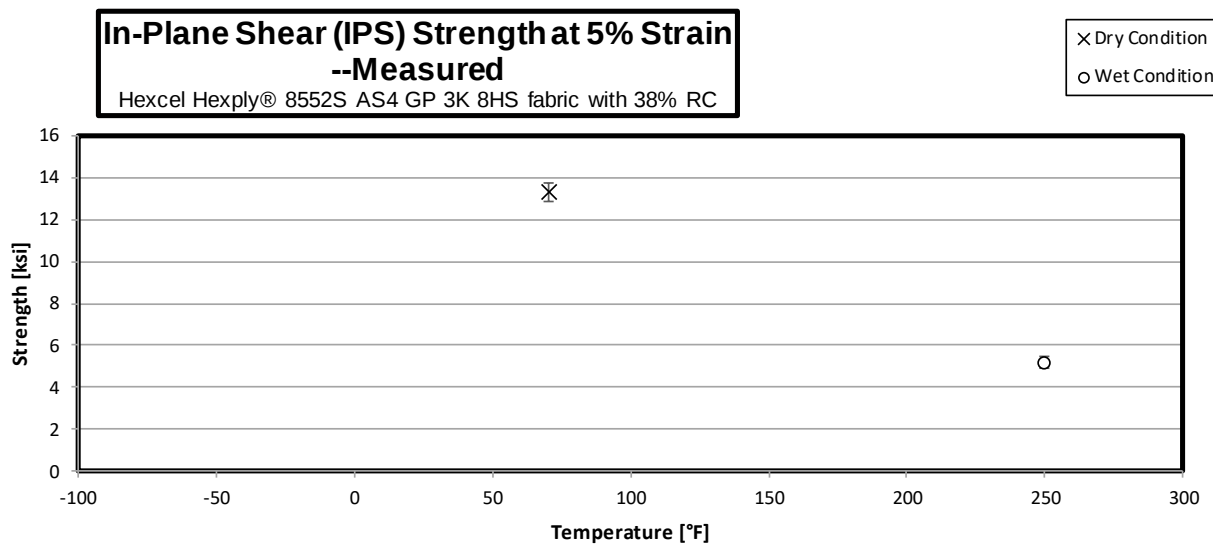
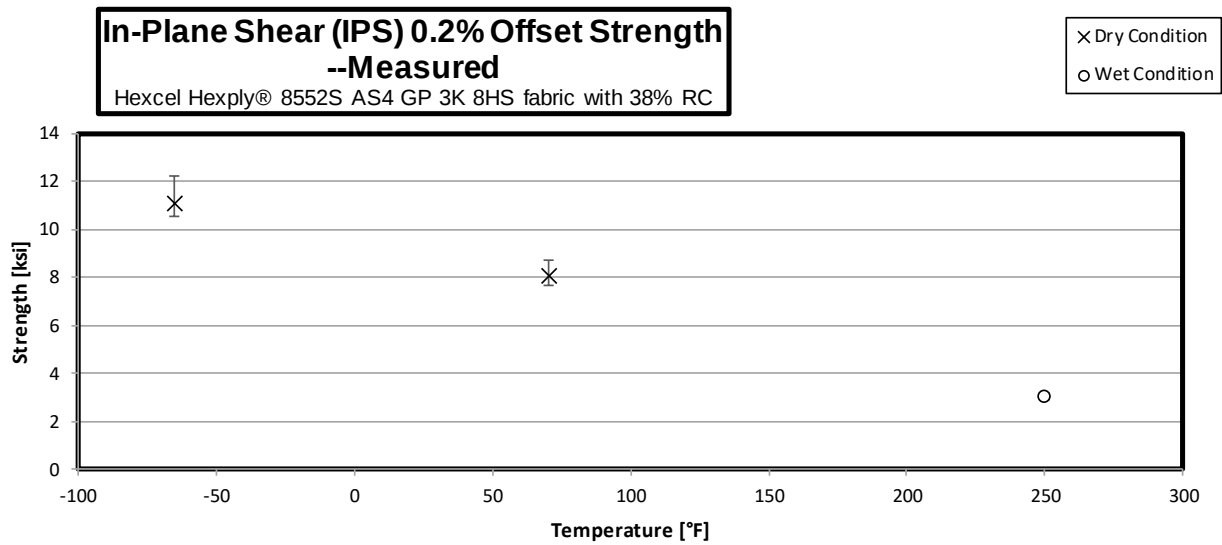
3.3 Warp Compression Properties (WC)

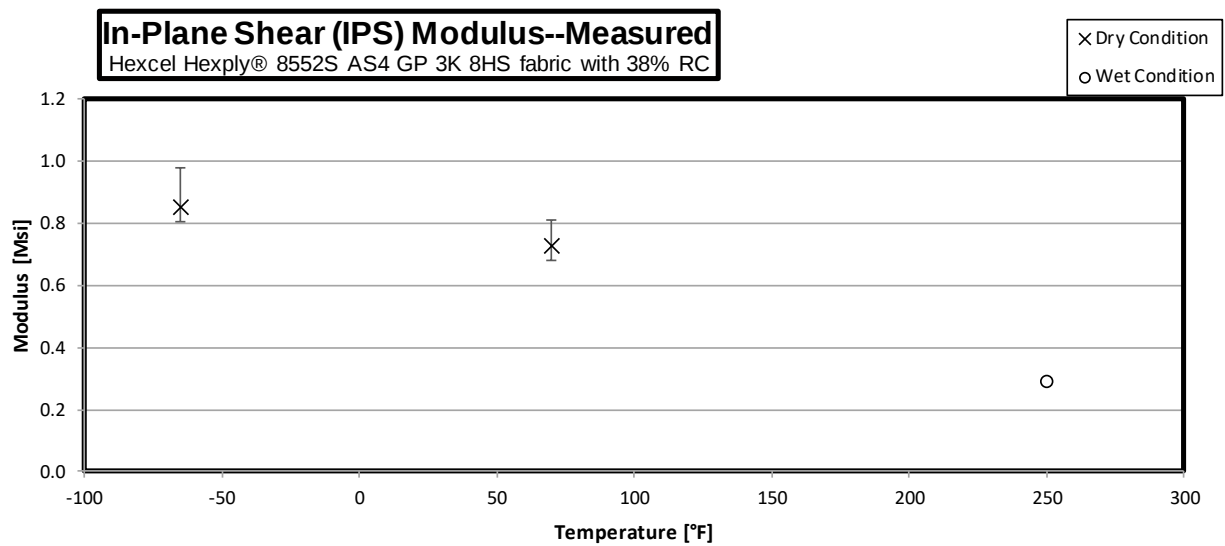
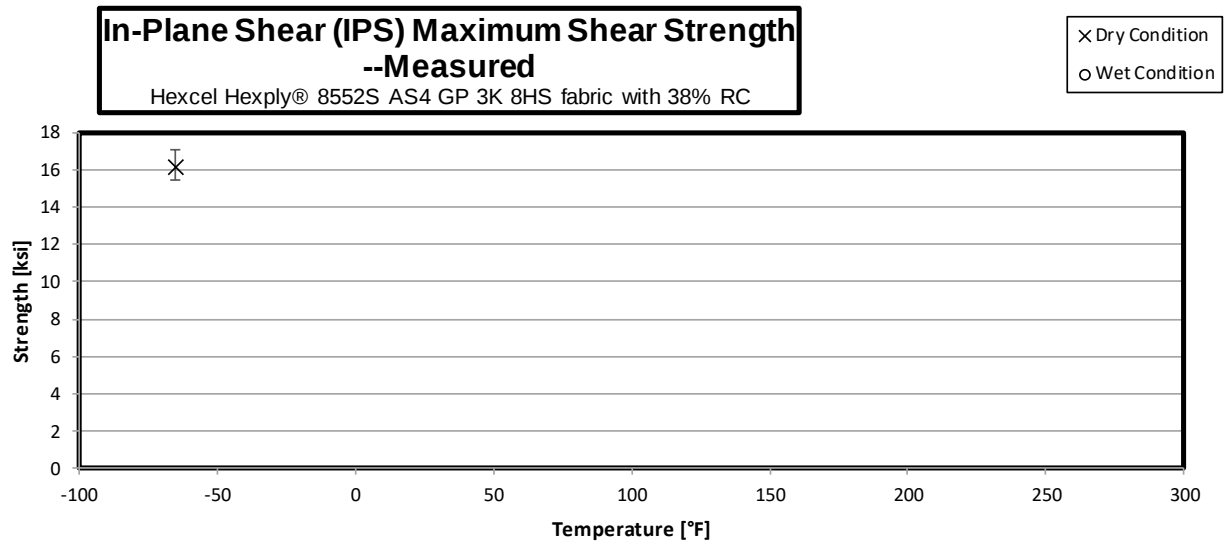


3.4 Fill Compression Properties (FC)

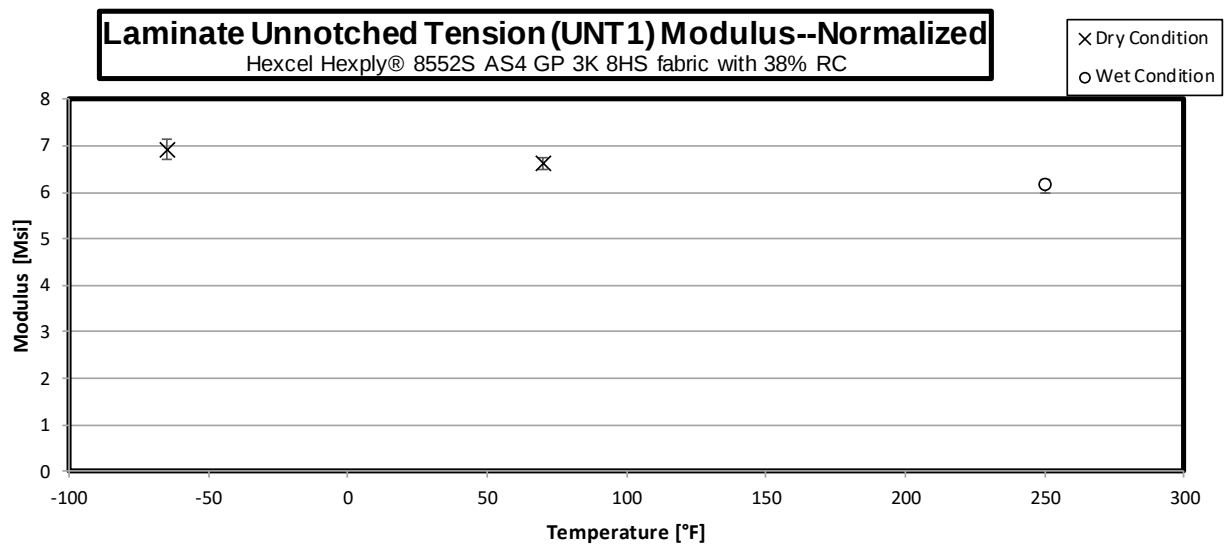
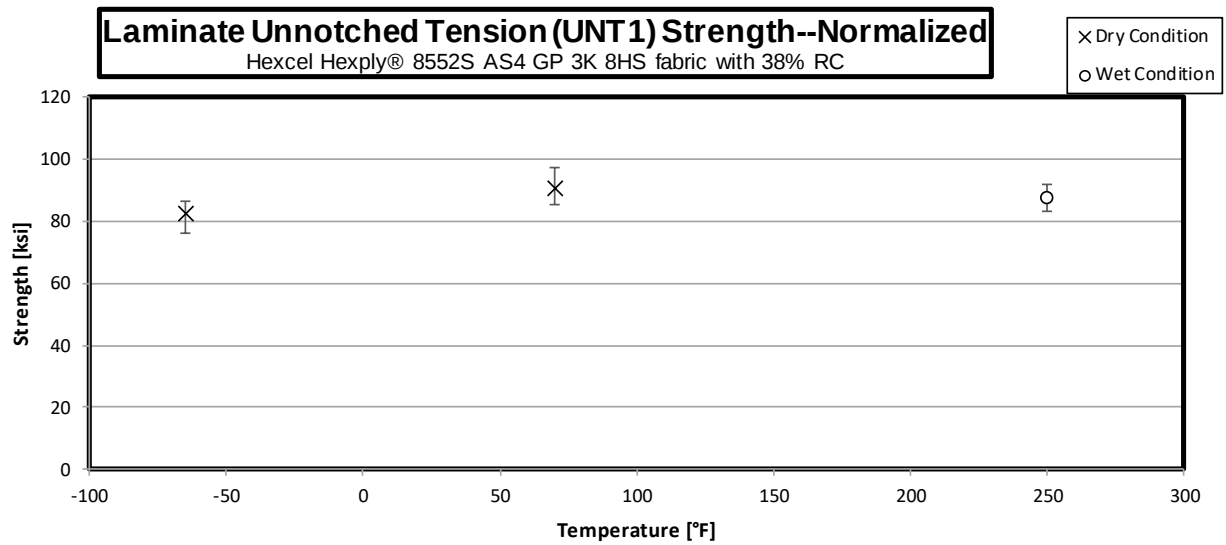


3.5 In-Plane Shear Properties (IPS)

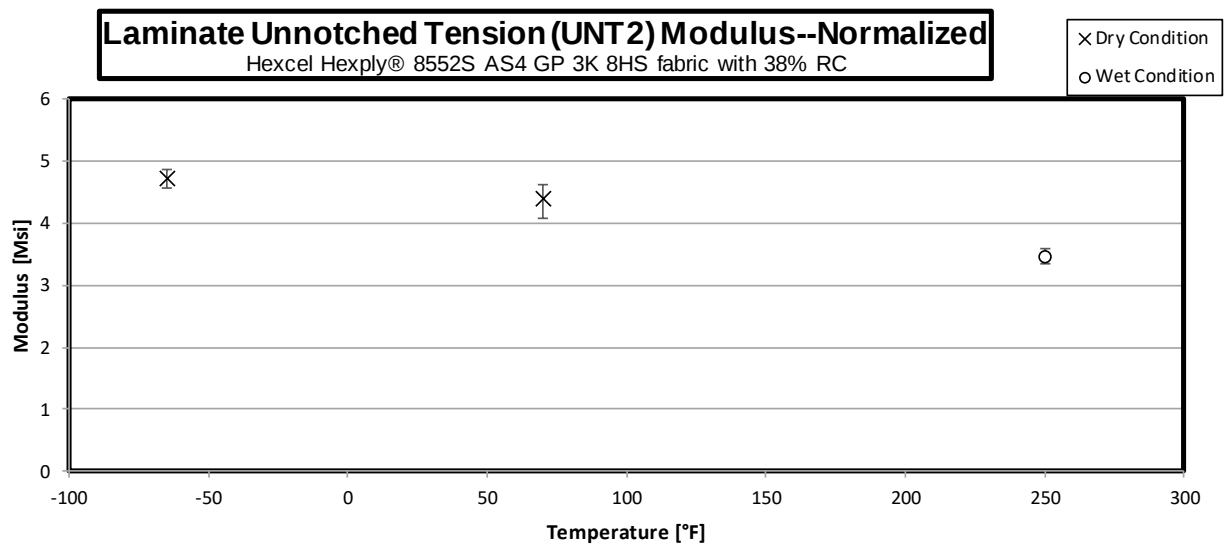
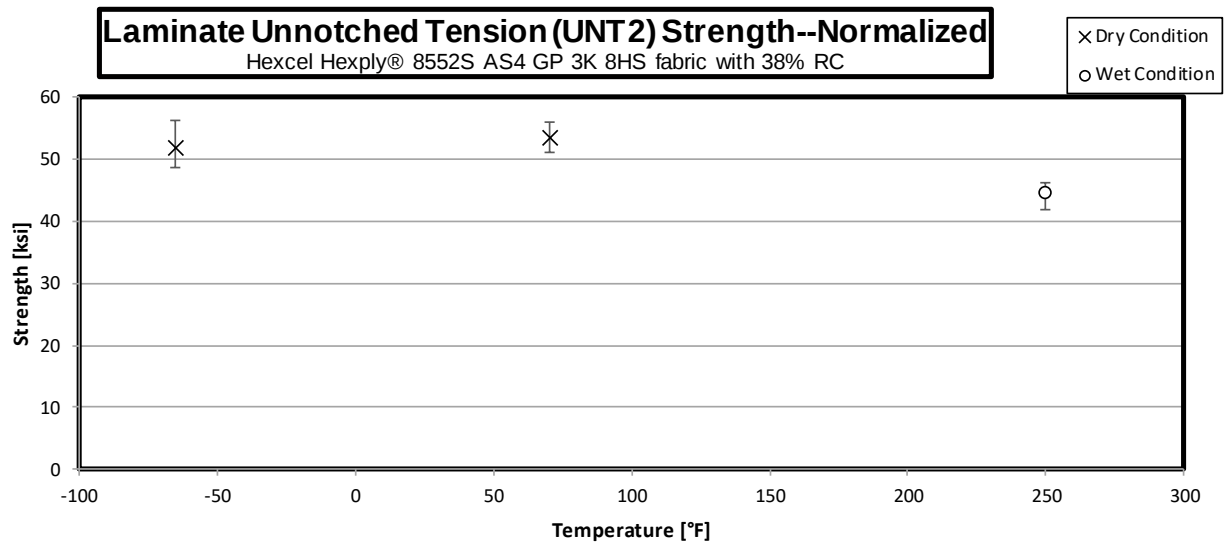




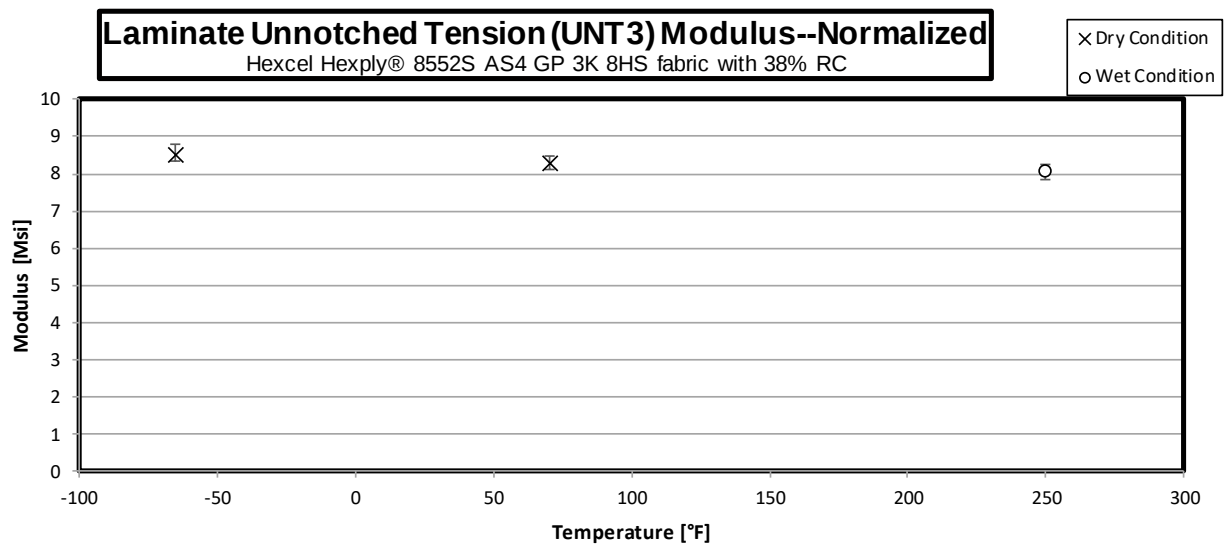
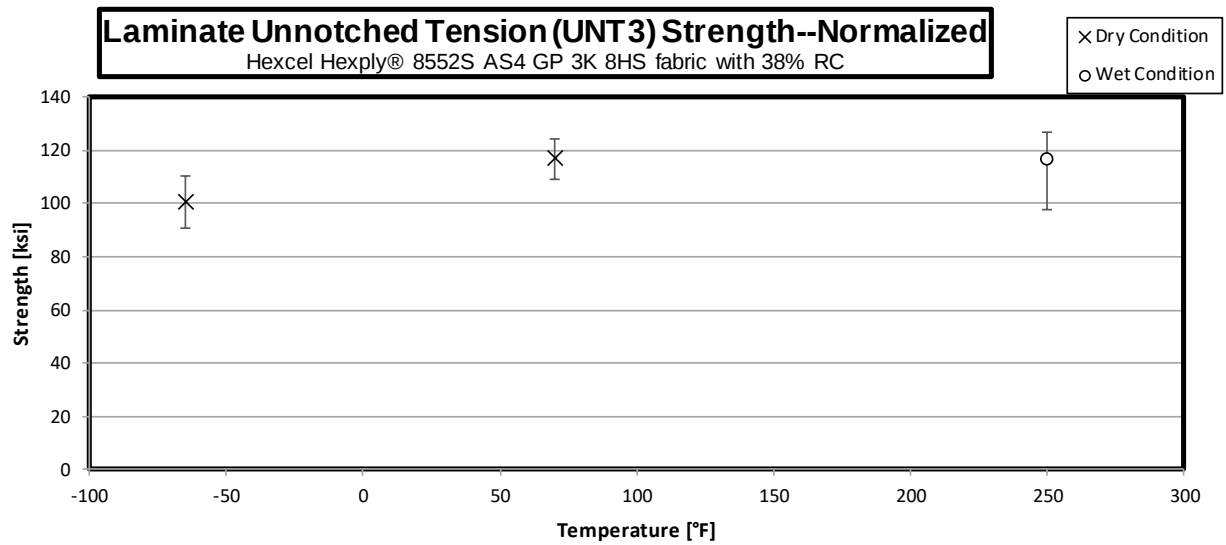
3.6 “25/50/25” Unnotched Tension 1 Properties (UNT1)



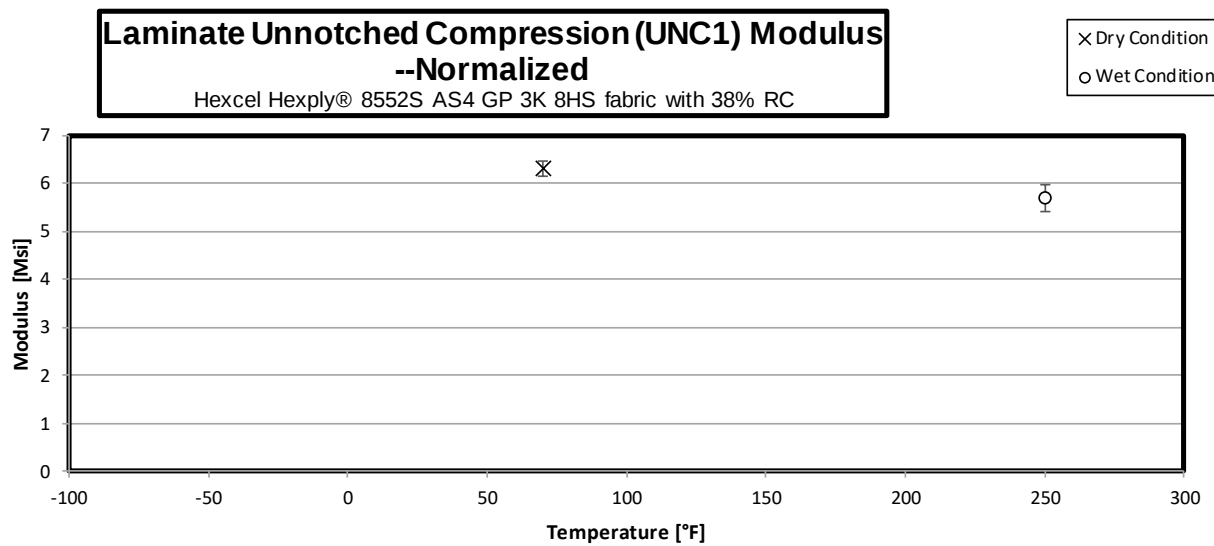
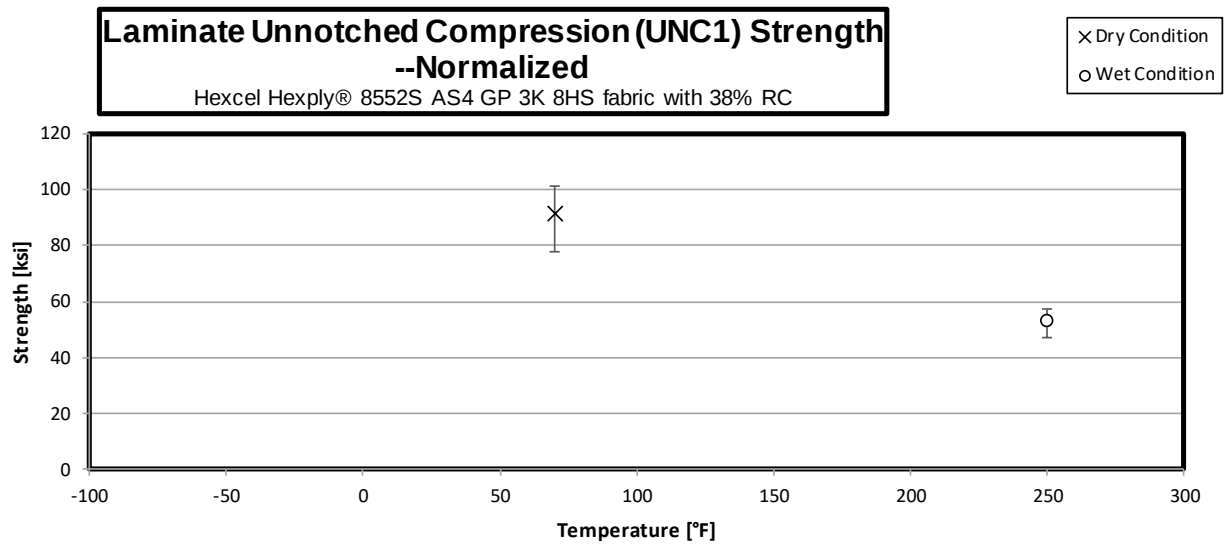
3.7 “10/80/10” Unnotched Tension 2 Properties (UNT2)



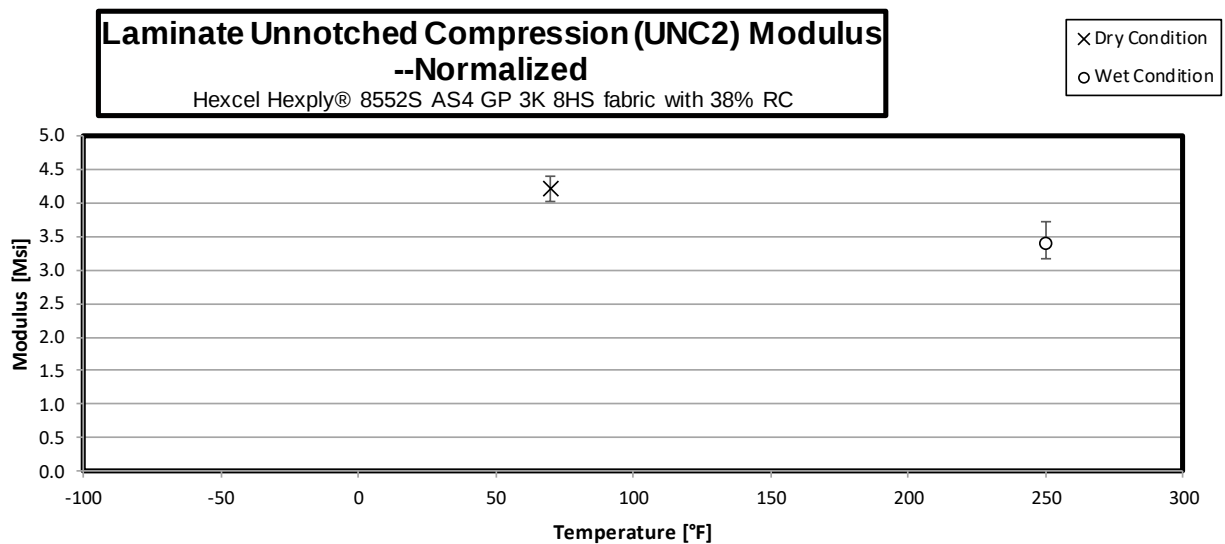
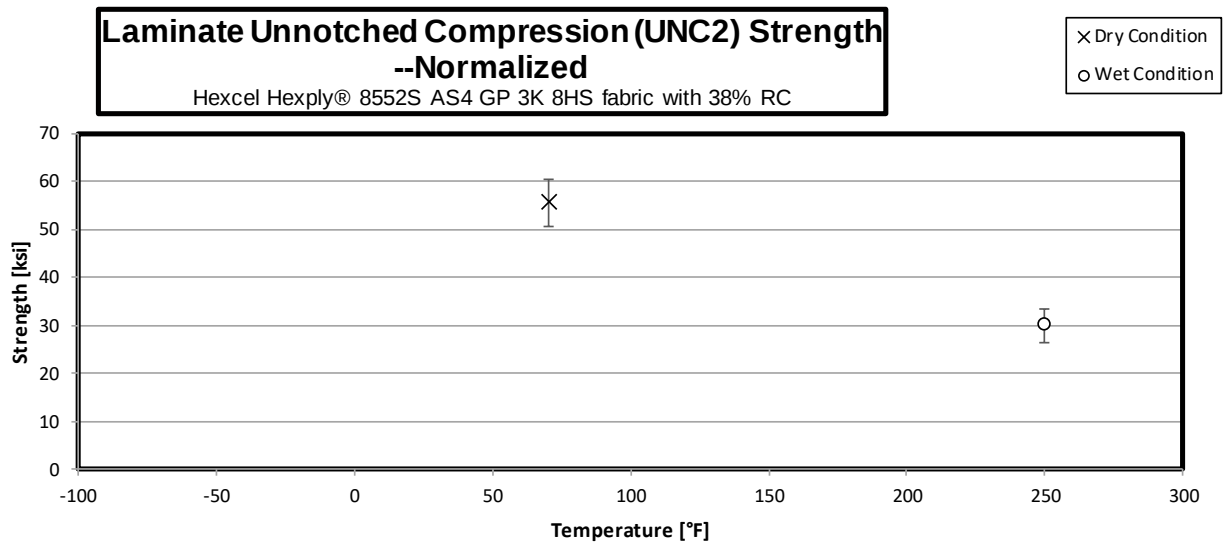
3.8 “40/20/40” Unnotched Tension 3 Properties (UNT3)



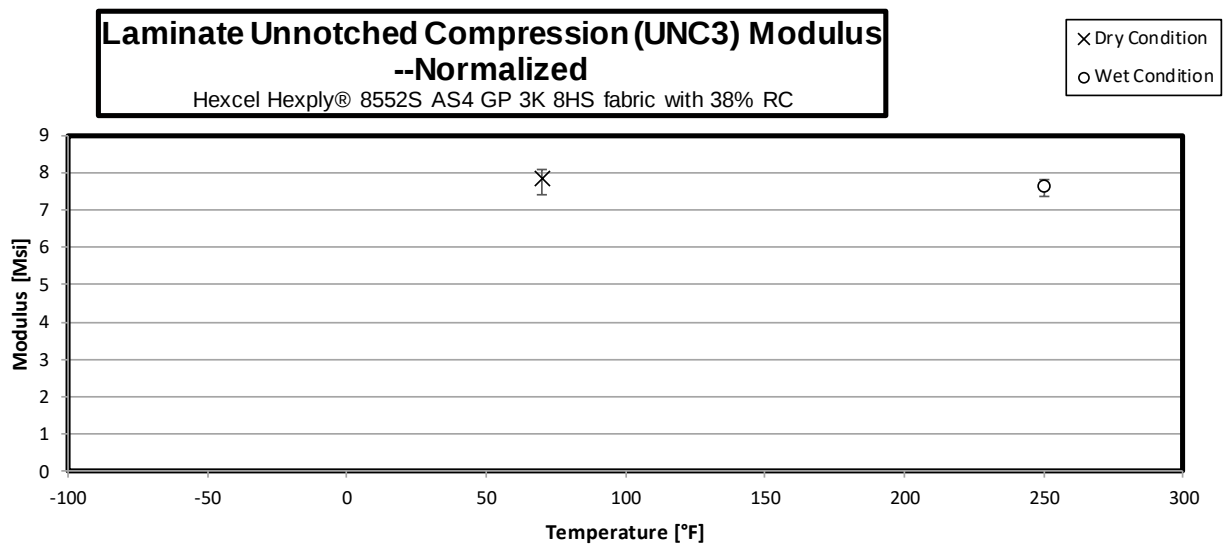
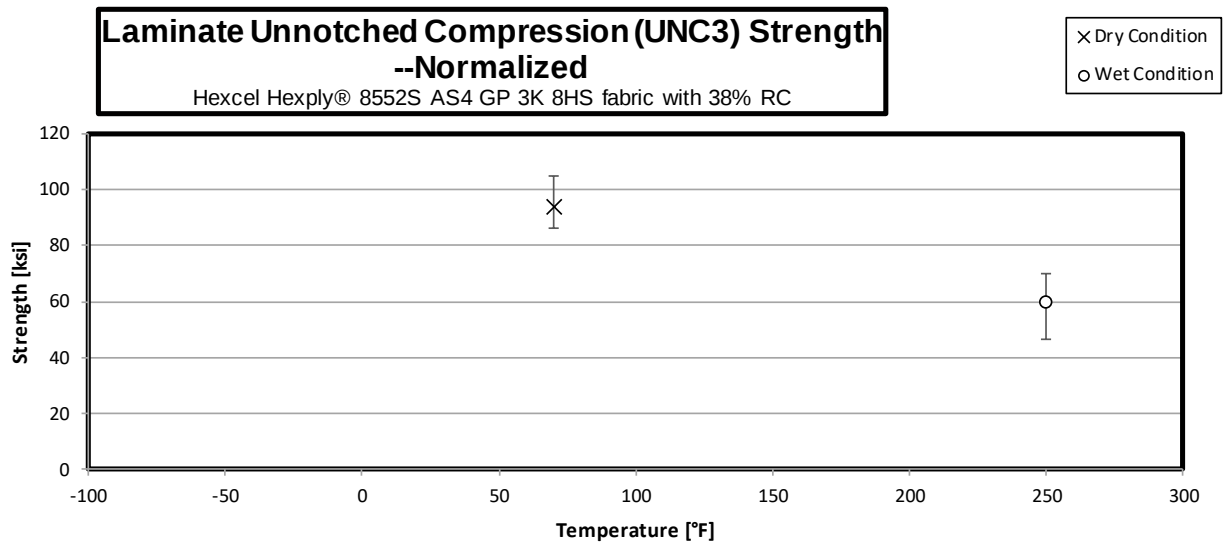
3.9 “25/50/25” Unnotched Compression 1 Properties (UNC1)



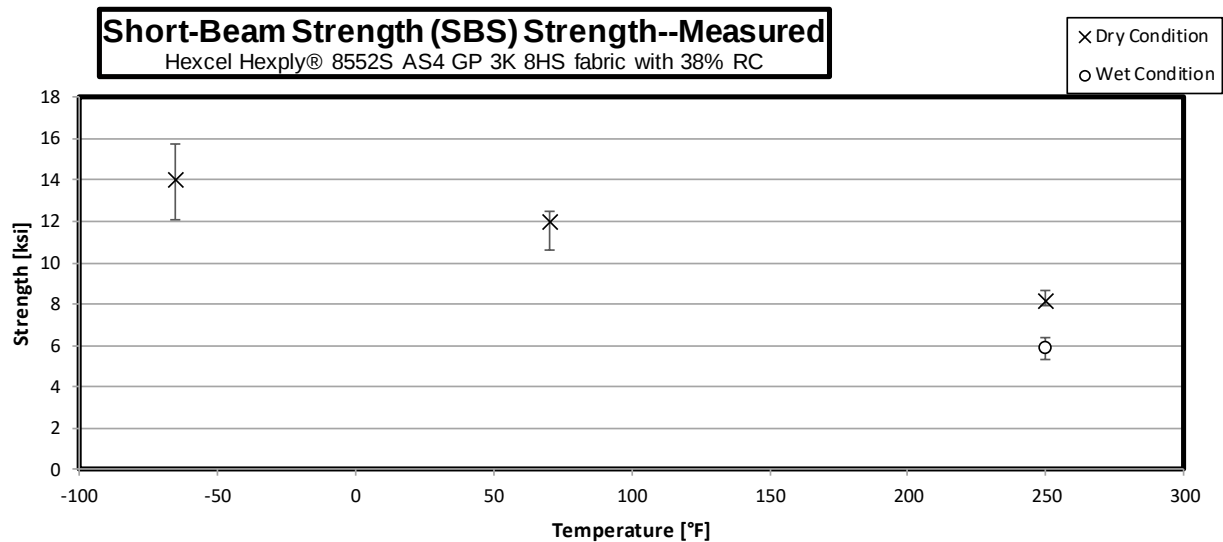
3.10 “10/80/10” Unnotched Compression 2 Properties (UNC2)



3.11 “40/20/40” Unnotched Compression 3 Properties (UNC3)

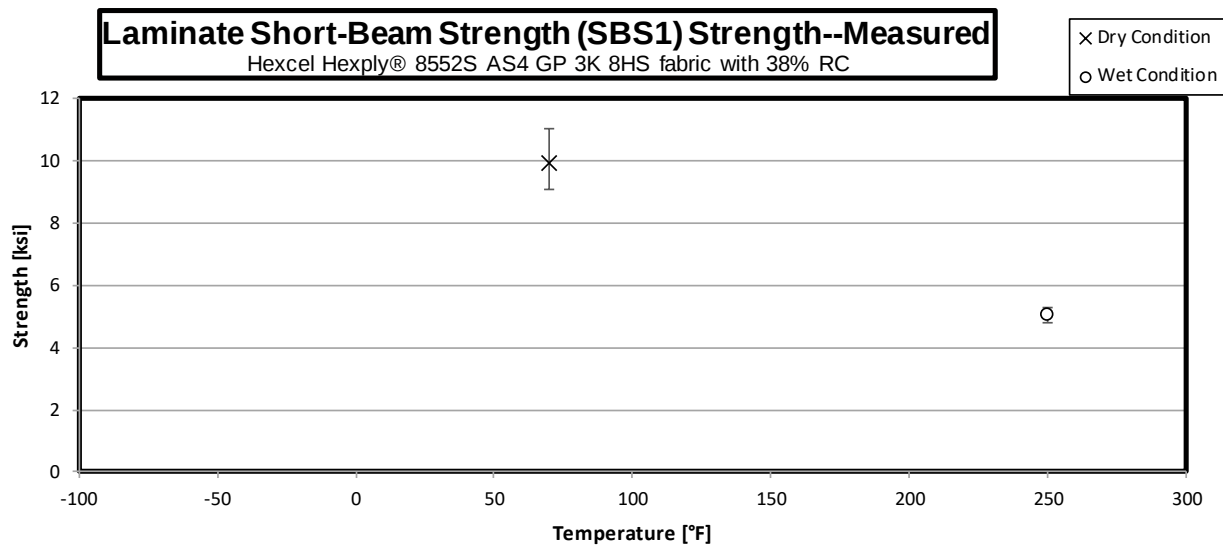


3.12 Lamina Short-Beam Strength Properties (SBS)

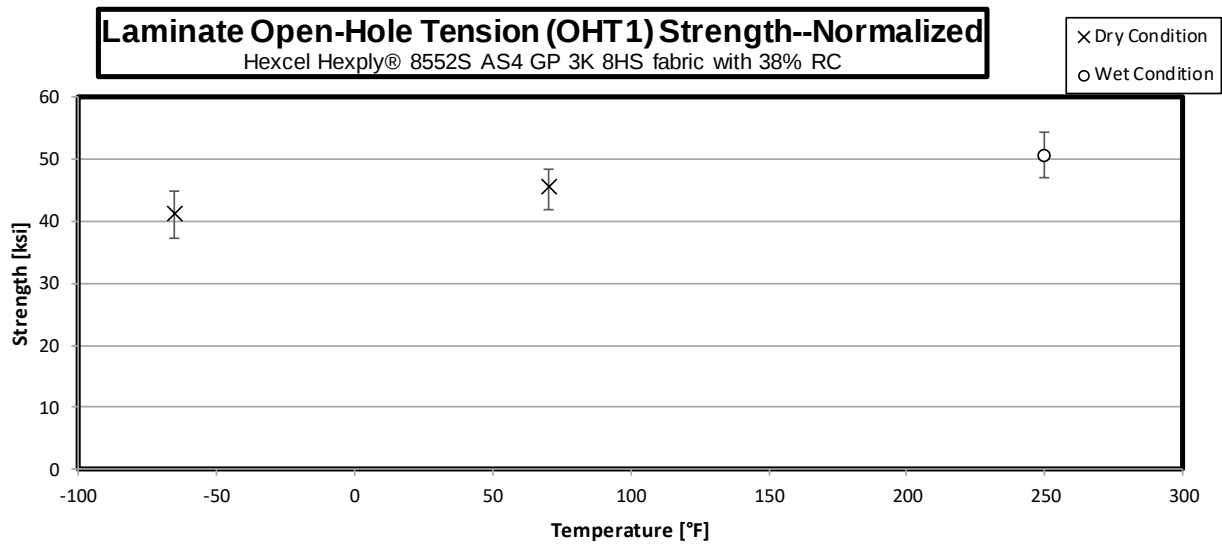


3.13 Laminate Short-Beam Strength Properties (SBS1)

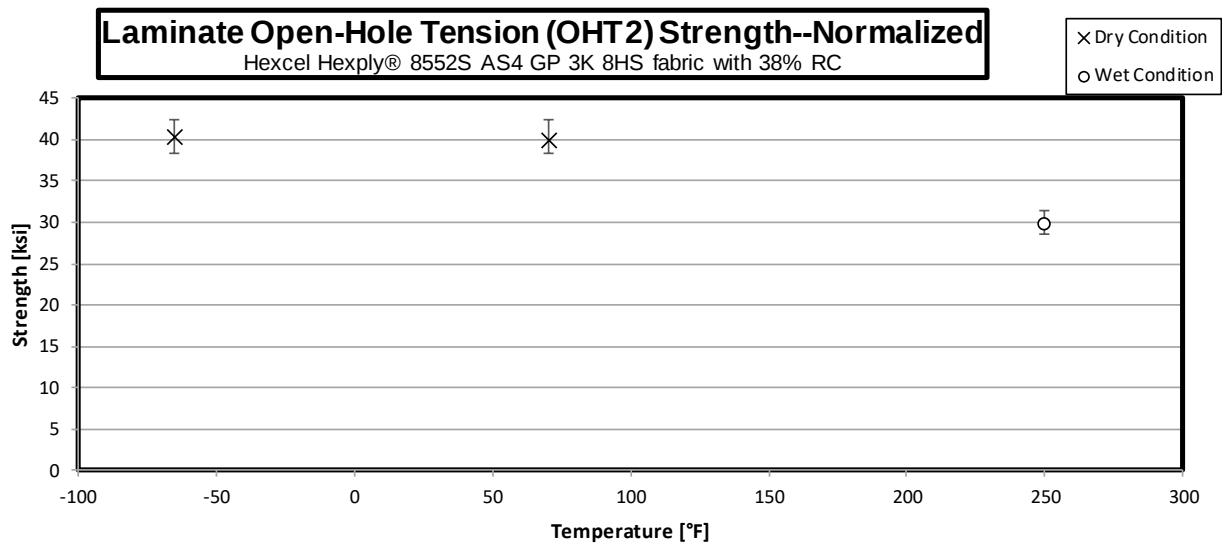
Layup for laminate is [45/0/-45/90/-45/90]S



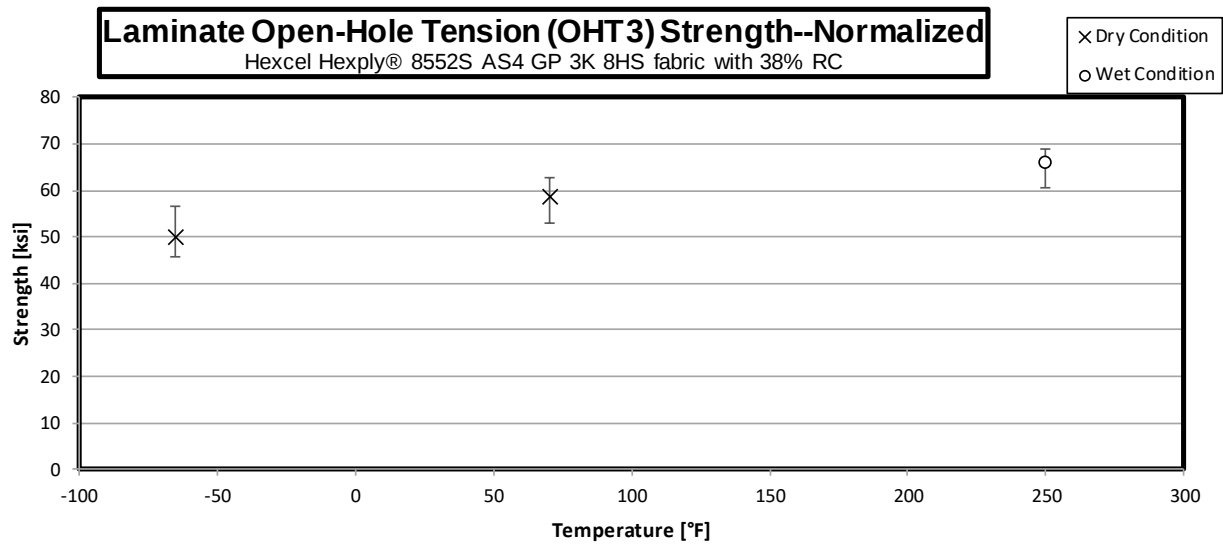
3.14 “25/50/25” Open-Hole Tension 1 Properties (OHT1)



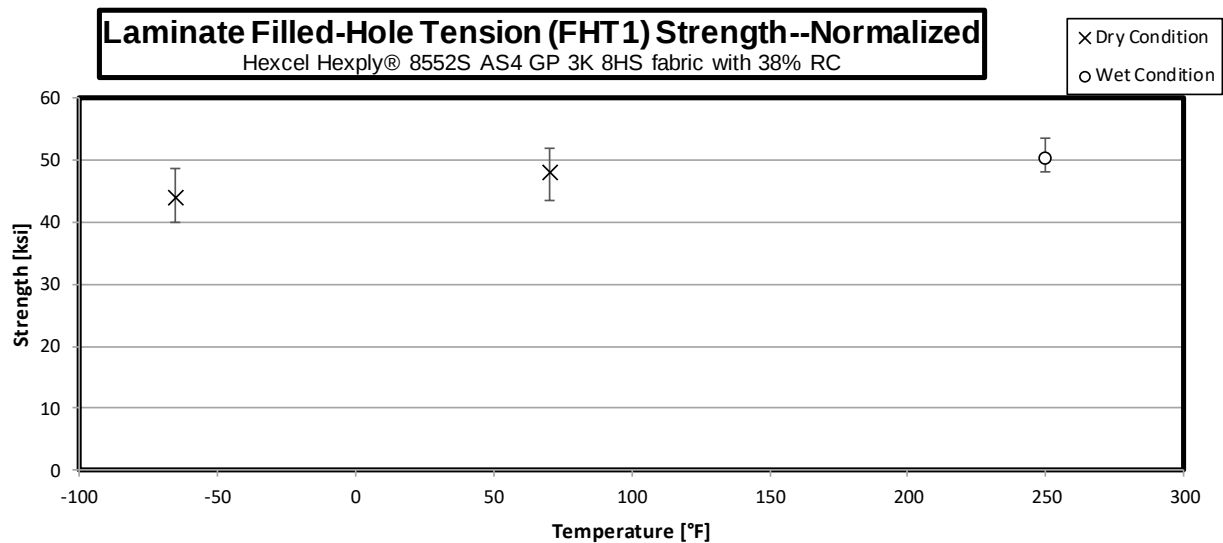
3.15 “10/80/10” Open-Hole Tension 2 Properties (OHT2)



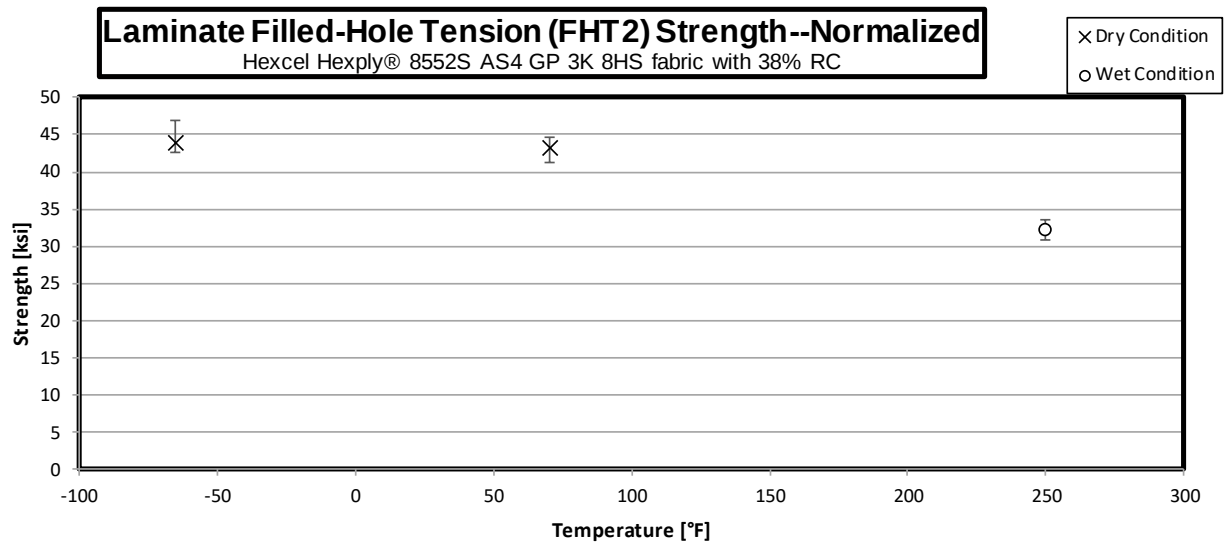
3.16 “40/20/40” Open-Hole Tension 3 Properties (OHT3)



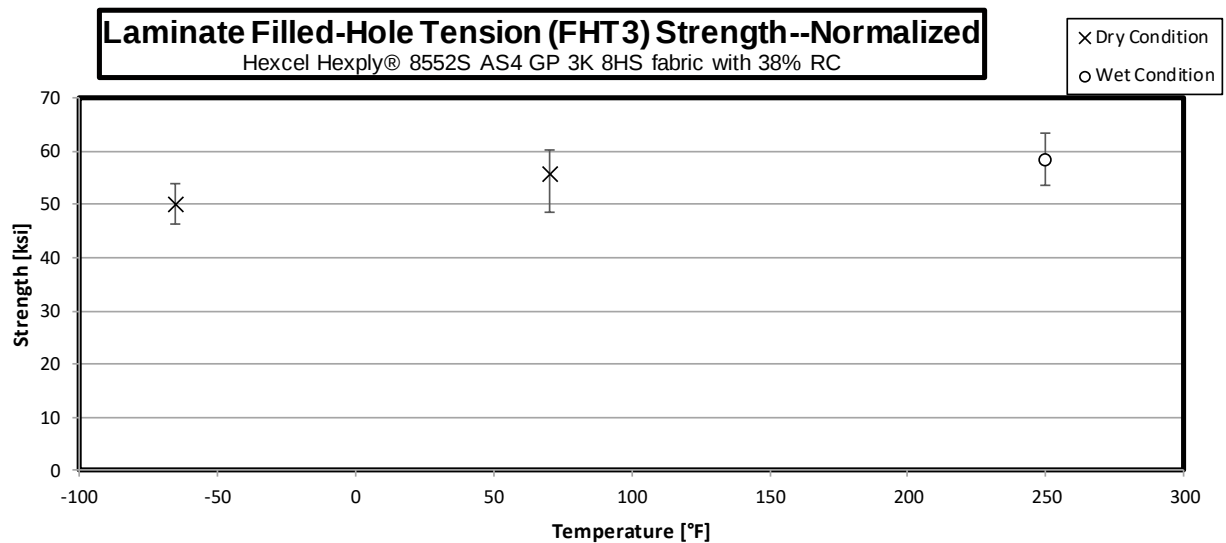
3.17 “25/50/25” Filled-Hole Tension 1 Properties (FHT1)



3.18 “10/80/10” Filled-Hole Tension 2 Properties (FHT2)

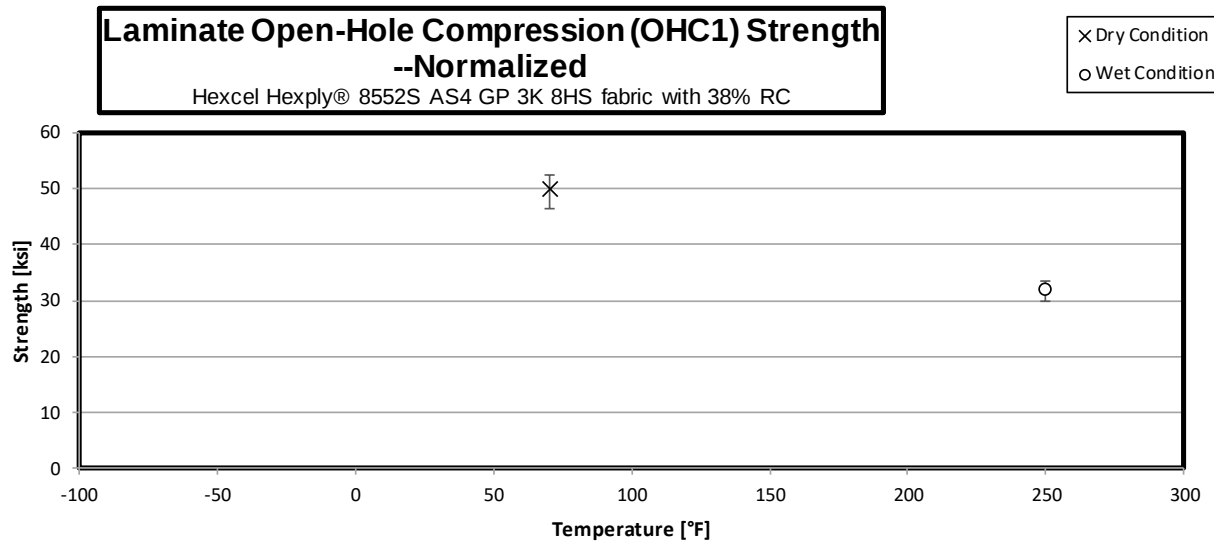


3.19 “40/20/40” Filled-Hole Tension 3 Properties (FHT3)

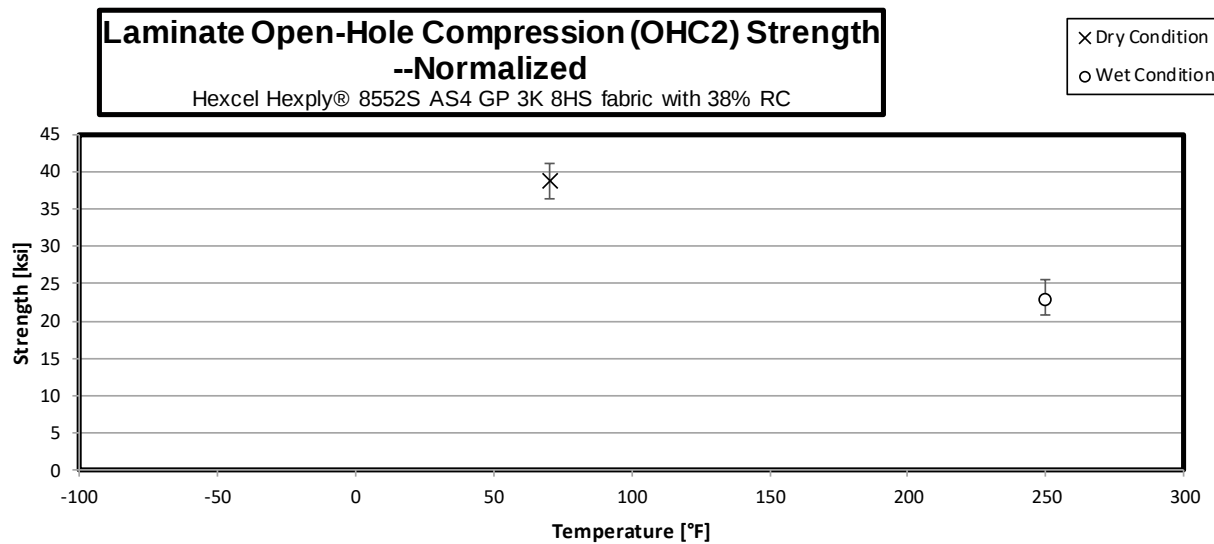


3.20 Laminate Open-Hole Compression 1 Properties (OHC1)

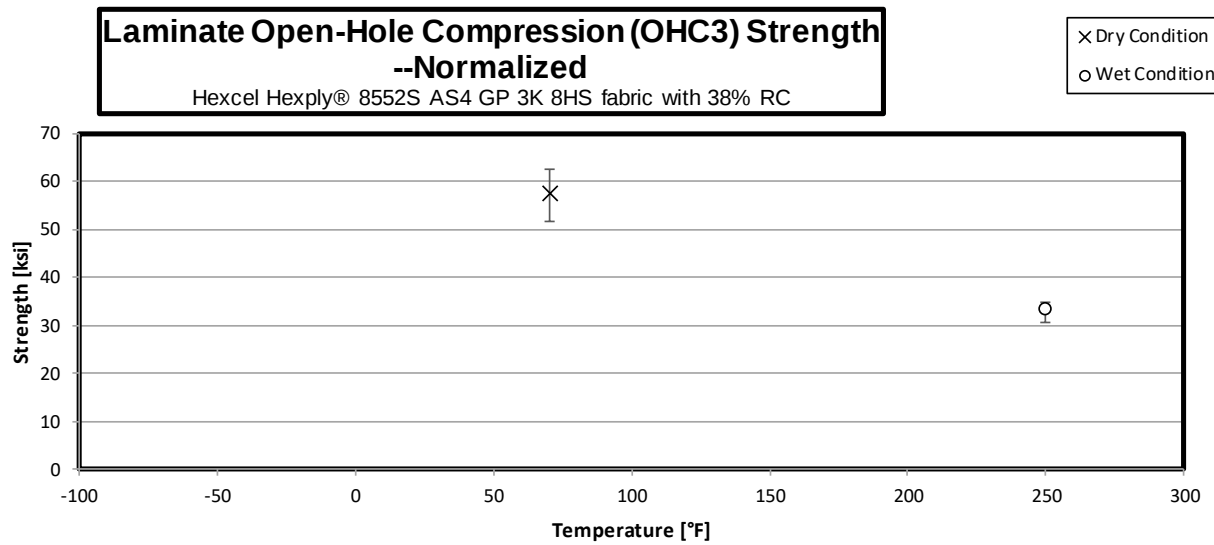
Layup for laminate is [45/0/-45/90/-45/90]S



3.21 “10/80/10” Open-Hole Compression 2 Properties (OHC2)

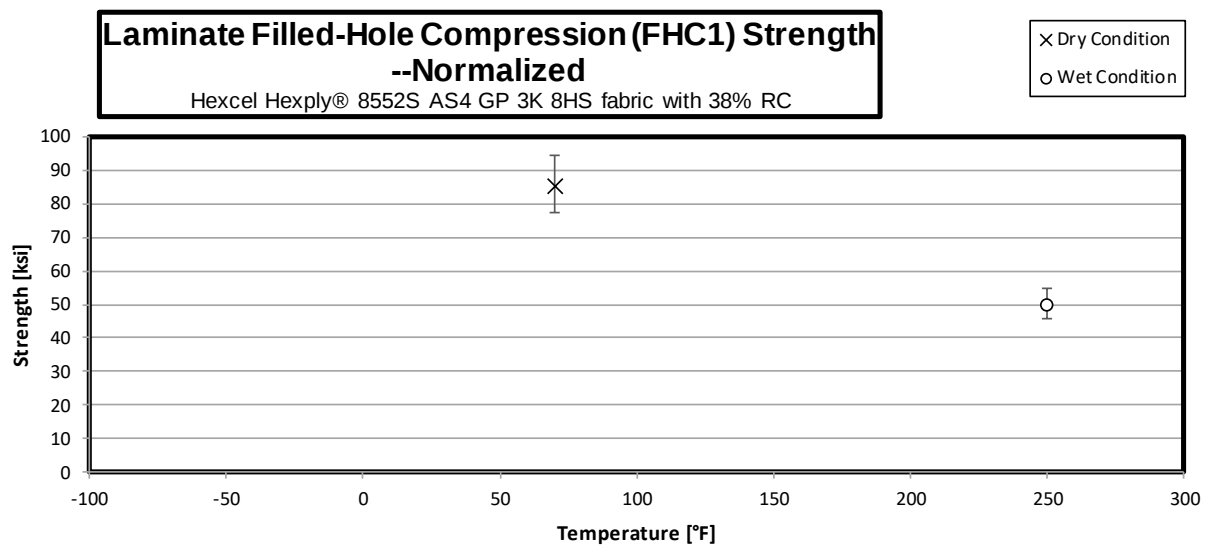


3.22 “40/20/40” Open-Hole Compression 3 Properties (OHC3)



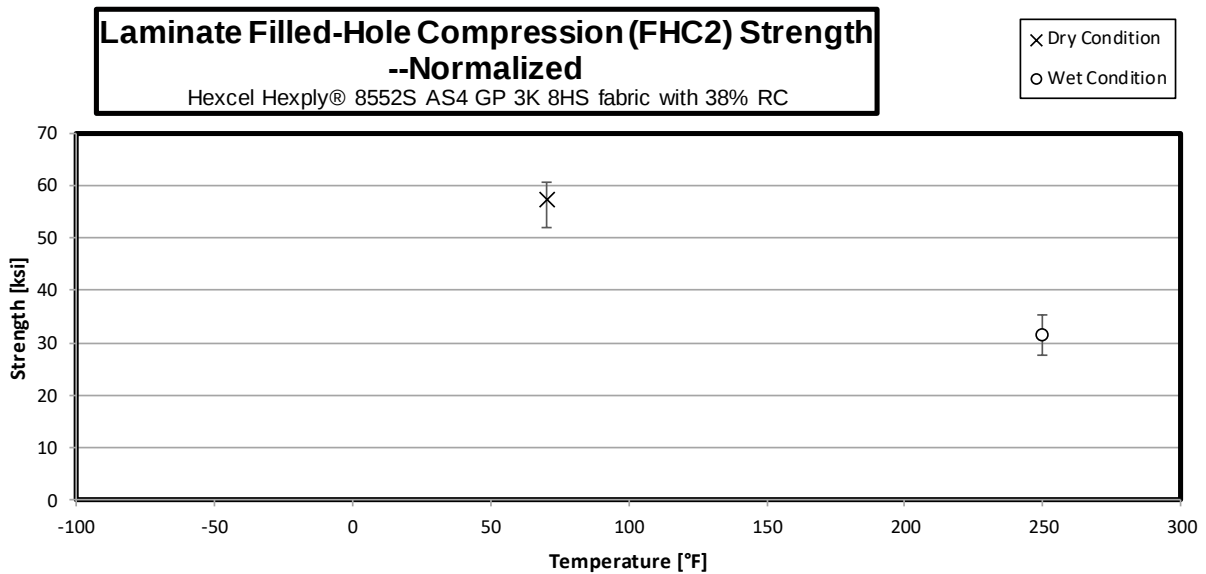
3.23 Laminate Filled-Hole Compression 1 Properties (FHC1)

Layup for laminate is [45/0/-45/90/-45/90]S

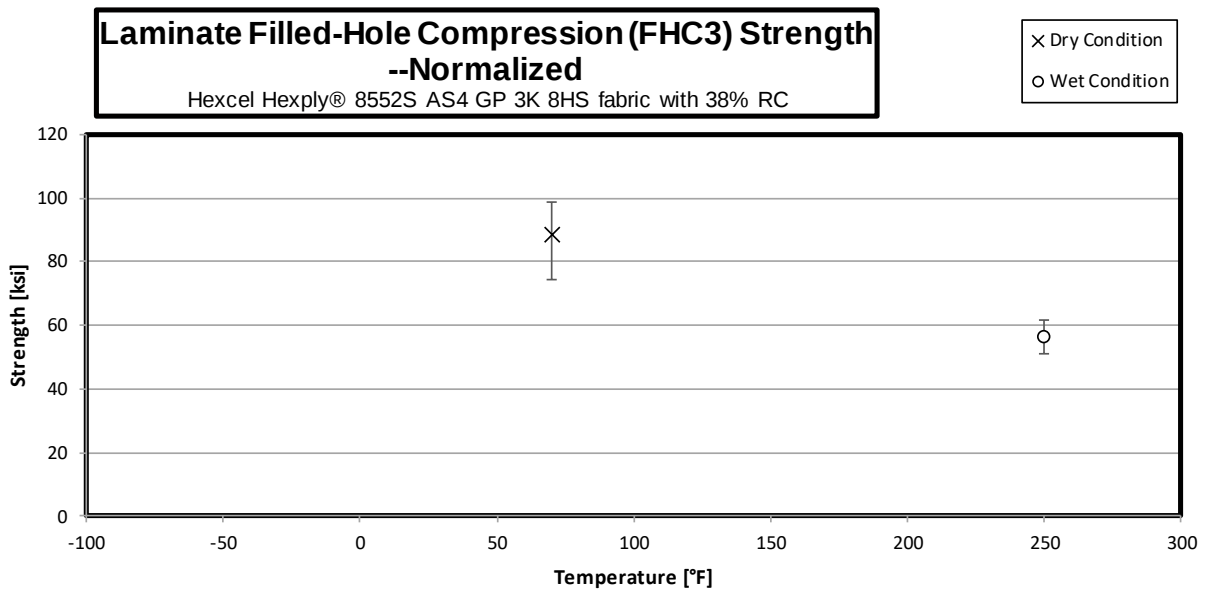


3.24 “10/80/10” Filled-Hole Compression 2 Properties (FHC2)

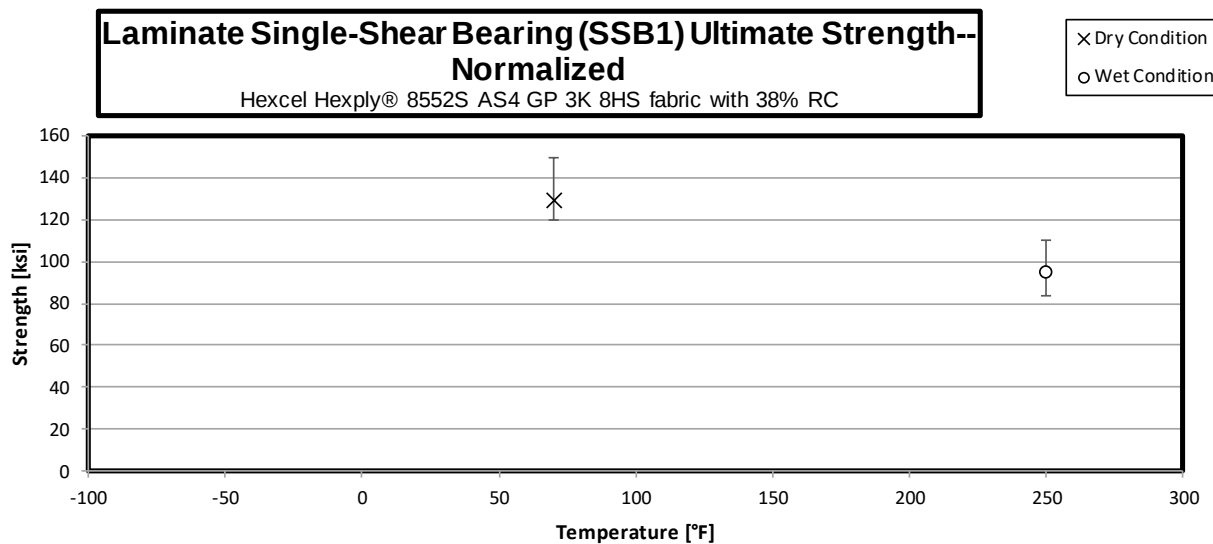
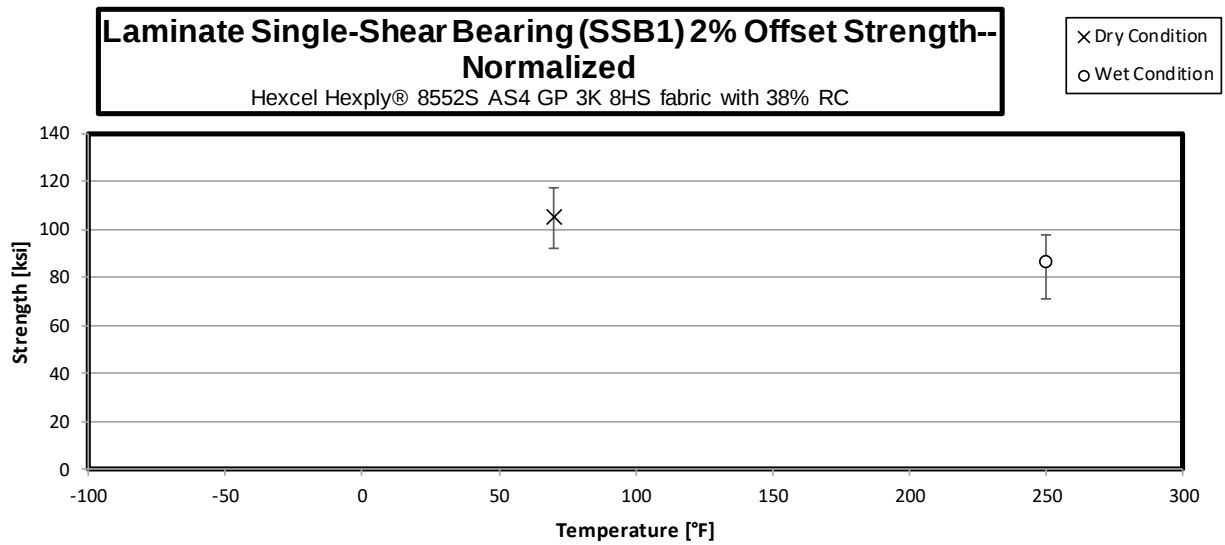
Data reported for reference only. FHC2 values are equal to or greater than UNC2 values, therefore CMH17 and NCAMP recommend the use of UNC2 values for design purposes.



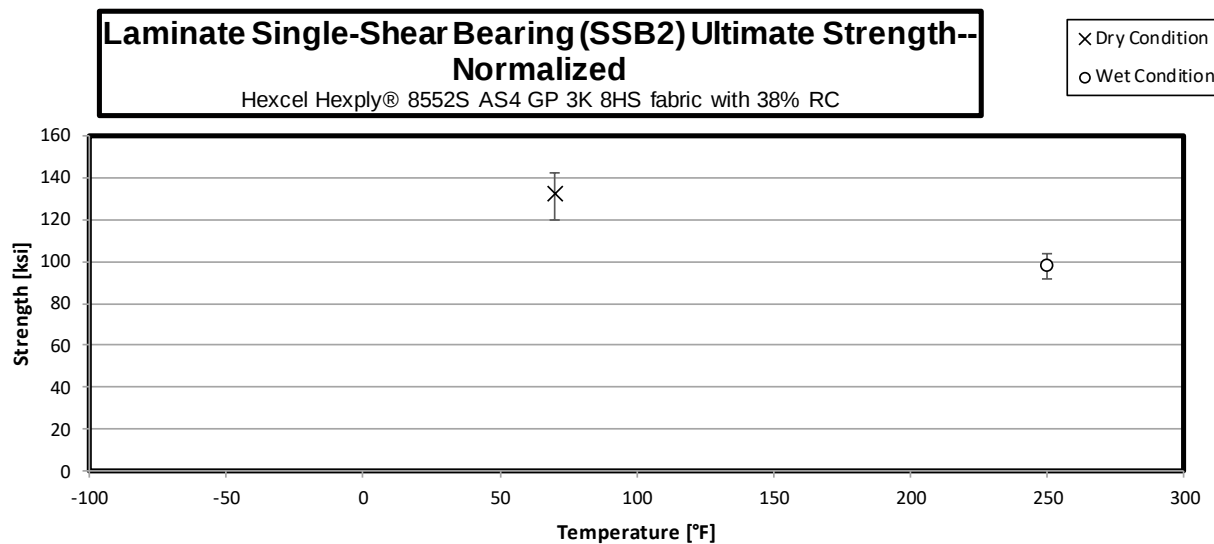
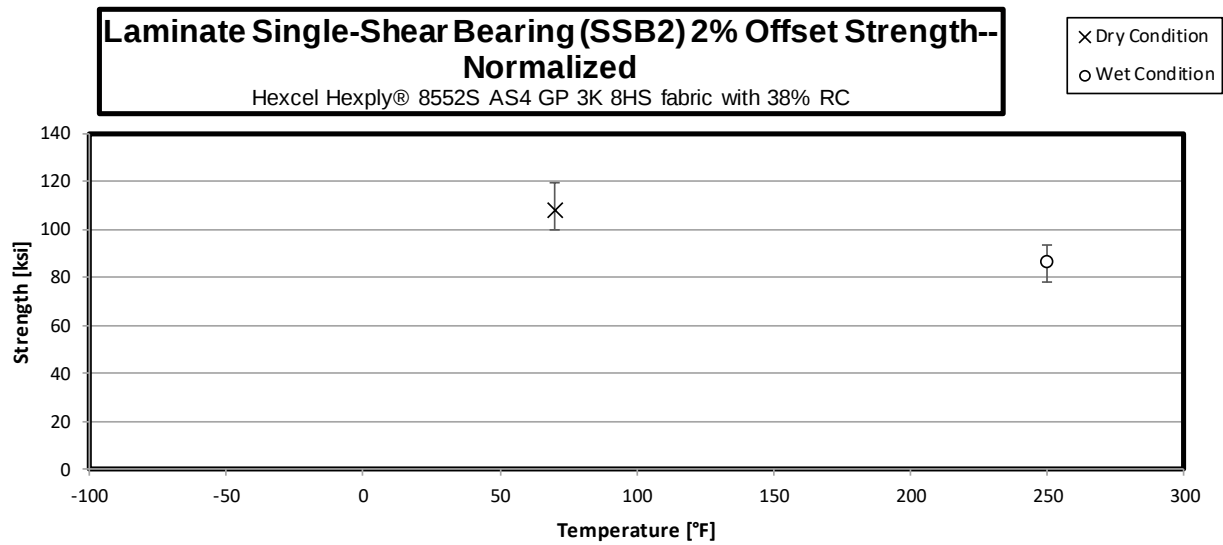
3.25 “40/20/40” Filled-Hole Compression 3 Properties (FHC3)



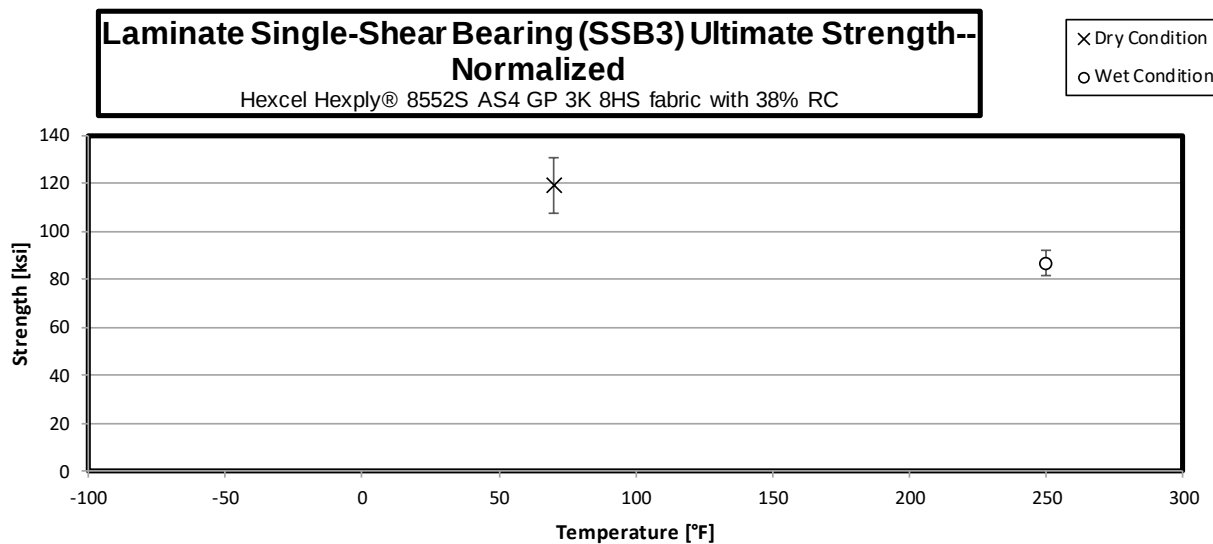
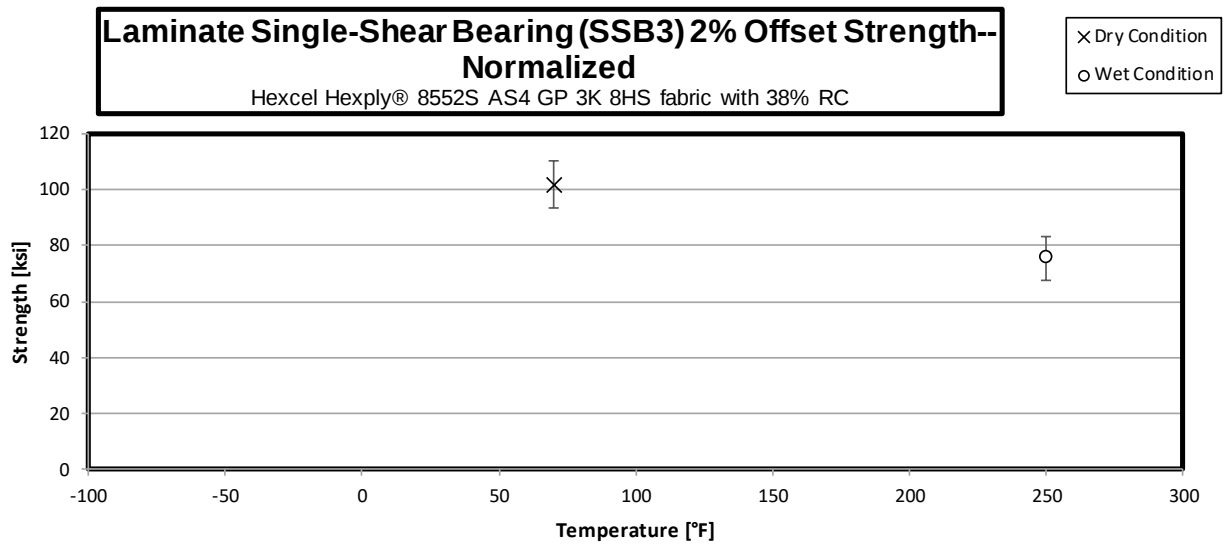
3.26 “25/50/25” Single-Shear Bearing 1 Properties (SSB1)



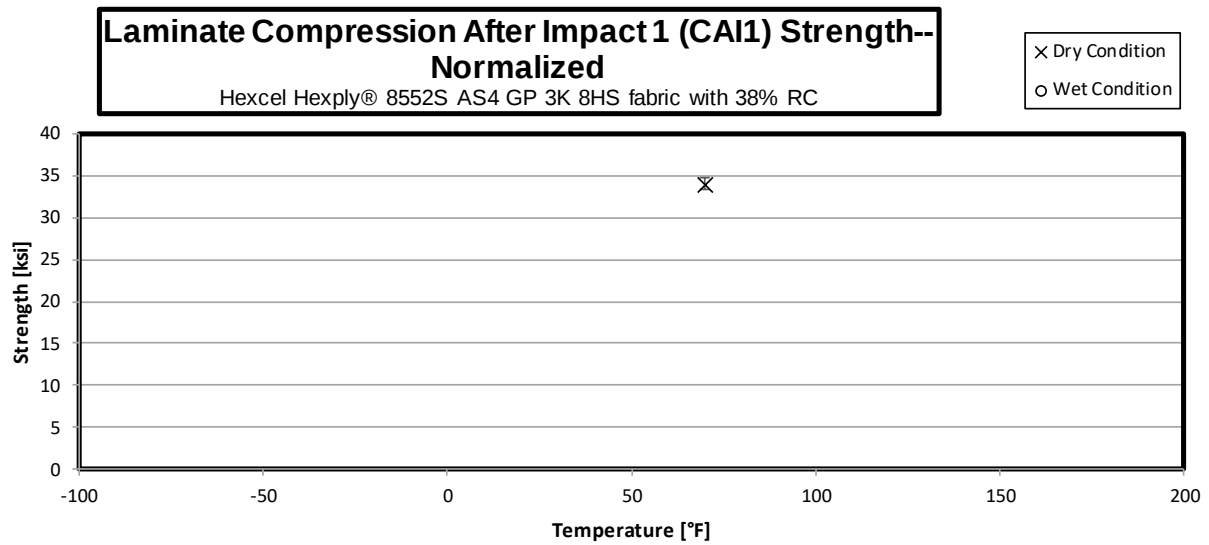
3.27 “10/80/10” Single-Shear Bearing 2 Properties (SSB2)



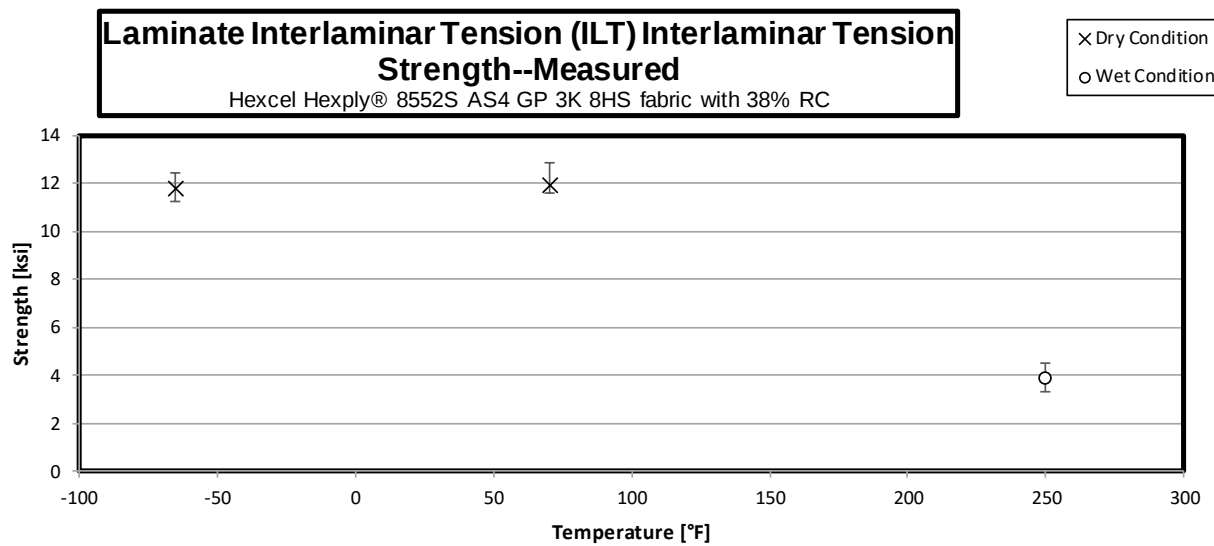
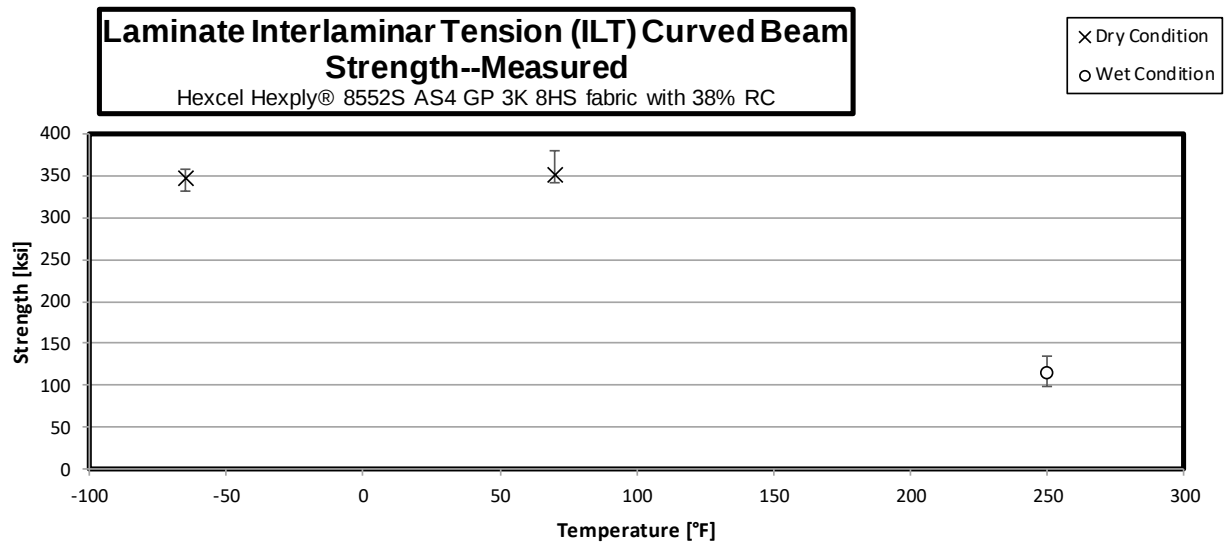
3.28 “40/20/40” Single-Shear Bearing 3 Properties (SSB3)



3.29 “25/50/25” Compression After Impact 1 Properties (CAI1)



3.30 Interlaminar Tension Properties (ILT)



July 16, 2025

CAM-RP-2019-057 Rev -

4. Raw Data

4.1 Warp Tension Properties (WT)

Warp Tension Properties (WT)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

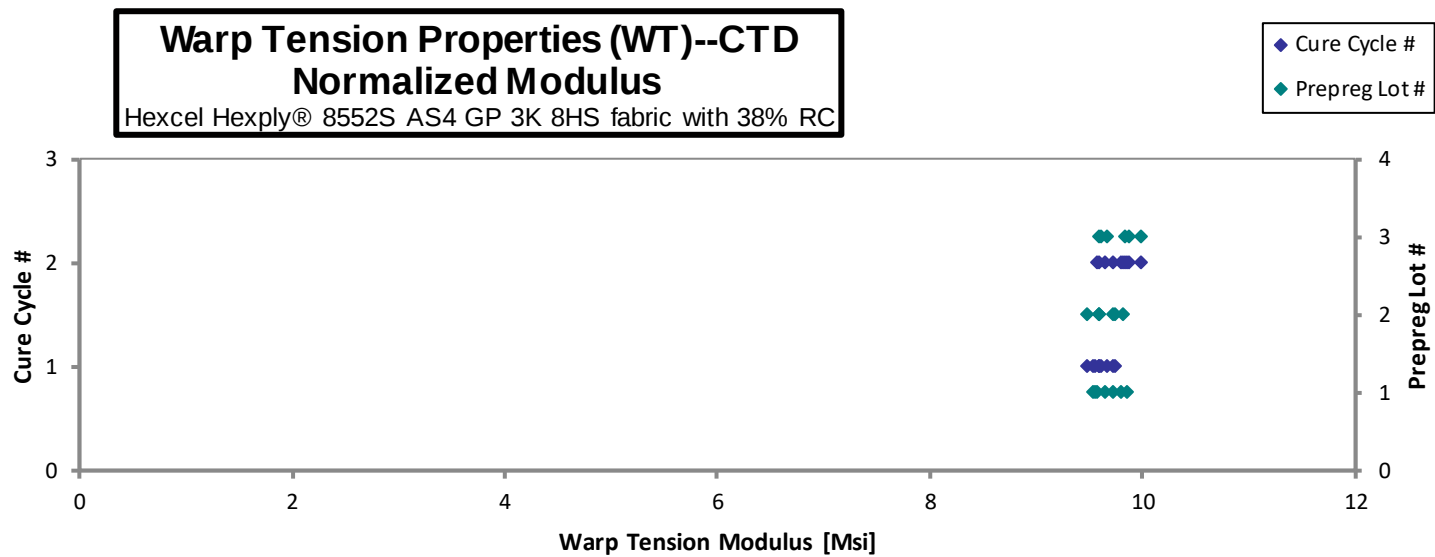
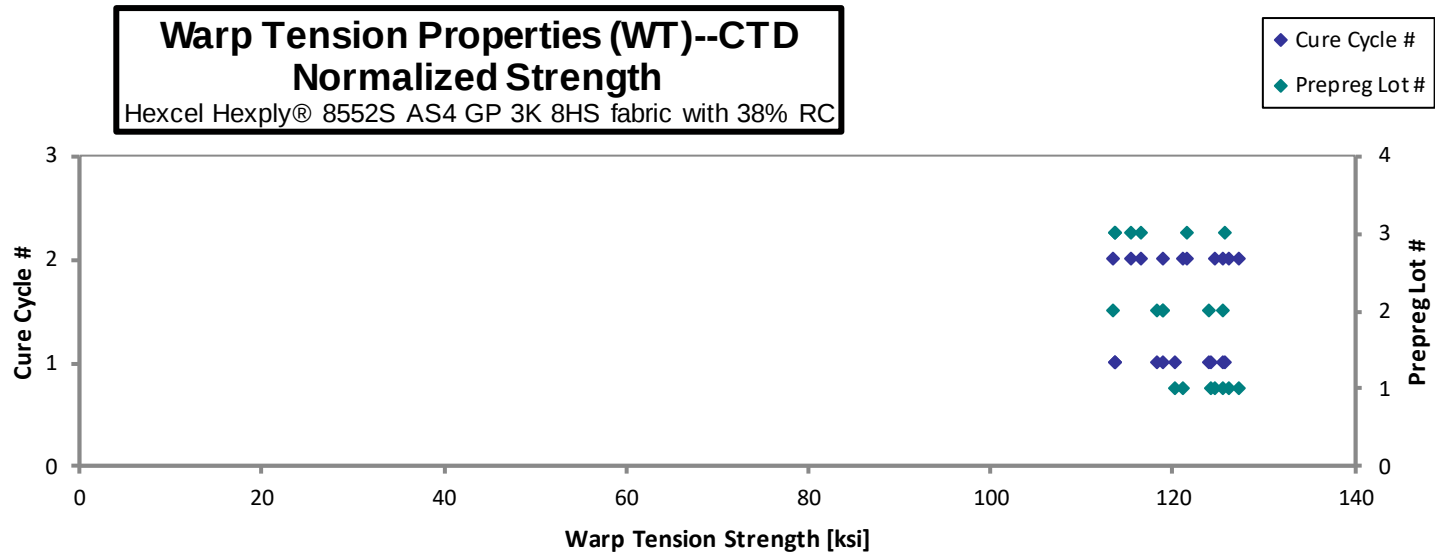
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAJA111B	A	M1	1	1	117.8	9.363	0.0631	0.1226	8	LGM
HPAJA112B	A	M1	1	1	124.9	9.682	0.0596	0.1206	8	LWB
HPAJA113B	A	M1	1	1	134.1	10.31	0.0650	0.1111	8	LGM
HPAJA211B	A	M2	1	2	124.7	9.798	0.0624	0.1200	8	LGM
HPAJA212B	A	M2	1	2	125.8	9.826	0.0679	0.1205	8	LWB
HPAJA213B	A	M2	1	2	138.0	10.47	0.0605	0.1106	8	LGM
HPAJA214B	A	M2	1	2	124.6	9.844	0.0497	0.1168	8	LAB
HPAJB111B	B	M1	2	1	113.6	9.354	0.0601	0.1251	8	LWB
HPAJB112B	B	M1	2	1	130.3	10.40	0.0575	0.1095	8	LWB
HPAJB113B	B	M1	2	1	123.6	9.559	0.0608	0.1204	8	LWB
HPAJB211B	B	M2	2	2	117.7	9.712	0.0633	0.1214	8	LGM
HPAJB212B	B	M2	2	2	125.5	9.732	0.0631	0.1200	8	LGM
HPAJB213B	B	M2	2	2	121.0	10.23	0.0567	0.1126	8	LWT
HPAJC111B	C	M1	3	1	111.2	9.407	0.0555	0.1227	8	LWB
HPAJC112B	C	M1	3	1	111.0	9.369	0.0482	0.1229	8	LWB
HPAJC113B	C	M1	3	1	134.2	10.33	0.0616	0.1124	8	LWB
HPAJC211B	C	M2	3	2	114.5	9.794	0.0619	0.1210	8	LGM
HPAJC212B	C	M2	3	2	118.9	9.624	0.0664	0.1227	8	LGM
HPAJC213B	C	M2	3	2	123.2	10.55	0.1136	0.1136	8	LGB

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0153	120.3	9.562
0.0151	125.5	9.730
0.0139	124.1	9.541
0.0150	124.7	9.794
0.0151	126.3	9.865
0.0138	127.2	9.652
0.0146	121.2	9.580
0.0156	118.4	9.748
0.0137	118.9	9.487
0.0151	124.0	9.592
0.0152	119.0	9.821
0.0150	125.5	9.729
0.0141	113.5	9.600
0.0153	113.6	9.616
0.0154	113.7	9.597
0.0140	125.6	9.673
0.0151	115.4	9.874
0.0153	121.5	9.837
0.0142	116.5	9.985

Average 122.9 9.861 0.0602
 Standard Dev. 7.708 0.3996 0.005174
 Coeff. of Var. [%] 6.274 4.052 8.597
 Min. 111.0 9.354 0.0482
 Max. 138.0 10.55 0.0679
 Number of Spec. 19 19 18

Average_{norm} 0.0148 120.8 9.699
 Standard Dev_{norm} 4.658 0.1357
 Coeff. of Var. [%]_{norm} 3.856 1.399
 Min. 0.0137 113.5 9.487
 Max. 0.0156 127.2 9.985
 Number of Spec. 19 19 19



July 16, 2025

CAM-RP-2019-057 Rev -

**Warp Tension Properties (WT)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

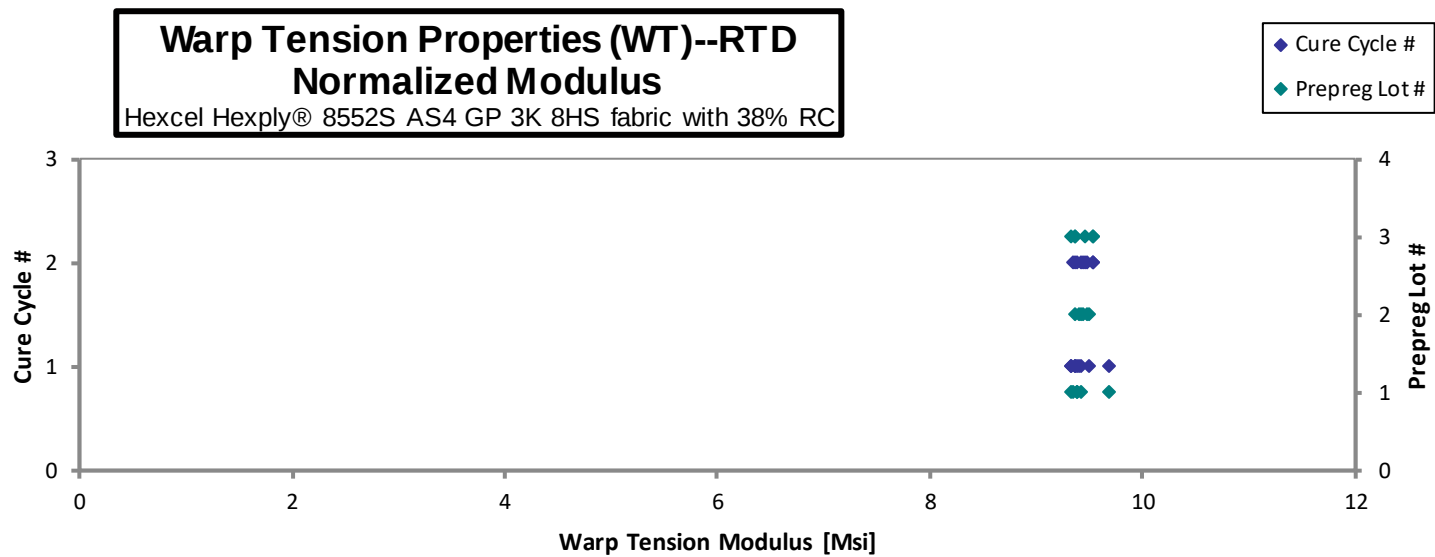
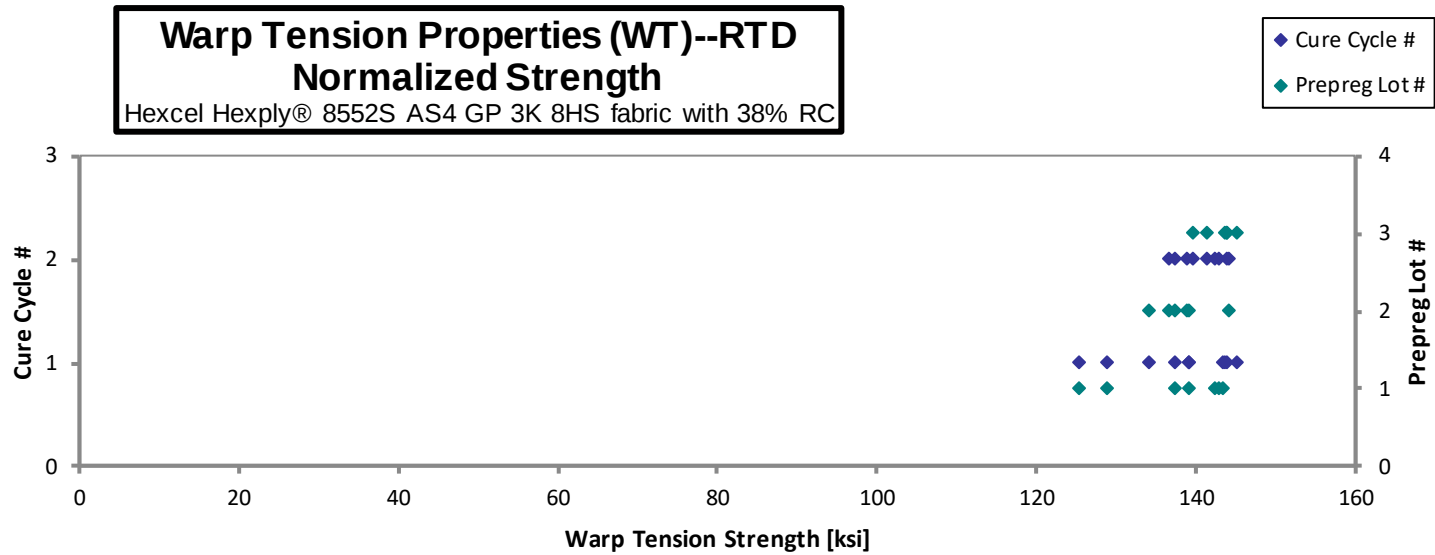
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAJA111A	A	M1	1	1	136.6	10.15	0.0525	0.1103	8	LWT
HPAJA112A	A	M1	1	1	130.0	9.780	0.0484	0.1190	8	LWB
HPAJA113A	A	M1	1	1	139.5	9.115	0.0543	0.1235	8	LWB
HPAJA114A	A	M1	1	1	134.2			0.1243	8	LWT
HPAJA211A	A	M2	1	2	153.3	10.42	0.0471	0.1077	8	LWB
HPAJA212A	A	M2	1	2	151.6	9.984	0.0520	0.1128	8	LGT
HPAJA213A	A	M2	1	2	147.8	9.739	0.0530	0.1162	8	LGM
HPAJB111A	B	M1	2	1	152.3	10.41	0.0485	0.1084	8	LGT
HPAJB112A	B	M1	2	1	143.8	9.742	0.0517	0.1162	8	LGT
HPAJB113A	B	M1	2	1	130.7	9.239	0.0532	0.1233	8	LGM
HPAJB211A	B	M2	2	2	152.6	10.30	0.0510	0.1093	8	LGM
HPAJB212A	B	M2	2	2	142.3	9.859	0.0540	0.1153	8	LGM
HPAJB213A	B	M2	2	2	145.8	9.542	0.0536	0.1188	8	LGM
HPAJC111A	C	M1	3	1	155.1	10.09	0.0500	0.1114	8	LWB
HPAJC112A	C	M1	3	1	148.3	9.561	0.0559	0.1175	8	LGM
HPAJC113A	C	M1	3	1	143.0	9.274	0.0564	0.1206	8	LGM
HPAJC211A	C	M2	3	2	155.7	10.31	0.0535	0.1109	8	LGM
HPAJC212A	C	M2	3	2	147.3	9.926	0.0528	0.1152	8	LWB
HPAJC213A	C	M2	3	2	141.1	9.567	0.0570	0.1188	8	LWB

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0138	125.5	9.326
0.0149	128.9	9.694
0.0154	143.6	9.382
0.0155	139.1	
0.0135	137.5	9.349
0.0141	142.5	9.387
0.0145	143.1	9.428
0.0136	137.6	9.408
0.0145	139.2	9.430
0.0154	134.3	9.493
0.0137	138.9	9.375
0.0144	136.7	9.472
0.0148	144.3	9.444
0.0139	143.9	9.361
0.0147	145.2	9.363
0.0151	143.7	9.322
0.0139	143.9	9.528
0.0144	141.5	9.532
0.0148	139.6	9.467

Average 144.8 9.833 0.0525
 Standard Dev. 7.945 0.4020 0.002741
 Coeff. of Var. [%] 5.488 4.089 5.221
 Min. 130.0 9.115 0.0471
 Max. 155.7 10.42 0.0570
 Number of Spec. 19 18 18

Average_{norm} 0.0145 139.4 9.431
 Standard Dev_{norm} 5.309 0.0917
 Coeff. of Var. [%]_{norm} 3.808 0.9721
 Min. 0.0135 125.5 9.322
 Max. 0.0155 145.2 9.694
 Number of Spec. 19 19 18



July 16, 2025

CAM-RP-2019-057 Rev -

Warp Tension Properties (WT)--ETW
Strength & Modulus
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing
 t_{ply} [in]
0.0150

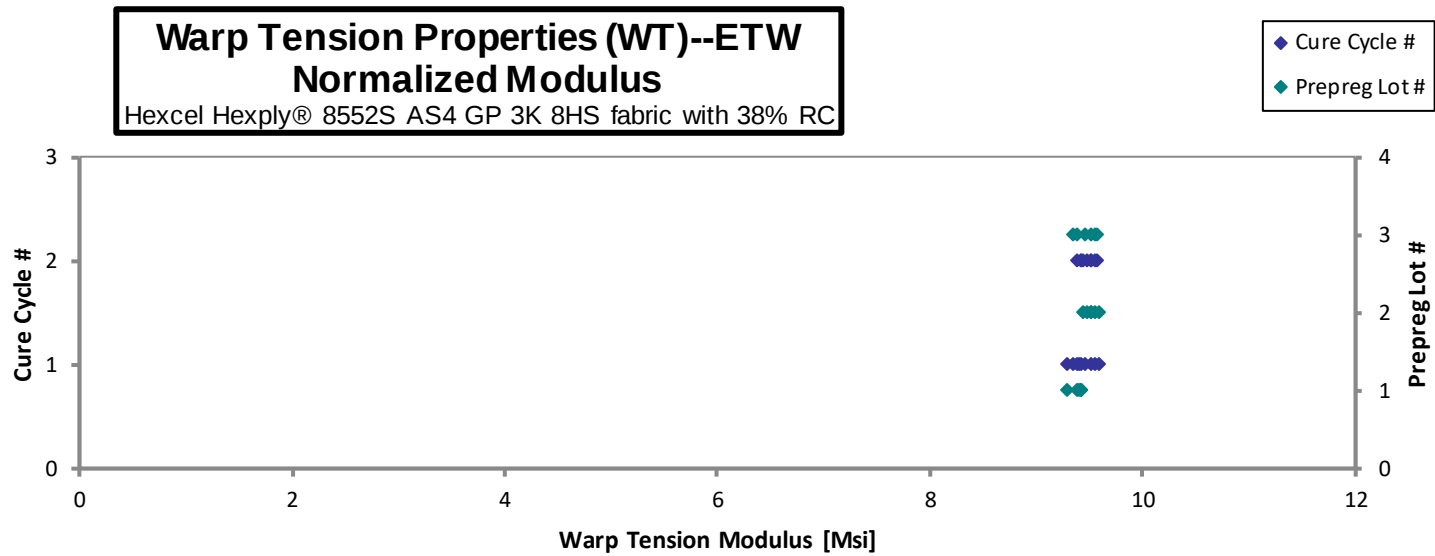
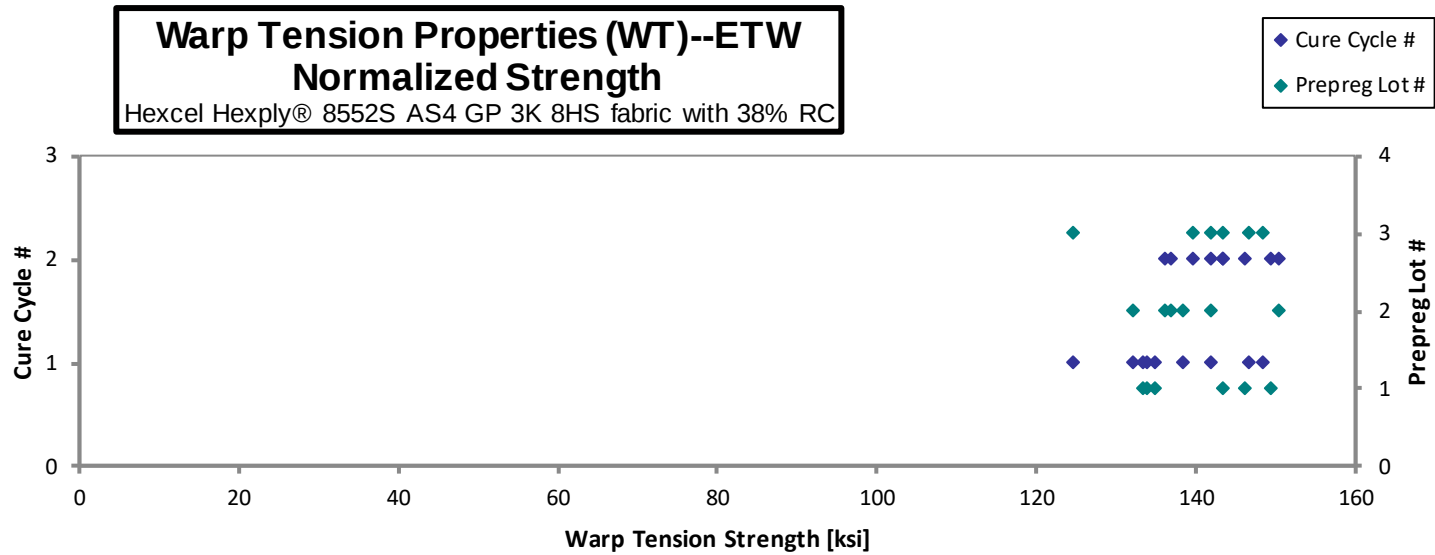
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Poisson's Ratio	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAJA111D*	A	M1	1	1	129.9	9.165		0.1233	8	LWB
HPAJA112D	A	M1	1	1	129.0	8.992	0.0425	0.1254	8	LWT, LWB
HPAJA113D	A	M1	1	1	129.1	8.961	0.0447	0.1245	8	LGT
HPAJA211D	A	M2	1	2	145.0	9.341	0.0355	0.1211	8	LWT, LWB
HPAJA212D*	A	M2	1	2	138.9	9.087		0.1239	8	LGM
HPAJA213D	A	M2	1	2	144.1	9.097	0.0525	0.1244	8	LGB
HPAJB111D	B	M1	2	1	132.2	9.092	0.0500	0.1256	8	LAB, LWT
HPAJB112D	B	M1	2	1	126.6	8.521	0.0485	0.1345	8	LGB
HPAJB113D	B	M1	2	1	120.3	8.732	0.0433	0.1319	8	LGM
HPAJB211D	B	M2	2	2	131.8	9.173	0.0457	0.1241	8	LWB
HPAJB212D	B	M2	2	2	143.2	9.000	0.0431	0.1260	8	LWB, LWT
HPAJB213D	B	M2	2	2	130.0	9.027	0.0521	0.1265	8	LWB, LWT
HPAJC111D	C	M1	3	1	144.6	9.147	0.0544	0.1232	8	LWB
HPAJC112D	C	M1	3	1	119.6	8.966	0.0431	0.1250	8	LAT
HPAJC113D	C	M1	3	1	140.4	9.063	0.0526	0.1253	8	LGM
HPAJC211D	C	M2	3	2	136.2	9.292	0.0501	0.1230	8	LGM
HPAJC212D	C	M2	3	2	135.7	9.157	0.0452	0.1256	8	LWB, LWT
HPAJC213D	C	M2	3	2	135.8	9.033	0.0468	0.1269	8	LGB, LAT

*Poissons not reported due to non linear data.

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0154	133.5	9.418
0.0157	134.8	9.400
0.0156	133.9	9.295
0.0151	146.3	9.422
0.0155	143.3	9.379
0.0156	149.4	9.432
0.0157	138.4	9.517
0.0168	141.8	9.549
0.0165	132.2	9.598
0.0155	136.2	9.482
0.0158	150.4	9.450
0.0158	137.0	9.513
0.0154	148.4	9.387
0.0156	124.6	9.341
0.0157	146.6	9.465
0.0154	139.6	9.522
0.0157	142.0	9.581
0.0159	143.6	9.550

Average 134.0 9.047 0.0469
Standard Dev. 7.800 0.1878 0.004968
Coeff. of Var. [%] 5.820 2.076 10.60
Min. 119.6 8.521 0.0355
Max. 145.0 9.341 0.0544
Number of Spec. 18 18 16

Average_{norm} 0.0157 140.1 9.461
Standard Dev._{norm} 6.899 0.0843
Coeff. of Var. [%]_{norm} 4.923 0.8910
Min. 0.0151 124.6 9.295
Max. 0.0168 150.4 9.598
Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.2 Fill Tension Properties (FT)

Fill Tension Properties (FT)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

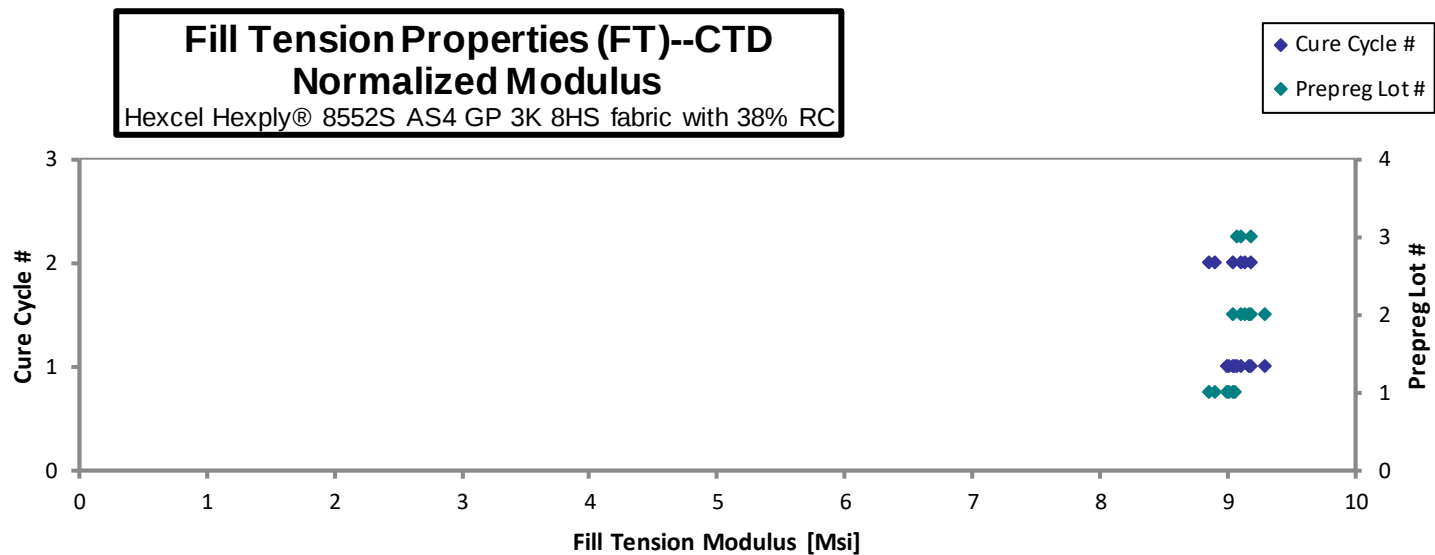
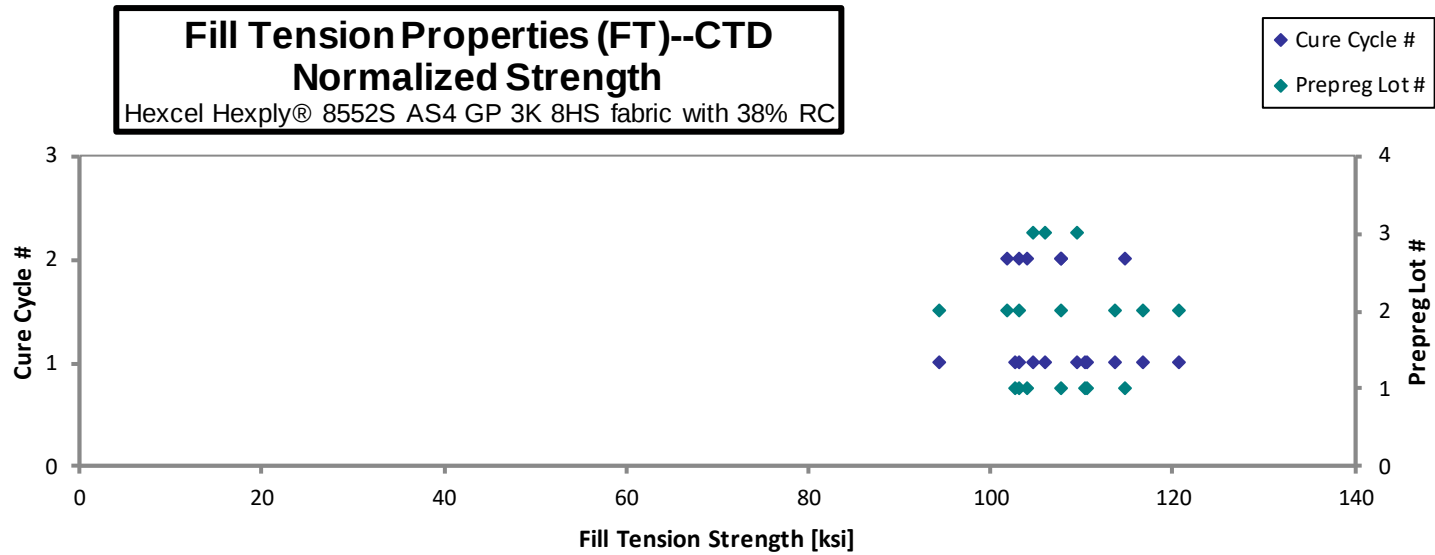
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAUA1R1B	A	M1	1	1	104.2	9.095	0.1188	8	LGM
HPAUA1R2B	A	M1	1	1	111.6	9.132	0.1191	8	LWT
HPAUA1R3B	A	M1	1	1	117.0	9.566	0.1131	8	LAB
HPAUA1R4B	A	M1	1	1	104.2		0.1184	8	LWB
HPAUA2R1B	A	M2	1	2	115.1	8.934	0.1196	8	LGB
HPAUA2R2B	A	M2	1	2	108.1	9.077	0.1195	8	LAT
HPAUA2R3B	A	M2	1	2	108.6	9.239	0.1150	8	LGM, LGT
HPAUB1R1B	B	M1	2	1	112.4	9.075	0.1213	8	LAB
HPAUB1R2B	B	M1	2	1	93.27	9.190	0.1213	8	LAB
HPAUB1R3B	B	M1	2	1	119.4	9.247	0.1174	8	LAB
HPAUB1R4B	B	M1	2	1	117.4		0.1234	8	LAB
HPAUB2R1B	B	M2	2	2	106.3	9.059	0.1216	8	LGT
HPAUB2R2B	B	M2	2	2	101.8	8.983	0.1216	8	LGM
HPAUB2R3B	B	M2	2	2	105.3	9.454	0.1160	8	LAB
HPAUC1R1B	C	M1	3	1	103.1	8.958	0.1220	8	LGB
HPAUC1R2B	C	M1	3	1	105.0	8.981	0.1212	8	LAB
HPAUC1R3B	C	M1	3	1	114.9	9.640	0.1144	8	LAT
HPAUC2R1B	C	M2	3	2	124.5	9.222	0.1196	8	LAT, LAB
HPAUC2R2B	C	M2	3	2	121.9	9.237	0.1191	8	LWB, LAT
HPAUC2R3B	C	M2	3	2	120.1	9.530	0.1140	8	LGB

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0149	103.1	9.004
0.0149	110.7	9.059
0.0141	110.3	9.015
0.0148	102.8	
0.0150	114.8	8.906
0.0149	107.7	9.039
0.0144	104.1	8.856
0.0152	113.6	9.170
0.0152	94.30	9.291
0.0147	116.8	9.046
0.0154	120.7	
0.0152	107.7	9.178
0.0152	103.1	9.101
0.0145	101.8	9.136
0.0152	104.8	9.106
0.0152	106.1	9.072
0.0143	109.5	9.187
0.0150	124.1	9.194
0.0149	121.0	9.167
0.0143	114.1	9.054

Average 110.7 9.201
 Standard Dev. 8.019 0.2165
 Coeff. of Var. [%] 7.243 2.353
 Min. 93.27 8.934
 Max. 124.5 9.640
 Number of Spec. 20 18

Average_{norm} 0.0149 109.5 9.088
 Standard Dev._{norm} 7.527 0.1063
 Coeff. of Var. [%]_{norm} 6.871 1.170
 Min. 0.0141 94.30 8.856
 Max. 0.0154 124.1 9.291
 Number of Spec. 20 20 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Fill Tension Properties (FT)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

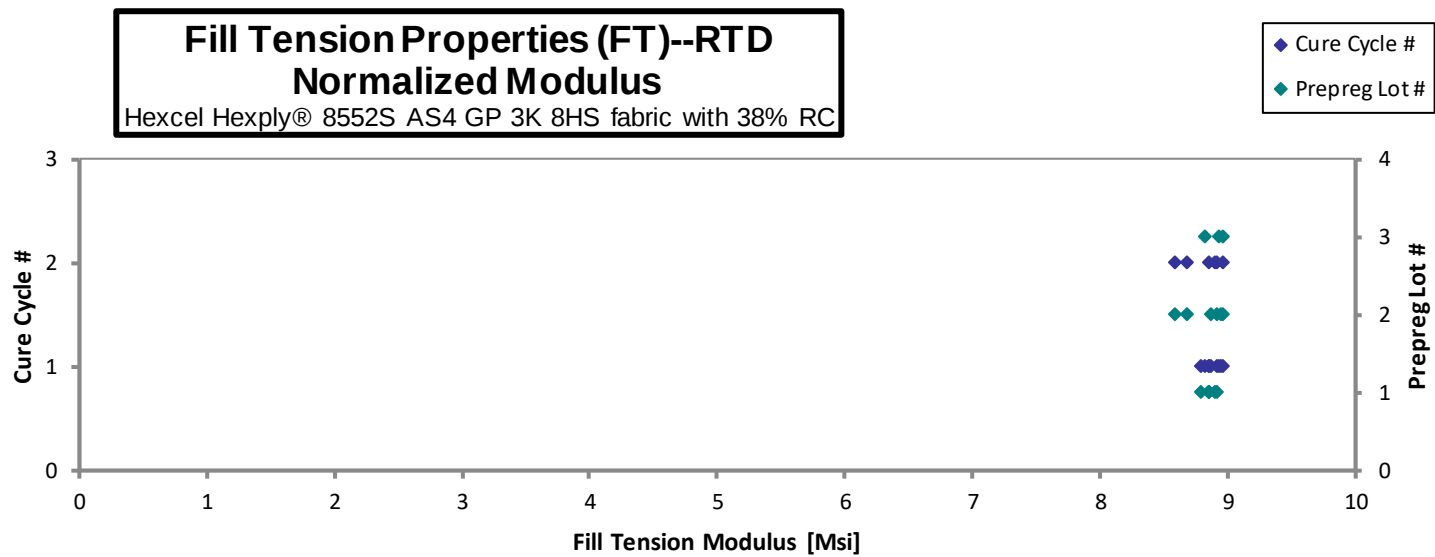
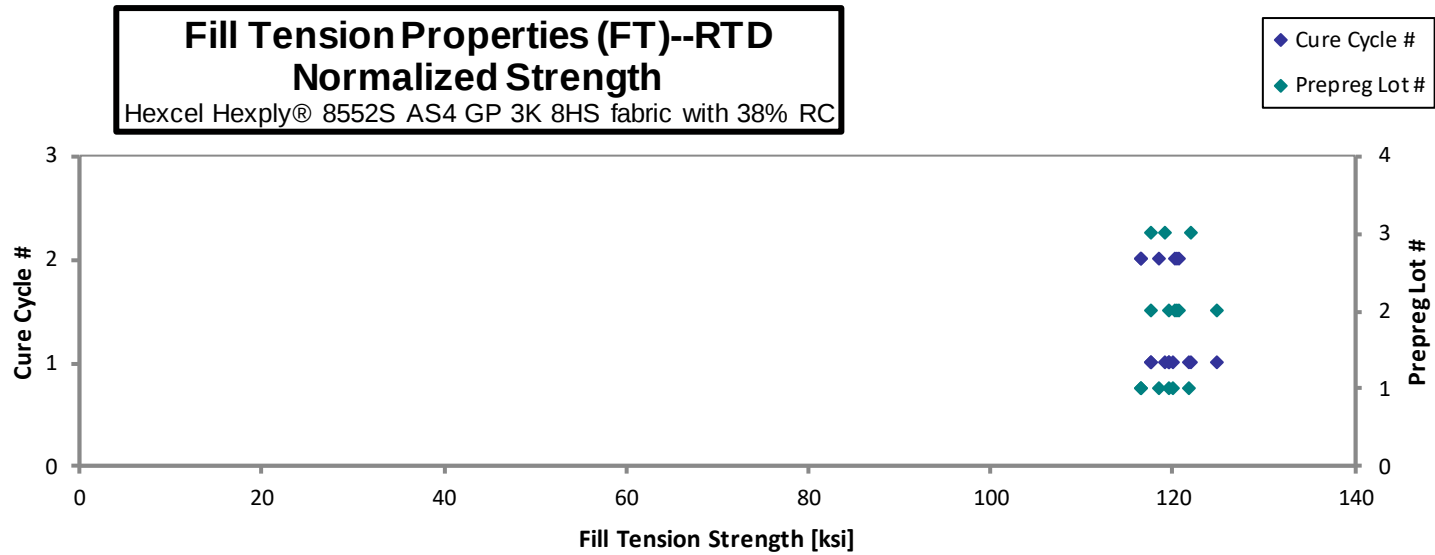
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAUA1R1A	A	M1	1	1	130.3	9.402	0.1122	8	LGB
HPAUA1R2A	A	M1	1	1	122.2	9.044	0.1175	8	LWT
HPAUA1R3A	A	M1	1	1	120.9	8.925	0.1191	8	LGB
HPAUA2R1A	A	M2	1	2	125.0	9.509	0.1118	8	LGB
HPAUA2R2A	A	M2	1	2	117.8	9.028	0.1186	8	LGB
HPAUA2R3A	A	M2	1	2	118.7	8.920	0.1198	8	LGM
HPAUB1R1A	B	M1	2	1	121.3	9.193	0.1164	8	LGB
HPAUB1R2A	B	M1	2	1	122.7	8.728	0.1221	8	LWT
HPAUB1R3A	B	M1	2	1	116.9	8.753	0.1227	8	LGB
HPAUB2R1A	B	M2	2	2	126.1	9.375	0.1147	8	LAB
HPAUB2R2A	B	M2	2	2	119.0	8.456	0.1219	8	LWB
HPAUB2R3A	B	M2	2	2	117.0	8.451	0.1233	8	LGM
HPAUC1R1A	C	M1	3	1	125.6	9.429	0.1124	8	LGM
HPAUC1R2A	C	M1	3	1	119.4	8.985	0.1198	8	LGB
HPAUC1R3A	C	M1	3	1	119.4	8.736	0.1227	8	LGT
HPAUC2R1A	C	M2	3	2	134.9	9.279	0.1145	8	LWB
HPAUC2R2A	C	M2	3	2	132.8	8.958	0.1189	8	LGB
HPAUC2R3A	C	M2	3	2	135.5	8.937	0.1202	8	LGT, LWB

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0140	121.8	8.791
0.0147	119.6	8.854
0.0149	120.0	8.857
0.0140	116.5	8.862
0.0148	116.5	8.923
0.0150	118.6	8.907
0.0146	117.7	8.918
0.0153	124.9	8.879
0.0153	119.5	8.946
0.0143	120.5	8.958
0.0152	120.8	8.586
0.0154	120.2	8.685
0.0141	117.6	8.832
0.0150	119.2	8.968
0.0153	122.0	8.931
0.0143	128.7	8.851
0.0149	131.6	8.877
0.0150	135.7	8.948

Average 123.6 9.006
 Standard Dev. 6.077 0.3146
 Coeff. of Var. [%] 4.916 3.494
 Min. 116.9 8.451
 Max. 135.5 9.509
 Number of Spec. 18 18

Average_{norm} 0.0148 121.7 8.865
 Standard Dev_{norm} 5.269 0.0978
 Coeff. of Var. [%]_{norm} 4.328 1.103
 Min. 0.0140 116.5 8.586
 Max. 0.0154 135.7 8.968
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Fill Tension Properties (FT)--ETW
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

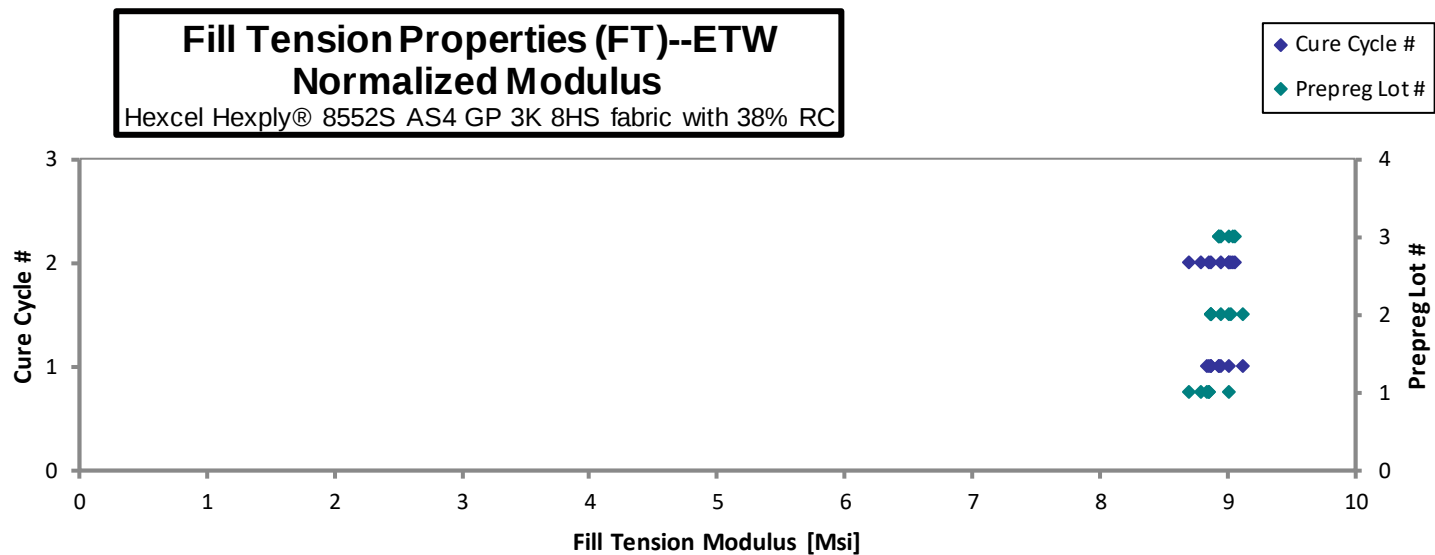
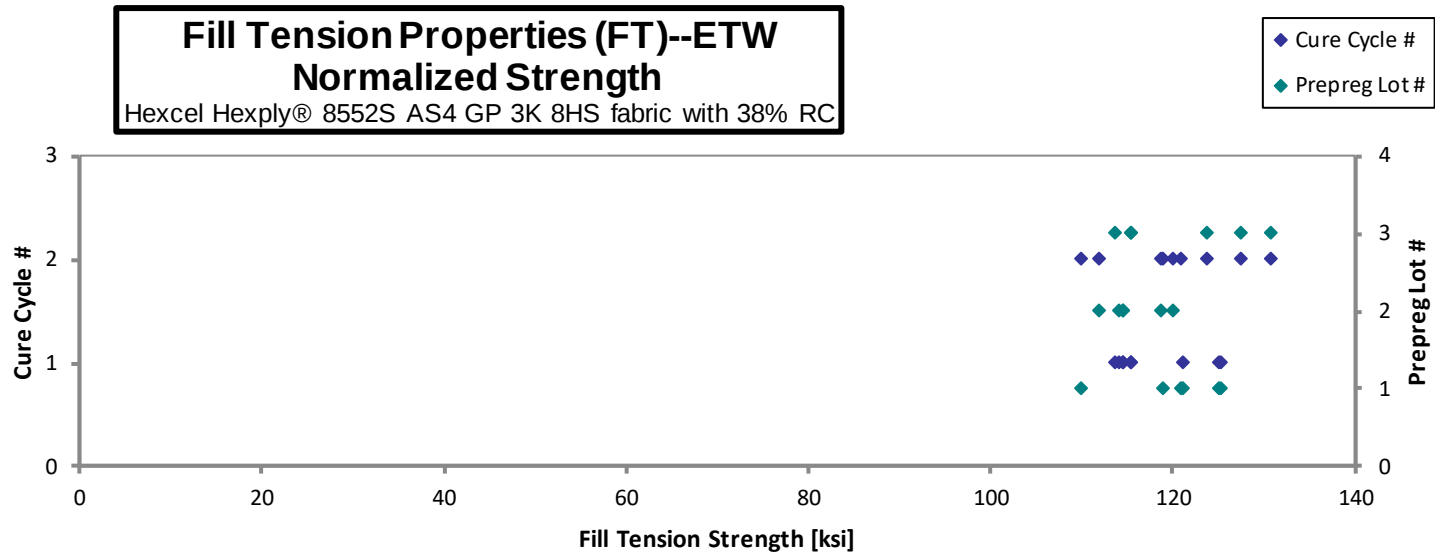
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAUA1R1D	A	M1	1	1	124.0	8.931	0.1210	8	LWT, LWB
HPAUA1R2D	A	M1	1	1	119.3	8.730	0.1218	8	LWT, LWB
HPAUA1R3D	A	M1	1	1	124.5	8.785	0.1208	8	LWT, LWB
HPAUA2R1D	A	M2	1	2	117.2	8.432	0.1238	8	LGM
HPAUA2R2D	A	M2	1	2	115.1	8.520	0.1239	8	LGB, LAT
HPAUA2R3D	A	M2	1	2	107.1	8.638	0.1230	8	LAT
HPAUB1R1D	B	M1	2	1	110.4	8.581	0.1240	8	LGT
HPAUB1R2D	B	M1	2	1	112.2	8.928	0.1225	8	LWT
HPAUB1R3D	B	M1	2	1	112.6	8.703	0.1223	8	LWT
HPAUB2R1D*	B	M2	2	2		8.559	0.1254	8	LIB
HPAUB2R2D	B	M2	2	2	115.7	8.677	0.1246	8	LAB
HPAUB2R3D	B	M2	2	2	108.6	8.772	0.1235	8	LAT
HPAUB2R4D	B	M2	2	2	115.7	8.643	0.1231	8	LGM
HPAUC1R1D	C	M1	3	1	108.7	8.552	0.1254	8	LWT, LWB
HPAUC1R2D	C	M1	3	1	109.7	8.515	0.1262	8	LAT
HPAUC1R3D	C	M1	3	1	110.1	8.523	0.1257	8	LWT, LWB
HPAUC2R1D	C	M2	3	2	125.7	8.904	0.1218	8	LGT
HPAUC2R2D	C	M2	3	2	129.2	8.902	0.1215	8	LGT
HPAUC2R3D	C	M2	3	2	122.6	8.980	0.1212	8	LWT

*Strength not reported due to unacceptable failure mode

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0151	125.0	9.007
0.0152	121.0	8.860
0.0151	125.3	8.842
0.0155	120.9	8.698
0.0155	118.9	8.797
0.0154	109.8	8.856
0.0155	114.1	8.865
0.0153	114.5	9.115
0.0153	114.7	8.867
0.0157		8.943
0.0156	120.1	9.006
0.0154	111.8	9.029
0.0154	118.7	8.868
0.0157	113.6	8.935
0.0158	115.4	8.954
0.0157	115.3	8.929
0.0152	127.6	9.040
0.0152	130.8	9.010
0.0151	123.8	9.066

Average 116.0 8.699
Standard Dev. 6.766 0.1687
Coeff. of Var. [%] 5.832 1.940
Min. 107.1 8.432
Max. 129.2 8.980
Number of Spec. 18 19

Average_{norm} 0.0154 119.0 8.931
Standard Dev_{norm} 5.815 0.1042
Coeff. of Var. [%]_{norm} 4.889 1.166
Min. 0.0151 109.8 8.698
Max. 0.0158 130.8 9.115
Number of Spec. 19 18 19



July 16, 2025

CAM-RP-2019-057 Rev -

4.3 Warp Compression Properties (WC)

Warp Compression Properties (WC)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

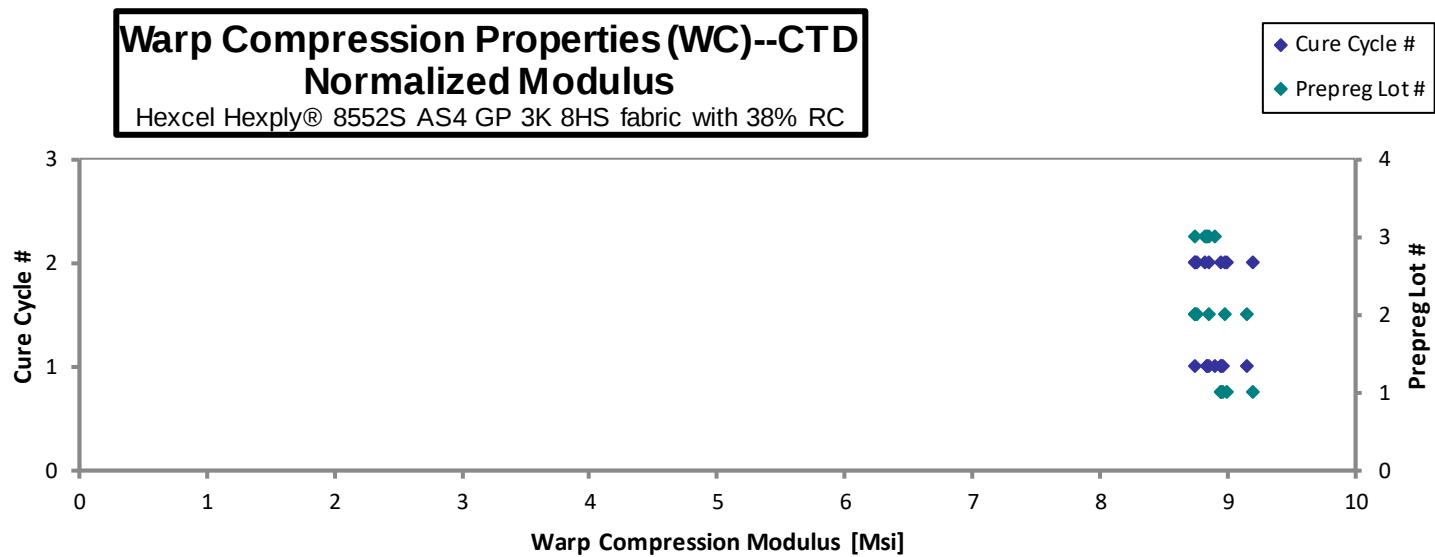
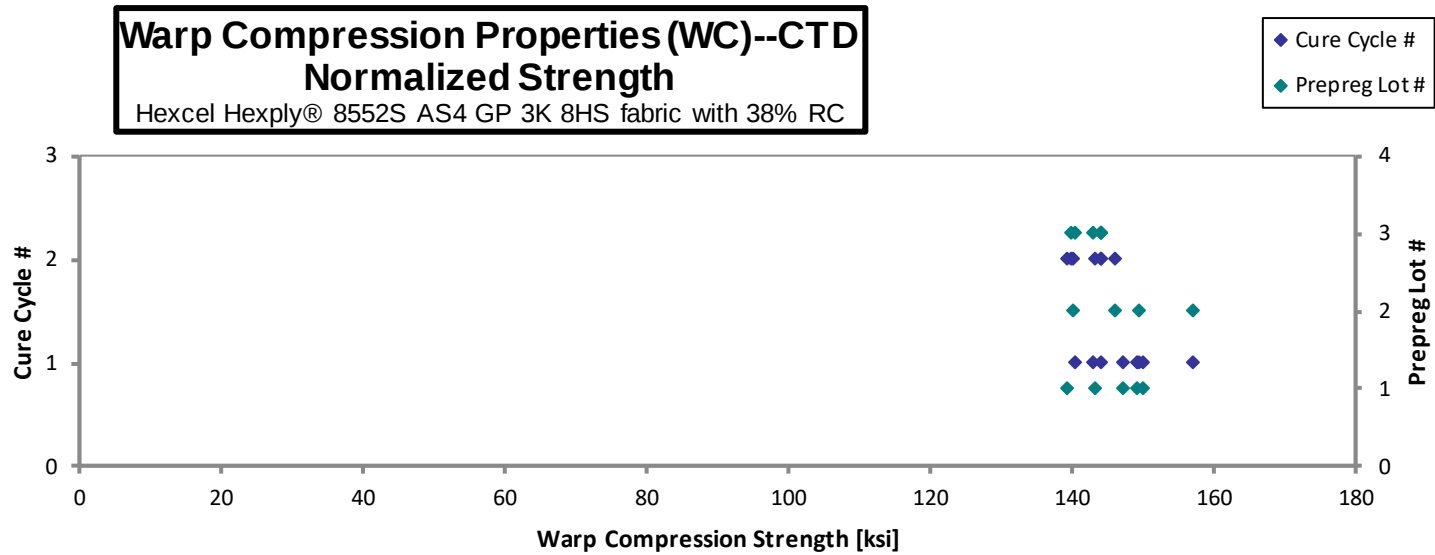
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPALA111B	A	M1	1	1	145.9	8.753	0.1228	8	BGM
HPALA112B	A	M1	1	1	141.7	8.608	0.1249	8	BGM
HPALA113B	A	M1	1	1	145.1	8.676	0.1241	8	BGM
HPALA211B	A	M2	1	2	142.1	9.116	0.1212	8	BAB
HPALA212B*	A	M2	1	2	8.781	8.781	0.1222	8	BGM, CIB
HPALA213B	A	M2	1	2	133.1	8.585	0.1257	8	BGM
HPALB111B	B	M1	2	1	142.0	8.422	0.1262	8	BAT
HPALB112B	B	M1	2	1	145.7	8.119	0.1293	8	BGM
HPALB113B*	B	M1	2	1	8.388	8.388	0.1311	8	BGM, CIB
HPALB211B*	B	M2	2	2	8.669	8.669	0.1214	8	BAB, CIB
HPALB212B	B	M2	2	2	142.4	8.512	0.1233	8	BGM
HPALB213B	B	M2	2	2	135.4	8.670	0.1243	8	BGM
HPALC111B	C	M1	3	1	137.9	8.525	0.1244	8	BGM
HPALC112B	C	M1	3	1	135.2	8.506	0.1247	8	BGM
HPALC113B	C	M1	3	1	140.8	8.698	0.1228	8	BGM
HPALC211B	C	M2	3	2	143.1	8.750	0.1209	8	BGM
HPALC212B	C	M2	3	2	140.5	8.643	0.1231	8	BGM
HPALC213B	C	M2	3	2	134.8	8.428	0.1246	8	BGM

*Strength not reported due to unacceptable failure mode.

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0153	149.2	8.955
0.0156	147.4	8.956
0.0155	150.0	8.971
0.0151	143.4	9.204
0.0153	8.944	8.944
0.0157	139.4	8.994
0.0158	149.4	8.860
0.0162	157.0	8.751
0.0164	9.161	9.161
0.0152	8.768	8.768
0.0154	146.3	8.744
0.0155	140.2	8.980
0.0156	143.0	8.840
0.0156	140.5	8.841
0.0153	144.1	8.899
0.0151	144.2	8.818
0.0154	144.1	8.862
0.0156	140.0	8.750

Average 140.4 8.603
Standard Dev. 4.152 0.2075
Coeff. of Var. [%] 2.958 2.412
Min. 133.1 8.119
Max. 145.9 9.116
Number of Spec. 15 18

Average_{norm} 0.0155 145.2 8.905
Standard Dev_{norm} 4.797 0.1309
Coeff. of Var. [%]_{norm} 3.303 1.470
Min. 0.0151 139.4 8.744
Max. 0.0164 157.0 9.204
Number of Spec. 18 15 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Warp Compression Properties (WC)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

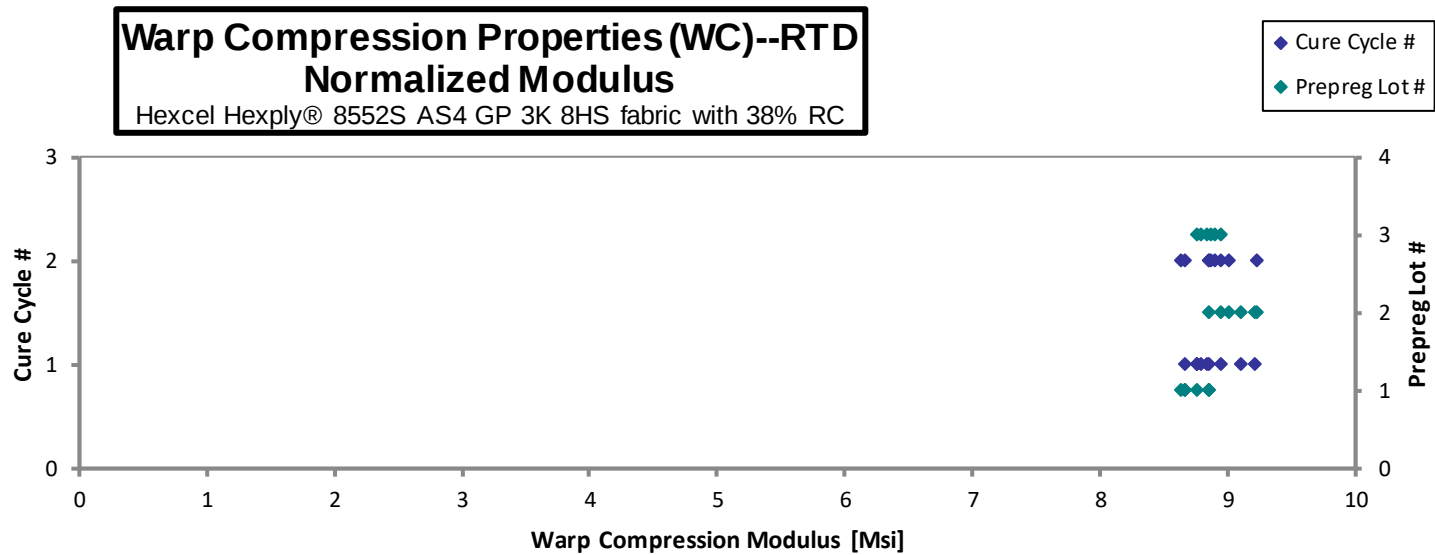
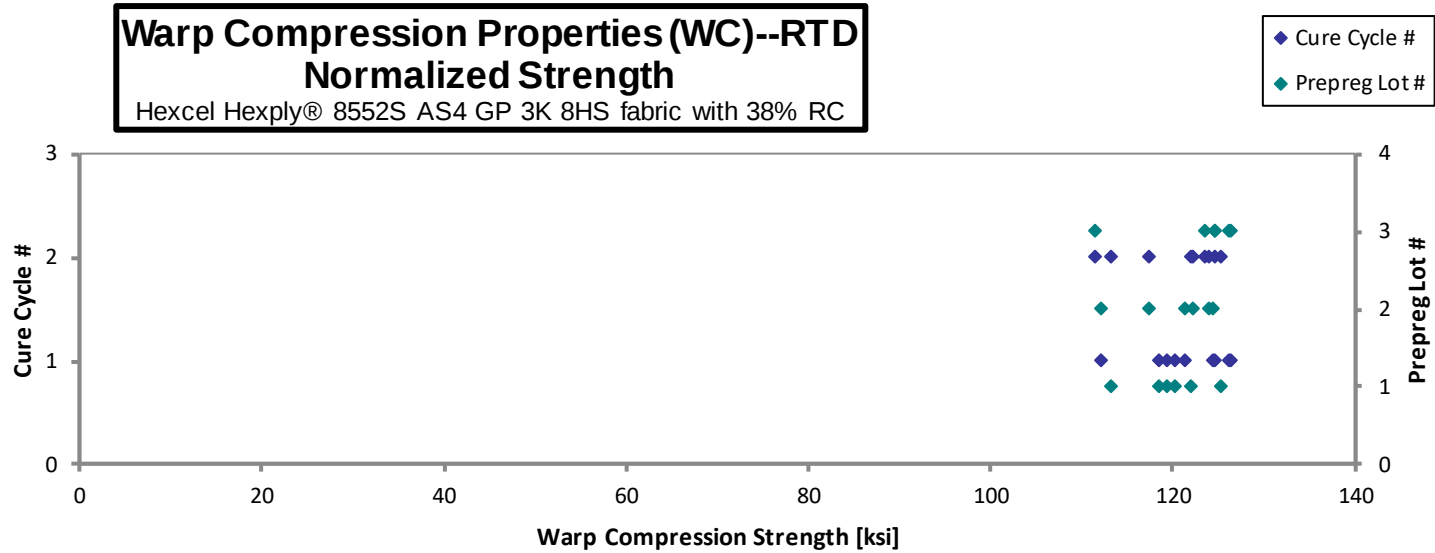
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPALA111A	A	M1	1	1	132.2	9.890	0.1075	8	BGM
HPALA112A	A	M1	1	1	126.7	9.241	0.1139	8	HAT, HIT
HPALA113A	A	M1	1	1	121.0	8.796	0.1183	8	BGM, HIB
HPALA211A	A	M2	1	2	126.9	9.929	0.1071	8	HAT
HPALA212A	A	M2	1	2	129.7	8.979	0.1159	8	HAT
HPALA213A	A	M2	1	2	126.3	8.936	0.1159	8	BGM
HPALB111A	B	M1	2	1	131.2	10.49	0.1025	8	BGM
HPALB112A	B	M1	2	1	134.5	9.850	0.1110	8	BGM
HPALB113A	B	M1	2	1	124.4	9.453	0.1171	8	BGM
HPALB211A*	B	M2	2	2		9.935	0.1115	8	CIT
HPALB212A	B	M2	2	2	122.8	9.428	0.1148	8	BGM
HPALB213A	B	M2	2	2	126.7	9.047	0.1175	8	BGM
HPALB214A	B	M2	2	2	122.5		0.1197	8	BGM
HPALC111A	C	M1	3	1	121.5	8.521	0.1246	8	BGM
HPALC112A	C	M1	3	1	120.2	8.452	0.1244	8	BGM, HIB
HPALC113A	C	M1	3	1	121.4	8.445	0.1250	8	HAB, HIB
HPALC211A	C	M2	3	2	123.0	9.890	0.1086	8	BGM
HPALC212A	C	M2	3	2	130.8	9.395	0.1133	8	BGM
HPALC213A	C	M2	3	2	128.1	9.152	0.1167	8	BGM

*Strength not reported due to unacceptable failure mode.

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0134	118.5	8.862
0.0142	120.3	8.769
0.0148	119.3	8.671
0.0134	113.2	8.860
0.0145	125.2	8.669
0.0145	122.0	8.631
0.0128	112.1	8.958
0.0139	124.4	9.107
0.0146	121.4	9.220
0.0139		9.230
0.0144	117.5	9.020
0.0147	124.1	8.858
0.0150	122.2	
0.0156	126.1	8.845
0.0156	124.6	8.764
0.0156	126.5	8.795
0.0136	111.4	8.954
0.0142	123.4	8.869
0.0146	124.6	8.899

Average 126.1 9.324
Standard Dev. 4.307 0.5880
Coeff. of Var. [%] 3.415 6.306
Min. 120.2 8.445
Max. 134.5 10.49
Number of Spec. 18 18

Average_{norm} 0.0144 120.9 8.888
Standard Dev_{norm} 4.751 0.1725
Coeff. of Var. [%]_{norm} 3.929 1.941
Min. 0.0128 111.4 8.631
Max. 0.0156 126.5 9.230
Number of Spec. 19 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Warp Compression Properties (WC)--ETD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

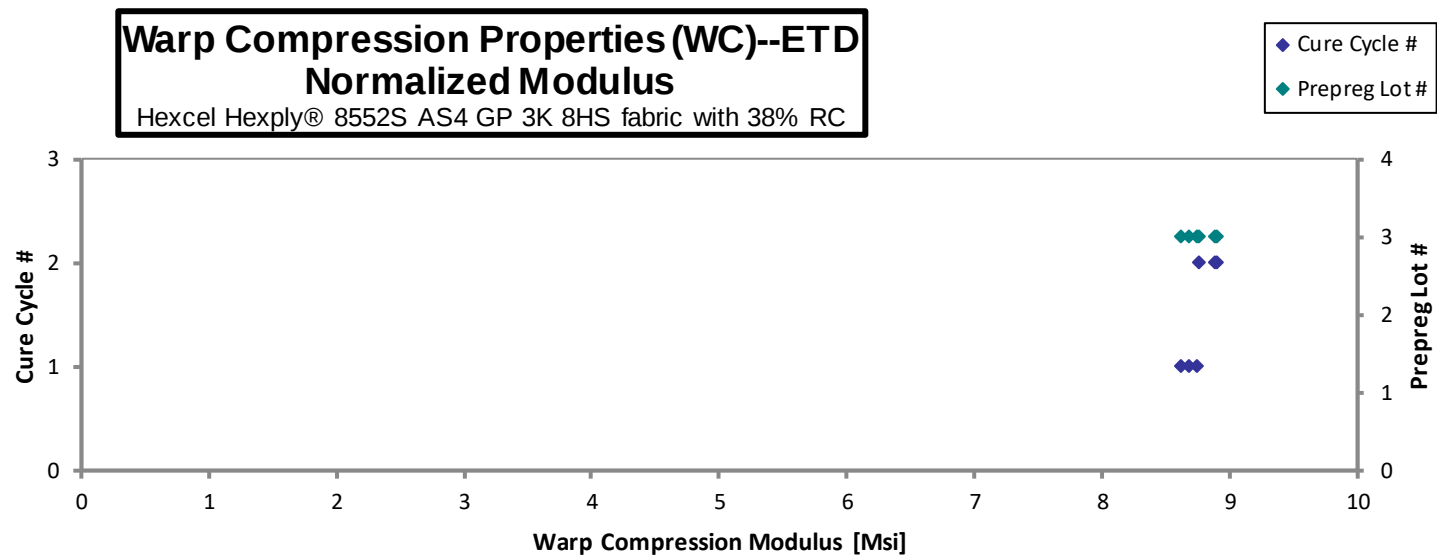
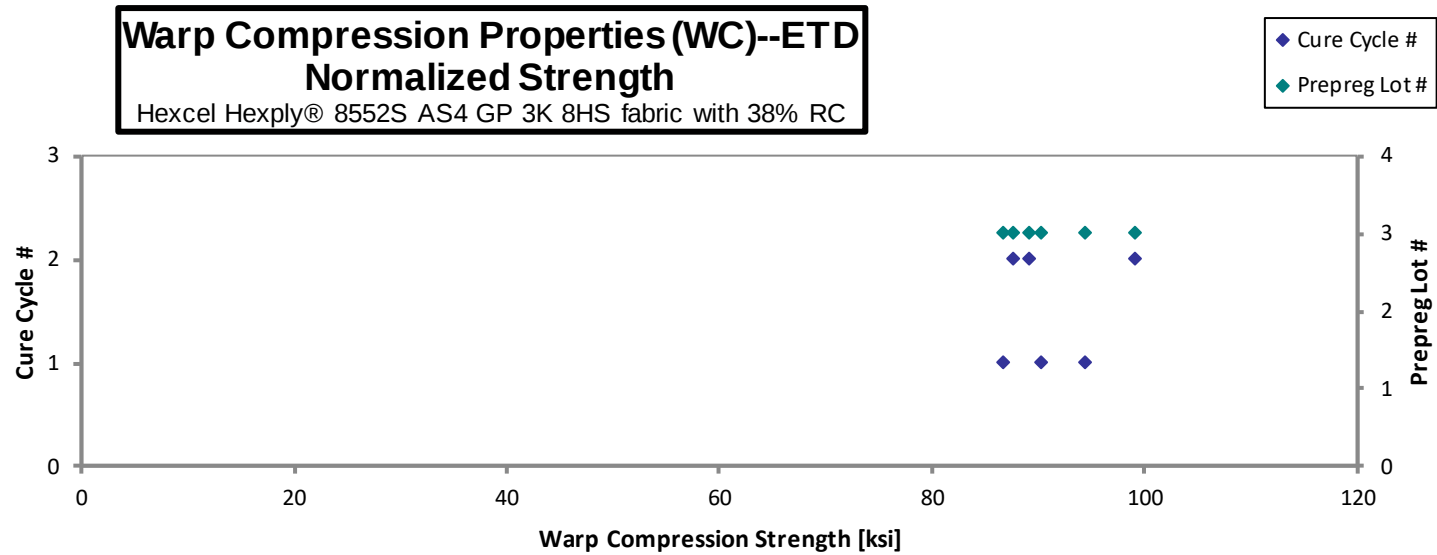
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPALC111C	C	M1	3	1	95.75	8.807	0.1184	8	BAB
HPALC112C	C	M1	3	1	89.18	8.988	0.1168	8	BGM
HPALC113C	C	M1	3	1	96.47	9.208	0.1124	8	BAT
HPALC211C	C	M2	3	2	95.23	8.541	0.1249	8	M(B,H)AT
HPALC212C	C	M2	3	2	85.69	8.420	0.1248	8	BAT
HPALC213C	C	M2	3	2	84.21	8.547	0.1250	8	BAT

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0148	94.47	8.689
0.0146	86.76	8.744
0.0140	90.33	8.623
0.0156	99.08	8.886
0.0156	89.14	8.759
0.0156	87.71	8.902

Average 91.09 8.752
Standard Dev. 5.438 0.3044
Coeff. of Var. [%] 5.970 3.478
Min. 84.21 8.420
Max. 96.47 9.208
Number of Spec. 6 6

Average_{norm} 0.0150 91.25 8.767
Standard Dev_{norm} 4.684 0.1094
Coeff. of Var. [%]_{norm} 5.133 1.248
Min. 0.0140 86.76 8.623
Max. 0.0156 99.08 8.902
Number of Spec. 6 6 6



July 16, 2025

CAM-RP-2019-057 Rev -

Warp Compression Properties (WC)--ETW Strength & Modulus			
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC			

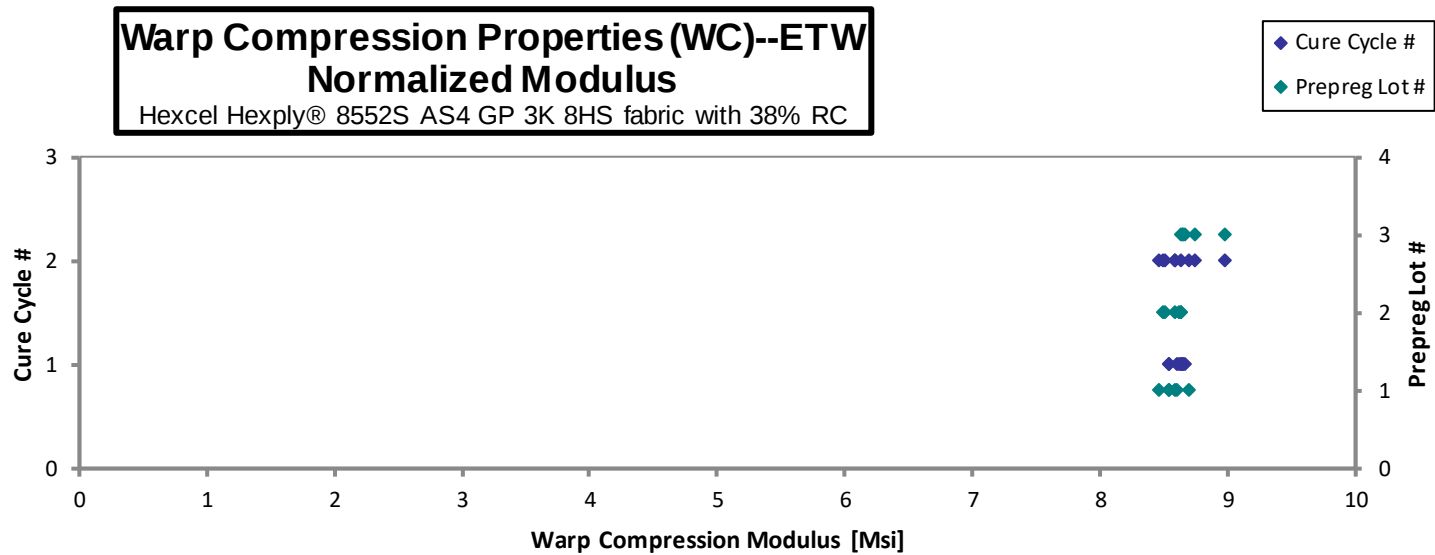
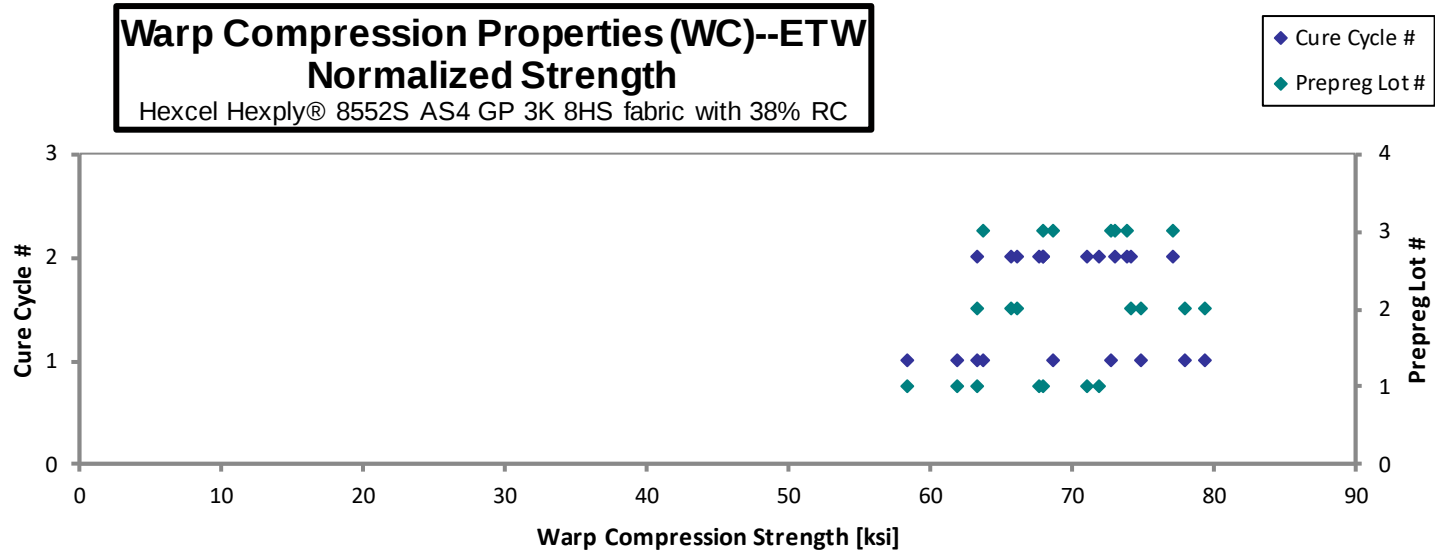
normalizing
t _{ply} [in]
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPALA111D	A	M1	1	1		8.110	0.1264	8	BGM
HPALA112D	A	M1	1	1		9.501	0.1080	8	HGM
HPALA113D	A	M1	1	1		9.083	0.1137	8	BGM
HPALA114D	A	M1	1	1	62.82		0.1182	8	BGM
HPALA115D	A	M1	1	1	57.66		0.1217	8	M(B,H)GM
HPALA116D	A	M1	1	1	60.85		0.1251	8	BGM
HPALA211D	A	M2	1	2		8.032	0.1264	8	BGM
HPALA212D	A	M2	1	2		9.336	0.1103	8	BGM
HPALA213D	A	M2	1	2		9.044	0.1155	8	HGM
HPALA214D	A	M2	1	2	72.30		0.1181	8	M(B,H)GM
HPALA215D	A	M2	1	2	67.01		0.1212	8	BGM
HPALA216D	A	M2	1	2	70.25		0.1229	8	BGM
HPALA217D	A	M2	1	2	65.34		0.1249	8	HGM
HPALB111D	B	M1	2	1		7.732	0.1338	8	BGM
HPALB112D	B	M1	2	1		9.789	0.1059	8	BGM
HPALB113D	B	M1	2	1		9.230	0.1124	8	BGM
HPALB115D	B	M1	2	1	77.81		0.1225	8	BGM
HPALB116D	B	M1	2	1	75.32		0.1244	8	BGM
HPALB117D	B	M1	2	1	71.55		0.1257	8	BGM
HPALB211D	B	M2	2	2		8.094	0.1261	8	BGM
HPALB212D	B	M2	2	2		9.299	0.1109	8	BGM
HPALB213D	B	M2	2	2		8.939	0.1141	8	BGM
HPALB214D	B	M2	2	2	67.17		0.1174	8	BGM
HPALB215D	B	M2	2	2	66.10		0.1202	8	BGM
HPALB216D	B	M2	2	2	73.10		0.1219	8	BGM
HPALB217D	B	M2	2	2	61.40		0.1237	8	BGM
HPALC111D	C	M1	3	1		8.986	0.1157	8	BGM
HPALC112D	C	M1	3	1		8.818	0.1179	8	BGM
HPALC113D	C	M1	3	1		8.667	0.1198	8	BGM
HPALC114D	C	M1	3	1	62.83		0.1217	8	BGM
HPALC115D	C	M1	3	1	66.64		0.1237	8	BGM
HPALC116D	C	M1	3	1	70.79		0.1235	8	BGM
HPALC211D	C	M2	3	2		9.512	0.1134	8	BGM
HPALC212D	C	M2	3	2		8.990	0.1167	8	M(B,H)GM
HPALC213D	C	M2	3	2		8.642	0.1200	8	BAT
HPALC214D	C	M2	3	2	72.23		0.1215	8	BGM
HPALC215D	C	M2	3	2	75.68		0.1223	8	BGM
HPALC216D	C	M2	3	2	66.17		0.1233	8	BGM
HPALC217D	C	M2	3	2	72.08		0.1231	8	BAB, HIB

Avg. t _{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0158		8.542
0.0135		8.550
0.0142		8.606
0.0148	61.88	
0.0152	58.46	
0.0156	63.42	
0.0158		8.463
0.0138		8.584
0.0144		8.704
0.0148	71.12	
0.0151	67.66	
0.0154	71.96	
0.0156	68.01	
0.0167		8.622
0.0132		8.640
0.0140		8.644
0.0153	79.41	
0.0155	78.06	
0.0157	74.92	
0.0158		8.505
0.0139		8.590
0.0143		8.501
0.0147	65.71	
0.0150	66.18	
0.0152	74.27	
0.0155	63.28	
0.0145		8.664
0.0147		8.660
0.0150		8.652
0.0152	63.74	
0.0155	68.67	
0.0154	72.83	
0.0142		8.988
0.0146		8.745
0.0150		8.642
0.0152	73.10	
0.0153	77.13	
0.0154	68.00	
0.0154	73.95	

Average 68.34 8.878
 Standard Dev. 5.403 0.5721
 Coeff. of Var. [%] 7.906 6.445
 Min. 57.66 7.732
 Max. 77.81 9.789
 Number of Spec. 21 18

Average_{norm} 0.0150 69.61 8.628
 Standard Dev._{norm} 0.1159
 Coeff. of Var. [%]_{norm} 8.234 1.343
 Min. 0.0132 58.46 8.463
 Max. 0.0167 79.41 8.988
 Number of Spec. 39 21 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.4 Fill Compression Properties (FC)

Fill Compression Properties (FC)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

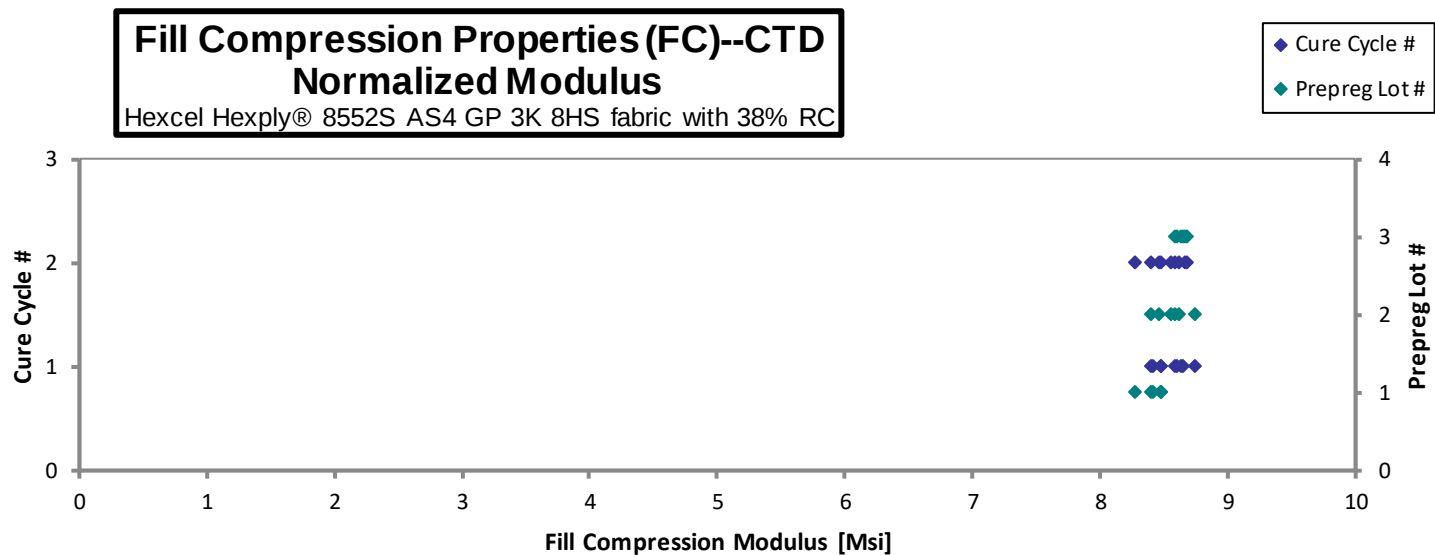
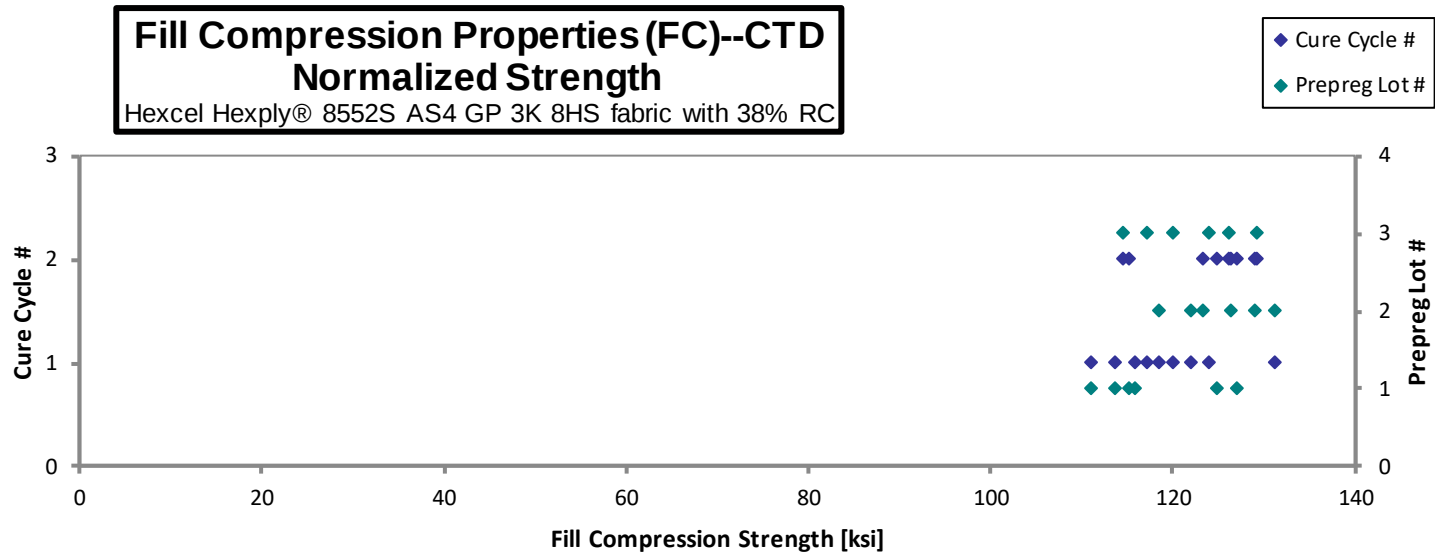
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAZA1R1B	A	M1	1	1	112.1	8.214	0.1239	8	BGM
HPAZA1R2B	A	M1	1	1	109.8	8.187	0.1243	8	BGM
HPAZA1R3B	A	M1	1	1	108.0	8.188	0.1235	8	BGM
HPAZA2R1B	A	M2	1	2	121.6	7.928	0.1253	8	BGM
HPAZA2R2B	A	M2	1	2	119.2	8.100	0.1256	8	BGM
HPAZA2R4B	A	M2	1	2	110.8	8.091	0.1247	8	BGM
HPAZB1R1B	B	M1	2	1	117.5	8.418	0.1247	8	BGM
HPAZB1R2B	B	M1	2	1	113.9	8.259	0.1248	8	BGM
HPAZB1R3B	B	M1	2	1	126.6	8.110	0.1243	8	BGM
HPAZB2R1B	B	M2	2	2	120.6	8.223	0.1257	8	BGM
HPAZB2R2B	B	M2	2	2	123.1	8.066	0.1258	8	BGM
HPAZB2R3B	B	M2	2	2	117.7	8.164	0.1257	8	BGM
HPAZC1R1B	C	M1	3	1	121.9	8.498	0.1221	8	BGM
HPAZC1R2B	C	M1	3	1	118.3	8.518	0.1218	8	BGM
HPAZC1R3B	C	M1	3	1	115.7	8.503	0.1214	8	BGM
HPAZC2R1B	C	M2	3	2	121.9	8.399	0.1242	8	BGM
HPAZC2R2B	C	M2	3	2	125.3	8.405	0.1239	8	BGM
HPAZC2R3B	C	M2	3	2	112.1	8.406	0.1226	8	BGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0155	115.8	8.482
0.0155	113.7	8.479
0.0154	111.1	8.425
0.0157	127.1	8.281
0.0157	124.8	8.481
0.0156	115.1	8.405
0.0156	122.1	8.746
0.0156	118.4	8.591
0.0155	131.2	8.402
0.0157	126.4	8.615
0.0157	129.1	8.458
0.0157	123.3	8.553
0.0153	124.0	8.643
0.0152	120.1	8.645
0.0152	117.1	8.604
0.0155	126.1	8.689
0.0155	129.3	8.675
0.0153	114.5	8.588

Average 117.6 8.260
 Standard Dev. 5.492 0.1742
 Coeff. of Var. [%] 4.671 2.109
 Min. 108.0 7.928
 Max. 126.6 8.518
 Number of Spec. 18 18

Average_{norm} 0.0155 121.6 8.542
 Standard Dev_{norm} 6.085 0.1224
 Coeff. of Var. [%]_{norm} 5.003 1.433
 Min. 0.0152 111.1 8.281
 Max. 0.0157 131.2 8.746
 Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Fill Compression Properties (FC)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

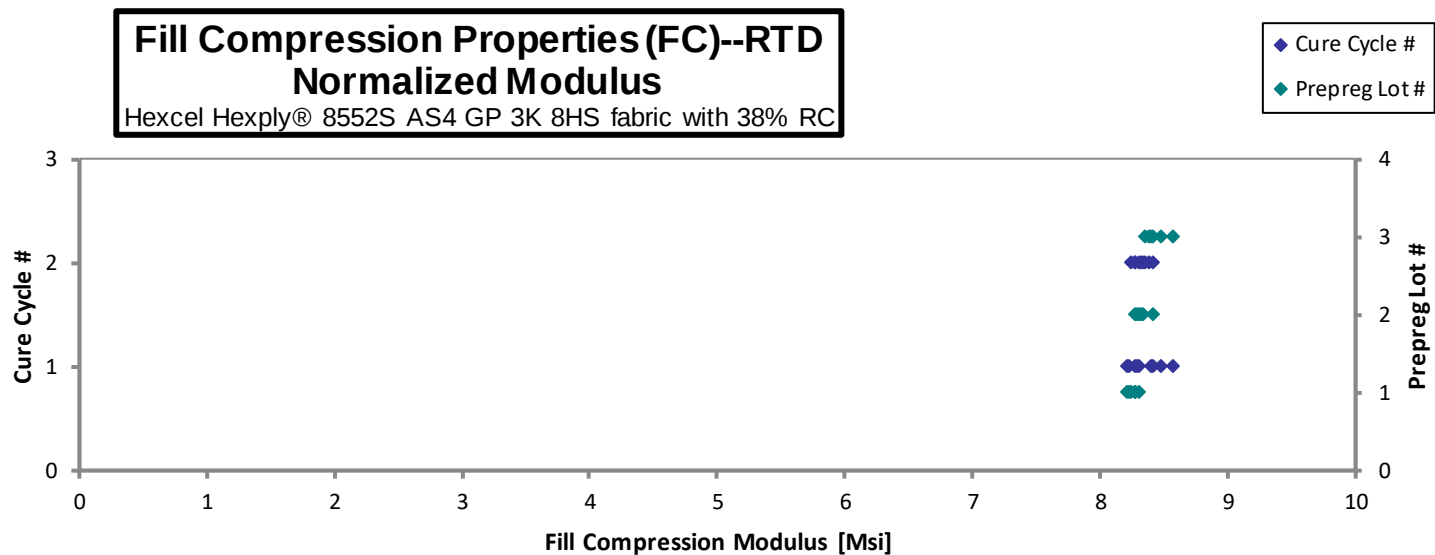
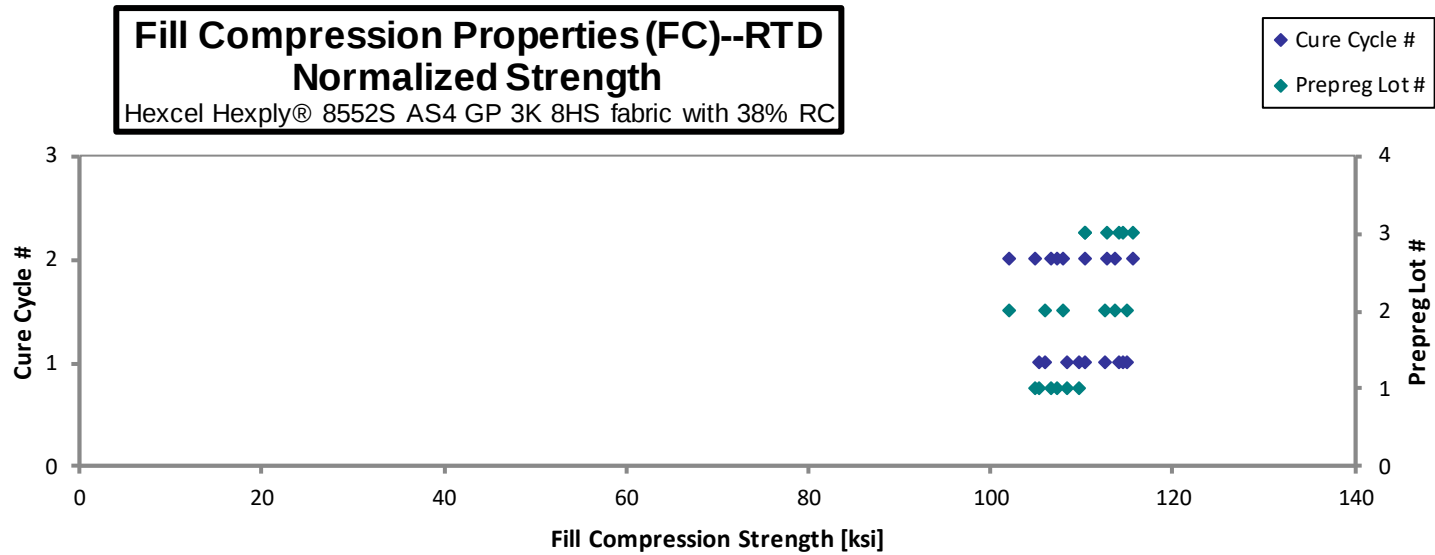
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAZA1R1A	A	M1	1	1	115.2	9.008	0.1096	8	BGM
HPAZA1R2A	A	M1	1	1	111.3	8.447	0.1168	8	BGM
HPAZA1R3A	A	M1	1	1	109.0	8.208	0.1209	8	BGM
HPAZA2R1A	A	M2	1	2	114.8	8.819	0.1121	8	HAB
HPAZA2R2A*	A	M2	1	2		8.412	0.1185	8	HIT
HPAZA2R3A	A	M2	1	2	103.3	8.153	0.1219	8	BGM
HPAZA2R4A	A	M2	1	2	103.2		0.1242	8	BGM
HPAZB1R1A*	B	M1	2	1		9.318	0.1070	8	HIB
HPAZB1R2A	B	M1	2	1	116.4	8.574	0.1161	8	BGM
HPAZB1R3A	B	M1	2	1	105.0	8.346	0.1211	8	BGM
HPAZB1R4A	B	M1	2	1	111.3		0.1242	8	BGM
HPAZB2R1A	B	M2	2	2	108.4	8.857	0.1129	8	BGM
HPAZB2R2A	B	M2	2	2	113.9	8.283	0.1198	8	BGM
HPAZB2R3A	B	M2	2	2	104.8	8.084	0.1236	8	BGM
HPAZC1R1A	C	M1	3	1	121.6	9.137	0.1127	8	BGM
HPAZC1R2A	C	M1	3	1	111.6	8.488	0.1188	8	BGM
HPAZC1R3A*	C	M1	3	1		8.400	0.1211	8	HIB
HPAZC1R4A	C	M1	3	1	112.9		0.1217	8	BGM
HPAZC2R1A	C	M2	3	2	117.8	8.972	0.1125	8	BGM
HPAZC2R2A	C	M2	3	2	113.3	8.432	0.1194	8	BGM
HPAZC2R3A	C	M2	3	2	112.8	8.153	0.1230	8	BGM

*Strength not reported due to unacceptable failure mode.

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0137	105.3	8.230
0.0146	108.3	8.219
0.0151	109.8	8.270
0.0140	107.3	8.240
0.0148		8.306
0.0152	104.9	8.281
0.0155	106.7	
0.0134		8.309
0.0145	112.7	8.297
0.0151	105.9	8.420
0.0155	115.1	
0.0141	102.0	8.333
0.0150	113.8	8.269
0.0155	107.9	8.328
0.0141	114.2	8.579
0.0149	110.5	8.403
0.0151		8.475
0.0152	114.5	
0.0141	110.4	8.413
0.0149	112.8	8.392
0.0154	115.7	8.358

Average 111.5 8.561
Standard Dev. 5.116 0.3694
Coeff. of Var. [%] 4.589 4.315
Min. 103.2 8.084
Max. 121.6 9.318
Number of Spec. 18 18

Average_{norm} 0.0147 109.9 8.340
Standard Dev_{norm} 4.055 0.0934
Coeff. of Var. [%]_{norm} 3.691 1.120
Min. 0.0134 102.0 8.219
Max. 0.0155 115.7 8.579
Number of Spec. 21 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

Fill Compression Properties (FC)--ETD
Strength & Modulus
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

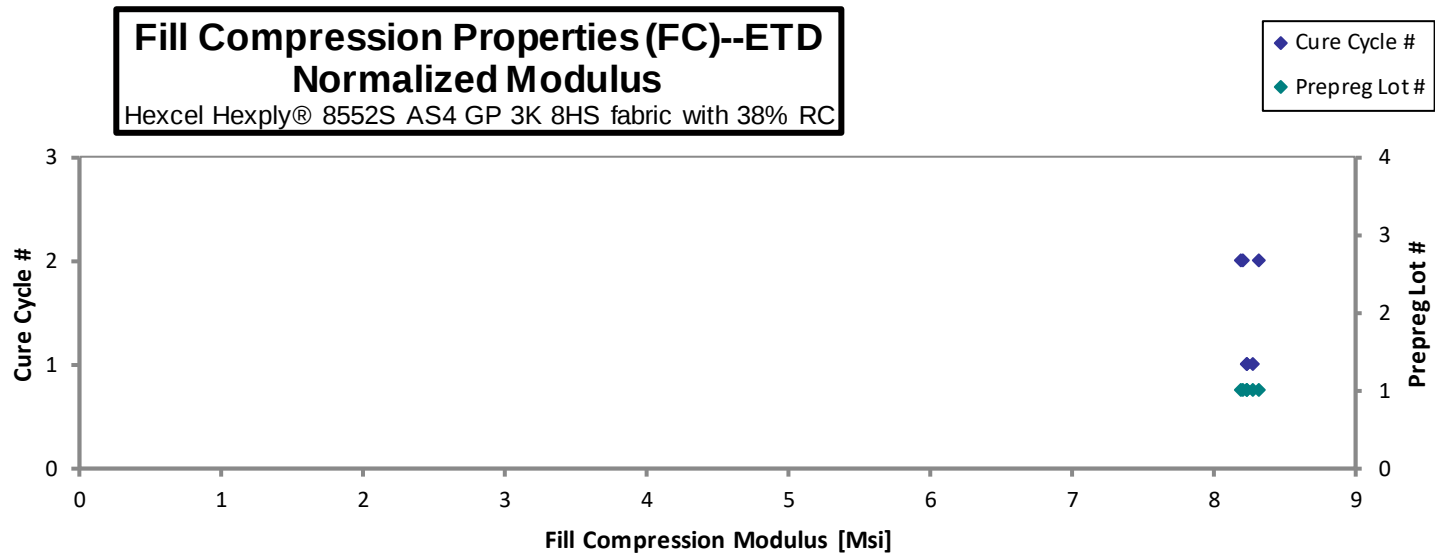
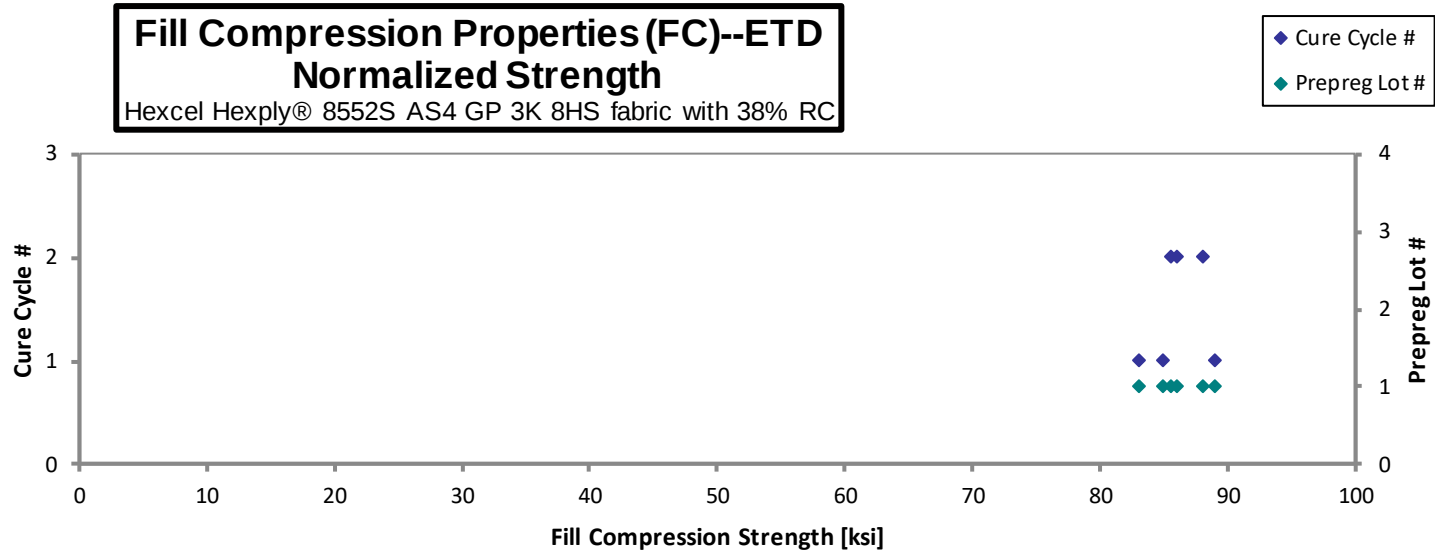
normalizing
 t_{ply} [in]
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAZA1R1C	A	M1	1	1	82.89	8.040	0.1231	8	BGM
HPAZA1R2C	A	M1	1	1	80.97	8.064	0.1232	8	HAT
HPAZA1R3C	A	M1	1	1	86.83	8.039	0.1230	8	BGM, HAT, HIT
HPAZA2R1C	A	M2	1	2	83.38	8.062	0.1240	8	BGM
HPAZA2R2C	A	M2	1	2	85.74	7.988	0.1233	8	BGM
HPAZA2R3C	A	M2	1	2	91.44	8.763	0.1123	8	BGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0154	85.01	8.245
0.0154	83.15	8.281
0.0154	89.01	8.241
0.0155	86.12	8.327
0.0154	88.12	8.210
0.0140	85.55	8.199

Average 85.21 8.159
Standard Dev. 3.700 0.2971
Coeff. of Var. [%] 4.343 3.641
Min. 80.97 7.988
Max. 91.44 8.763
Number of Spec. 6 6

Average_{norm} 0.0152 86.16 8.251
Standard Dev._{norm} 2.133 0.0476
Coeff. of Var. [%]_{norm} 2.476 0.5765
Min. 0.0140 83.15 8.199
Max. 0.0155 89.01 8.327
Number of Spec. 6 6 6



July 16, 2025

CAM-RP-2019-057 Rev -

Fill Compression Properties (FC)--ETW
Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

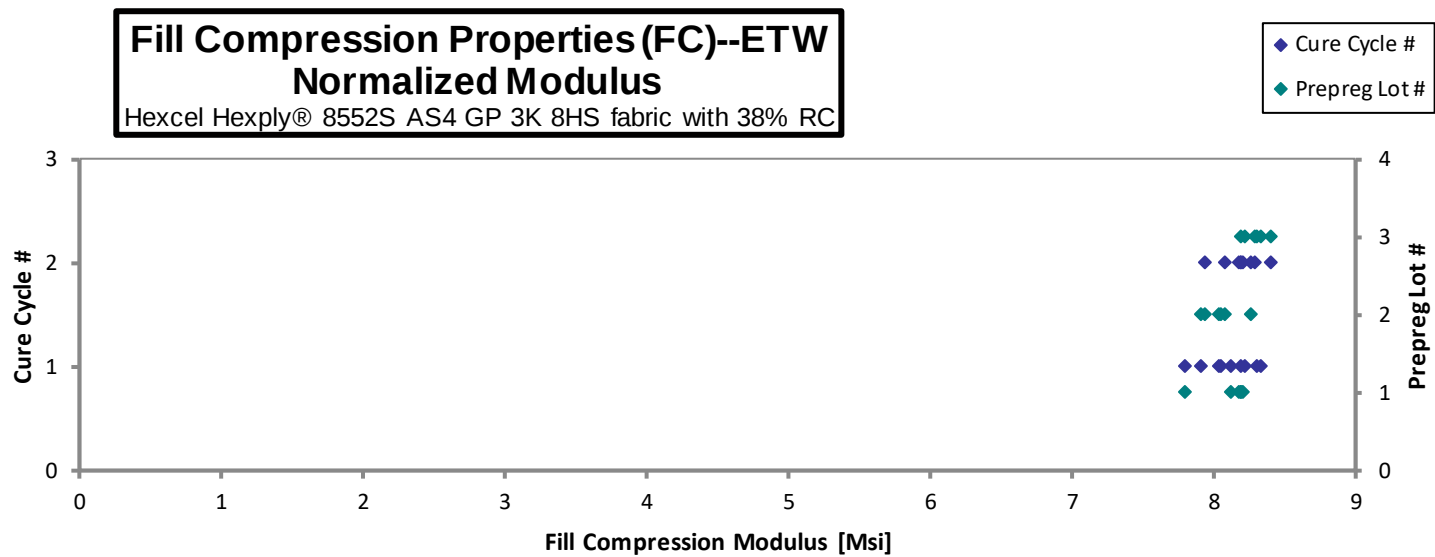
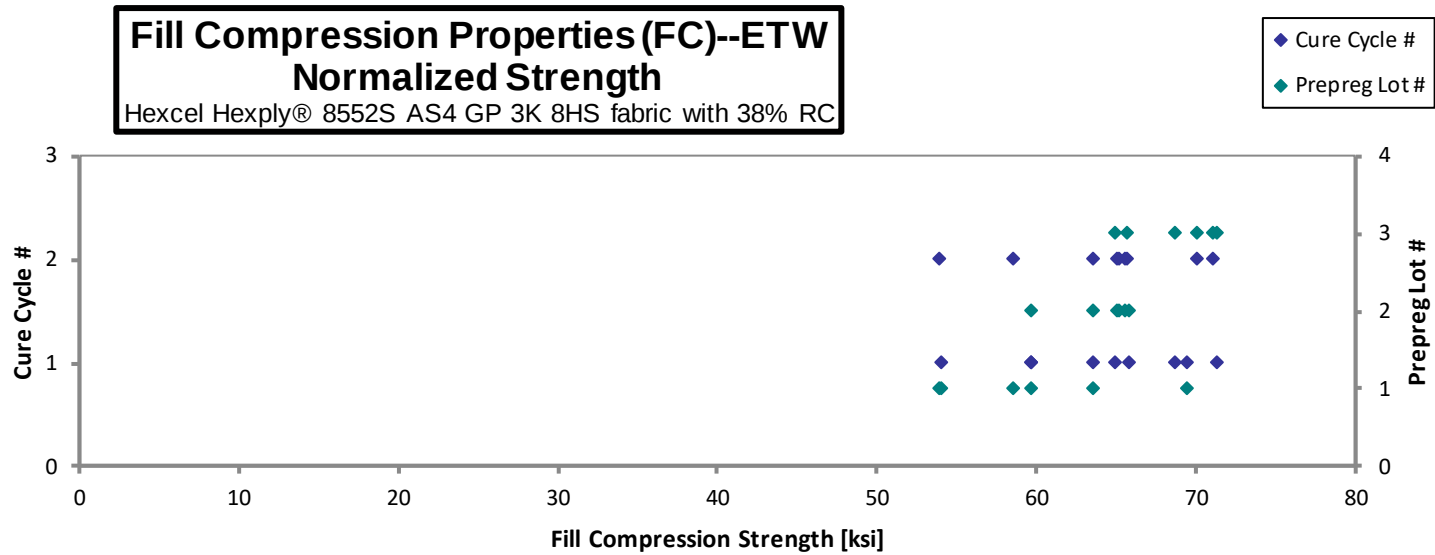
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAZA1R1D	A	M1	1	1		8.014	0.1169	8	BGM
HPAZA1R2D	A	M1	1	1		8.016	0.1217	8	CIB
HPAZA1R3D	A	M1	1	1		8.006	0.1228	8	BGM
HPAZA1R4D	A	M1	1	1	67.60		0.1233	8	BGM
HPAZA1R5D	A	M1	1	1	52.81		0.1230	8	BGM
HPAZA1R6D	A	M1	1	1	58.62		0.1223	8	HGM
HPAZA2R1D	A	M2	1	2		8.125	0.1213	8	HGM
HPAZA2R2D	A	M2	1	2		7.976	0.1231	8	CIB
HPAZA2R3D	A	M2	1	2		7.909	0.1243	8	HGM
HPAZA2R4D	A	M2	1	2	52.03		0.1244	8	BGM
HPAZA2R5D	A	M2	1	2	61.56		0.1239	8	MB,H)GM
HPAZA2R6D	A	M2	1	2	56.95		0.1234	8	HAB
HPAZB1R1D	B	M1	2	1		7.830	0.1234	8	BGM
HPAZB1R2D	B	M1	2	1		7.824	0.1234	8	BGM
HPAZB1R3D	B	M1	2	1		7.692	0.1235	8	HGM
HPAZB1R4D	B	M1	2	1	58.06		0.1234	8	HGM
HPAZB1R5D	B	M1	2	1	63.85		0.1237	8	BGM
HPAZB1R6D	B	M1	2	1	61.86		0.1235	8	HGM
HPAZB2R1D	B	M2	2	2		7.969	0.1244	8	M(B,H)AT
HPAZB2R2D	B	M2	2	2		7.665	0.1243	8	BGM
HPAZB2R3D	B	M2	2	2		7.816	0.1241	8	BGM
HPAZB2R4D	B	M2	2	2	63.16		0.1245	8	BGM
HPAZB2R6D	B	M2	2	2	62.44		0.1252	8	BGM
HPAZB2R7D	B	M2	2	2	62.28		0.1256	8	HGM
HPAZC1R1D	C	M1	3	1		8.156	0.1210	8	M(B,H)GM
HPAZC1R2D	C	M1	3	1		8.284	0.1209	8	BGM
HPAZC1R3D	C	M1	3	1		8.243	0.1210	8	BGM
HPAZC1R4D	C	M1	3	1	64.19		0.1214	8	HGM
HPAZC1R5D	C	M1	3	1	67.56		0.1221	8	HGM
HPAZC1R6D	C	M1	3	1	69.94		0.1224	8	BGM
HPAZC2R1D	C	M2	3	2		8.274	0.1218	8	CIB
HPAZC2R2D	C	M2	3	2		8.161	0.1220	8	CIB
HPAZC2R3D	C	M2	3	2		8.072	0.1219	8	BGM
HPAZC2R4D	C	M2	3	2	69.04		0.1218	8	BGM
HPAZC2R5D	C	M2	3	2	69.43		0.1229	8	BGM
HPAZC2R6D	C	M2	3	2	63.96		0.1234	8	HGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0146		7.808
0.0152		8.126
0.0154		8.193
0.0154	69.47	
0.0154	54.11	
0.0153	59.72	
0.0152		8.214
0.0154		8.183
0.0155		8.190
0.0155	53.93	
0.0155	63.57	
0.0154	58.55	
0.0154		8.050
0.0154		8.042
0.0154		7.916
0.0154	59.69	
0.0155	65.81	
0.0154	63.64	
0.0156		8.263
0.0155		7.937
0.0155		8.083
0.0156	65.52	
0.0156	65.13	
0.0157	65.17	
0.0151		8.226
0.0151		8.344
0.0151		8.309
0.0152	64.94	
0.0153	68.72	
0.0153	71.33	
0.0152		8.401
0.0152		8.295
0.0152		8.199
0.0152	70.09	
0.0154	71.11	
0.0154	65.75	

Average 62.52 8.002
Standard Dev. 5.288 0.1874
Coeff. of Var. [%] 8.459 2.342
Min. 52.03 7.665
Max. 69.94 8.284
Number of Spec. 18 18

Average_{norm} 0.0154 64.24 8.154
Standard Dev._{norm} 5.262 0.1570
Coeff. of Var. [%]_{norm} 8.192 1.926
Min. 0.0146 53.93 7.808
Max. 0.0157 71.33 8.401
Number of Spec. 36 18 18



4.5 In-Plane Shear Properties (IPS)

In-Plane Shear Properties (IPS)--CTD

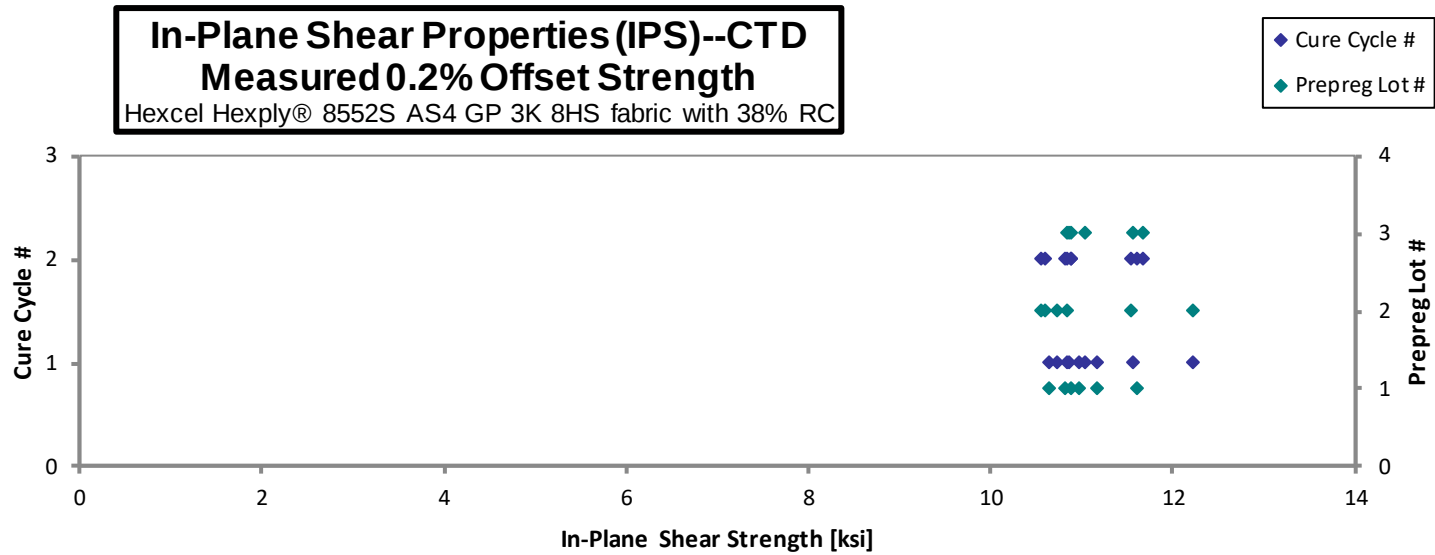
Strength & Modulus

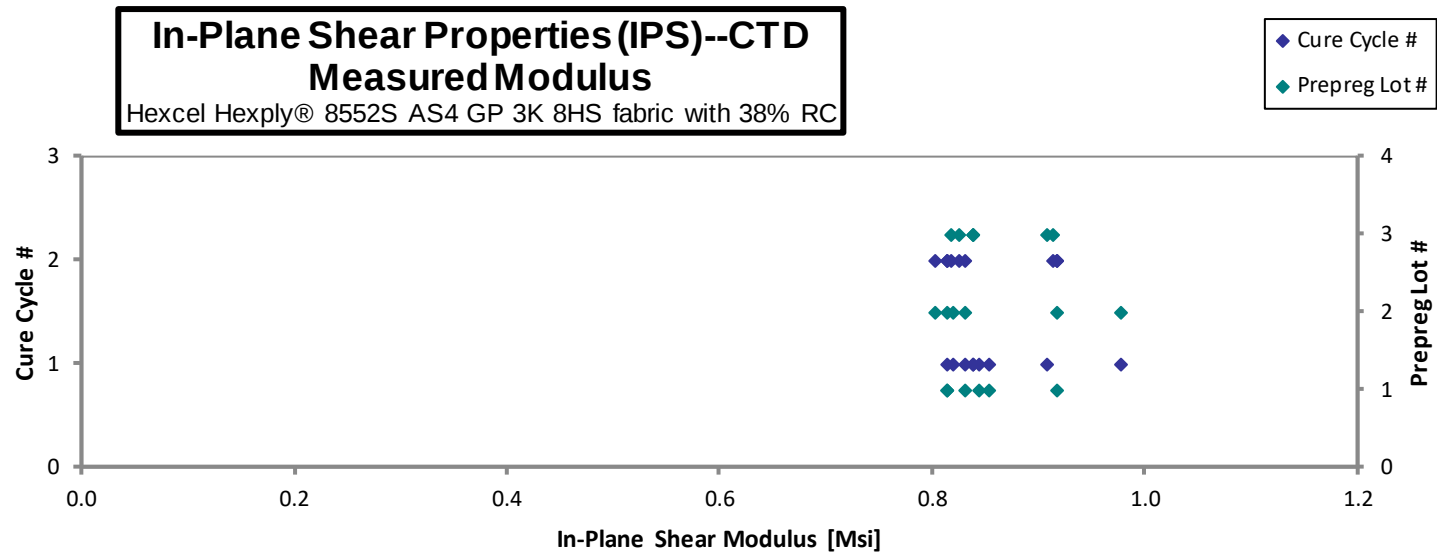
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	0.2% Offset Strength [ksi]	Maximum Shear Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPANA111B	A	M1	1	1	10.98	15.91	0.8455	0.1194	8	0.0149	AWT
HPANA112B	A	M1	1	1	11.18	15.94	0.8543	0.1193	8	0.0149	AWB
HPANA113B	A	M1	1	1	10.64	16.17	0.8155	0.1219	8	0.0152	AWB
HPANA211B	A	M2	1	2	10.82	15.69	0.8147	0.1229	8	0.0154	AWB
HPANA212B	A	M2	1	2	10.89	15.84	0.8324	0.1212	8	0.0152	AWT
HPANA213B	A	M2	1	2	11.62	17.10	0.9189	0.1087	8	0.0136	AGB
HPANB111B	B	M1	2	1	10.85	16.33	0.8317	0.1244	8	0.0156	AWB
HPANB112B	B	M1	2	1	10.72	15.93	0.8211	0.1255	8	0.0157	AWT
HPANB113B	B	M1	2	1	12.22	16.99	0.9776	0.1044	8	0.0130	AGT
HPANB211B	B	M2	2	2	10.57	15.71	0.8039	0.1269	8	0.0159	AWT
HPANB212B	B	M2	2	2	10.60	15.77	0.8141	0.1270	8	0.0159	AWT
HPANB213B	B	M2	2	2	11.55	16.73	0.9181	0.1094	8	0.0137	AGT
HPANC112B	C	M1	3	1	11.05	16.20	0.8400	0.1212	8	0.0152	AWB
HPANC113B	C	M1	3	1	11.56	16.62	0.9080	0.1104	8	0.0138	AGT
HPANC114B	C	M1	3	1	10.86	16.25	0.8385	0.1185	8	0.0148	AWB
HPANC211B	C	M2	3	2	10.85	15.43	0.8177	0.1221	8	0.0153	AWB
HPANC212B	C	M2	3	2	10.89	15.58	0.8261	0.1213	8	0.0152	AWB
HPANC213B	C	M2	3	2	11.69	16.99	0.9151	0.1114	8	0.0139	AWT

Maximum Shear Strength reported occurred prior to reaching 5% strain

Average	11.09	16.18	0.8552	0.0148
Standard Dev.	0.4561	0.5173	0.0497	
Coeff. of Var. [%]	4.114	3.198	5.813	
Min.	10.57	15.43	0.8039	0.0130
Max.	12.22	17.10	0.9776	0.0159
Number of Spec.	18	18	18	18





July 16, 2025

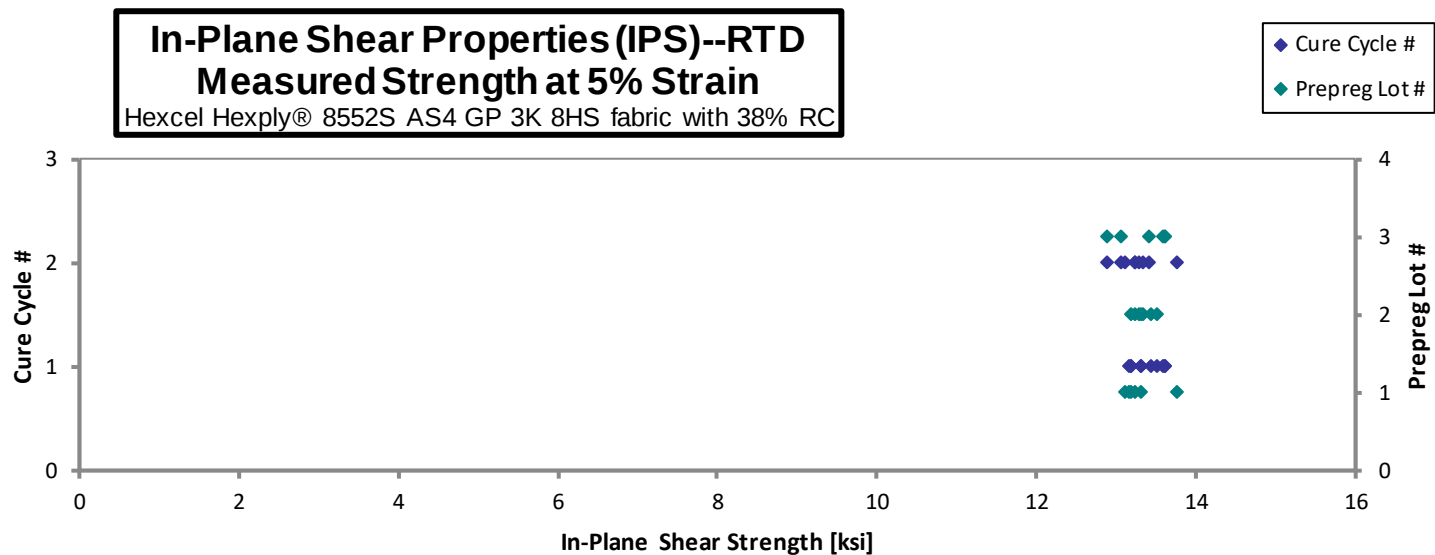
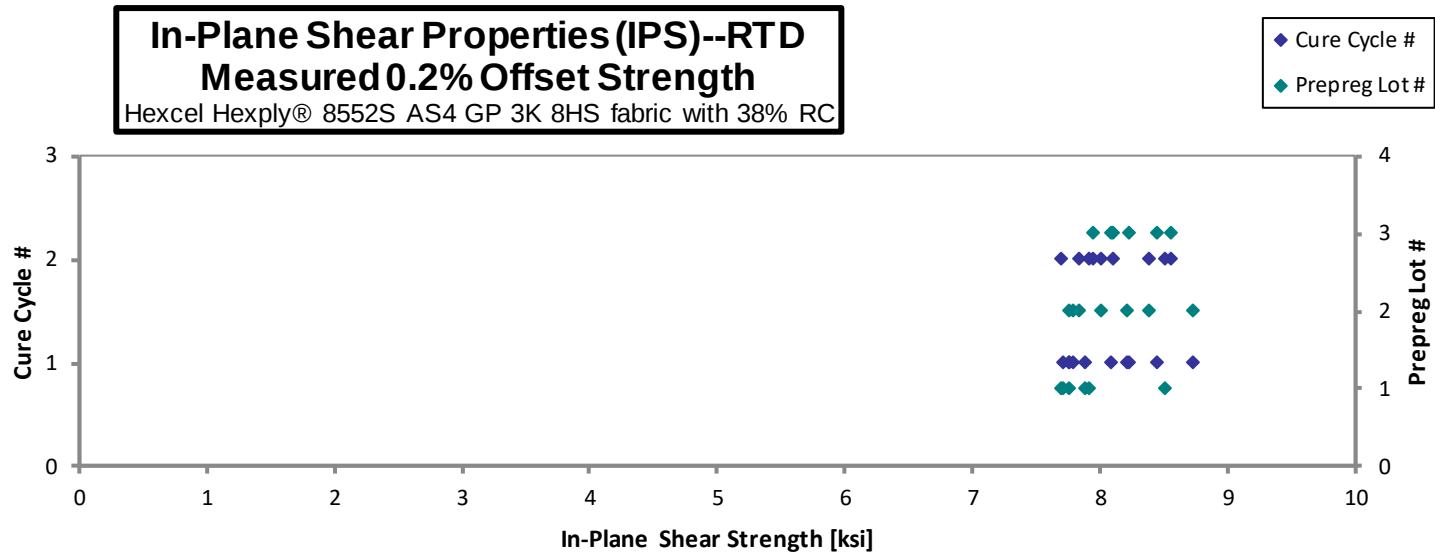
CAM-RP-2019-057 Rev -

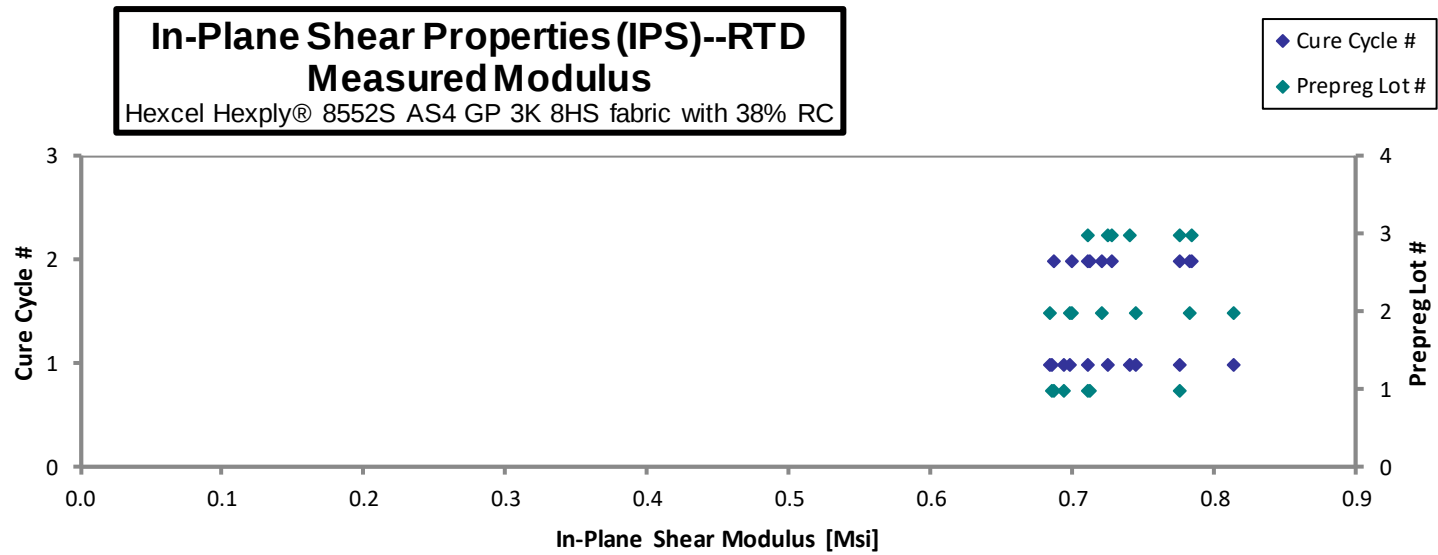
**In-Plane Shear Properties (IPS)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	0.2% Offset Strength [ksi]	Strength at 5% Strain [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPANA111A	A	M1	1	1	7.892	13.31	0.7099	0.1162	8	0.0145	AGM
HPANA112A	A	M1	1	1	7.753	13.19	0.6932	0.1197	8	0.0150	AWB
HPANA113A	A	M1	1	1	7.712	13.17	0.6856	0.1212	8	0.0151	AGB
HPANA211A	A	M2	1	2	8.506	13.76	0.7758	0.1063	8	0.0133	AGT
HPANA212A	A	M2	1	2	7.914	13.25	0.7118	0.1152	8	0.0144	AGB
HPANA213A	A	M2	1	2	7.697	13.12	0.6862	0.1199	8	0.0150	AWB
HPANB111A	B	M1	2	1	8.728	13.45	0.8130	0.1042	8	0.0130	AGB
HPANB112A	B	M1	2	1	8.208	13.51	0.7438	0.1139	8	0.0142	AGT
HPANB113A	B	M1	2	1	7.797	13.19	0.6979	0.1213	8	0.0152	AGB
HPANB114A	B	M1	2	1	7.764	13.32	0.6832	0.1236	8	0.0155	AGB
HPANB211A	B	M2	2	2	8.387	13.35	0.7823	0.1100	8	0.0137	AGT
HPANB212A	B	M2	2	2	8.003	13.28	0.7200	0.1172	8	0.0147	AGT
HPANB213A	B	M2	2	2	7.840	13.23	0.6989	0.1212	8	0.0151	AWB
HPANC111A	C	M1	3	1	8.452	13.60	0.7753	0.1074	8	0.0134	AGT
HPANC112A	C	M1	3	1	8.223	13.61	0.7398	0.1145	8	0.0143	AGT
HPANC113A	C	M1	3	1	8.088	13.62	0.7239	0.1180	8	0.0148	AGB
HPANC211A	C	M2	3	2	8.555	13.42	0.7833	0.1086	8	0.0136	AWB
HPANC212A	C	M2	3	2	8.098	13.07	0.7273	0.1156	8	0.0144	AWB
HPANC213A	C	M2	3	2	7.951	12.88	0.7105	0.1191	8	0.0149	AGB

Average	8.083	13.33	0.7296	0.0144
Standard Dev.	0.3169	0.2204	0.0392	
Coeff. of Var. [%]	3.921	1.653	5.368	
Min.	7.697	12.88	0.6832	0.0130
Max.	8.728	13.76	0.8130	0.0155
Number of Spec.	19	19	19	19





July 16, 2025

CAM-RP-2019-057 Rev -

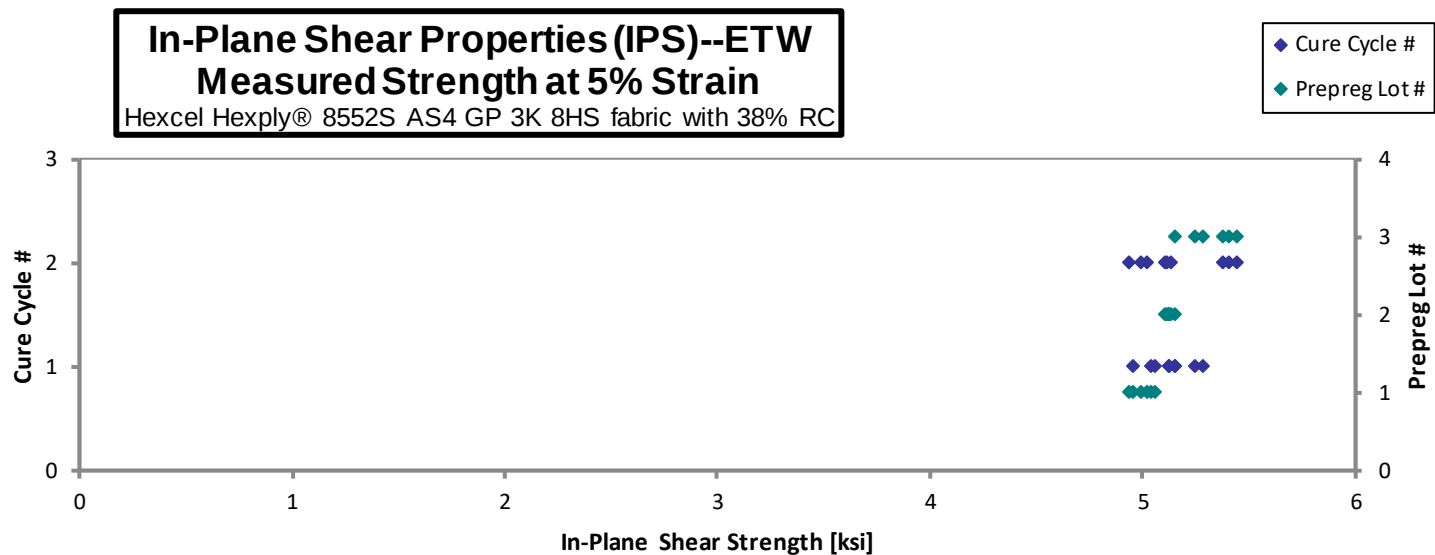
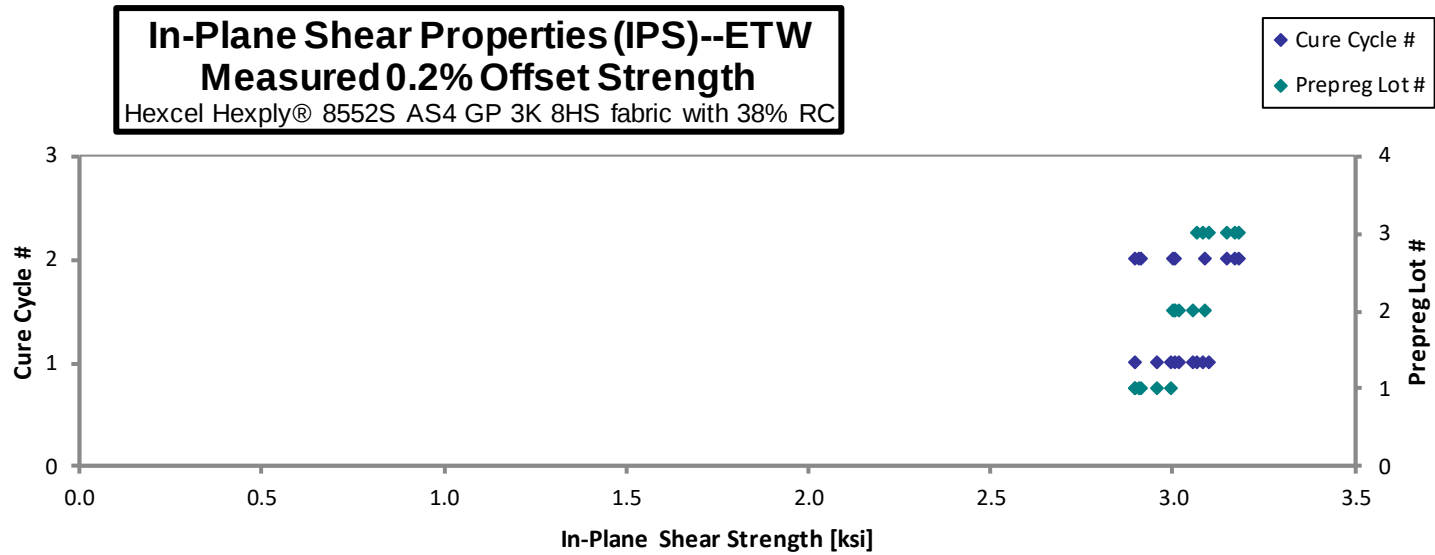
**In-Plane Shear Properties (IPS)--ETW
Strength & Modulus**

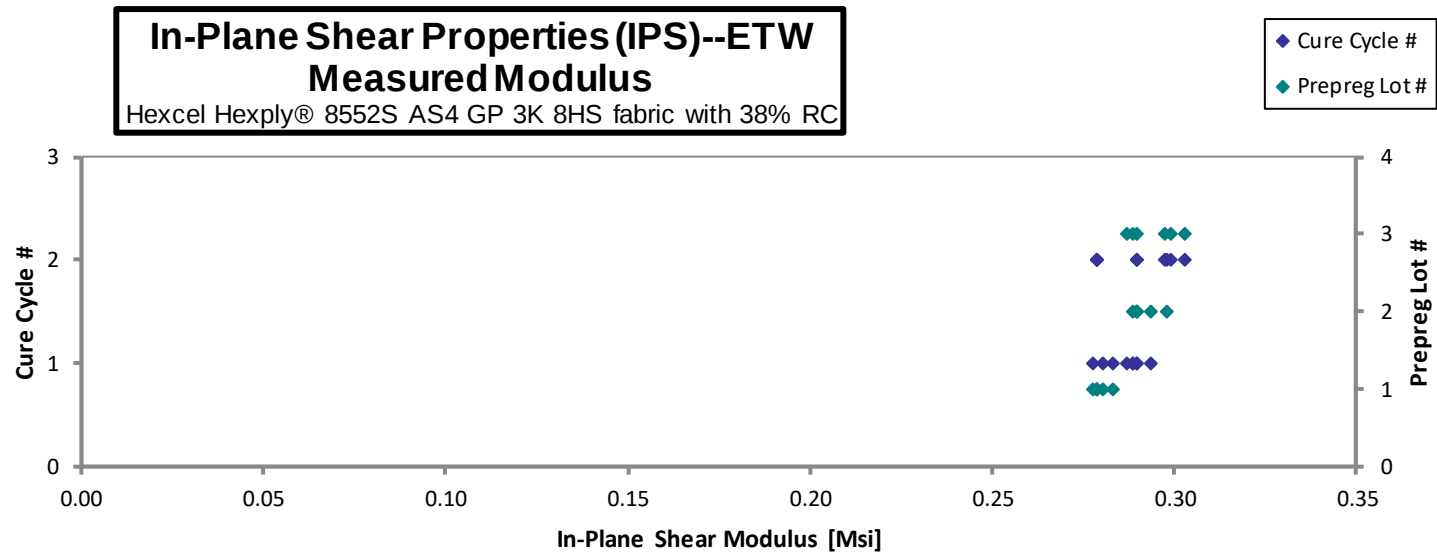
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	0.2% Offset Strength [ksi]	Strength at 5% Strain [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPANA111D	A	M1	1	1	2.995	5.058	0.2804	0.1269	8	0.0159	AGM, AGT
HPANA112D	A	M1	1	1	2.895	4.952	0.2777	0.1269	8	0.0159	AGM
HPANA113D	A	M1	1	1	2.955	5.038	0.2834	0.1249	8	0.0156	AGM
HPANA211D	A	M2	1	2	2.910	4.940	0.2789	0.1250	8	0.0156	AGM
HPANA212D	A	M2	1	2	2.912	4.998	0.2787	0.1279	8	0.0160	AGT
HPANA213D	A	M2	1	2	2.896	5.019	0.2785	0.1284	8	0.0160	AGB
HPANB111D	B	M1	2	1	3.058	5.125	0.2934	0.1257	8	0.0157	AGM
HPANB112D	B	M1	2	1	3.019	5.124	0.2899	0.1299	8	0.0162	AGB
HPANB113D	B	M1	2	1	3.008	5.155	0.2888	0.1305	8	0.0163	AGM
HPANB211D	B	M2	2	2	3.091	5.138	0.2978	0.1243	8	0.0155	AGT
HPANB212D	B	M2	2	2	3.009	5.118	0.2900	0.1291	8	0.0161	AGT
HPANB213D	B	M2	2	2	3.003	5.109	0.2899	0.1316	8	0.0165	AGT
HPANC111D	C	M1	3	1	3.081	5.158	0.2872	0.1238	8	0.0155	*
HPANC112D	C	M1	3	1	3.100	5.282	0.2899	0.1263	8	0.0158	AGT
HPANC113D	C	M1	3	1	3.069	5.244	0.2886	0.1269	8	0.0159	AGT
HPANC211D	C	M2	3	2	3.171	5.404	0.3030	0.1232	8	0.0154	AGM
HPANC212D	C	M2	3	2	3.146	5.379	0.2971	0.1255	8	0.0157	AGT
HPANC213D	C	M2	3	2	3.181	5.443	0.2993	0.1257	8	0.0157	AGT

* Machine actuator maxed out prior to reaching ultimate failure

Average	3.028	5.149	0.2885	0.0158
Standard Dev.	0.0916	0.1491	0.007742	
Coeff. of Var. [%]	3.026	2.896	2.684	
Min.	2.895	4.940	0.2777	0.0154
Max.	3.181	5.443	0.3030	0.0165
Number of Spec.	18	18	18	18





July 16, 2025

CAM-RP-2019-057 Rev -

4.6 “25/50/25” Unnotched Tension 1 Properties (UNT1)

Laminate Unnotched Tension Properties (UNT1)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

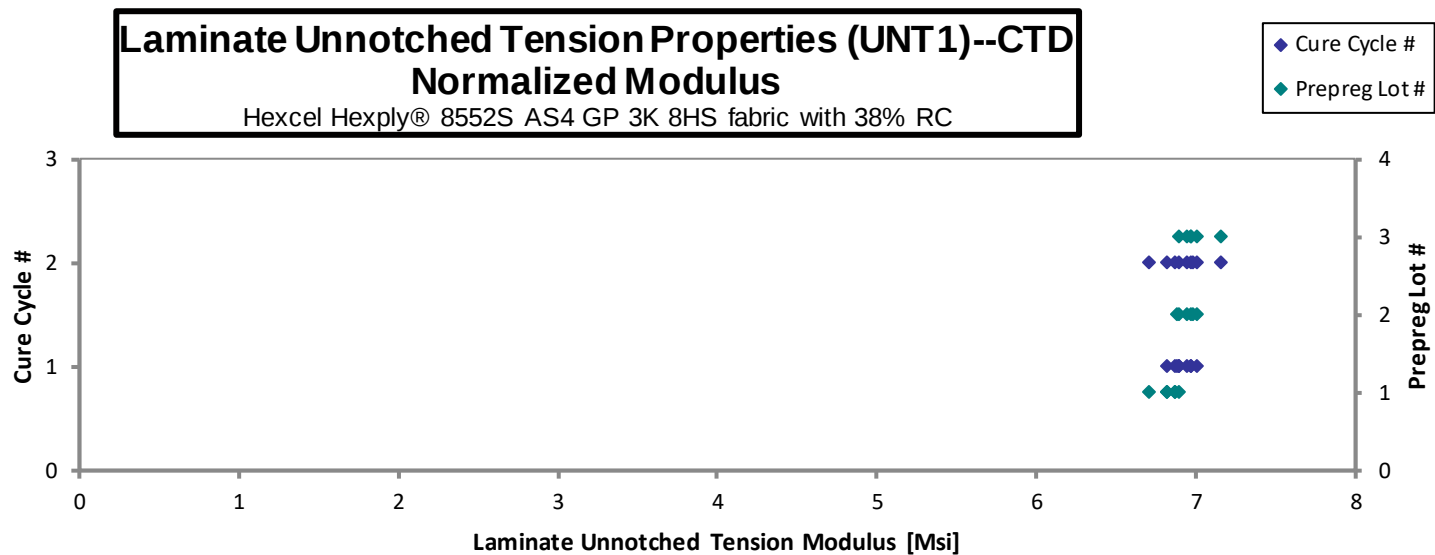
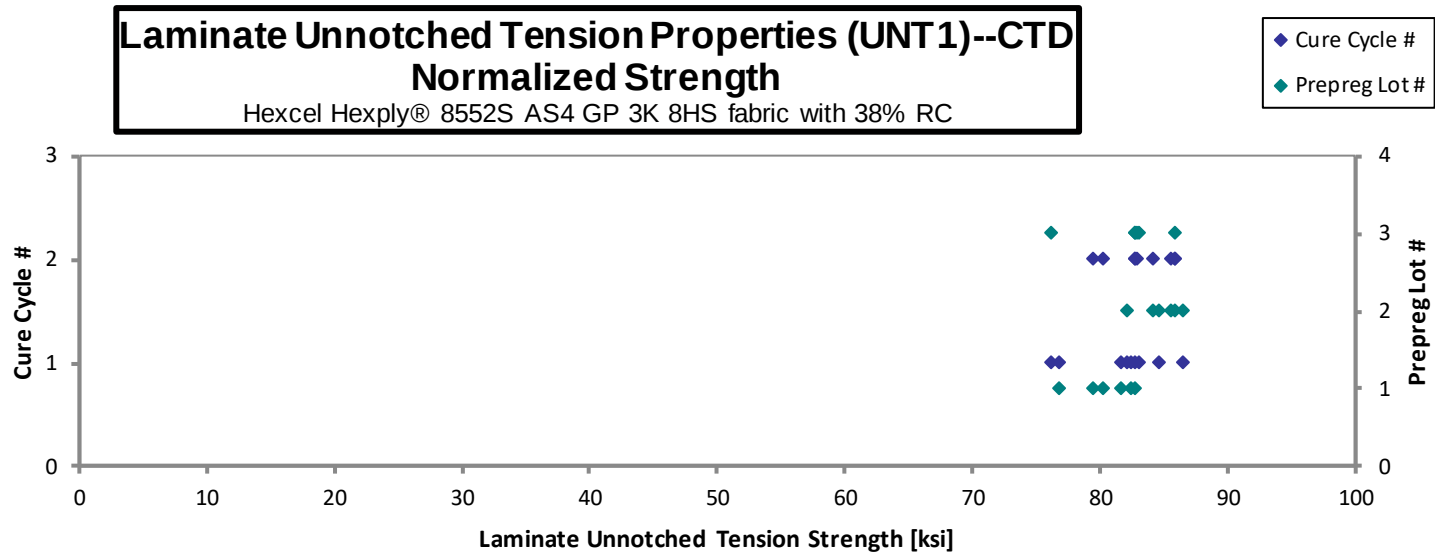
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAAA111B	A	M1	1	1	82.22	6.859	0.1203	8	LGM
HPAAA112B	A	M1	1	1	81.67	6.903	0.1200	8	LGM
HPAAA113B	A	M1	1	1	83.28	7.394	0.1106	8	LGM
HPAAA211B	A	M2	1	2	80.51	6.834	0.1197	8	LGM
HPAAA212B	A	M2	1	2	83.19	6.901	0.1194	8	LGM
HPAAA213B	A	M2	1	2	84.40	7.124	0.1130	8	LGM
HPAAB111B	B	M1	2	1	83.38	6.841	0.1218	8	LGM
HPAAB112B	B	M1	2	1	85.04	6.885	0.1222	8	LGM
HPAAB113B	B	M1	2	1	90.48	7.579	0.1089	8	LGM
HPAAB211B	B	M2	2	2	84.66	6.908	0.1213	8	LGT
HPAAB212B	B	M2	2	2	83.63	6.917	0.1209	8	LGM
HPAAB213B	B	M2	2	2	92.91	7.454	0.1110	8	LGM
HPAAC111B	C	M1	3	1	80.68	6.801	0.1231	8	LGM
HPAAC112B	C	M1	3	1	74.68	6.838	0.1224	8	LGM
HPAAC113B	C	M1	3	1	88.41	7.337	0.1128	8	LGM
HPAAC211B	C	M2	3	2	84.59	6.902	0.1218	8	LGM
HPAAC212B	C	M2	3	2	82.00	6.874	0.1214	8	LGB
HPAAC213B	C	M2	3	2	90.04	7.790	0.1103	8	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0150	82.39	6.873
0.0150	81.67	6.903
0.0138	76.77	6.816
0.0150	80.33	6.818
0.0149	82.77	6.867
0.0141	79.50	6.711
0.0152	84.65	6.945
0.0153	86.59	7.012
0.0136	82.14	6.880
0.0152	85.60	6.985
0.0151	84.25	6.968
0.0139	85.90	6.892
0.0154	82.76	6.977
0.0153	76.18	6.974
0.0141	83.07	6.894
0.0152	85.88	7.007
0.0152	82.92	6.951
0.0138	82.72	7.157

Average 84.21 7.063
 Standard Dev. 4.220 0.3058
 Coeff. of Var. [%] 5.011 4.329
 Min. 74.68 6.801
 Max. 92.91 7.790
 Number of Spec. 18 18

Average_{norm} 0.0147 82.56 6.924
 Standard Dev_{norm} 2.921 0.0969
 Coeff. of Var. [%]_{norm} 3.538 1.399
 Min. 0.0136 76.18 6.711
 Max. 0.0154 86.59 7.157
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Unnotched Tension Properties (UNT1)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

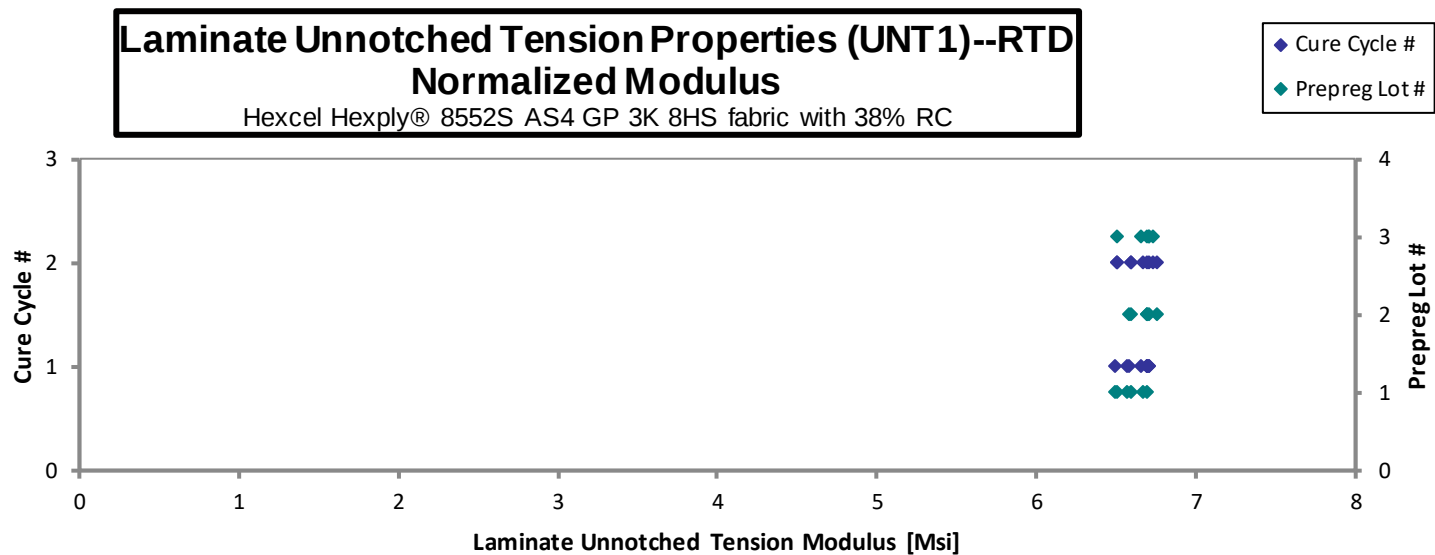
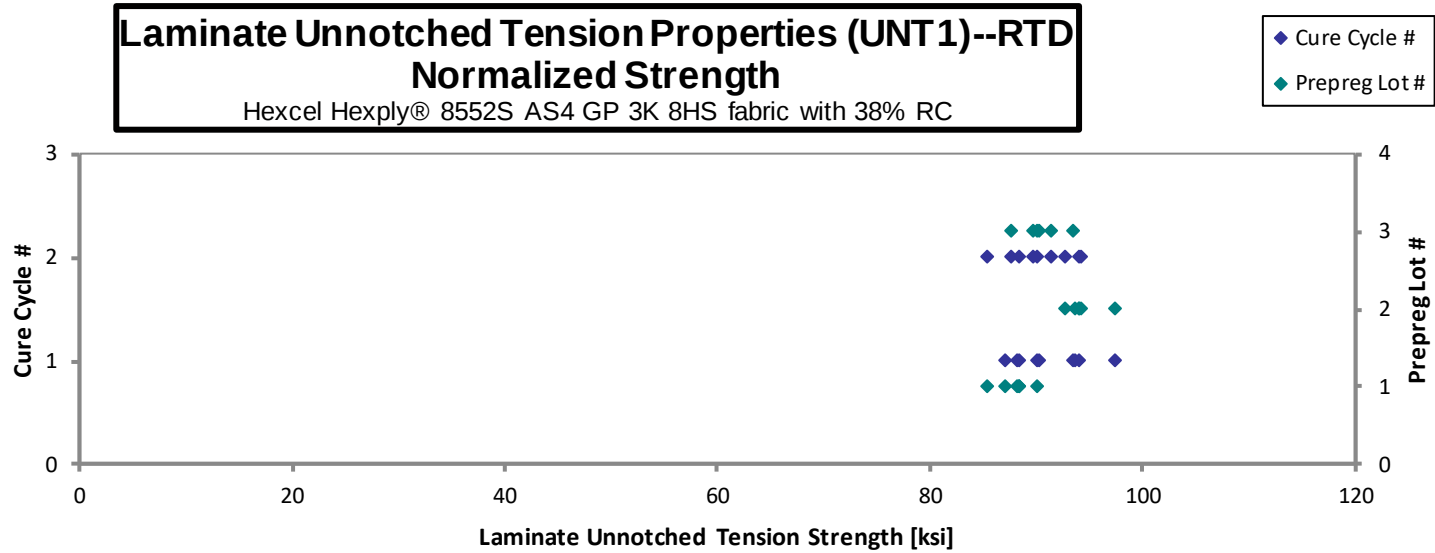
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAAA111A*	A	M1	1	1	96.88	7.301	0.1079	8	LGM
HPAAA112A*	A	M1	1	1	92.80	7.042	0.1141	8	LGM
HPAAA113A	A	M1	1	1	90.30	6.626	0.1175	8	LGM
HPAAA211A*	A	M2	1	2	95.25	7.018	0.1113	8	LWT
HPAAA212A*	A	M2	1	2	86.95	6.790	0.1178	8	LWB
HPAAA213A	A	M2	1	2	89.84	6.575	0.1203	8	LWB
HPAAB111A	B	M1	2	1	105.8	7.412	0.1067	8	LGM
HPAAB112A	B	M1	2	1	98.36	7.038	0.1143	8	LGM
HPAAB113A	B	M1	2	1	98.76	6.793	0.1185	8	LWB
HPAAB211A	B	M2	2	2	102.6	7.410	0.1085	8	LWB
HPAAB212A	B	M2	2	2	98.97	7.093	0.1144	8	LGM
HPAAB213A	B	M2	2	2	95.81	6.721	0.1178	8	LWT
HPAAC111A	C	M1	3	1	99.25	7.319	0.1092	8	LGM
HPAAC112A	C	M1	3	1	93.55	6.966	0.1155	8	LGM
HPAAC113A	C	M1	3	1	93.22	6.674	0.1204	8	LWT
HPAAC211A	C	M2	3	2	100.0	7.371	0.1097	8	LWB
HPAAC212A	C	M2	3	2	91.29	6.768	0.1153	8	LGM
HPAAC213A	C	M2	3	2	90.45	6.760	0.1190	8	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0135	87.13	6.565
0.0143	88.23	6.695
0.0147	88.44	6.490
0.0139	88.37	6.511
0.0147	85.37	6.666
0.0150	90.08	6.592
0.0133	94.04	6.588
0.0143	93.66	6.701
0.0148	97.53	6.708
0.0136	92.78	6.701
0.0143	94.32	6.760
0.0147	94.05	6.598
0.0137	90.33	6.661
0.0144	90.01	6.703
0.0151	93.55	6.697
0.0137	91.39	6.736
0.0144	87.73	6.504
0.0149	89.71	6.705

*Strain data is obtained from strain gages instead of extensometers.

Average 95.56 6.982
Standard Dev. 4.944 0.2847
Coeff. of Var. [%] 5.174 4.078
Min. 86.95 6.575
Max. 105.8 7.412
Number of Spec. 18 18

Average_{norm} 0.0143 90.93 6.643
Standard Dev_{norm} 3.176 0.0843
Coeff. of Var. [%]_{norm} 3.493 1.269
Min. 0.0133 85.37 6.490
Max. 0.0151 97.53 6.760
Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

Laminate Unnotched Tension Properties (UNT1)--ETW
Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

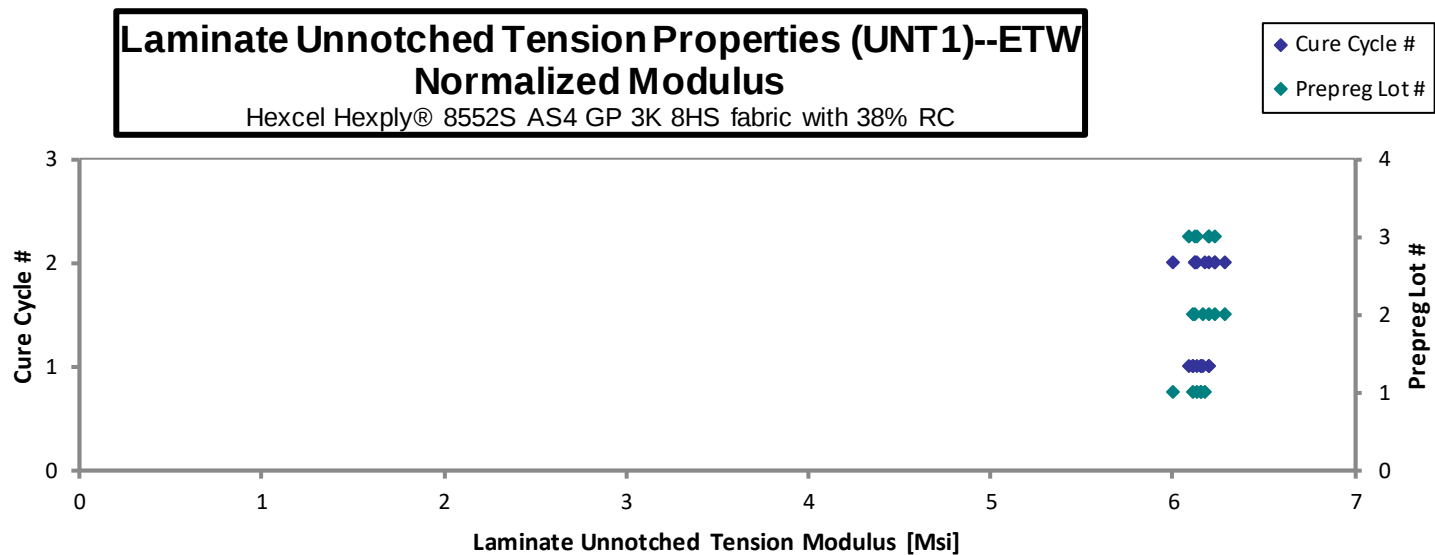
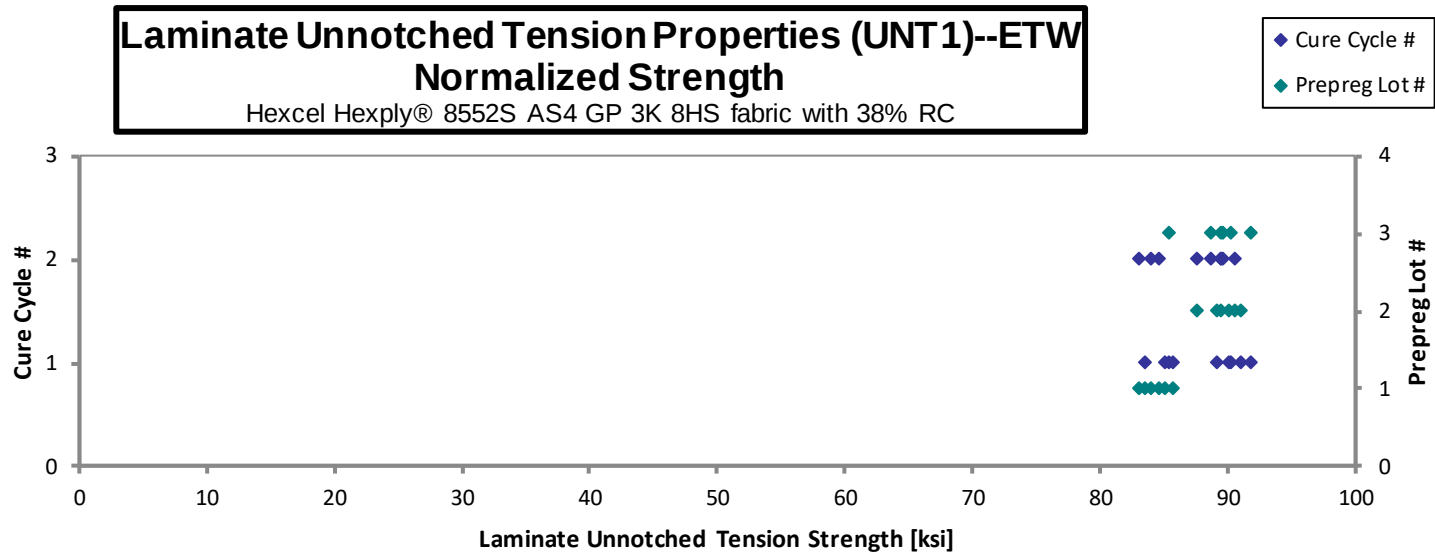
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAAA111D	A	M1	1	1	85.08	6.108	0.1210	8	LGT
HPAAA112D	A	M1	1	1	80.95	5.923	0.1238	8	LWT, LWB
HPAAA113D	A	M1	1	1	81.74	5.906	0.1250	8	LWT, LWB
HPAAA211D	A	M2	1	2	80.71	5.955	0.1236	8	LWT, LWB
HPAAA212D	A	M2	1	2	80.97	5.959	0.1245	8	LWT, LWB
HPAAA213D	A	M2	1	2	82.10	5.815	0.1238	8	LGB
HPAAB111D	B	M1	2	1	89.20	6.138	0.1213	8	LWT, M(A,L)WB
HPAAB112D	B	M1	2	1	85.77	5.887	0.1247	8	LWT, M(A,L)WB
HPAAB113D	B	M1	2	1	86.62	5.867	0.1261	8	LWT, M(A,L)WB
HPAAB211D	B	M2	2	2	87.89	6.174	0.1221	8	LWT, M(A,L)WB
HPAAB212D	B	M2	2	2	87.13	5.994	0.1247	8	LGT
HPAAB213D	B	M2	2	2	84.05	5.871	0.1251	8	LWT, LWB
HPAAC111D	C	M1	3	1	81.50	5.810	0.1258	8	LGT, M(A,L)WB
HPAAC112D	C	M1	3	1	83.65	5.682	0.1295	8	LGT
HPAAC113D	C	M1	3	1	85.21	5.754	0.1294	8	LGB, LWT
HPAAC211D	C	M2	3	2	87.88	6.005	0.1223	8	LWT, LWB
HPAAC212D	C	M2	3	2	85.11	5.950	0.1251	8	LWT, LWB
HPAAC213D	C	M2	3	2	84.83	5.903	0.1266	8	LGT

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0151	85.80	6.160
0.0155	83.52	6.110
0.0156	85.13	6.151
0.0154	83.12	6.133
0.0156	83.98	6.181
0.0155	84.70	5.999
0.0152	90.16	6.204
0.0156	89.12	6.117
0.0158	91.03	6.165
0.0153	89.45	6.284
0.0156	90.54	6.229
0.0156	87.61	6.119
0.0157	85.44	6.091
0.0162	90.23	6.130
0.0162	91.85	6.203
0.0153	89.59	6.122
0.0156	88.69	6.200
0.0158	89.48	6.227

Average 84.47 5.928
Standard Dev. 2.680 0.1275
Coeff. of Var. [%] 3.173 2.151
Min. 80.71 5.682
Max. 89.20 6.174
Number of Spec. 18 18

Average_{norm} 0.0156 87.75 6.157
Standard Dev._{norm} 2.851 0.0641
Coeff. of Var. [%]_{norm} 3.249 1.042
Min. 0.0151 83.12 5.999
Max. 0.0162 91.85 6.284
Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.7 “10/80/10” Unnotched Tension 2 Properties (UNT2)

Laminate Unnotched Tension Properties (UNT2)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

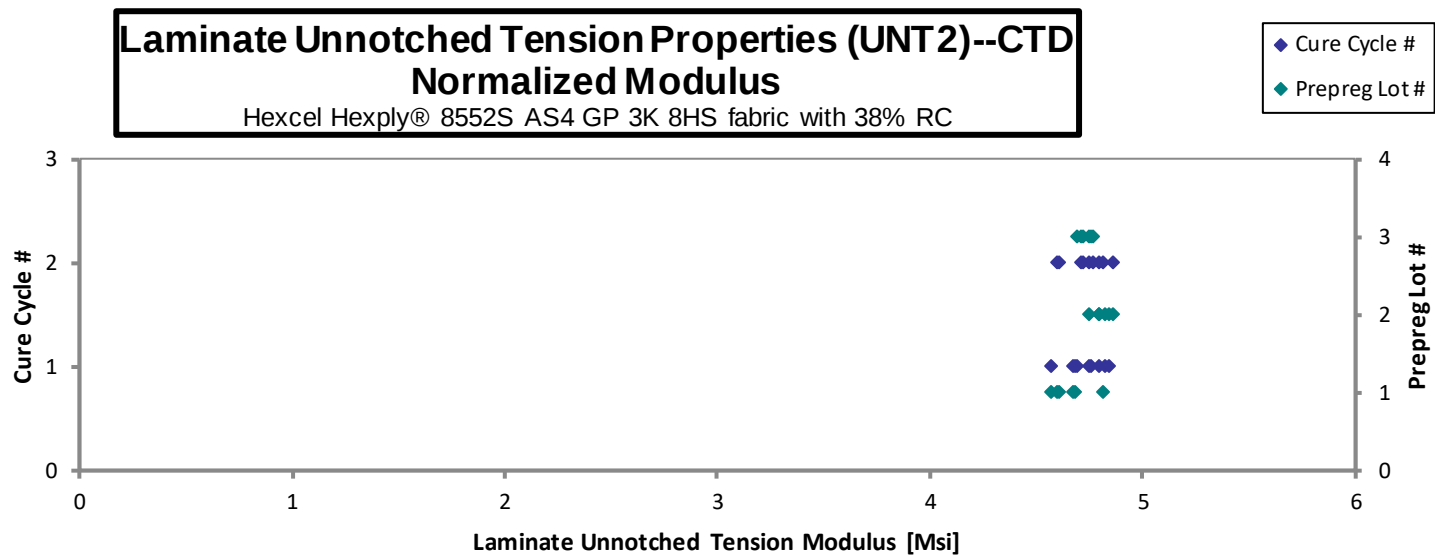
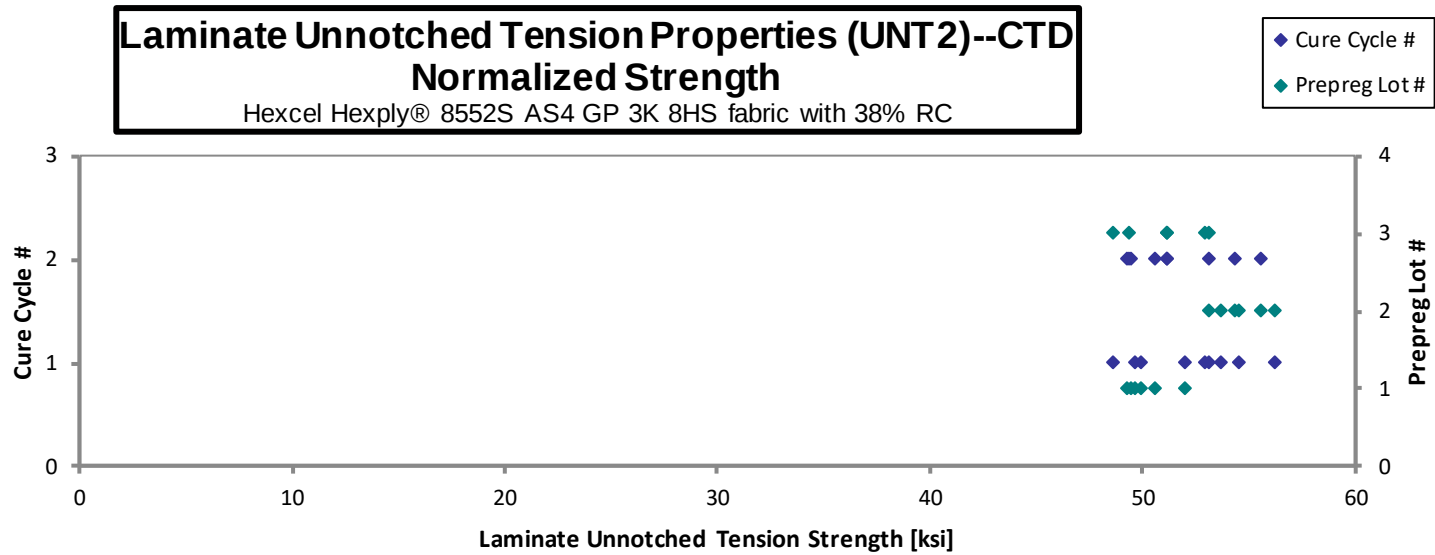
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPABA111B	A	M1	1	1	49.87	4.678	0.1502	10	AGM
HPABA112B	A	M1	1	1	49.56	4.671	0.1502	10	AGM
HPABA113B	A	M1	1	1	57.48	5.053	0.1357	10	AGM
HPABA211B	A	M2	1	2	49.23	4.688	0.1542	10	AWT
HPABA212B	A	M2	1	2	47.89	4.463	0.1545	10	AWT
HPABA213B	A	M2	1	2	48.57	4.526	0.1528	10	AGM
HPABB111B	B	M1	2	1	53.73	4.752	0.1523	10	AWT
HPABB112B	B	M1	2	1	55.42	4.731	0.1522	10	AGB
HPABB113B	B	M1	2	1	59.32	5.348	0.1358	10	AGM
HPABB211B	B	M2	2	2	53.48	4.779	0.1490	10	AWB
HPABB212B	B	M2	2	2	55.15	4.934	0.1478	10	AWB
HPABB213B	B	M2	2	2	58.85	5.070	0.1418	10	AWB
HPABC111B	C	M1	3	1	51.65	4.581	0.1538	10	AGT
HPABC112B	C	M1	3	1	52.16	4.673	0.1528	10	AGT
HPABC113B	C	M1	3	1	50.96	4.978	0.1431	10	AWB
HPABC211B	C	M2	3	2	49.94	4.655	0.1538	10	AGB
HPABC212B	C	M2	3	2	48.13	4.610	0.1538	10	AWB
HPABC213B	C	M2	3	2	56.92	5.242	0.1349	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0150	49.93	4.684
0.0150	49.62	4.676
0.0136	51.98	4.569
0.0154	50.61	4.819
0.0154	49.32	4.596
0.0153	49.48	4.610
0.0152	54.56	4.826
0.0152	56.22	4.799
0.0136	53.69	4.841
0.0149	53.13	4.747
0.0148	54.35	4.863
0.0142	55.63	4.792
0.0154	52.96	4.698
0.0153	53.12	4.759
0.0143	48.63	4.750
0.0154	51.21	4.773
0.0154	49.34	4.725
0.0135	51.17	4.713

Average 52.68 4.802
 Standard Dev. 3.759 0.2478
 Coeff. of Var. [%] 7.135 5.160
 Min. 47.89 4.463
 Max. 59.32 5.348
 Number of Spec. 18 18

Average_{norm} 0.0148 51.94 4.736
 Standard Dev_{norm} 2.357 0.0850
 Coeff. of Var. [%]_{norm} 4.538 1.796
 Min. 0.0135 48.63 4.569
 Max. 0.0154 56.22 4.863
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Unnotched Tension Properties (UNT2)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

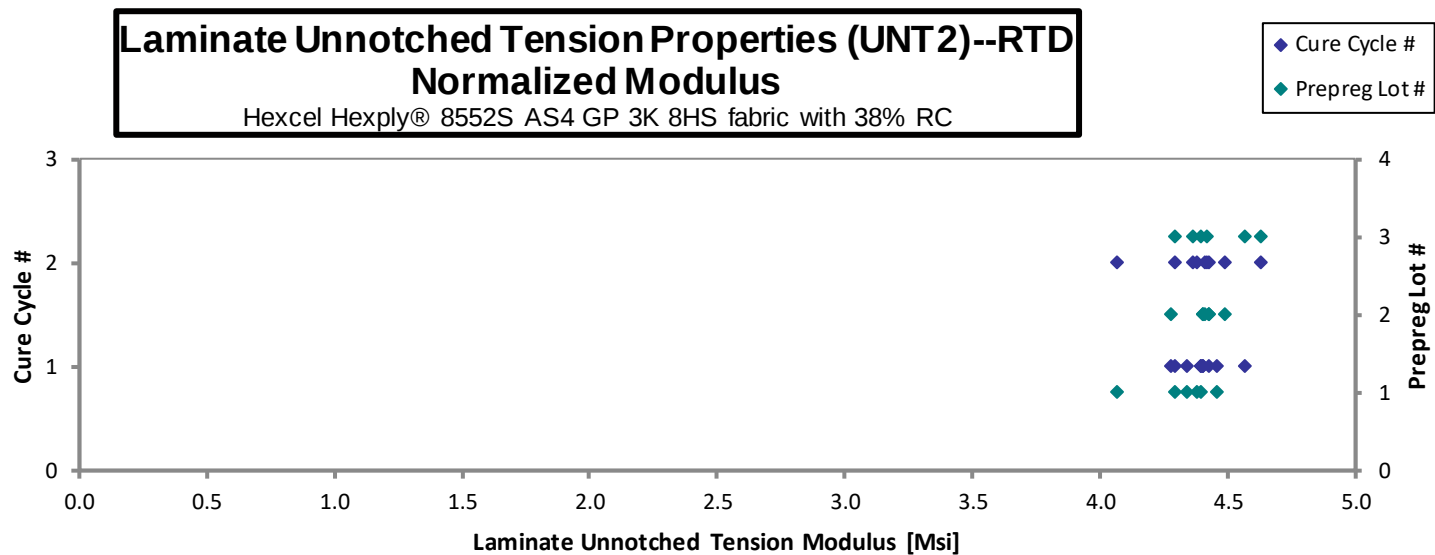
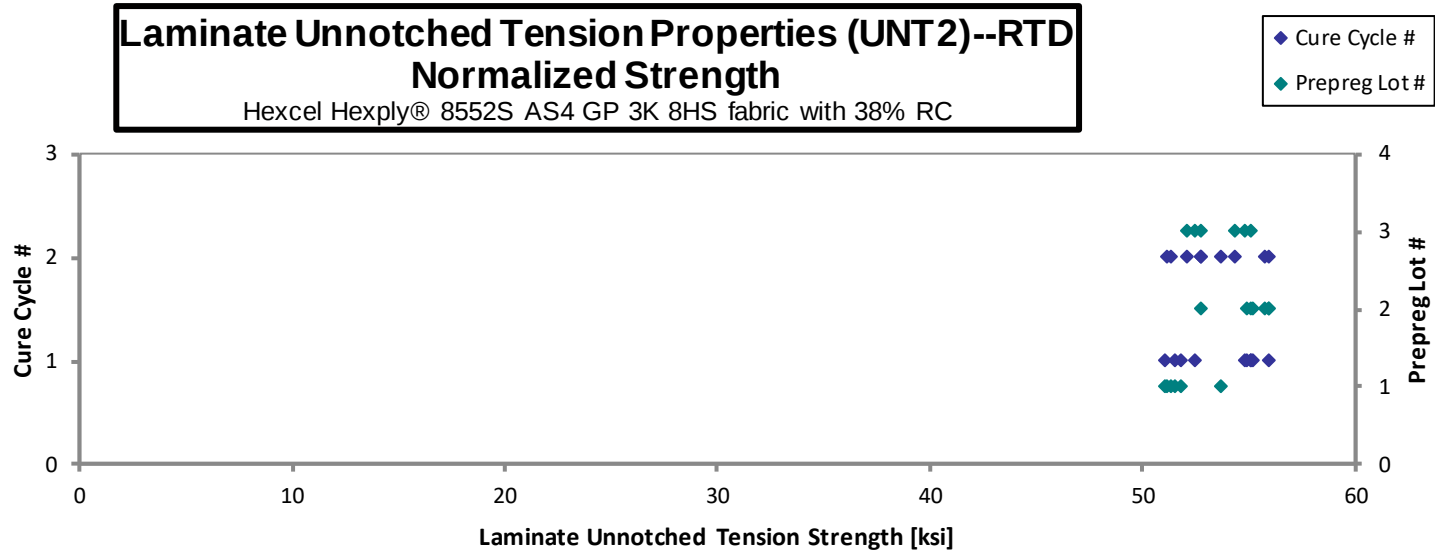
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPABA111A*	A	M1	1	1	57.61	5.025	0.1331	10	AGM
HPABA112A*	A	M1	1	1	54.73	4.612	0.1412	10	AGM
HPABA113A	A	M1	1	1	53.15	4.515	0.1462	10	AGM
HPABA211A	A	M2	1	2	55.98	4.793	0.1371	10	AWT
HPABA212A	A	M2	1	2	53.89	4.507	0.1430	10	AWB
HPABA213A	A	M2	1	2	54.22	4.113	0.1485	10	AGB
HPABB111A	B	M1	2	1	61.82	4.802	0.1338	10	AGM
HPABB112A	B	M1	2	1	57.32	4.596	0.1438	10	AGM
HPABB113A	B	M1	2	1	56.27	4.427	0.1492	10	AWT
HPABB114A	B	M1	2	1	54.56	4.382	0.1517	10	AWB
HPABB211A	B	M2	2	2	56.62	4.754	0.1398	10	AGB
HPABB212A	B	M2	2	2	55.94	4.502	0.1496	10	AWT
HPABB213A	B	M2	2	2	55.39	4.374	0.1514	10	AWT
HPABC111A	C	M1	3	1	55.86	4.681	0.1410	10	AGM
HPABC112A	C	M1	3	1	55.58	4.635	0.1479	10	AGT
HPABC113A	C	M1	3	1	54.67	4.257	0.1512	10	AGB
HPABC211A	C	M2	3	2	58.64	5.208	0.1333	10	AGT
HPABC212A	C	M2	3	2	56.39	4.584	0.1447	10	AWT
HPABC213A	C	M2	3	2	53.25	4.403	0.1488	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0133	51.11	4.458
0.0141	51.52	4.342
0.0146	51.80	4.400
0.0137	51.16	4.380
0.0143	51.38	4.297
0.0148	53.67	4.071
0.0134	55.14	4.283
0.0144	54.96	4.407
0.0149	55.95	4.402
0.0152	55.18	4.431
0.0140	52.75	4.429
0.0150	55.81	4.491
0.0151	55.92	4.416
0.0141	52.51	4.400
0.0148	54.79	4.570
0.0151	55.11	4.292
0.0133	52.13	4.630
0.0145	54.39	4.421
0.0149	52.80	4.366

*Strain data is obtained from strain gages instead of extensometers.

Average 55.89 4.588
Standard Dev. 2.041 0.2588
Coeff. of Var. [%] 3.652 5.640
Min. 53.15 4.113
Max. 61.82 5.208
Number of Spec. 19 19

Average_{norm} 0.0144 53.58 4.394
Standard Dev_{norm} 1.767 0.1165
Coeff. of Var. [%]_{norm} 3.297 2.651
Min. 0.0133 51.11 4.071
Max. 0.0152 55.95 4.630
Number of Spec. 19 19 19



July 16, 2025

CAM-RP-2019-057 Rev -

Laminate Unnotched Tension Properties (UNT2)--ETW
Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

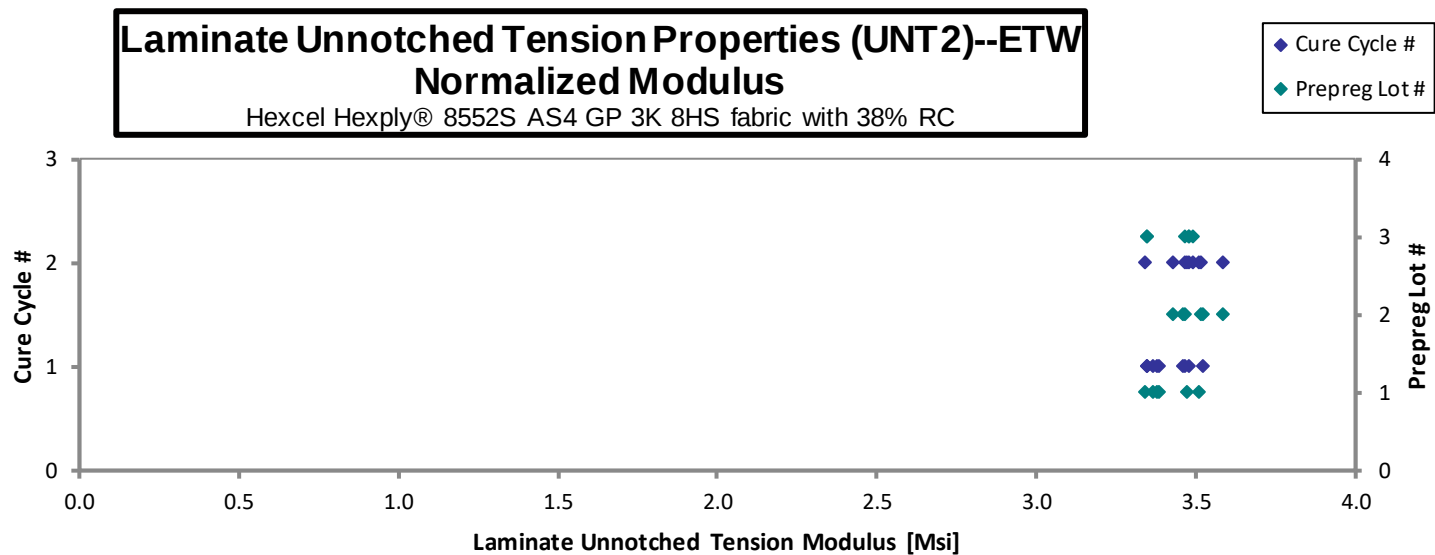
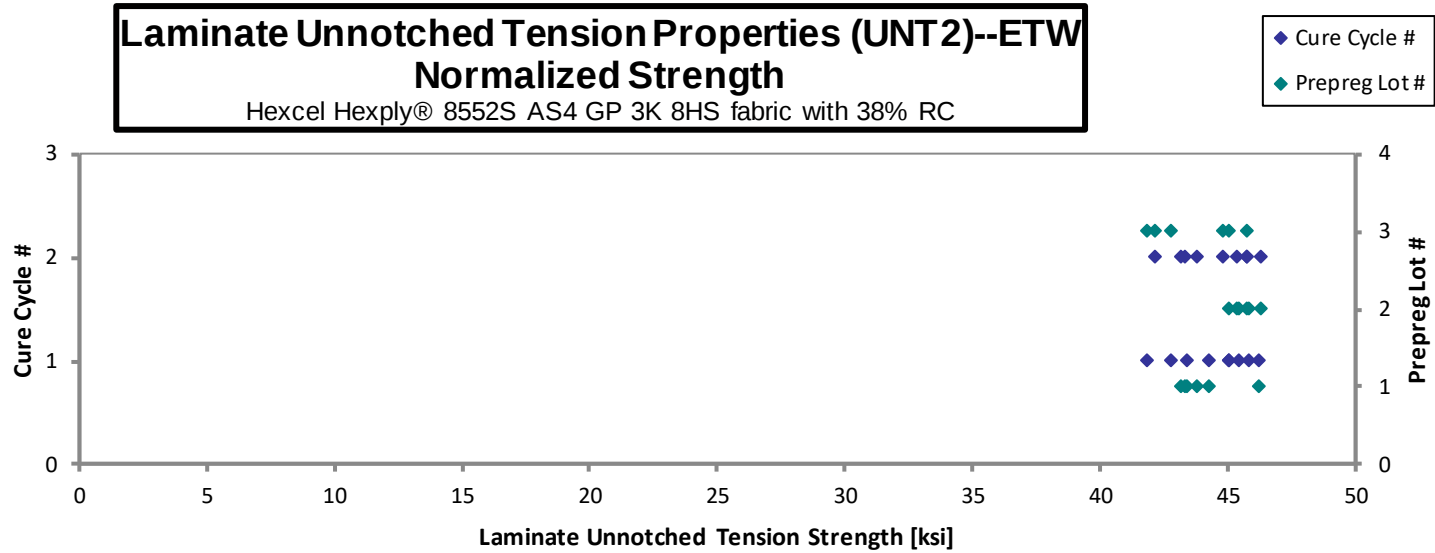
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPABA111D	A	M1	1	1	43.29	3.355	0.1504	10	M(A,D)GM
HPABA112D	A	M1	1	1	42.96	3.274	0.1547	10	M(A,D)GM
HPABA113D	A	M1	1	1	44.42	3.253	0.1562	10	M(A,D)GM
HPABA211D	A	M2	1	2	46.50	3.765	0.1399	10	M(A,D)GM
HPABA212D	A	M2	1	2	44.92	3.615	0.1443	10	M(A,D)GM
HPABA213D	A	M2	1	2	44.64	3.402	0.1472	10	M(A,D)GM
HPABB111D	B	M1	2	1	43.63	3.351	0.1548	10	M(A,D)GM
HPABB112D	B	M1	2	1	43.06	3.285	0.1583	10	M(A,D)GM
HPABB113D	B	M1	2	1	43.12	3.318	0.1594	10	DGM, AGB
HPABB211D	B	M2	2	2	44.74	3.397	0.1553	10	M(A,D)GM
HPABB212D	B	M2	2	2	43.10	3.406	0.1581	10	DGM
HPABB213D	B	M2	2	2	43.10	3.225	0.1594	10	DGM
HPABC111D	C	M1	3	1	40.32	3.224	0.1558	10	M(A,D)GM
HPABC112D	C	M1	3	1	40.40	3.287	0.1588	10	M(A,D)GM
HPABC113D	C	M1	3	1	42.65	3.170	0.1584	10	M(A,D)GM
HPABC211D	C	M2	3	2	43.58	3.370	0.1544	10	M(A,D)GB
HPABC212D	C	M2	3	2	40.11	3.321	0.1577	10	M(A,D)GM
HPABC213D	C	M2	3	2	42.81	3.258	0.1603	10	M(A,D)GT

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0150	43.41	3.365
0.0155	44.31	3.377
0.0156	46.26	3.388
0.0140	43.37	3.511
0.0144	43.20	3.476
0.0147	43.82	3.339
0.0155	45.03	3.458
0.0158	45.43	3.467
0.0159	45.82	3.525
0.0155	46.33	3.517
0.0158	45.41	3.589
0.0159	45.80	3.428
0.0156	41.87	3.348
0.0159	42.76	3.479
0.0158	45.04	3.348
0.0154	44.84	3.468
0.0158	42.18	3.492
0.0160	45.75	3.481

Average 43.18 3.349
Standard Dev. 1.652 0.1430
Coeff. of Var. [%] 3.825 4.271
Min. 40.11 3.170
Max. 46.50 3.765
Number of Spec. 18 18

Average_{norm} 0.0155 44.48 3.448
Standard Dev_{norm} 1.410 0.0720
Coeff. of Var. [%]_{norm} 3.170 2.088
Min. 0.0140 41.87 3.339
Max. 0.0160 46.33 3.589
Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.8 “40/20/40” Unnotched Tension 3 Properties (UNT3)

Laminate Unnotched Tension Properties (UNT3)--CTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

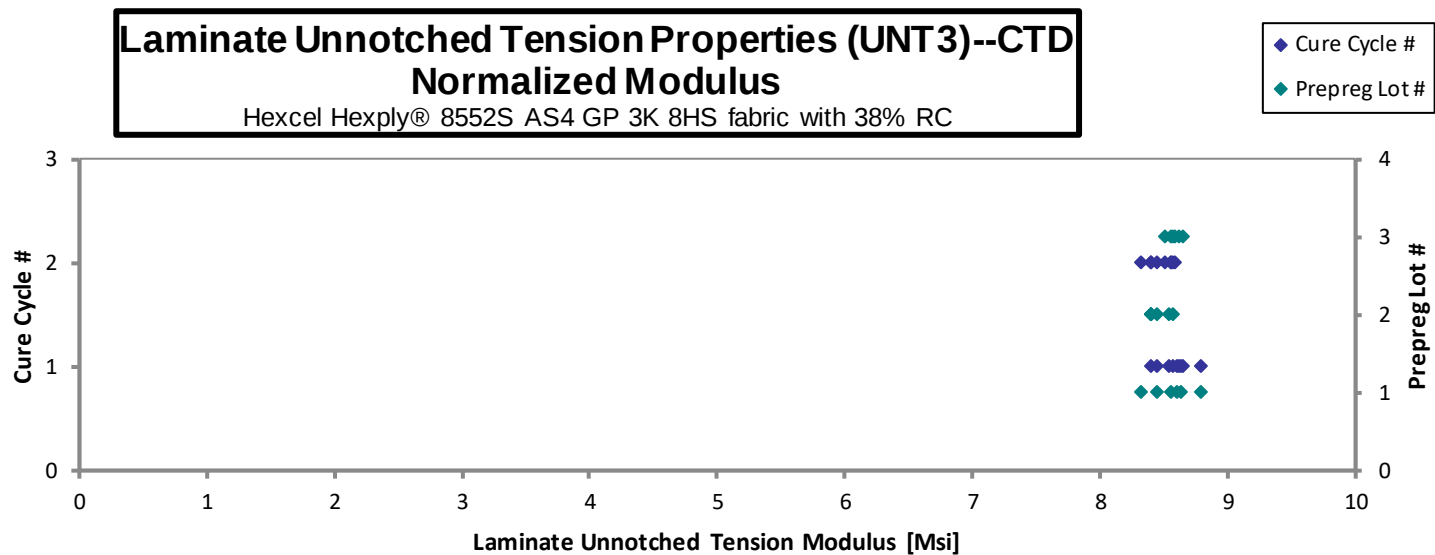
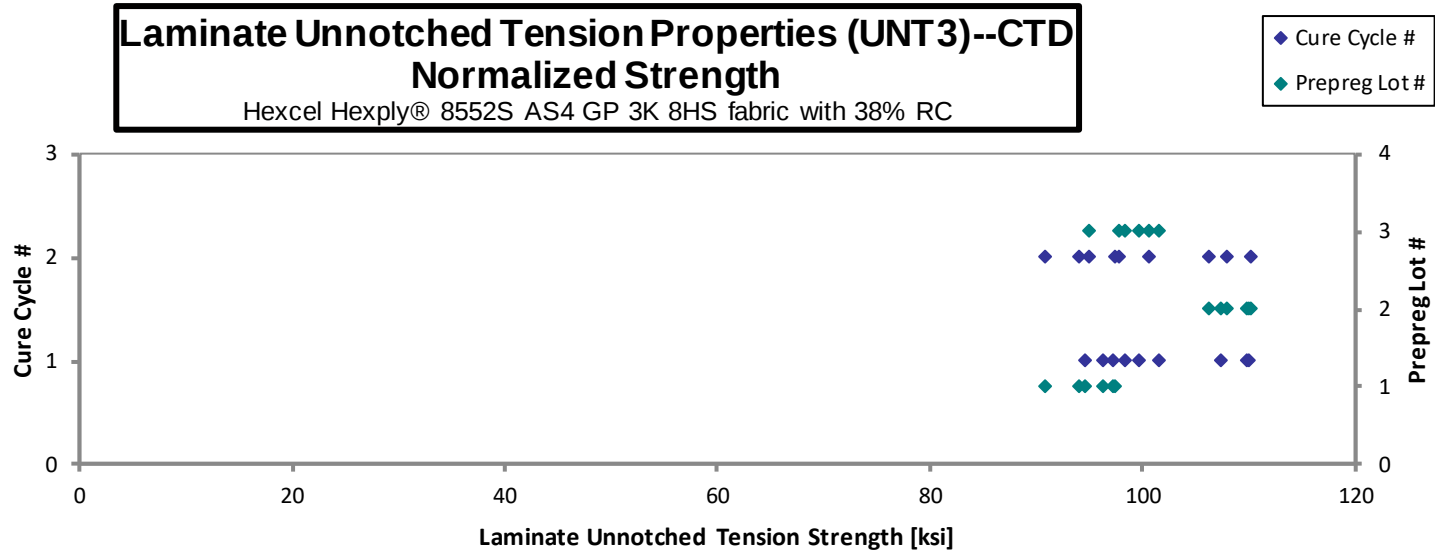
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPACA111B	A	M1	1	1	91.16	8.238	0.1601	10	LWB
HPACA112B	A	M1	1	1	88.82	8.079	0.1599	10	LGT
HPACA113B	A	M1	1	1	91.56	8.202	0.1579	10	LGM
HPACA211B	A	M2	1	2	90.14	8.260	0.1513	10	LGM
HPACA212B	A	M2	1	2	93.42	8.385	0.1511	10	LWB
HPACA213B	A	M2	1	2	106.0	9.310	0.1380	10	LGB
HPACB1R1B	B	M1	2	1	106.9	8.501	0.1506	10	LGT
HPACB1R2B	B	M1	2	1	109.6	8.422	0.1504	10	LGT
HPACB1R4B	B	M1	2	1	109.7	8.394	0.1501	10	LWT, LWB
HPACB2R1B	B	M2	2	2	106.4	8.444	0.1522	10	LGT
HPACB2R2B	B	M2	2	2	104.5	8.269	0.1525	10	LGT
HPACB2R3B	B	M2	2	2	114.8	8.752	0.1441	10	LGM
HPACC111B	C	M1	3	1	99.10	8.410	0.1537	10	LGT
HPACC112B	C	M1	3	1	95.71	8.345	0.1541	10	LGM
HPACC113B	C	M1	3	1	106.7	9.264	0.1401	10	LGM
HPACC211B	C	M2	3	2	96.37	8.427	0.1522	10	LWT
HPACC212B	C	M2	3	2	94.68	8.558	0.1507	10	LGM
HPACC213B	C	M2	3	2	108.7	9.188	0.1389	10	LWT

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0160	97.28	8.791
0.0160	94.68	8.612
0.0158	96.38	8.634
0.0151	90.91	8.331
0.0151	94.12	8.448
0.0138	97.46	8.563
0.0151	107.4	8.537
0.0150	110.0	8.445
0.0150	109.8	8.398
0.0152	107.9	8.567
0.0152	106.2	8.404
0.0144	110.3	8.405
0.0154	101.6	8.619
0.0154	98.31	8.571
0.0140	99.63	8.650
0.0152	97.81	8.552
0.0151	95.09	8.596
0.0139	100.7	8.510

Average 100.8 8.525
 Standard Dev. 8.177 0.3666
 Coeff. of Var. [%] 8.112 4.301
 Min. 88.82 8.079
 Max. 114.8 9.310
 Number of Spec. 18 18

Average_{norm} 0.0150 100.9 8.535
 Standard Dev_{norm} 6.183 0.1136
 Coeff. of Var. [%]_{norm} 6.130 1.331
 Min. 0.0138 90.91 8.331
 Max. 0.0160 110.3 8.791
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Unnotched Tension Properties (UNT3)--RTD
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

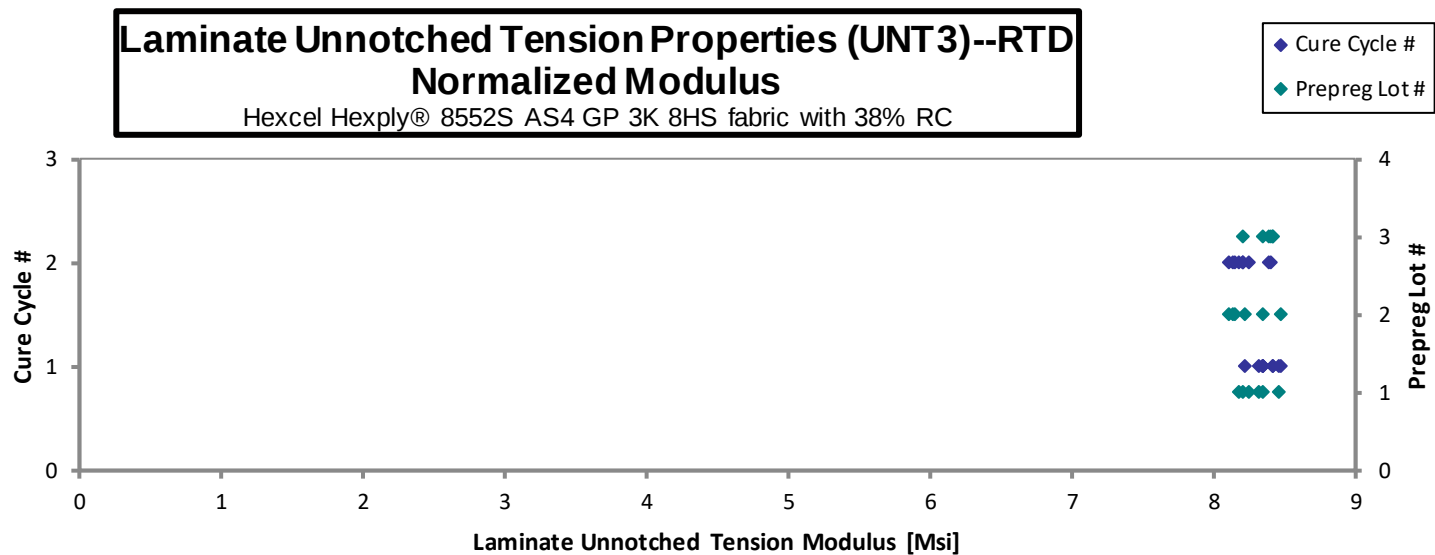
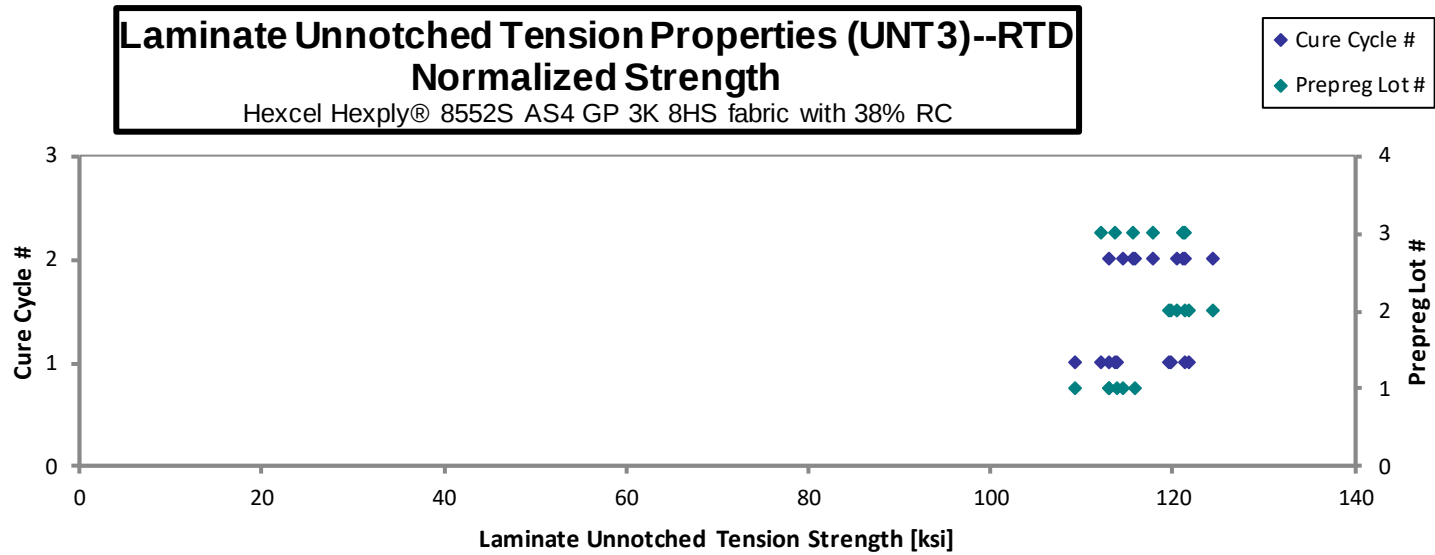
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPACA111A*	A	M1	1	1	126.5	9.391	0.1351	10	LGT
HPACA112A*	A	M1	1	1	112.6	8.598	0.1458	10	LGB
HPACA113A	A	M1	1	1	110.6	8.143	0.1533	10	LGM
HPACA211A	A	M2	1	2	125.6	9.091	0.1350	10	LGM
HPACA212A	A	M2	1	2	121.9	8.629	0.1427	10	LGM
HPACA213A	A	M2	1	2	116.4	8.389	0.1476	10	LWT
HPACB1R1A	B	M1	2	1	128.5	8.816	0.1399	10	LGB
HPACB1R2A	B	M1	2	1	122.5	8.548	0.1466	10	LWB, LWT
HPACB1R3A	B	M1	2	1	122.5	8.534	0.1491	10	LGT
HPACB2R1A	B	M2	2	2	128.7	8.593	0.1416	10	LGT
HPACB2R2A	B	M2	2	2	126.4	8.290	0.1477	10	LWT
HPACB2R3A	B	M2	2	2	120.9	8.167	0.1496	10	LGM
HPACC111A	C	M1	3	1	124.1	9.195	0.1375	10	LWT, LWB
HPACC112A	C	M1	3	1	124.9	8.663	0.1457	10	M(A,L)GM
HPACC113A	C	M1	3	1	111.4	8.291	0.1511	10	LWT
HPACC211A	C	M2	3	2	132.0	8.959	0.1376	10	LWT
HPACC212A	C	M2	3	2	122.7	8.758	0.1439	10	LGT
HPACC213A	C	M2	3	2	117.1	8.497	0.1481	10	LWB

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0135	114.0	8.460
0.0146	109.4	8.354
0.0153	113.0	8.324
0.0135	113.0	8.182
0.0143	116.0	8.211
0.0148	114.5	8.252
0.0140	119.9	8.224
0.0147	119.7	8.354
0.0149	121.8	8.485
0.0142	121.5	8.112
0.0148	124.5	8.160
0.0150	120.5	8.142
0.0137	113.8	8.427
0.0146	121.3	8.415
0.0151	112.2	8.349
0.0138	121.0	8.215
0.0144	117.7	8.403
0.0148	115.6	8.387

*Strain data is obtained from strain gages instead of extensometers.

Average	122.0	8.642
Standard Dev.	6.141	0.3468
Coeff. of Var. [%]	5.036	4.013
Min.	110.6	8.143
Max.	132.0	9.391
Number of Spec.	18	18

Average _{norm}	0.0144	117.2	8.303
Standard Dev _{norm}		4.219	0.1171
Coeff. of Var. [%] _{norm}		3.600	1.410
Min.	0.0135	109.4	8.112
Max.	0.0153	124.5	8.485
Number of Spec.	18	18	18



July 16, 2025

CAM-RP-2019-057 Rev -

Laminate Unnotched Tension Properties (UNT3)--ETW
Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]
0.0150

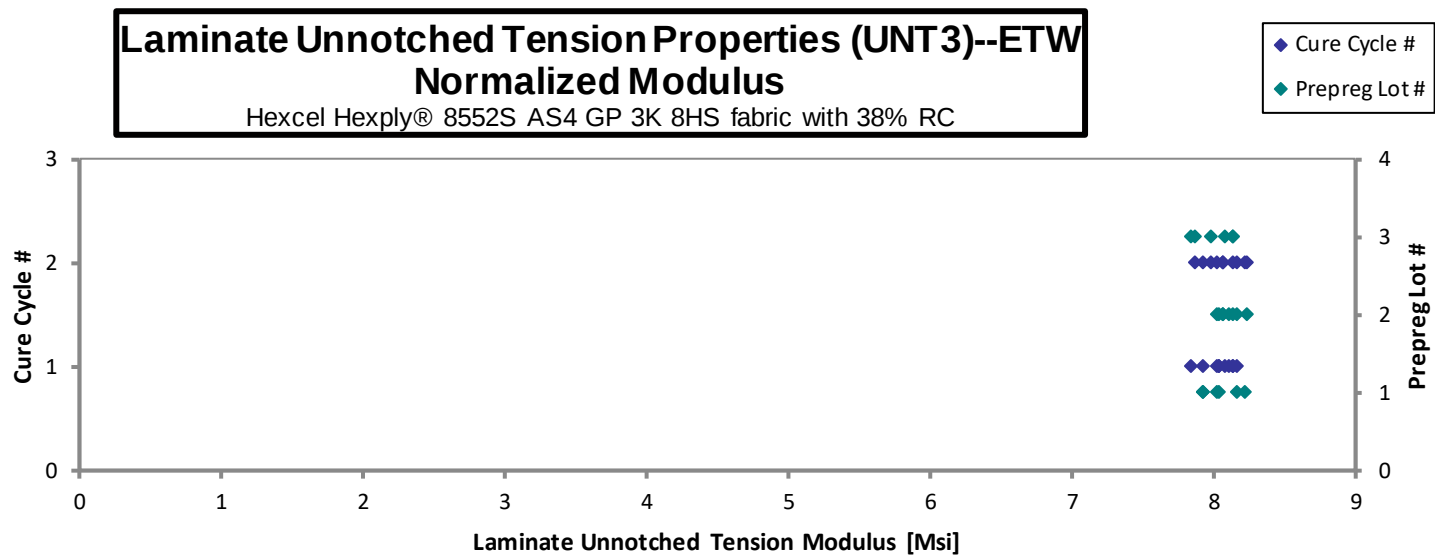
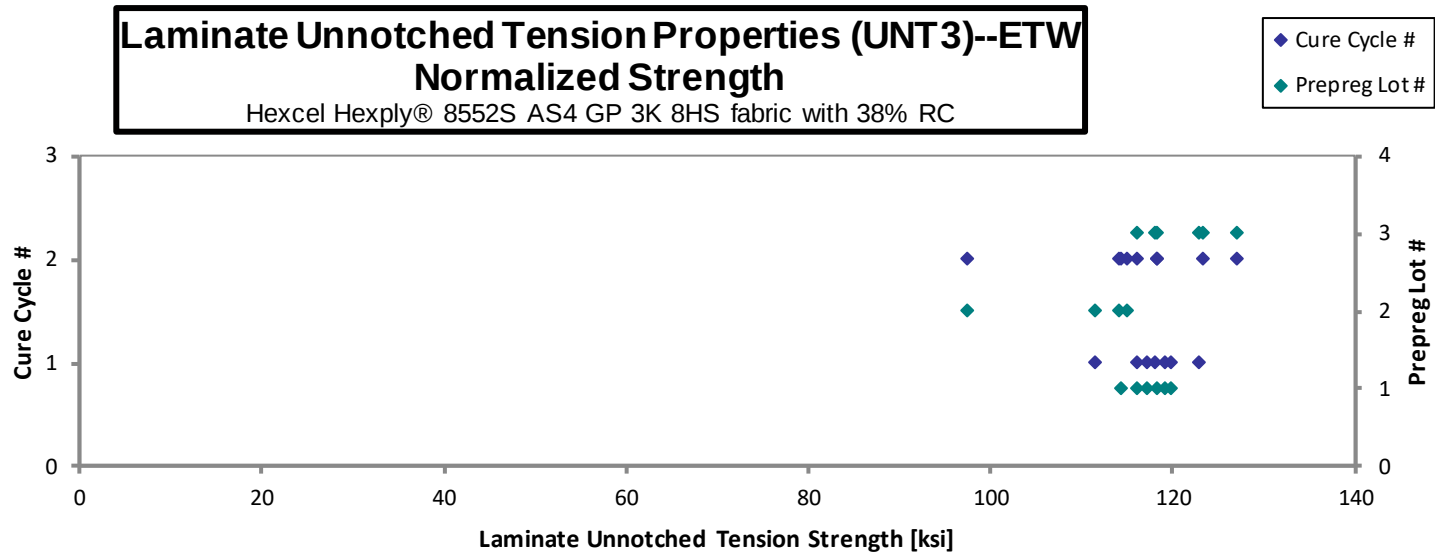
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPACA111D	A	M1	1	1	118.3	7.997	0.1487	10	LGM
HPACA112D	A	M1	1	1	118.5	7.952	0.1516	10	LGT
HPACA113D	A	M1	1	1	116.6	7.993	0.1532	10	LGB, M(A,L)WT
HPACA211D	A	M2	1	2	117.5	7.871	0.1511	10	LGB, LWT
HPACA212D	A	M2	1	2	111.2	7.998	0.1542	10	LGB
HPACA213D	A	M2	1	2	111.6	7.716	0.1560	10	LGB, LIT
HPACB1R1D	B	M1	2	1	109.0	7.948	0.1535	10	LWT, LWB
HPACB1R2D*	B	M1	2	1		7.791	0.1547	10	LIB
HPACB1R3D*	B	M1	2	1		7.814	0.1557	10	LIB
HPACB1R4D*	B	M1	2	1		7.692	0.1569	10	LIB
HPACB2R1D	B	M2	2	2	112.3	7.880	0.1537	10	M(L,A)GB
HPACB2R2D	B	M2	2	2	93.95	7.943	0.1557	10	LAB
HPACB2R3D	B	M2	2	2	109.7	7.840	0.1562	10	M(L,A)GT, M(L,A)WT
HPACB2R4D*	B	M2	2	2		7.771	0.1557	10	LIB
HPACC111D	C	M1	3	1	113.3	7.886	0.1538	10	M(A,L)GT, LWB
HPACC112D	C	M1	3	1	112.8	7.781	0.1568	10	LWT
HPACC113D	C	M1	3	1	116.1	7.416	0.1587	10	LWT, LWB
HPACC211D	C	M2	3	2	115.5	7.940	0.1537	10	LGB, LAT
HPACC212D	C	M2	3	2	121.6	7.528	0.1568	10	LGB
HPACC213D	C	M2	3	2	117.1	7.587	0.1580	10	LGB

*Strength not reported due to unacceptable failure mode.

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0149	117.3	7.925
0.0152	119.8	8.038
0.0153	119.1	8.164
0.0151	118.4	7.930
0.0154	114.3	8.222
0.0156	116.1	8.023
0.0154	111.5	8.133
0.0155		8.033
0.0156		8.112
0.0157		8.047
0.0154	115.1	8.076
0.0156	97.49	8.242
0.0156	114.2	8.161
0.0156		8.065
0.0154	116.2	8.087
0.0157	118.0	8.135
0.0159	122.9	7.847
0.0154	118.4	8.133
0.0157	127.1	7.869
0.0158	123.3	7.991

Average 113.4 7.817
Standard Dev. 6.271 0.1625
Coeff. of Var. [%] 5.528 2.078
Min. 93.95 7.416
Max. 121.6 7.998
Number of Spec. 16 20

Average_{norm} 0.0155 116.8 8.062
Standard Dev_{norm} 6.442 0.1089
Coeff. of Var. [%]_{norm} 5.515 1.351
Min. 0.0149 97.49 7.847
Max. 0.0159 127.1 8.242
Number of Spec. 20 16 20



July 16, 2025

CAM-RP-2019-057 Rev -

4.9 “25/50/25” Unnotched Compression 1 Properties (UNC1)

Laminate Unnotched Compression Properties (UNC1)--RTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

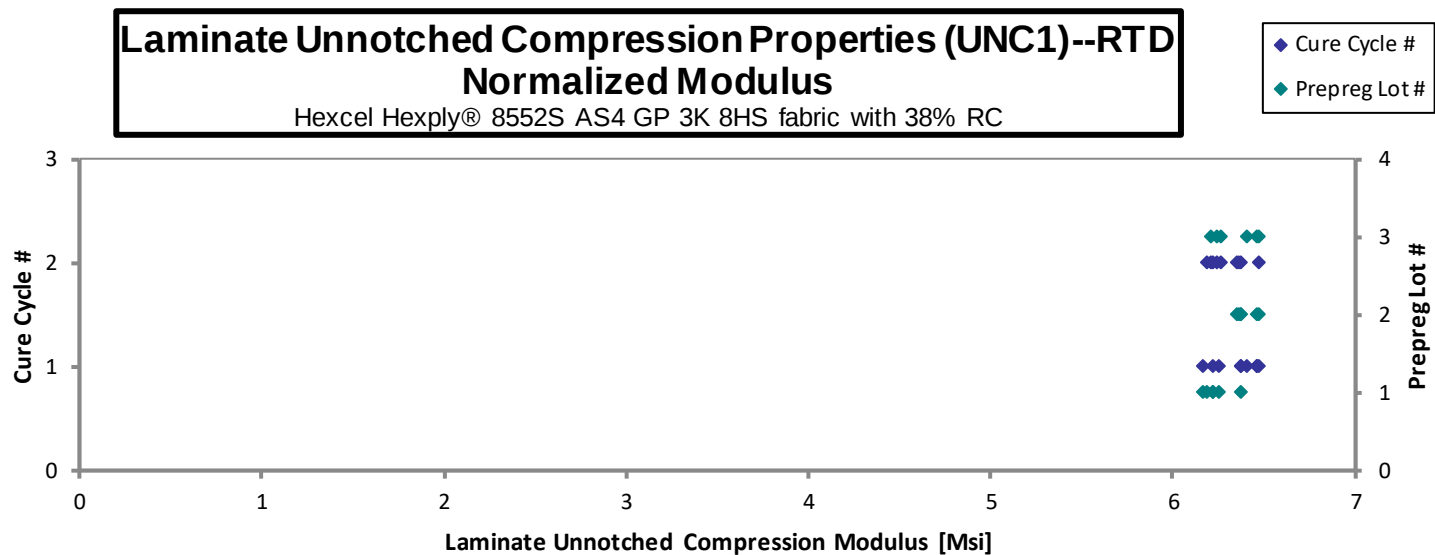
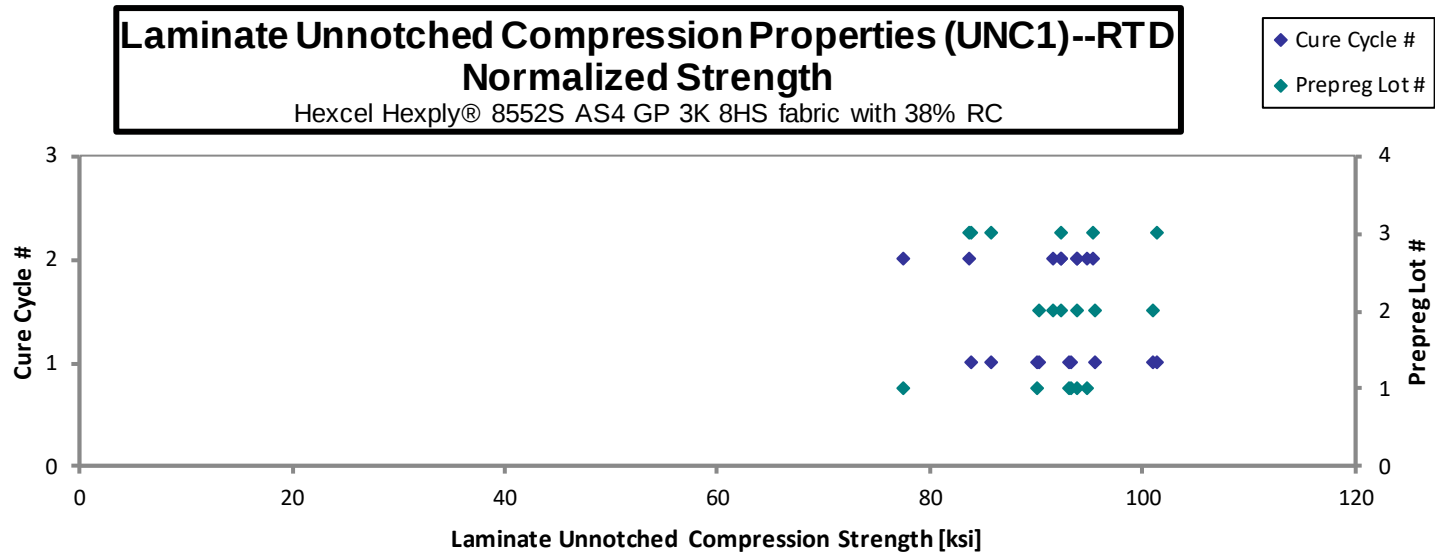
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAWA111A	A	M1	1	1	101.7	6.790	0.1099	8	BGM
HPAWA112A	A	M1	1	1	97.87	6.462	0.1144	8	BGM
HPAWA113A	A	M1	1	1	91.45	6.353	0.1182	8	BGM
HPAWA211A	A	M2	1	2	86.99	6.979	0.1070	8	BGM
HPAWA212A	A	M2	1	2	99.69	6.572	0.1130	8	BAB
HPAWA213A	A	M2	1	2	96.90	6.512	0.1175	8	BGM
HPAWB111A	B	M1	2	1	96.55	6.811	0.1123	8	BGM
HPAWB112A	B	M1	2	1	96.47	6.519	0.1190	8	BGM
HPAWB113A	B	M1	2	1	97.39	6.155	0.1244	8	BGM
HPAWB211A	B	M2	2	2	99.92	6.999	0.1110	8	BGM
HPAWB212A	B	M2	2	2	96.25	6.675	0.1142	8	BGM
HPAWB213A	B	M2	2	2	95.26	6.452	0.1184	8	BGM
HPAWC111A	C	M1	3	1	97.41	7.513	0.1034	8	BGM
HPAWC112A	C	M1	3	1	93.63	7.055	0.1100	8	BGM
HPAWC113A	C	M1	3	1	106.2	6.722	0.1145	8	BAT
HPAWC211A	C	M2	3	2	92.88	6.896	0.1081	8	BGM
HPAWC212A	C	M2	3	2	95.70	6.486	0.1159	8	BGM
HPAWC213A	C	M2	3	2	94.25	6.171	0.1214	8	BGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0137	93.15	6.218
0.0143	93.33	6.162
0.0148	90.10	6.259
0.0134	77.59	6.225
0.0141	93.87	6.189
0.0147	94.85	6.374
0.0140	90.32	6.371
0.0149	95.63	6.462
0.0155	100.9	6.379
0.0139	92.42	6.473
0.0143	91.59	6.351
0.0148	93.96	6.365
0.0129	83.94	6.474
0.0137	85.81	6.465
0.0143	101.3	6.412
0.0135	83.63	6.210
0.0145	92.44	6.265
0.0152	95.37	6.244

Average 96.48 6.673
 Standard Dev. 4.144 0.3384
 Coeff. of Var. [%] 4.295 5.072
 Min. 86.99 6.155
 Max. 106.2 7.513
 Number of Spec. 18 18

Average_{norm} 0.0143 91.68 6.328
 Standard Dev_{norm} 5.922 0.1068
 Coeff. of Var. [%]_{norm} 6.459 1.688
 Min. 0.0129 77.59 6.162
 Max. 0.0155 101.3 6.474
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Unnotched Compression Properties (UNC1)--ETW
Strength & Modulus**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

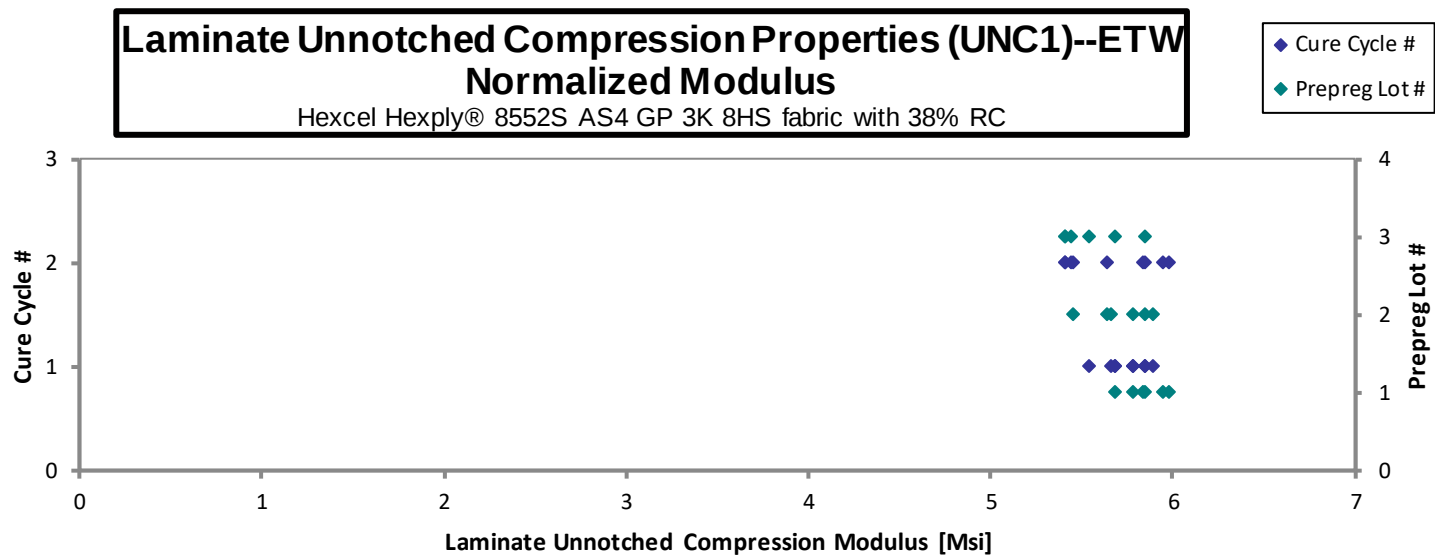
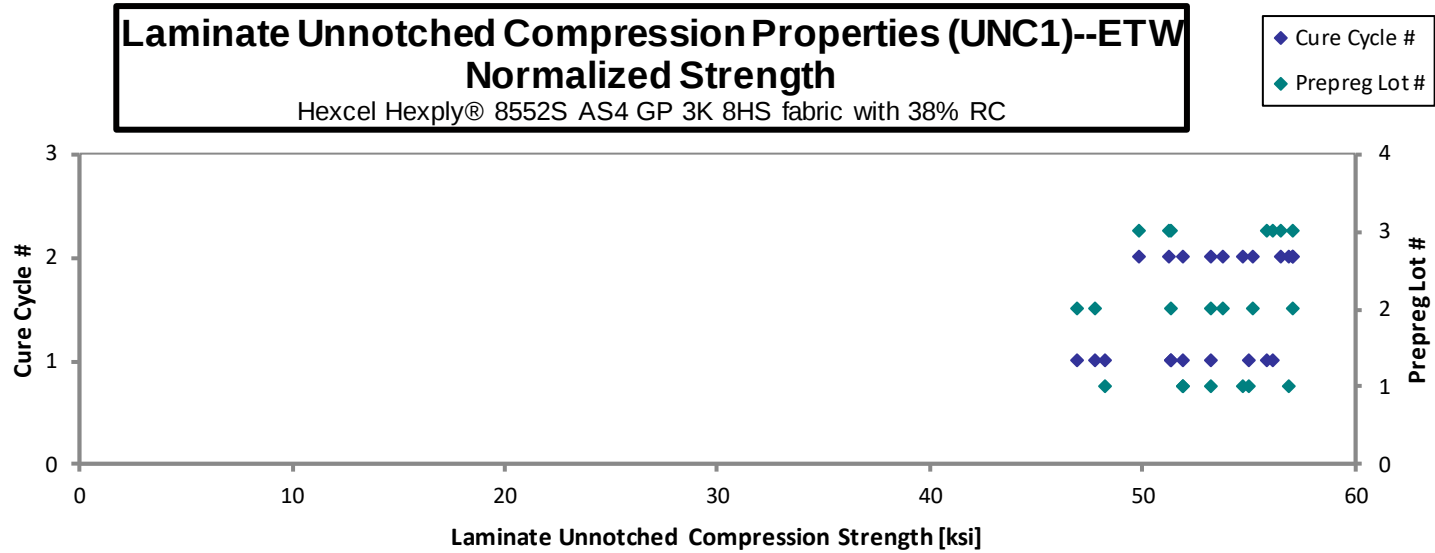
normalizing
t_{ply} [in]
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAWA111D	A	M1	1	1		5.755	0.1220	8	BGM
HPAWA112D	A	M1	1	1		5.556	0.1228	8	BGM
HPAWA113D	A	M1	1	1		5.586	0.1242	8	BGM
HPAWA114D	A	M1	1	1	57.32		0.1115	8	BGM
HPAWA115D	A	M1	1	1	50.29		0.1152	8	BGM
HPAWA116D	A	M1	1	1	52.47		0.1188	8	BGM
HPAWA117D	A	M1	1	1	54.28		0.1217	8	BGM
HPAWA211D	A	M2	1	2		5.839	0.1230	8	BGM
HPAWA212D	A	M2	1	2		5.622	0.1246	8	BGM
HPAWA213D	A	M2	1	2		5.701	0.1252	8	BGM
HPAWA214D	A	M2	1	2	58.50		0.1066	8	BGM
HPAWA215D	A	M2	1	2	58.26		0.1127	8	BGM
HPAWA216D	A	M2	1	2	57.97		0.1178	8	BGM
HPAWB111D	B	M1	2	1		5.227	0.1299	8	BGM
HPAWB112D	B	M1	2	1		5.277	0.1315	8	BGM
HPAWB113D	B	M1	2	1		5.339	0.1324	8	BGM
HPAWB114D	B	M1	2	1	51.19		0.1099	8	BGM
HPAWB115D	B	M1	2	1	49.38		0.1161	8	BGM
HPAWB116D	B	M1	2	1	50.79		0.1212	8	BGM
HPAWB211D	B	M2	2	2		5.554	0.1219	8	BGM
HPAWB212D	B	M2	2	2		5.273	0.1241	8	BGM
HPAWB213D	B	M2	2	2		5.609	0.1251	8	BGM
HPAWB214D	B	M2	2	2	57.12		0.1119	8	BGM
HPAWB215D	B	M2	2	2	57.05		0.1162	8	BGM
HPAWB216D	B	M2	2	2	53.69		0.1202	8	BGM
HPAWB217D	B	M2	2	2	55.31		0.1238	8	BGM
HPAWC111D	C	M1	3	1		5.517	0.1206	8	BGM
HPAWC112D	C	M1	3	1		5.758	0.1218	8	BAT
HPAWC113D	C	M1	3	1		5.486	0.1244	8	BGM
HPAWC114D	C	M1	3	1	58.51		0.1053	8	BGM
HPAWC115D	C	M1	3	1	59.80		0.1122	8	BGM
HPAWC116D	C	M1	3	1	57.38		0.1174	8	BGM
HPAWC211D	C	M2	3	2		5.102	0.1272	8	BGM
HPAWC212D	C	M2	3	2		5.040	0.1288	8	BGM
HPAWC213D	C	M2	3	2		5.034	0.1297	8	BGM
HPAWC214D	C	M2	3	2	54.82		0.1092	8	BGM
HPAWC215D	C	M2	3	2	53.31		0.1155	8	BGM
HPAWC216D	C	M2	3	2	56.47		0.1201	8	BGM
HPAWC217D	C	M2	3	2	55.53		0.1233	8	BAT

Avg. t _{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0153		5.852
0.0154		5.685
0.0155		5.780
0.0139	53.26	
0.0144	48.29	
0.0149	51.96	
0.0152	55.03	
0.0154		5.984
0.0156		5.837
0.0157		5.949
0.0133	51.96	
0.0141	54.69	
0.0147	56.92	
0.0162		5.659
0.0164		5.781
0.0166		5.892
0.0137	46.89	
0.0145	47.76	
0.0152	51.31	
0.0152		5.641
0.0155		5.453
0.0156		5.846
0.0140	53.24	
0.0145	55.23	
0.0150	53.78	
0.0155	57.06	
0.0151		5.542
0.0152		5.845
0.0155		5.685
0.0132	51.33	
0.0140	55.90	
0.0147	56.12	
0.0159		5.408
0.0161		5.409
0.0162		5.441
0.0136	49.88	
0.0144	51.30	
0.0150	56.51	
0.0154	57.06	

Average 55.21 5.460
Standard Dev. 3.048 0.2528
Coeff. of Var. [%] 5.520 4.630
Min. 49.38 5.034
Max. 59.80 5.839
Number of Spec. 21 18

Average_{norm} 0.0150 53.12 5.705
Standard Dev._{norm} 3.152 0.1887
Coeff. of Var. [%]_{norm} 5.934 3.307
Min. 0.0132 46.89 5.408
Max. 0.0166 57.06 5.984
Number of Spec. 39 21 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.10 “10/80/10” Unnotched Compression 2 Properties (UNC2)

Laminate Unnotched Compression Properties (UNC2)--RTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

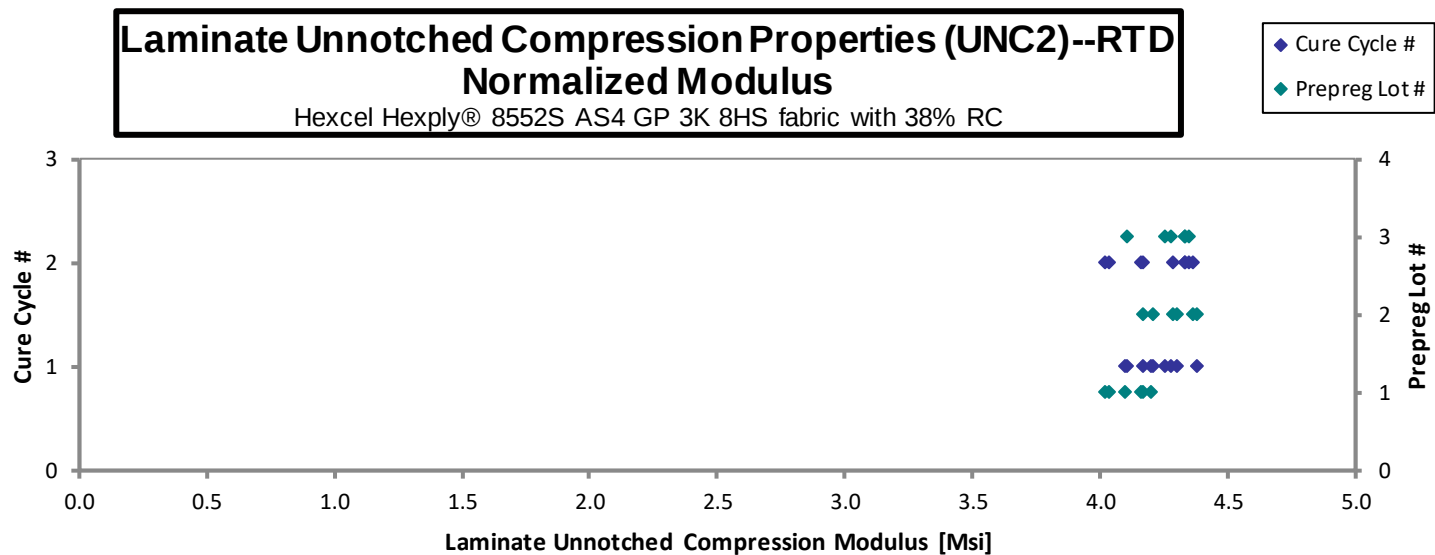
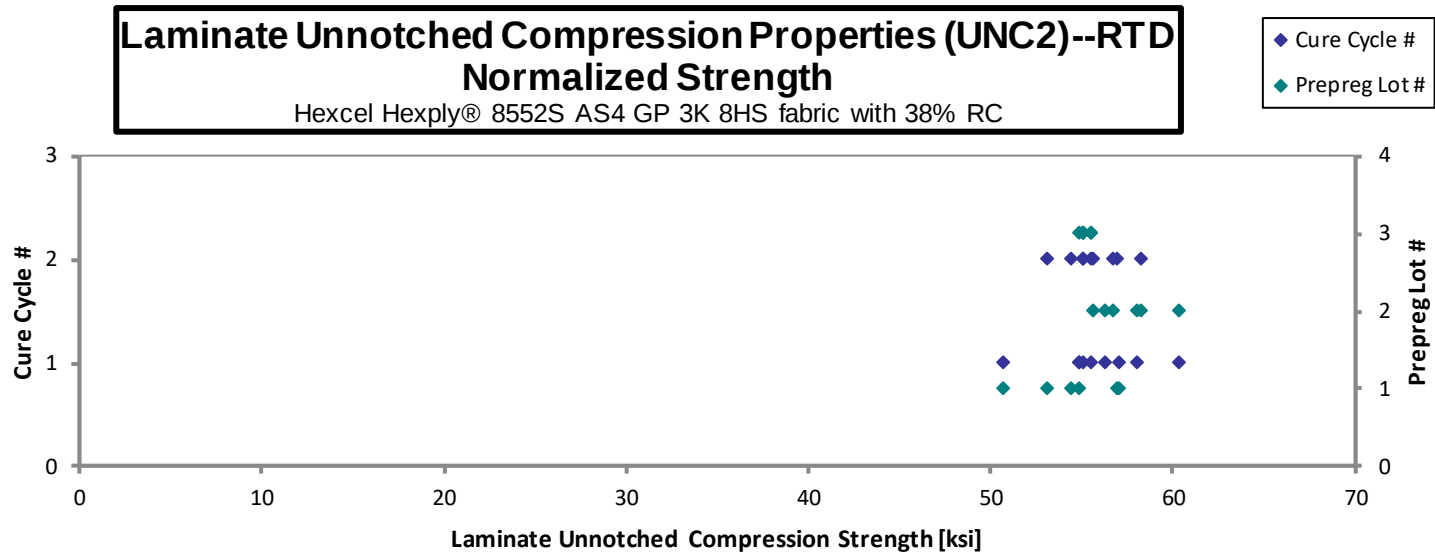
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAXA111A	A	M1	1	1	60.78	4.651	0.1354	10	BGM
HPAXA112A	A	M1	1	1	53.11	4.367	0.1432	10	BGM
HPAXA113A	A	M1	1	1	57.28	4.116	0.1493	10	BGM
HPAXA211A	A	M2	1	2	60.47	4.579	0.1318	10	BGM
HPAXA212A	A	M2	1	2	60.03	4.449	0.1360	10	BGM
HPAXA213A	A	M2	1	2	60.79	4.440	0.1406	10	BGM
HPAXB111A	B	M1	2	1	63.00	4.754	0.1383	10	BGM
HPAXB112A	B	M1	2	1	58.34	4.362	0.1448	10	BGM
HPAXB113A	B	M1	2	1	60.51	4.311	0.1497	10	BGM
HPAXB211A	B	M2	2	2	60.88	4.559	0.1372	10	BGM
HPAXB212A	B	M2	2	2	60.25	4.630	0.1414	10	BGM
HPAXB213A	B	M2	2	2	59.96	4.410	0.1458	10	BGM
HPAXC111A	C	M1	3	1	63.23	4.717	0.1306	10	BGM
HPAXC112A	C	M1	3	1	60.03	4.653	0.1372	10	BGM
HPAXC113A	C	M1	3	1	58.60	4.518	0.1420	10	BGM
HPAXC211A	C	M2	3	2	59.32	4.636	0.1403	10	BGM
HPAXC212A	C	M2	3	2	57.78	4.547	0.1429	10	BGM
HPAXC213A	C	M2	3	2	56.90	4.495	0.1452	10	BGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0135	54.88	4.200
0.0143	50.70	4.168
0.0149	57.03	4.098
0.0132	53.13	4.023
0.0136	54.43	4.034
0.0141	56.99	4.163
0.0138	58.09	4.383
0.0145	56.31	4.210
0.0150	60.39	4.301
0.0137	55.68	4.170
0.0141	56.78	4.364
0.0146	58.27	4.286
0.0131	55.06	4.108
0.0137	54.90	4.255
0.0142	55.47	4.277
0.0140	55.49	4.337
0.0143	55.04	4.332
0.0145	55.08	4.351

Average 59.51 4.511
 Standard Dev. 2.330 0.1604
 Coeff. of Var. [%] 3.915 3.556
 Min. 53.11 4.116
 Max. 63.23 4.754
 Number of Spec. 18 18

Average_{norm} 0.0141 55.76 4.226
 Standard Dev_{norm} 2.102 0.1126
 Coeff. of Var. [%]_{norm} 3.769 2.664
 Min. 0.0131 50.70 4.023
 Max. 0.0150 60.39 4.383
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Unnotched Compression Properties (UNC2)--ETW
Strength & Modulus**

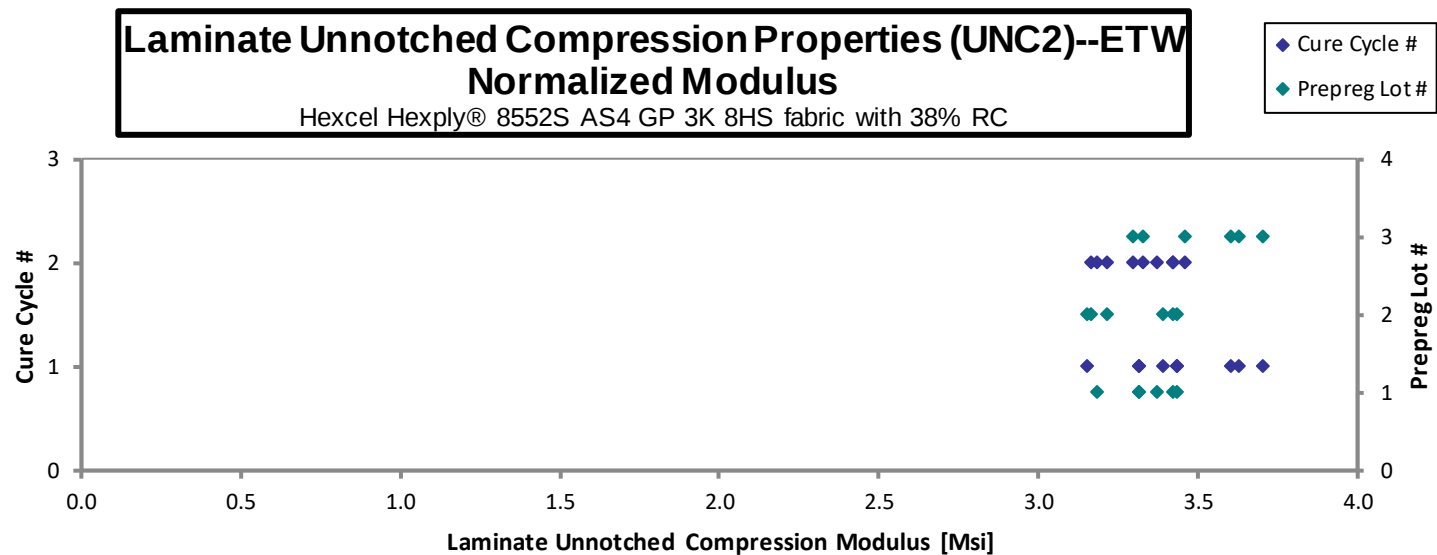
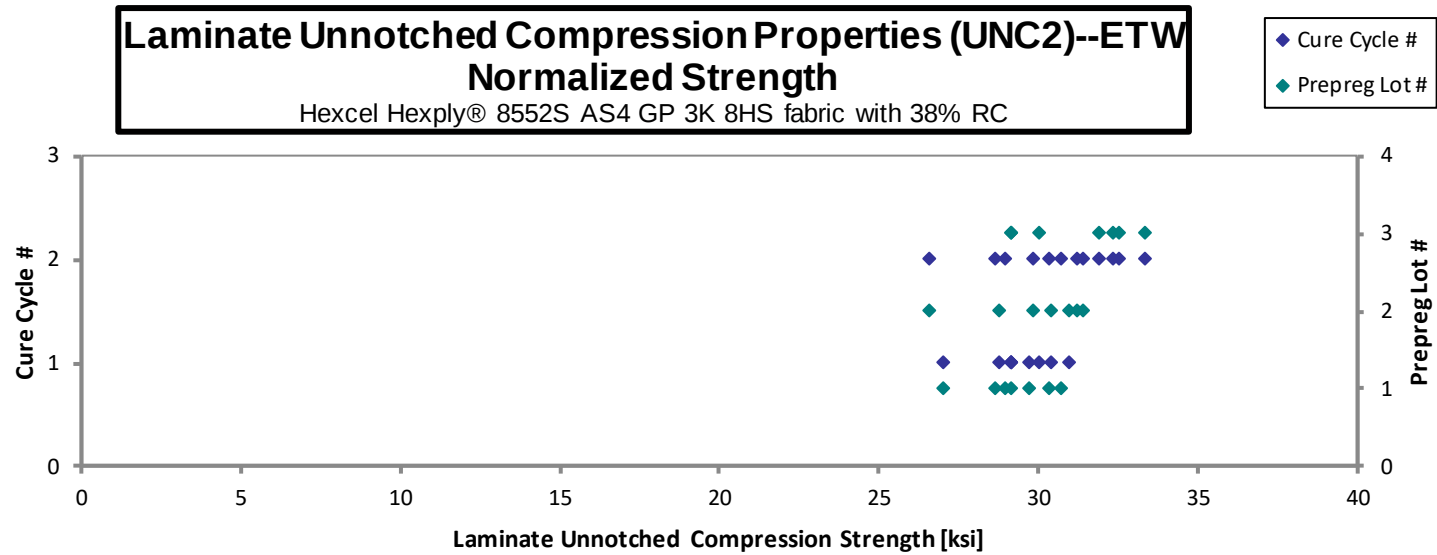
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing
t_{ply} [in]
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t _{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
HPAXA111D	A	M1	1	1		3.145	0.1582	10	BGM	0.0158		3.317
HPAXA112D	A	M1	1	1		3.188	0.1618	10	BGM	0.0162		3.437
HPAXA113D	A	M1	1	1		3.079	0.1615	10	BGM	0.0162		3.316
HPAXA114D	A	M1	1	1	30.00		0.1350	10	BGM	0.0135	27.01	
HPAXA115D	A	M1	1	1	30.66		0.1428	10	BGM	0.0143	29.18	
HPAXA116D	A	M1	1	1	30.07		0.1483	10	BGM	0.0148	29.74	
HPAXA211D	A	M2	1	2		3.486	0.1474	10	BGM	0.0147		3.424
HPAXA212D	A	M2	1	2		3.390	0.1492	10	BGM	0.0149		3.372
HPAXA213D	A	M2	1	2		3.183	0.1502	10	BGM	0.0150		3.188
HPAXA214D	A	M2	1	2	33.81		0.1345	10	BGM	0.0135	30.32	
HPAXA215D	A	M2	1	2	31.23		0.1393	10	BGM	0.0139	28.99	
HPAXA216D	A	M2	1	2	30.05		0.1430	10	BGM	0.0143	28.64	
HPAXA217D	A	M2	1	2	31.33		0.1471	10	BGM	0.0147	30.71	
HPAXB111D	B	M1	2	1		3.325	0.1550	10	BGM	0.0155		3.437
HPAXB112D	B	M1	2	1		3.008	0.1573	10	BGM	0.0157		3.154
HPAXB113D	B	M1	2	1		3.217	0.1581	10	BGM	0.0158		3.391
HPAXB114D	B	M1	2	1	31.45		0.1373	10	BGM	0.0137	28.79	
HPAXB115D	B	M1	2	1	31.72		0.1439	10	BGM	0.0144	30.43	
HPAXB116D	B	M1	2	1	31.15		0.1492	10	BGM	0.0149	30.99	
HPAXB211D	B	M2	2	2		3.387	0.1516	10	BGM	0.0152		3.423
HPAXB212D	B	M2	2	2		3.151	0.1532	10	BGM	0.0153		3.217
HPAXB213D	B	M2	2	2		3.054	0.1554	10	BGM	0.0155		3.164
HPAXB214D	B	M2	2	2	29.21		0.1365	10	BGM	0.0137	26.58	
HPAXB215D	B	M2	2	2	33.20		0.1421	10	BGM	0.0142	31.44	
HPAXB216D	B	M2	2	2	30.52		0.1468	10	BGM	0.0147	29.86	
HPAXB217D	B	M2	2	2	31.06		0.1508	10	BGM	0.0151	31.22	
HPAXC111D	C	M1	3	1		3.640	0.1487	10	BGM	0.0149		3.608
HPAXC112D	C	M1	3	1		3.692	0.1506	10	BGM	0.0151		3.706
HPAXC113D	C	M1	3	1		3.587	0.1519	10	BGM	0.0152		3.631
HPAXC114D	C	M1	3	1	32.47		0.1347	10	BGM	0.0135	29.16	
HPAXC115D	C	M1	3	1	31.82		0.1417	10	BGM	0.0142	30.06	
HPAXC116D	C	M1	3	1	29.72		0.1470	10	BGM	0.0147	29.13	
HPAXC211D	C	M2	3	2		3.460	0.1502	10	BGM	0.0150		3.464
HPAXC212D	C	M2	3	2		3.286	0.1520	10	BGM	0.0152		3.330
HPAXC213D	C	M2	3	2		3.235	0.1531	10	BGM	0.0153		3.301
HPAXC214D	C	M2	3	2	34.35		0.1413	10	BGM	0.0141	32.36	
HPAXC215D	C	M2	3	2	33.26		0.1439	10	BGM	0.0144	31.90	
HPAXC216D	C	M2	3	2	33.93		0.1474	10	BGM	0.0147	33.34	
HPAXC217D	C	M2	3	2	32.41		0.1505	10	BGM	0.0151	32.52	

Average 31.59 3.306
Standard Dev. 1.484 0.2039
Coeff. of Var. [%] 4.696 6.166
Min. 29.21 3.008
Max. 34.35 3.692
Number of Spec. 21 18

Average_{norm} 0.0148 30.11 3.382
Standard Dev._{norm} 1.718 0.1566
Coeff. of Var. [%]_{norm} 5.704 4.631
Min. 0.0135 26.58 3.154
Max. 0.0162 33.34 3.706
Number of Spec. 39 21 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.11 “40/20/40” Unnotched Compression 3 Properties (UNC3)

Laminate Unnotched Compression Properties (UNC3)--RTD Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

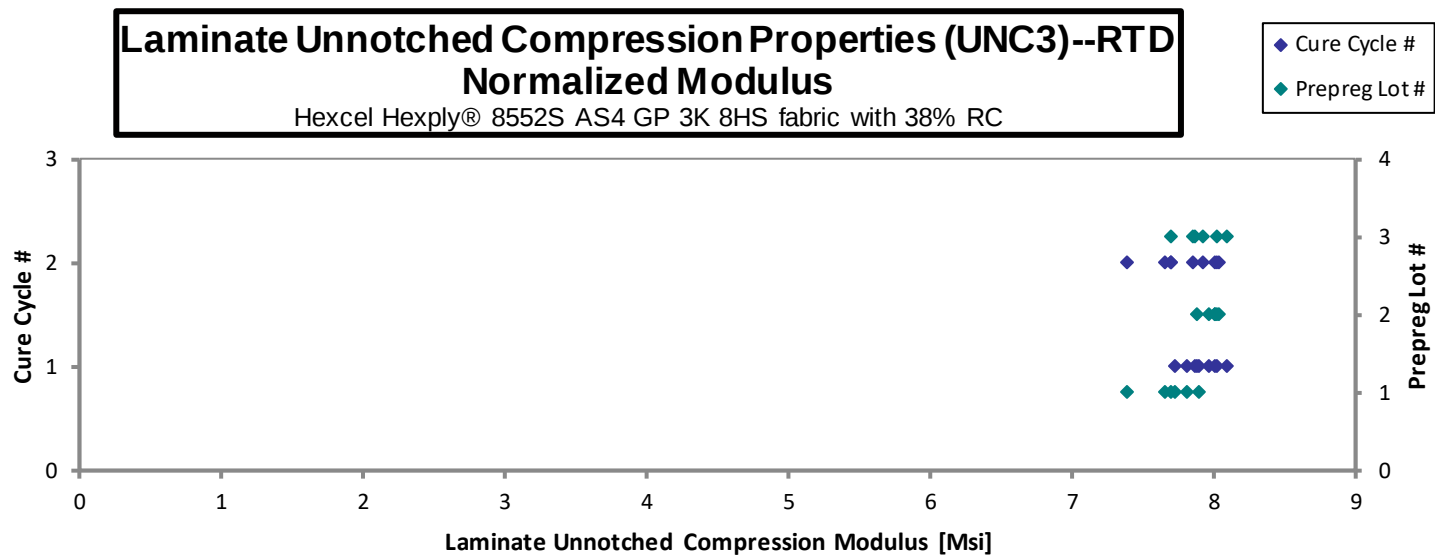
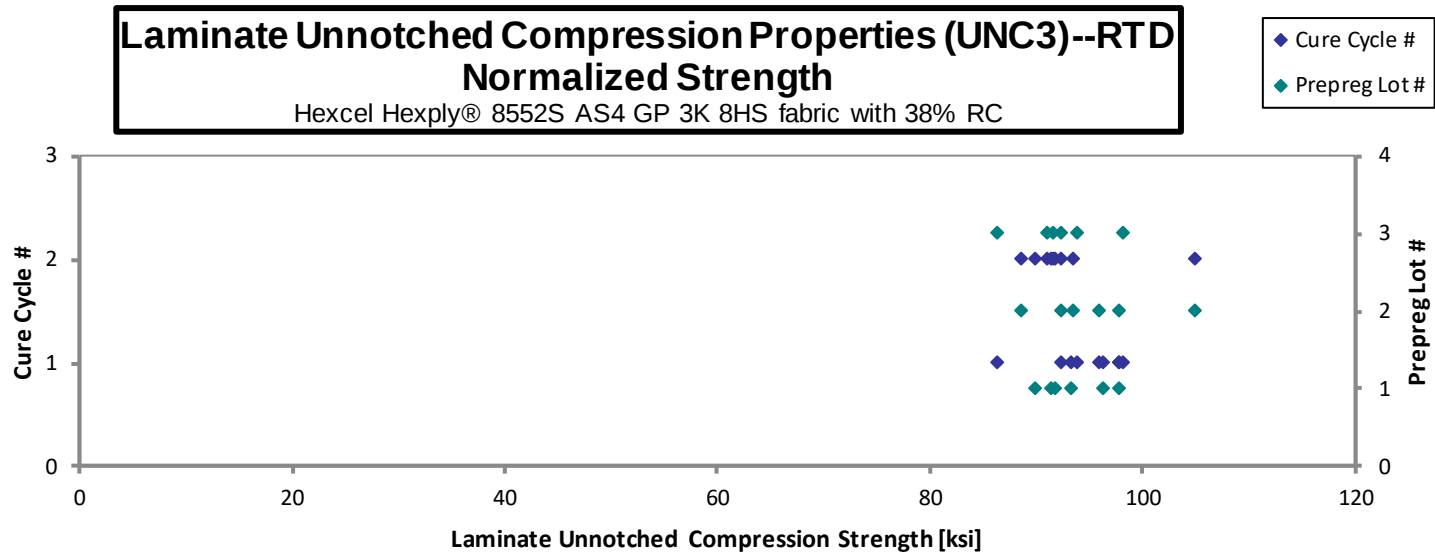
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAYA111A	A	M1	1	1	107.9	8.714	0.1359	10	BGM
HPAYA112A	A	M1	1	1	96.19	8.059	0.1454	10	BGM
HPAYA113A	A	M1	1	1	94.51	7.587	0.1528	10	BGM
HPAYA211A	A	M2	1	2	99.89	8.520	0.1349	10	BGM
HPAYA212A	A	M2	1	2	97.69	8.195	0.1409	10	BGM
HPAYA213A	A	M2	1	2	94.34	7.633	0.1453	10	BGM
HPAYB112A	B	M1	2	1	104.4	8.547	0.1406	10	BGM
HPAYB113A	B	M1	2	1	94.46	8.070	0.1466	10	BGM
HPAYB114A	B	M1	2	1	92.97	7.716	0.1549	10	BGM
HPAYB211A	B	M2	2	2	103.5	8.892	0.1354	10	BGM
HPAYB212A	B	M2	2	2	92.24	8.334	0.1442	10	BAT
HPAYB213A	B	M2	2	2	105.1	8.056	0.1497	10	BGM
HPAYC111A	C	M1	3	1	113.6	9.116	0.1296	10	BGM
HPAYC112A	C	M1	3	1	101.6	8.761	0.1386	10	BGM
HPAYC113A	C	M1	3	1	89.59	8.336	0.1445	10	BGM
HPAYC211A	C	M2	3	2	98.33	8.360	0.1409	10	BGM
HPAYC212A	C	M2	3	2	93.67	7.918	0.1459	10	BGM
HPAYC213A	C	M2	3	2	91.25	7.903	0.1505	10	BGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0136	97.76	7.895
0.0145	93.25	7.812
0.0153	96.29	7.729
0.0135	89.83	7.663
0.0141	91.76	7.697
0.0145	91.39	7.394
0.0141	97.83	8.011
0.0147	92.34	7.889
0.0155	96.00	7.968
0.0135	93.42	8.024
0.0144	88.69	8.013
0.0150	104.9	8.041
0.0130	98.14	7.876
0.0139	93.86	8.095
0.0144	86.29	8.029
0.0141	92.34	7.851
0.0146	91.10	7.701
0.0150	91.54	7.927

Average 98.40 8.262
 Standard Dev. 6.471 0.4386
 Coeff. of Var. [%] 6.576 5.309
 Min. 89.59 7.587
 Max. 113.6 9.116
 Number of Spec. 18 18

Average_{norm} 0.0143 93.71 7.867
 Standard Dev_{norm} 4.275 0.1773
 Coeff. of Var. [%]_{norm} 4.562 2.253
 Min. 0.0130 86.29 7.394
 Max. 0.0155 104.9 8.095
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

Laminate Unnotched Compression Properties (UNC3)--ETW
Strength & Modulus

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

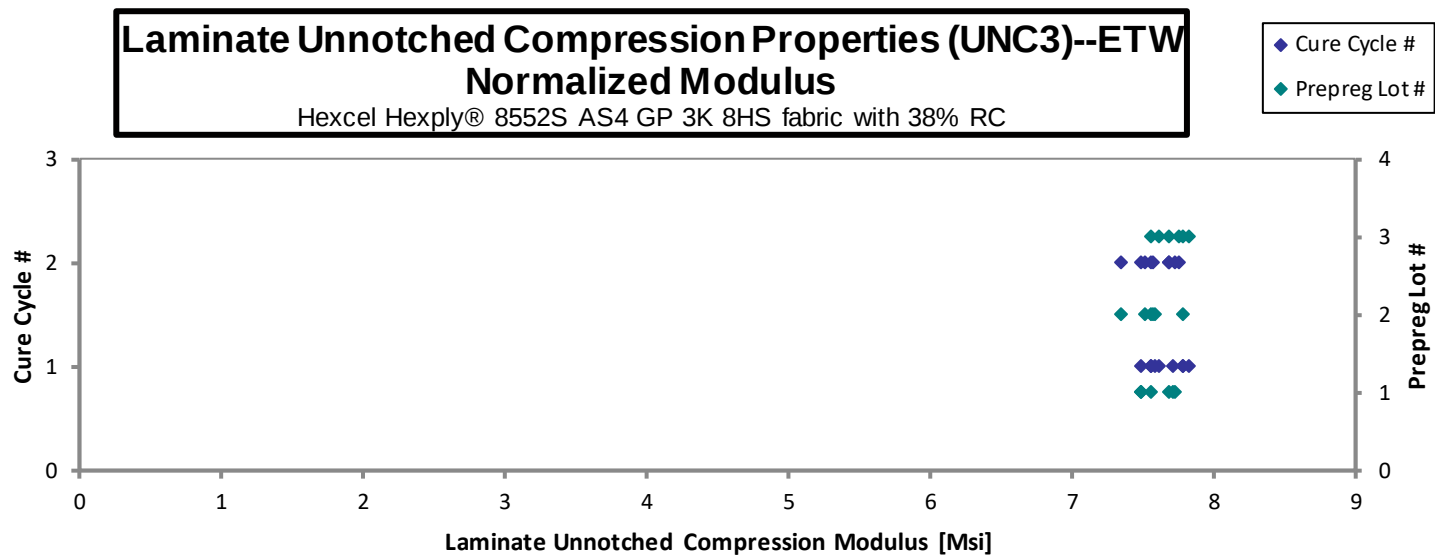
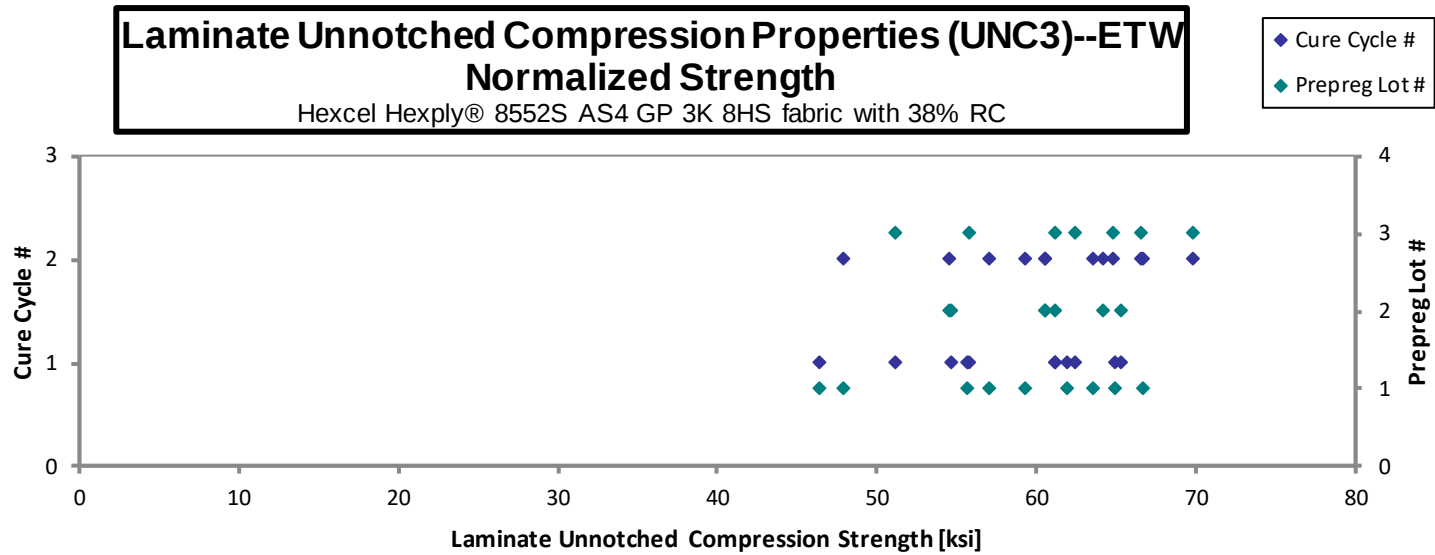
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Modulus [Msi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAYA111D	A	M1	1	1		7.030	0.1615	10	CIT, BGM
HPAYA112D	A	M1	1	1		6.878	0.1634	10	HGM
HPAYA113D	A	M1	1	1		7.019	0.1649	10	CIT, BGM
HPAYA114D	A	M1	1	1	52.92		0.1315	10	BGM
HPAYA115D	A	M1	1	1	59.08		0.1415	10	BGM
HPAYA116D	A	M1	1	1	65.59		0.1484	10	BGM
HPAYA117D	A	M1	1	1	60.69		0.1532	10	HAB
HPAYA211D	A	M2	1	2		7.429	0.1512	10	CIT, BGM
HPAYA212D	A	M2	1	2		7.636	0.1519	10	BGM
HPAYA213D	A	M2	1	2		7.547	0.1528	10	BGM
HPAYA214D	A	M2	1	2	52.83		0.1360	10	BAB
HPAYA215D	A	M2	1	2	60.03		0.1427	10	BGM
HPAYA216D	A	M2	1	2	60.65		0.1468	10	BGM
HPAYA217D	A	M2	1	2	66.18		0.1511	10	BAT
HPAYA218D	A	M2	1	2	61.95		0.1538	10	BAT
HPAYB111D	B	M1	2	1		7.728	0.1511	10	M(B,H)GM
HPAYB112D	B	M1	2	1		7.261	0.1569	10	M(B,H)GM
HPAYB113D	B	M1	2	1		7.171	0.1581	10	M(C,H)IB, CIT
HPAYB114D	B	M1	2	1	61.15		0.1341	10	BGM
HPAYB115D	B	M1	2	1	64.58		0.1422	10	HGM
HPAYB116D	B	M1	2	1	66.20		0.1481	10	BGM
HPAYB211D	B	M2	2	2		7.204	0.1567	10	BAT
HPAYB212D	B	M2	2	2		7.090	0.1602	10	BGM
HPAYB213D	B	M2	2	2		6.863	0.1606	10	BGM
HPAYB214D	B	M2	2	2	61.59		0.1329	10	BGM
HPAYB215D	B	M2	2	2	64.23		0.1415	10	BGM
HPAYB216D	B	M2	2	2	64.89		0.1484	10	BGM
HPAYB217D	B	M2	2	2	59.30		0.1534	10	BGM
HPAYC111D	C	M1	3	1		7.747	0.1515	10	BGM
HPAYC112D	C	M1	3	1		7.363	0.1551	10	BGM
HPAYC113D	C	M1	3	1		7.506	0.1555	10	BGM
HPAYC114D	C	M1	3	1	63.50		0.1320	10	HGM
HPAYC115D	C	M1	3	1	54.74		0.1402	10	M(B,H)GM
HPAYC116D	C	M1	3	1	63.82		0.1467	10	BGM
HPAYC117D	C	M1	3	1	60.82		0.1508	10	HGM
HPAYC211D	C	M2	3	2		7.242	0.1567	10	BGM
HPAYC212D	C	M2	3	2		7.317	0.1590	10	BAT
HPAYC213D	C	M2	3	2		7.172	0.1607	10	BAT
HPAYC217D	C	M2	3	2	65.68		0.1521	10	BGM
HPAYC218D	C	M2	3	2	67.90		0.1543	10	BGM
HPAYC219D	C	M2	3	2	62.28		0.1561	10	BGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]	Modulus _{norm} [Msi]
0.0161		7.569
0.0163		7.491
0.0165		7.717
0.0131	46.38	
0.0141	55.73	
0.0148	64.90	
0.0153	61.98	
0.0151		7.489
0.0152		7.730
0.0153		7.690
0.0136	47.90	
0.0143	57.10	
0.0147	59.35	
0.0151	66.67	
0.0154	63.53	
0.0151		7.783
0.0157		7.593
0.0158		7.560
0.0134	54.66	
0.0142	61.21	
0.0148	65.37	
0.0157		7.525
0.0160		7.571
0.0161		7.348
0.0133	54.56	
0.0141	60.56	
0.0148	64.21	
0.0153	60.62	
0.0151		7.823
0.0155		7.612
0.0156		7.783
0.0132	55.86	
0.0140	51.15	
0.0147	62.43	
0.0151	61.14	
0.0157		7.565
0.0159		7.756
0.0161		7.684
0.0152	66.58	
0.0154	69.82	
0.0156	64.83	

Average 61.77 7.289
Standard Dev. 4.076 0.2690
Coeff. of Var. [%] 6.599 3.690
Min. 52.83 6.863
Max. 67.90 7.747
Number of Spec. 23 18

Average_{norm} 0.0150 59.85 7.627
Standard Dev._{norm} 6.090 0.1265
Coeff. of Var. [%]_{norm} 10.18 1.658
Min. 0.0131 46.38 7.348
Max. 0.0165 69.82 7.823
Number of Spec. 41 23 18



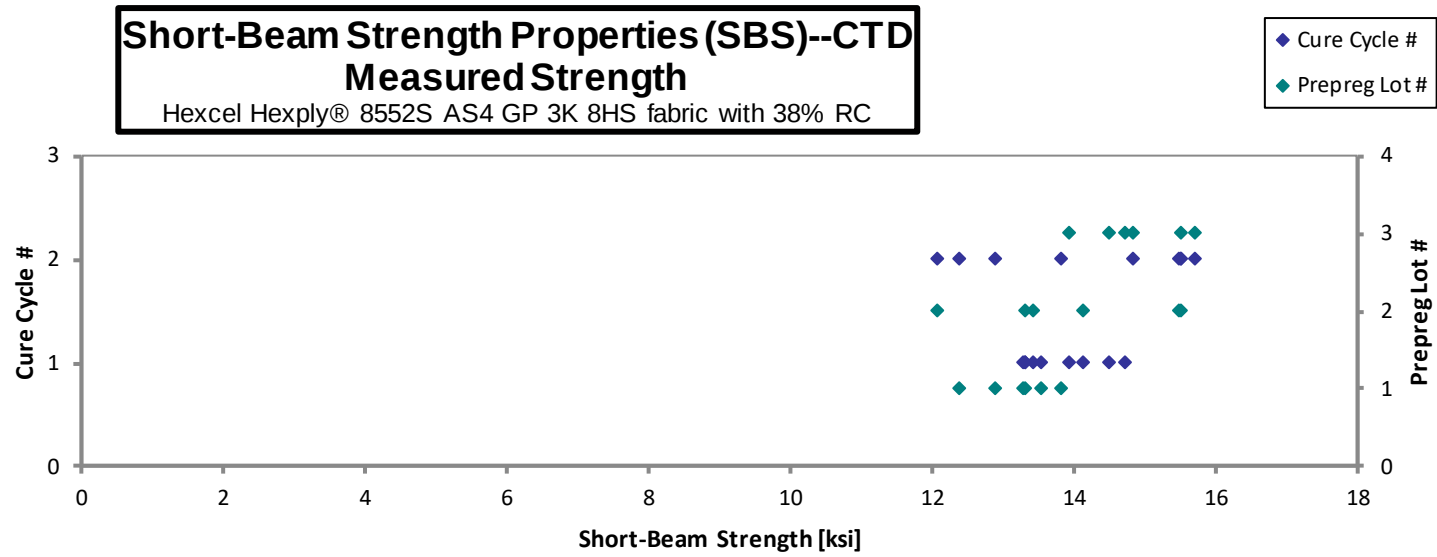
4.12 Lamina Short-Beam Strength Properties (SBS)

Short-Beam Strength Properties (SBS)--CTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAQA111B	A	M1	1	1	13.30	0.2746	18	0.0153	INTERLAMINAR SHEAR
HPAQA112B	A	M1	1	1	13.31	0.2732	18	0.0152	INTERLAMINAR SHEAR
HPAQA113B	A	M1	1	1	13.55	0.2708	18	0.0150	INTERLAMINAR SHEAR
HPAQA211B	A	M2	1	2	13.84	0.2936	18	0.0163	INTERLAMINAR SHEAR
HPAQA212B	A	M2	1	2	12.38	0.2952	18	0.0164	INTERLAMINAR SHEAR
HPAQA213B	A	M2	1	2	12.89	0.2868	18	0.0159	INTERLAMINAR SHEAR
HPAQB111B (Redo)	B	M1	2	1	14.13	0.2495	18	0.0139	INTERLAMINAR SHEAR
HPAQB112B (Redo)	B	M1	2	1	13.31	0.2498	18	0.0139	INTERLAMINAR SHEAR
HPAQB113B (Redo)	B	M1	2	1	13.43	0.2530	18	0.0141	INTERLAMINAR SHEAR
HPAQB211B (Redo)	B	M2	2	2	15.51	0.2426	18	0.0135	INTERLAMINAR SHEAR
HPAQB212B (Redo)	B	M2	2	2	15.50	0.2461	18	0.0137	INTERLAMINAR SHEAR
HPAQB213B (Redo)	B	M2	2	2	12.07	0.2481	18	0.0138	INTERLAMINAR SHEAR
HPAQC111B	C	M1	3	1	14.50	0.2465	18	0.0137	INTERLAMINAR SHEAR
HPAQC112B	C	M1	3	1	13.93	0.2435	18	0.0135	INTERLAMINAR SHEAR
HPAQC113B	C	M1	3	1	14.72	0.2409	18	0.0134	INTERLAMINAR SHEAR
HPAQC211B	C	M2	3	2	15.71	0.2426	18	0.0135	INTERLAMINAR SHEAR
HPAQC212B	C	M2	3	2	14.84	0.2422	18	0.0135	INTERLAMINAR SHEAR
HPAQC213B	C	M2	3	2	15.53	0.2412	18	0.0134	INTERLAMINAR SHEAR

Average	14.02	0.0143
Standard Dev.	1.107	
Coeff. of Var. [%]	7.894	
Min.	12.07	0.0134
Max.	15.71	0.0164
Number of Spec.	18	18



July 16, 2025

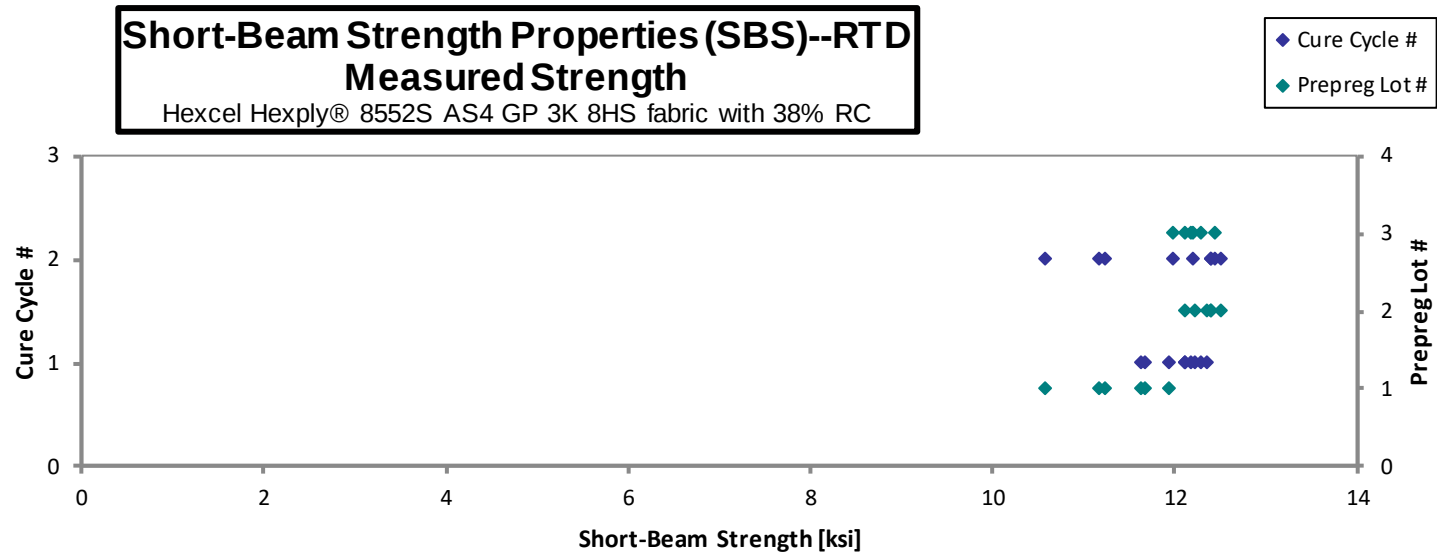
CAM-RP-2019-057 Rev -

**Short-Beam Strength Properties (SBS)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAQA111A	A	M1	1	1	11.95	0.2708	18	0.0150	INTERLAMINAR SHEAR
HPAQA112A	A	M1	1	1	11.68	0.2725	18	0.0151	INTERLAMINAR SHEAR
HPAQA113A	A	M1	1	1	11.63	0.2747	18	0.0153	INTERLAMINAR SHEAR
HPAQA211A	A	M2	1	2	10.58	0.2762	18	0.0153	INTERLAMINAR SHEAR
HPAQA212A	A	M2	1	2	11.17	0.2863	18	0.0159	INTERLAMINAR SHEAR
HPAQA213A	A	M2	1	2	11.23	0.2920	18	0.0162	INTERLAMINAR SHEAR
HPAQB111A (Redo)	B	M1	2	1	12.12	0.2516	18	0.0140	INTERLAMINAR SHEAR
HPAQB112A (Redo)	B	M1	2	1	12.22	0.2500	18	0.0139	INTERLAMINAR SHEAR
HPAQB113A (Redo)	B	M1	2	1	12.35	0.2509	18	0.0139	INTERLAMINAR SHEAR
HPAQB211A (Redo)	B	M2	2	2	12.39	0.2487	18	0.0138	INTERLAMINAR SHEAR
HPAQB212A (Redo)	B	M2	2	2	12.50	0.2470	18	0.0137	INTERLAMINAR SHEAR
HPAQB213A (Redo)	B	M2	2	2	12.40	0.2445	18	0.0136	INTERLAMINAR SHEAR
HPAQC111A	C	M1	3	1	12.29	0.2373	18	0.0132	INTERLAMINAR SHEAR
HPAQC112A	C	M1	3	1	12.18	0.2423	18	0.0135	INTERLAMINAR SHEAR
HPAQC113A	C	M1	3	1	12.11	0.2452	18	0.0136	INTERLAMINAR SHEAR
HPAQC211A	C	M2	3	2	12.45	0.2342	18	0.0130	INTERLAMINAR SHEAR
HPAQC212A	C	M2	3	2	12.20	0.2372	18	0.0132	INTERLAMINAR SHEAR
HPAQC213A	C	M2	3	2	11.97	0.2406	18	0.0134	INTERLAMINAR SHEAR

Average	11.97	0.0142
Standard Dev.	0.5227	
Coeff. of Var. [%]	4.367	
Min.	10.58	0.0130
Max.	12.50	0.0162
Number of Spec.	18	18

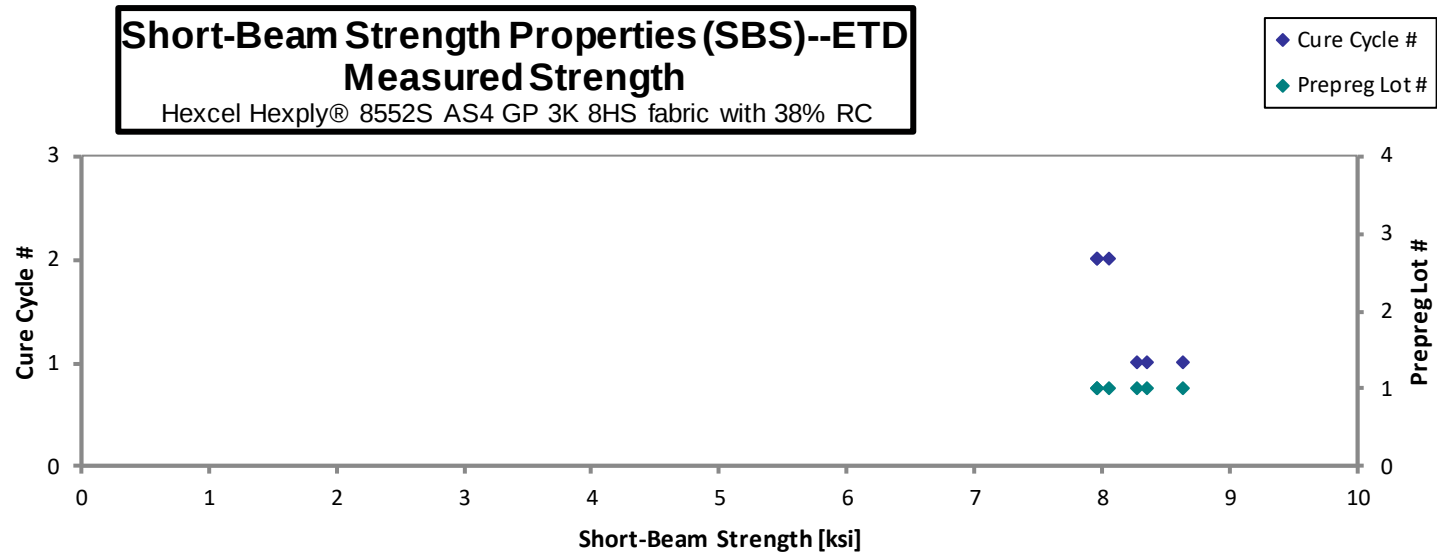


Short-Beam Strength Properties (SBS)--ETD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAQA111C	A	M1	1	1	8.643	0.2766	18	0.0154	INTERLAMINAR SHEAR
HPAQA112C	A	M1	1	1	8.360	0.2783	18	0.0155	INTERLAMINAR SHEAR
HPAQA113C	A	M1	1	1	8.274	0.2799	18	0.0155	INTERLAMINAR SHEAR
HPAQA211C	A	M2	1	2	7.969	0.2797	18	0.0155	INTERLAMINAR SHEAR
HPAQA212C	A	M2	1	2	7.959	0.2732	18	0.0152	INTERLAMINAR SHEAR
HPAQA213C	A	M2	1	2	8.055	0.2804	18	0.0156	INTERLAMINAR SHEAR

Average	8.210	0.0154
Standard Dev.	0.2680	
Coeff. of Var. [%]	3.264	
Min.	7.959	0.0152
Max.	8.643	0.0156
Number of Spec.	6	6



July 16, 2025

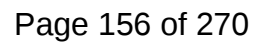
CAM-RP-2019-057 Rev -

**Short-Beam Strength Properties (SBS)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAQA111D	A	M1	1	1	5.748	0.2801	18	0.0156	INTERLAMINAR SHEAR
HPAQA112D	A	M1	1	1	5.717	0.2786	18	0.0155	INTERLAMINAR SHEAR
HPAQA113D	A	M1	1	1	5.701	0.2756	18	0.0153	INTERLAMINAR SHEAR
HPAQA212D	A	M2	1	2	5.501	0.2948	18	0.0164	INTERLAMINAR SHEAR
HPAQA213D	A	M2	1	2	5.330	0.2902	18	0.0161	INTERLAMINAR SHEAR
HPAQA215D	A	M2	1	2	5.499	0.2963	18	0.0165	INTERLAMINAR SHEAR
HPAQB111D (Redo)	B	M1	2	1	5.955	0.2533	18	0.0141	INTERLAMINAR SHEAR, INELASTIC DEFORMATION
HPAQB112D (Redo)	B	M1	2	1	6.242	0.2474	18	0.0137	INTERLAMINAR SHEAR, INELASTIC DEFORMATION
HPAQB114D (Redo)	B	M1	2	1	6.370	0.2436	18	0.0135	INTERLAMINAR SHEAR, INELASTIC DEFORMATION
HPAQB211D (Redo)	B	M2	2	2	6.261	0.2486	18	0.0138	INTERLAMINAR SHEAR, INELASTIC DEFORMATION
HPAQB212D (Redo)	B	M2	2	2	6.274	0.2474	18	0.0137	INTERLAMINAR SHEAR, INELASTIC DEFORMATION
HPAQB213D (Redo)	B	M2	2	2	6.258	0.2460	18	0.0137	INTERLAMINAR SHEAR, INELASTIC DEFORMATION
HPAQC112D	C	M1	3	1	5.913	0.2565	18	0.0143	INTERLAMINAR SHEAR
HPAQC113D	C	M1	3	1	5.869	0.2582	18	0.0143	INTERLAMINAR SHEAR
HPAQC114D	C	M1	3	1	5.949	0.2580	18	0.0143	INTERLAMINAR SHEAR
HPAQC212D	C	M2	3	2	5.896	0.2532	18	0.0141	INTERLAMINAR SHEAR
HPAQC213D	C	M2	3	2	5.889	0.2515	18	0.0140	INTERLAMINAR SHEAR
HPAQC214D	C	M2	3	2	5.848	0.2487	18	0.0138	INTERLAMINAR SHEAR

Average	5.901	0.0146
Standard Dev.	0.2958	
Coeff. of Var. [%]	5.012	
Min.	5.330	0.0135
Max.	6.370	0.0165
Number of Spec.	18	18



4.13 Laminate Short-Beam Strength Properties (SBS1)

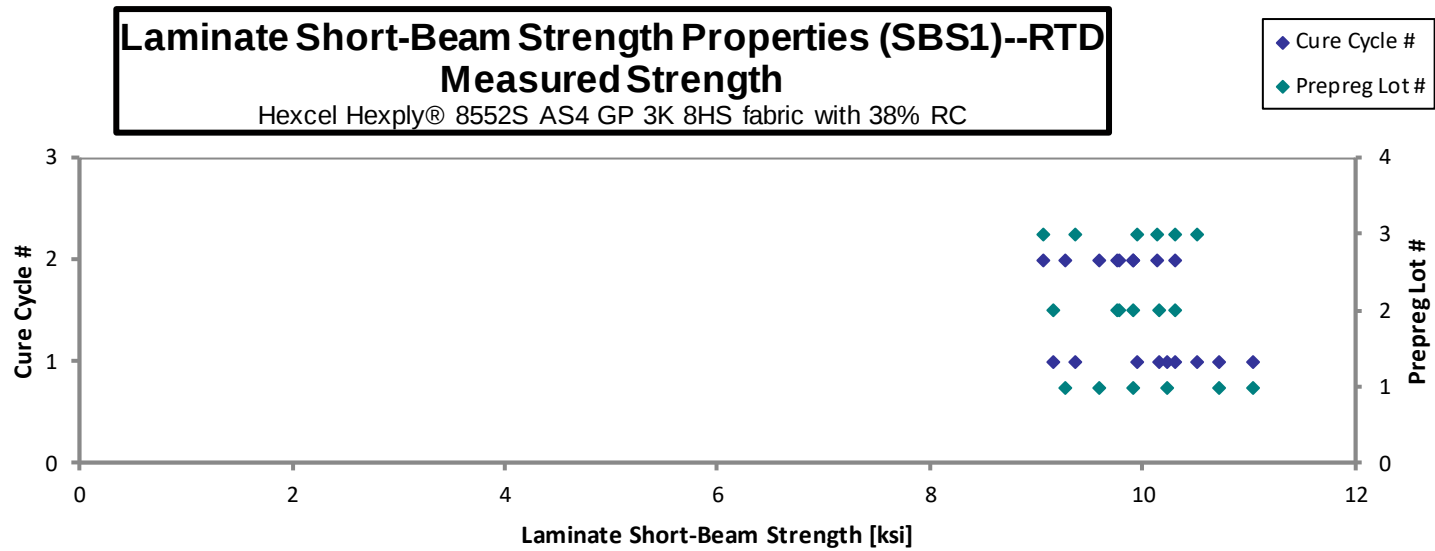
Layup for laminate is [45/0/-45/90/-45/90]S

Laminate Short-Beam Strength Properties (SBS1)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAqA1G11A	A	M1	1	1	11.03	0.1745	12	0.0145	INTERLAMINAR SHEAR
HPAqA1G12A	A	M1	1	1	10.72	0.1750	12	0.0146	INTERLAMINAR SHEAR
HPAqA1G13A	A	M1	1	1	10.23	0.1661	12	0.0138	INTERLAMINAR SHEAR
HPAqA2G11A	A	M2	1	2	9.589	0.1695	12	0.0141	INTERLAMINAR SHEAR
HPAqA2G12A	A	M2	1	2	9.919	0.1700	12	0.0142	INTERLAMINAR SHEAR
HPAqA2G13A	A	M2	1	2	9.281	0.1698	12	0.0141	INTERLAMINAR SHEAR
HPAqB1G11A	B	M1	2	1	10.30	0.1712	12	0.0143	INTERLAMINAR SHEAR
HPAqB1G12A	B	M1	2	1	10.16	0.1608	12	0.0134	INTERLAMINAR SHEAR
HPAqB1G13A	B	M1	2	1	9.165	0.1561	12	0.0130	INTERLAMINAR SHEAR
HPAqB2G11A	B	M2	2	2	9.752	0.1891	12	0.0158	INTERLAMINAR SHEAR
HPAqB2G12A	B	M2	2	2	9.902	0.1894	12	0.0158	INTERLAMINAR SHEAR
HPAqB2G13A	B	M2	2	2	9.772	0.1894	12	0.0158	INTERLAMINAR SHEAR
HPAqC1G11A	C	M1	3	1	10.50	0.1762	12	0.0147	INTERLAMINAR SHEAR
HPAqC1G12A	C	M1	3	1	9.363	0.1643	12	0.0137	INTERLAMINAR SHEAR
HPAqC1G13A	C	M1	3	1	9.948	0.1679	12	0.0140	INTERLAMINAR SHEAR
HPAqC2G11A	C	M2	3	2	10.31	0.1751	12	0.0146	INTERLAMINAR SHEAR
HPAqC2G12A	C	M2	3	2	9.073	0.1694	12	0.0141	INTERLAMINAR SHEAR
HPAqC2G13A	C	M2	3	2	10.13	0.1731	12	0.0144	INTERLAMINAR SHEAR

Average	9.953	0.0144
Standard Dev.	0.5344	
Coeff. of Var. [%]	5.370	
Min.	9.073	0.0130
Max.	11.03	0.0158
Number of Spec.	18	18



July 16, 2025

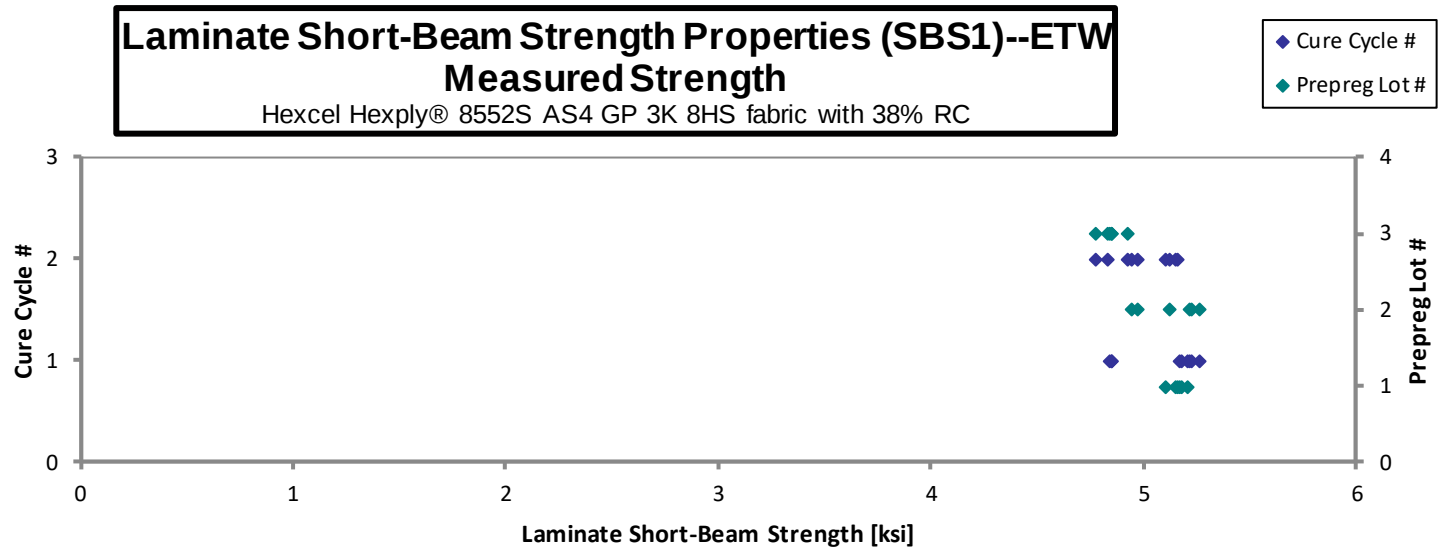
CAM-RP-2019-057 Rev -

**Laminate Short-Beam Strength Properties (SBS1)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAqA1G11D	A	M1	1	1	5.202	0.1736	12	0.0145	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqA1G14D	A	M1	1	1	5.169	0.1749	12	0.0146	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqA1G15D	A	M1	1	1	5.179	0.1708	12	0.0142	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqA2G11D	A	M2	1	2	5.161	0.1699	12	0.0142	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqA2G12D	A	M2	1	2	5.154	0.1690	12	0.0141	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqA2G13D	A	M2	1	2	5.100	0.1705	12	0.0142	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqB1G11D	B	M1	2	1	5.261	0.1689	12	0.0141	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqB1G12D	B	M1	2	1	5.214	0.1704	12	0.0142	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqB1G13D	B	M1	2	1	5.226	0.1712	12	0.0143	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqB2G11D	B	M2	2	2	5.122	0.1877	12	0.0156	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqB2G12D	B	M2	2	2	4.974	0.1860	12	0.0155	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqB2G13D	B	M2	2	2	4.938	0.1837	12	0.0153	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqC1G11D	C	M1	3	1	4.853	0.1756	12	0.0146	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqC1G12D	C	M1	3	1	4.853	0.1722	12	0.0143	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqC1G14D	C	M1	3	1	4.839	0.1738	12	0.0145	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqC2G11D	C	M2	3	2	4.926	0.1789	12	0.0149	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqC2G12D	C	M2	3	2	4.834	0.1807	12	0.0151	INELASTIC DEFORMATION, INTERLAMINAR SHEAR
HPAqC2G13D	C	M2	3	2	4.774	0.1808	12	0.0151	INELASTIC DEFORMATION, INTERLAMINAR SHEAR

Average	5.043	0.0146
Standard Dev.	0.1654	
Coeff. of Var. [%]	3.279	
Min.	4.774	0.0141
Max.	5.261	0.0156
Number of Spec.	18	18



July 16, 2025

CAM-RP-2019-057 Rev -

4.14 “25/50/25” Open-Hole Tension 1 Properties (OHT1)

Laminate Open-Hole Tension Properties (OHT1)--CTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

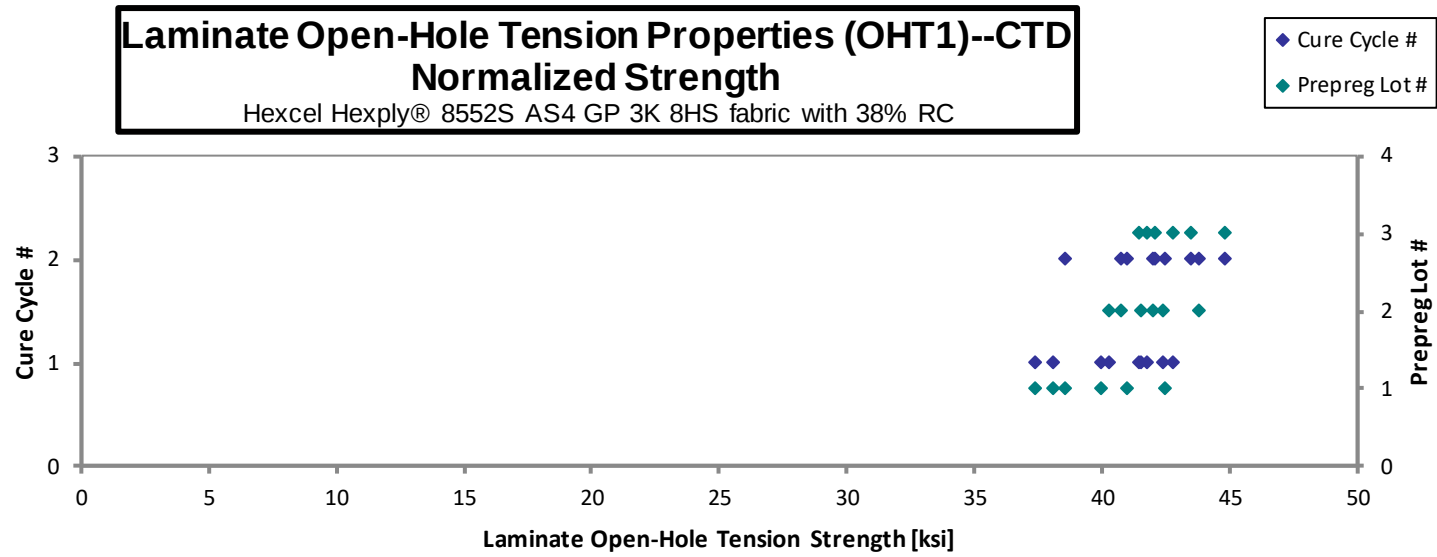
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPADA111B	A	M1	1	1	36.83	0.1217	8	LGM
HPADA112B	A	M1	1	1	37.44	0.1221	8	LGM
HPADA113B	A	M1	1	1	39.30	0.1220	8	LGM
HPADA211B	A	M2	1	2	40.67	0.1252	8	LGM
HPADA212B	A	M2	1	2	37.02	0.1251	8	LGM
HPADA213B	A	M2	1	2	43.01	0.1145	8	LGM
HPADB111B	B	M1	2	1	38.25	0.1264	8	LGM
HPADB112B	B	M1	2	1	40.32	0.1263	8	LGM
HPADB113B	B	M1	2	1	44.12	0.1130	8	LGM
HPADB211B	B	M2	2	2	38.35	0.1275	8	LGM
HPADB212B	B	M2	2	2	39.86	0.1265	8	LGM
HPADB213B	B	M2	2	2	46.91	0.1122	8	LGM
HPADC111B	C	M1	3	1	39.15	0.1272	8	LGM
HPADC112B	C	M1	3	1	40.56	0.1266	8	LGM
HPADC113B	C	M1	3	1	44.40	0.1129	8	LGM
HPADC211B	C	M2	3	2	40.18	0.1258	8	LGM
HPADC212B	C	M2	3	2	42.28	0.1236	8	LGM
HPADC213B	C	M2	3	2	48.30	0.1114	8	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0152	37.36
0.0153	38.10
0.0152	39.94
0.0157	42.45
0.0156	38.59
0.0143	41.03
0.0158	40.27
0.0158	42.43
0.0141	41.53
0.0159	40.76
0.0158	42.00
0.0140	43.84
0.0159	41.49
0.0158	42.79
0.0141	41.78
0.0157	42.11
0.0154	43.53
0.0139	44.82

Average 40.94
Standard Dev. 3.296
Coeff. of Var. [%] 8.050
Min. 36.83
Max. 48.30
Number of Spec. 18

Average_{norm} 0.0152 41.38
Standard Dev._{norm} 1.977
Coeff. of Var. [%]_{norm} 4.777
Min. 0.0139 37.36
Max. 0.0159 44.82
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Tension Properties (OHT1)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

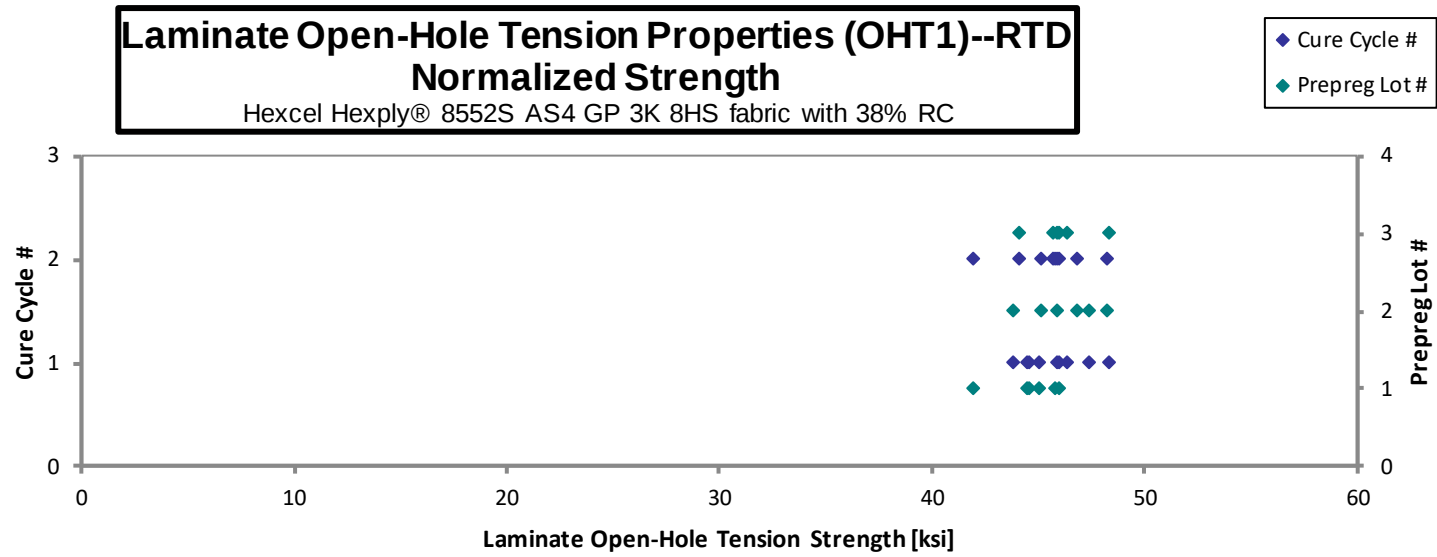
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPADA111A	A	M1	1	1	46.62	0.1145	8	LGM
HPADA112A	A	M1	1	1	43.77	0.1222	8	LGM
HPADA113A	A	M1	1	1	43.49	0.1243	8	LGM
HPADA211A	A	M2	1	2	48.27	0.1144	8	LGM
HPADA212A	A	M2	1	2	40.47	0.1243	8	LGM
HPADA213A	A	M2	1	2	43.90	0.1252	8	LGM
HPADB111A	B	M1	2	1	50.85	0.1119	8	LGM
HPADB112A	B	M1	2	1	45.12	0.1221	8	LGM
HPADB113A	B	M1	2	1	41.86	0.1258	8	LGM
HPADB211A	B	M2	2	2	47.77	0.1134	8	LGM
HPADB212A	B	M2	2	2	48.14	0.1202	8	LGM
HPADB213A	B	M2	2	2	44.90	0.1253	8	LGM
HPADC111A	C	M1	3	1	48.88	0.1138	8	LGM
HPADC112A	C	M1	3	1	47.95	0.1210	8	LGM
HPADC113A	C	M1	3	1	44.04	0.1253	8	LGM
HPADC212A	C	M2	3	2	43.54	0.1217	8	LGM
HPADC213A	C	M2	3	2	43.66	0.1257	8	LGM
HPADC214A	C	M2	3	2	43.67	0.1261	8	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0143	44.46
0.0153	44.58
0.0155	45.03
0.0143	46.02
0.0155	41.92
0.0157	45.81
0.0140	47.41
0.0153	45.90
0.0157	43.88
0.0142	45.15
0.0150	48.22
0.0157	46.88
0.0142	46.35
0.0151	48.36
0.0157	45.97
0.0152	44.14
0.0157	45.71
0.0158	45.88

Average 45.38
Standard Dev. 2.746
Coeff. of Var. [%] 6.051
Min. 40.47
Max. 50.85
Number of Spec. 18

Average_{norm} 0.0151 45.65
Standard Dev._{norm} 1.571
Coeff. of Var. [%]_{norm} 3.442
Min. 0.0140 41.92
Max. 0.0158 48.36
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Tension Properties (OHT1)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

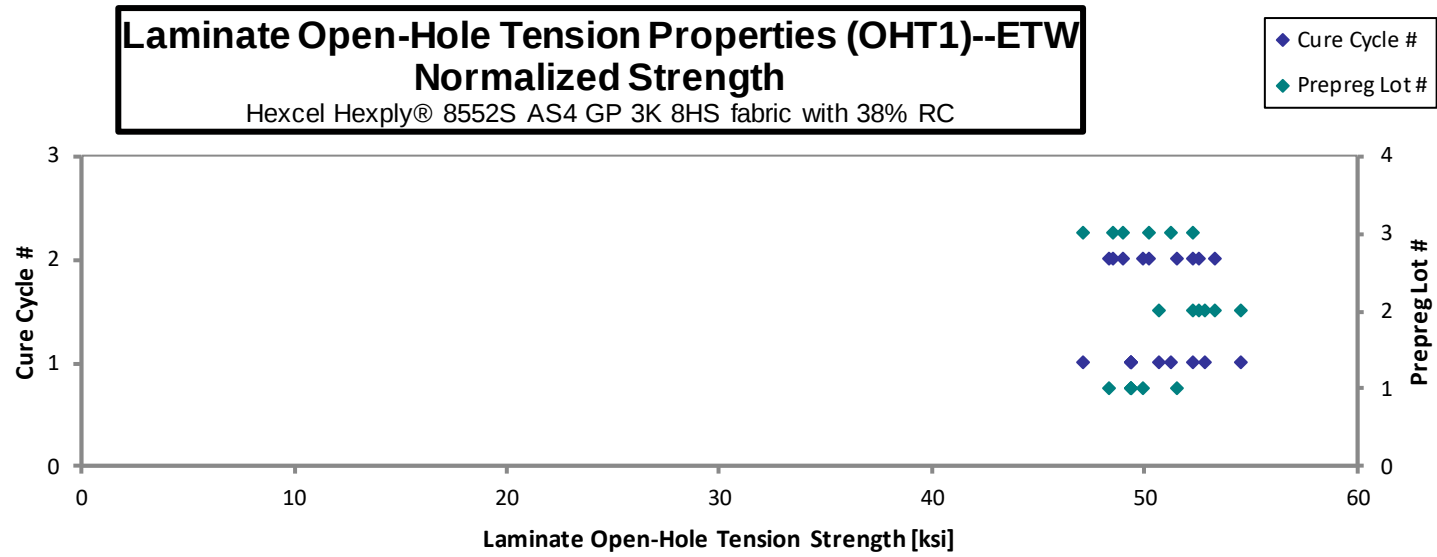
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPADA111D	A	M1	1	1	48.08	0.1234	8	M(A,L)GM
HPADA112D	A	M1	1	1	47.13	0.1256	8	M(A,L)GM
HPADA113D	A	M1	1	1	47.53	0.1246	8	M(A,L)GM
HPADA211D	A	M2	1	2	48.43	0.1237	8	M(A,L)GM
HPADA212D	A	M2	1	2	46.91	0.1237	8	M(A,L)GM
HPADA213D	A	M2	1	2	50.03	0.1235	8	M(A,L)GM
HPADB111D	B	M1	2	1	52.23	0.1253	8	M(A,L)GM
HPADB112D	B	M1	2	1	48.26	0.1261	8	M(A,L)GM
HPADB113D	B	M1	2	1	50.22	0.1264	8	M(A,L)GM
HPADB211D	B	M2	2	2	51.80	0.1235	8	M(A,L)GM
HPADB212D	B	M2	2	2	50.09	0.1254	8	M(A,L)GM
HPADB213D	B	M2	2	2	50.37	0.1252	8	M(A,L)GM
HPADC111D	C	M1	3	1	51.31	0.1224	8	M(A,L)GM
HPADC112D	C	M1	3	1	45.47	0.1244	8	M(A,L)GM
HPADC113D	C	M1	3	1	49.18	0.1250	8	M(A,L)GM
HPADC211D	C	M2	3	2	48.94	0.1231	8	M(A,L)GM
HPADC212D	C	M2	3	2	47.50	0.1239	8	M(A,L)GM
HPADC213D	C	M2	3	2	47.13	0.1235	8	M(A,L)GM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0154	49.42
0.0157	49.34
0.0156	49.37
0.0155	49.93
0.0155	48.35
0.0154	51.50
0.0157	54.51
0.0158	50.72
0.0158	52.90
0.0154	53.29
0.0157	52.34
0.0157	52.56
0.0153	52.32
0.0156	47.15
0.0156	51.21
0.0154	50.19
0.0155	49.03
0.0154	48.50

Average 48.92
Standard Dev. 1.863
Coeff. of Var. [%] 3.808
Min. 45.47
Max. 52.23
Number of Spec. 18

Average_{norm} 0.0155 50.70
Standard Dev._{norm} 1.994
Coeff. of Var. [%]_{norm} 3.934
Min. 0.0153 47.15
Max. 0.0158 54.51
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.15 “10/80/10” Open-Hole Tension 2 Properties (OHT2)

Laminate Open-Hole Tension Properties (OHT2)--CTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

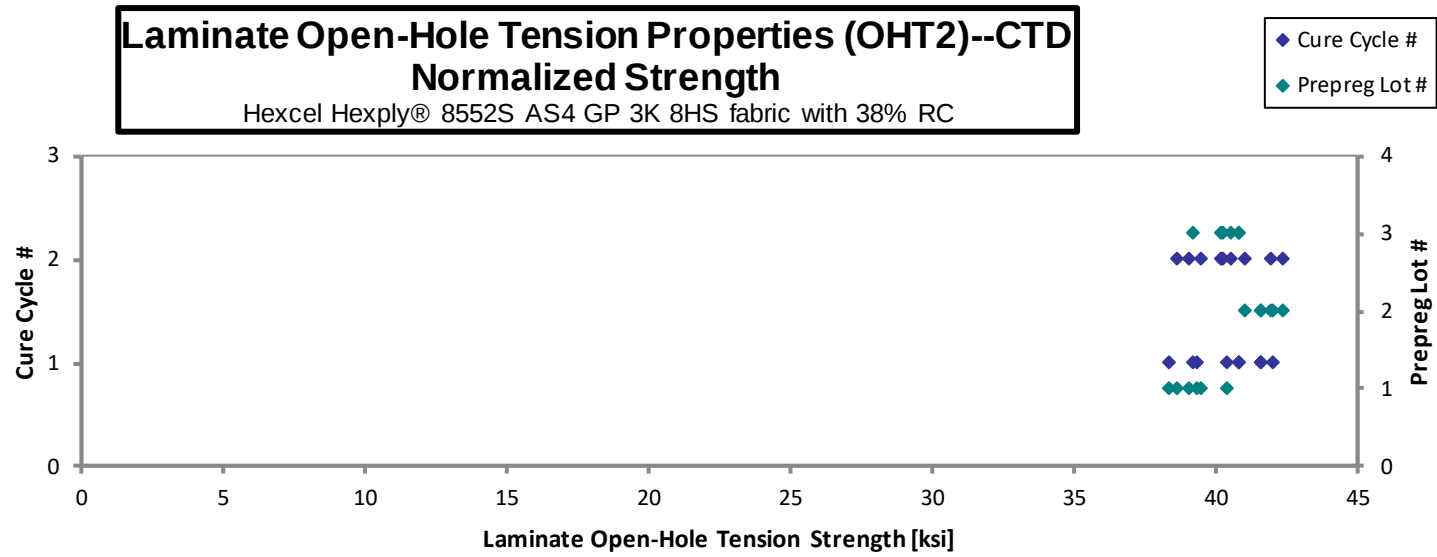
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAEA111B	A	M1	1	1	36.99	0.1596	10	AGM
HPAEA112B	A	M1	1	1	38.96	0.1556	10	AGM
HPAEA113B	A	M1	1	1	40.83	0.1411	10	AGM
HPAEA211B	A	M2	1	2	37.69	0.1557	10	AGM
HPAEA212B	A	M2	1	2	37.42	0.1550	10	AGM
HPAEA213B	A	M2	1	2	38.86	0.1525	10	AGM
HPAEB111B	B	M1	2	1	39.88	0.1581	10	LGM
HPAEB112B	B	M1	2	1	39.80	0.1567	10	LGM
HPAEB113B	B	M1	2	1	40.92	0.1526	10	LGM
HPAEB211B	B	M2	2	2	39.49	0.1595	10	AGM
HPAEB212B	B	M2	2	2	40.40	0.1575	10	AGM
HPAEB213B	B	M2	2	2	40.43	0.1522	10	AGM
HPAEC111B	C	M1	3	1	38.59	0.1589	10	AGM
HPAEC112B	C	M1	3	1	39.09	0.1568	10	AGM
HPAEC113B	C	M1	3	1	42.31	0.1390	10	AGM
HPAEC211B	C	M2	3	2	38.10	0.1582	10	AGM
HPAEC212B	C	M2	3	2	38.65	0.1563	10	AGM
HPAEC213B	C	M2	3	2	43.89	0.1386	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0160	39.36
0.0156	40.42
0.0141	38.40
0.0156	39.11
0.0155	38.66
0.0152	39.50
0.0158	42.04
0.0157	41.59
0.0153	41.62
0.0160	42.00
0.0157	42.41
0.0152	41.03
0.0159	40.87
0.0157	40.87
0.0139	39.19
0.0158	40.19
0.0156	40.27
0.0139	40.55

Average 39.57
Standard Dev. 1.733
Coeff. of Var. [%] 4.379
Min. 36.99
Max. 43.89
Number of Spec. 18

Average_{norm} 0.0154 40.45
Standard Dev._{norm} 1.214
Coeff. of Var. [%]_{norm} 3.001
Min. 0.0139 38.40
Max. 0.0160 42.41
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Tension Properties (OHT2)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

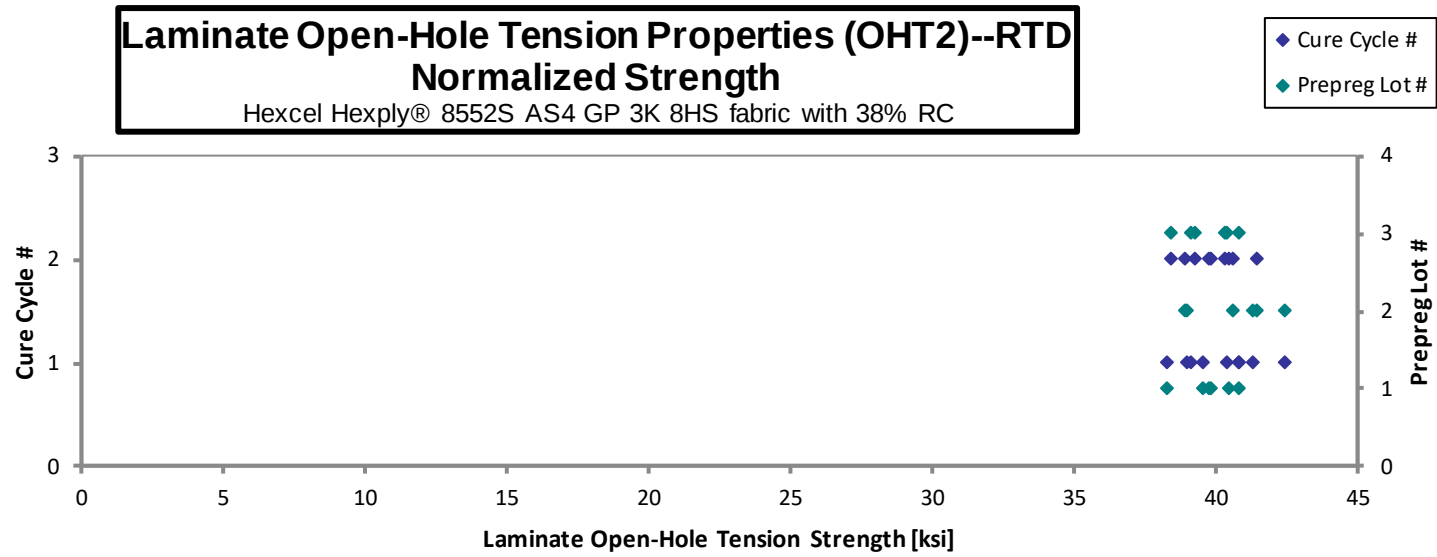
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAEA111A	A	M1	1	1	41.29	0.1392	10	AGM
HPAEA112A	A	M1	1	1	38.67	0.1534	10	AGM
HPAEA113A	A	M1	1	1	38.53	0.1589	10	AGM
HPAEA211A	A	M2	1	2	41.55	0.1439	10	AGM
HPAEA212A	A	M2	1	2	38.85	0.1537	10	AGM
HPAEA213A	A	M2	1	2	38.80	0.1566	10	AGM
HPAEB111A	B	M1	2	1	42.07	0.1390	10	AGM
HPAEB112A	B	M1	2	1	41.34	0.1501	10	AGM
HPAEB113A	B	M1	2	1	40.97	0.1555	10	AGM
HPAEB211A	B	M2	2	2	41.44	0.1409	10	AGM
HPAEB212A	B	M2	2	2	39.83	0.1530	10	AGM
HPAEB213A	B	M2	2	2	39.43	0.1578	10	AGM
HPAEC111A	C	M1	3	1	41.71	0.1407	10	AGM
HPAEC112A	C	M1	3	1	40.06	0.1513	10	AGM
HPAEC113A	C	M1	3	1	39.06	0.1569	10	AGM
HPAEC211A	C	M2	3	2	41.25	0.1398	10	AGM
HPAEC212A	C	M2	3	2	39.52	0.1492	10	AGM
HPAEC213A	C	M2	3	2	38.95	0.1554	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0139	38.30
0.0153	39.54
0.0159	40.82
0.0144	39.86
0.0154	39.81
0.0157	40.49
0.0139	38.99
0.0150	41.36
0.0155	42.47
0.0141	38.91
0.0153	40.62
0.0158	41.48
0.0141	39.13
0.0151	40.41
0.0157	40.84
0.0140	38.44
0.0149	39.30
0.0155	40.36

Average 40.18
Standard Dev. 1.244
Coeff. of Var. [%] 3.096
Min. 38.53
Max. 42.07
Number of Spec. 18

Average_{norm} 0.0150 40.06
Standard Dev._{norm} 1.122
Coeff. of Var. [%]_{norm} 2.801
Min. 0.0139 38.30
Max. 0.0159 42.47
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Tension Properties (OHT2)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

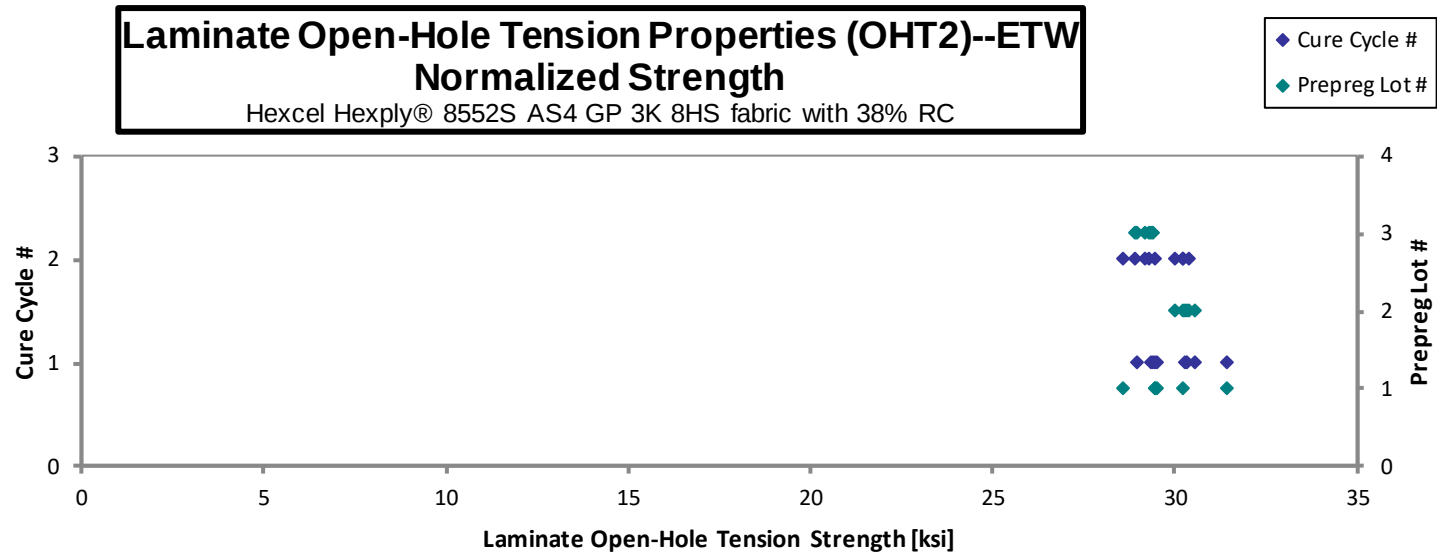
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAEA111D	A	M1	1	1	27.92	0.1583	10	AGM
HPAEA112D	A	M1	1	1	29.60	0.1594	10	AGM
HPAEA113D	A	M1	1	1	28.00	0.1581	10	AGM
HPAEA211D	A	M2	1	2	28.58	0.1546	10	AGM
HPAEA212D	A	M2	1	2	27.13	0.1581	10	AGM
HPAEA213D	A	M2	1	2	28.71	0.1579	10	AGM
HPAEB111D	B	M1	2	1	29.98	0.1516	10	AGM
HPAEB112D	B	M1	2	1	28.84	0.1590	10	AGM
HPAEB113D	B	M1	2	1	28.36	0.1603	10	AGM
HPAEB211D	B	M2	2	2	29.63	0.1531	10	AGM
HPAEB212D	B	M2	2	2	28.28	0.1592	10	AGM
HPAEB213D	B	M2	2	2	28.35	0.1608	10	AGM
HPAEC111D	C	M1	3	1	28.68	0.1539	10	AGM
HPAEC112D	C	M1	3	1	28.21	0.1559	10	AGM
HPAEC113D	C	M1	3	1	27.83	0.1561	10	AGM
HPAEC211D	C	M2	3	2	28.62	0.1535	10	AGM
HPAEC212D	C	M2	3	2	27.87	0.1557	10	AGM
HPAEC213D	C	M2	3	2	28.10	0.1557	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0158	29.45
0.0159	31.45
0.0158	29.51
0.0155	29.46
0.0158	28.59
0.0158	30.23
0.0152	30.30
0.0159	30.57
0.0160	30.31
0.0153	30.23
0.0159	30.02
0.0161	30.39
0.0154	29.42
0.0156	29.33
0.0156	28.96
0.0153	29.28
0.0156	28.93
0.0156	29.17

Average 28.48
Standard Dev. 0.7071
Coeff. of Var. [%] 2.482
Min. 27.13
Max. 29.98
Number of Spec. 18

Average_{norm} 0.0157 29.76
Standard Dev._{norm} 0.7201
Coeff. of Var. [%]_{norm} 2.420
Min. 0.0152 28.59
Max. 0.0161 31.45
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.16 “40/20/40” Open-Hole Tension 3 Properties (OHT3)

Laminate Open-Hole Tension Properties (OHT3)--CTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

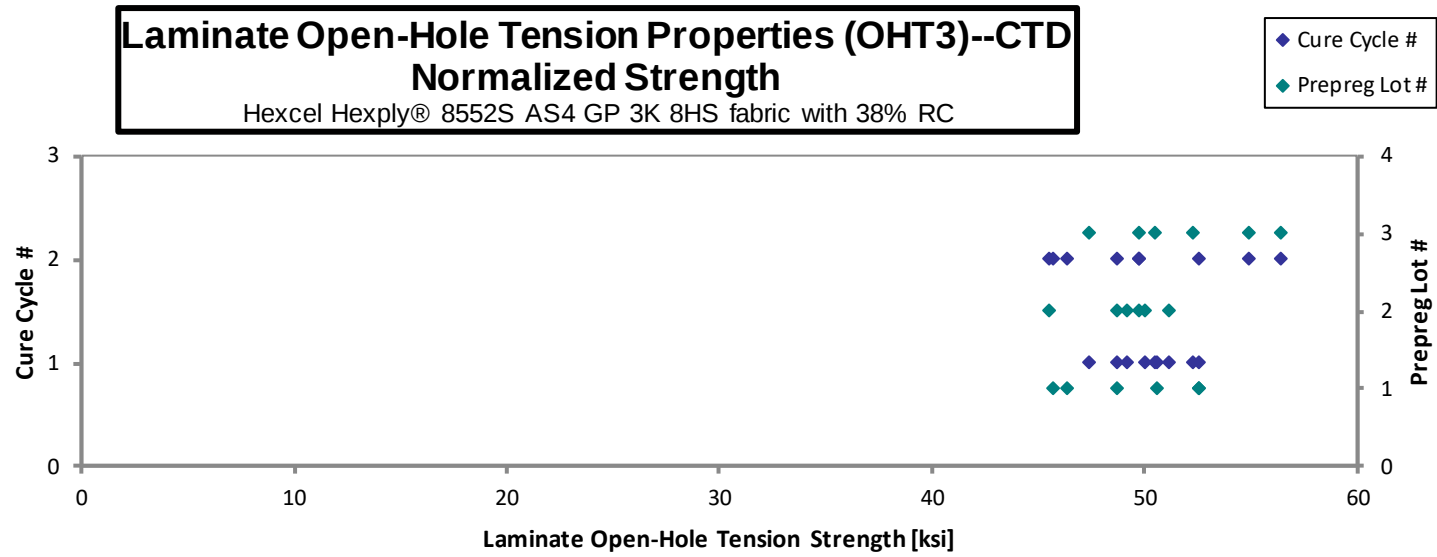
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAFA111B	A	M1	1	1	45.24	0.1617	10	LGM
HPAFA112B	A	M1	1	1	48.13	0.1576	10	LGM
HPAFA113B	A	M1	1	1	55.96	0.1408	10	LGM
HPAFA211B	A	M2	1	2	45.67	0.1524	10	LGM
HPAFA212B	A	M2	1	2	42.96	0.1595	10	LGM
HPAFA213B	A	M2	1	2	49.72	0.1586	10	LGM
HPAFB111B	B	M1	2	1	49.36	0.1521	10	LGM
HPAFB112B	B	M1	2	1	54.12	0.1418	10	LGM
HPAFB113B	B	M1	2	1	48.21	0.1531	10	LGM
HPAFB211B	B	M2	2	2	45.71	0.1599	10	LGM
HPAFB212B	B	M2	2	2	42.85	0.1595	10	LGM
HPAFB213B	B	M2	2	2	48.17	0.1549	10	LGM
HPAFC111B	C	M1	3	1	49.58	0.1582	10	LGM
HPAFC112B	C	M1	3	1	48.57	0.1561	10	LGM
HPAFC113B	C	M1	3	1	50.55	0.1408	10	LGM
HPAFC211B	C	M2	3	2	47.82	0.1561	10	LGM
HPAFC212B	C	M2	3	2	53.13	0.1550	10	LGM
HPAFC213B	C	M2	3	2	61.03	0.1387	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0162	48.76
0.0158	50.56
0.0141	52.54
0.0152	46.41
0.0159	45.67
0.0159	52.55
0.0152	50.05
0.0142	51.16
0.0153	49.19
0.0160	48.74
0.0159	45.56
0.0155	49.72
0.0158	52.28
0.0156	50.54
0.0141	47.43
0.0156	49.76
0.0155	54.89
0.0139	56.43

Average 49.27
Standard Dev. 4.554
Coeff. of Var. [%] 9.243
Min. 42.85
Max. 61.03
Number of Spec. 18

Average_{norm} 0.0153 50.12
Standard Dev._{norm} 2.940
Coeff. of Var. [%]_{norm} 5.866
Min. 0.0139 45.56
Max. 0.0162 56.43
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Tension Properties (OHT3)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

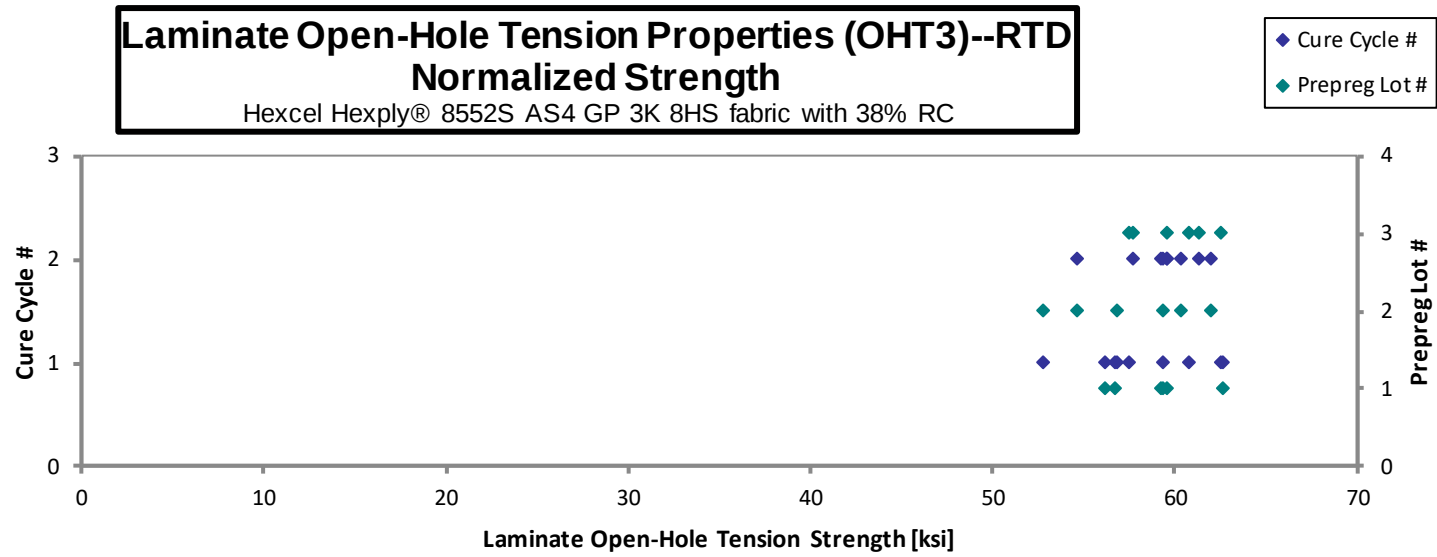
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAFA111A	A	M1	1	1	67.53	0.1392	10	LGM
HPAFA112A	A	M1	1	1	55.06	0.1547	10	LGM
HPAFA113A	A	M1	1	1	52.30	0.1612	10	LGM
HPAFA211A	A	M2	1	2	64.59	0.1384	10	LGM
HPAFA212A	A	M2	1	2	58.85	0.1514	10	LGM
HPAFA213A	A	M2	1	2	56.18	0.1582	10	LGM
HPAFB111A	B	M1	2	1	49.72	0.1593	10	LGM
HPAFB112A	B	M1	2	1	52.84	0.1615	10	LGM
HPAFB113A	B	M1	2	1	55.51	0.1603	10	LGM
HPAFB211A	B	M2	2	2	65.81	0.1413	10	LGM
HPAFB212A	B	M2	2	2	54.13	0.1514	10	LGM
HPAFB213A	B	M2	2	2	57.81	0.1566	10	LGM
HPAFC111A	C	M1	3	1	64.55	0.1413	10	LGM
HPAFC112A	C	M1	3	1	62.29	0.1506	10	LGM
HPAFC113A	C	M1	3	1	55.44	0.1556	10	LGM
HPAFC211A	C	M2	3	2	64.07	0.1396	10	LGM
HPAFC212A	C	M2	3	2	61.92	0.1486	10	LGM
HPAFC213A	C	M2	3	2	56.42	0.1534	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0139	62.67
0.0155	56.77
0.0161	56.19
0.0138	59.60
0.0151	59.39
0.0158	59.25
0.0159	52.80
0.0161	56.89
0.0160	59.32
0.0141	61.98
0.0151	54.62
0.0157	60.37
0.0141	60.79
0.0151	62.56
0.0156	57.50
0.0140	59.61
0.0149	61.33
0.0153	57.70

Average 58.61
Standard Dev. 5.273
Coeff. of Var. [%] 8.996
Min. 49.72
Max. 67.53
Number of Spec. 18

Average_{norm} 0.0151 58.85
Standard Dev._{norm} 2.712
Coeff. of Var. [%]_{norm} 4.609
Min. 0.0138 52.80
Max. 0.0161 62.67
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Tension Properties (OHT3)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

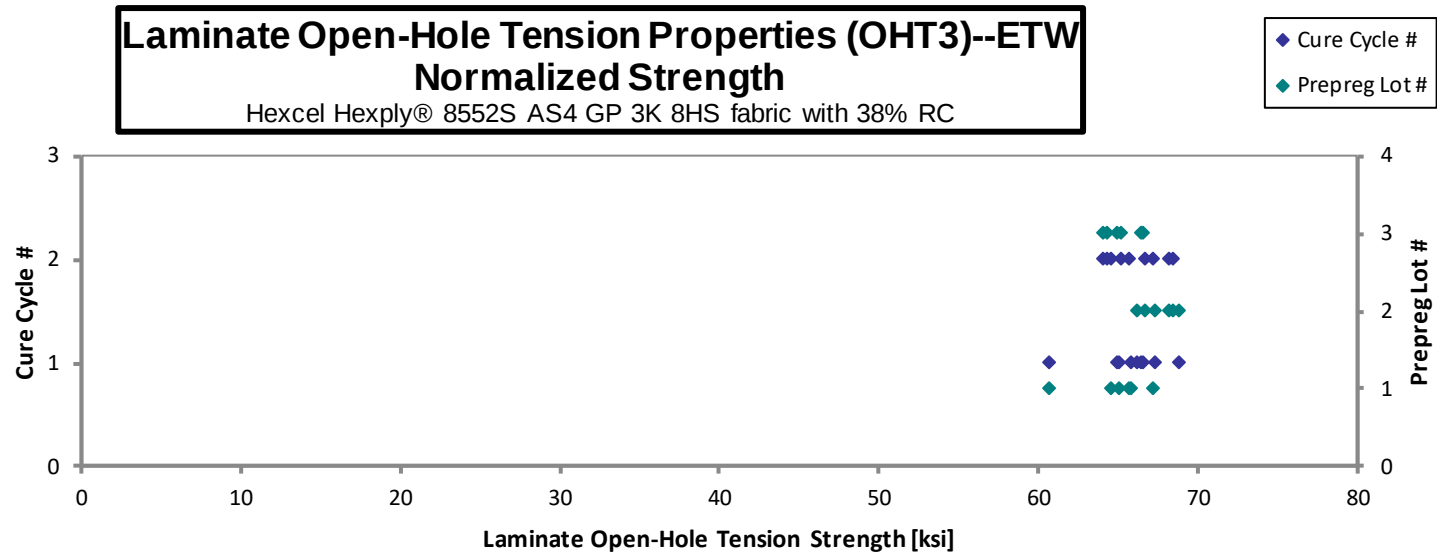
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAFA111D	A	M1	1	1	61.60	0.1584	10	LGM
HPAFA112D	A	M1	1	1	56.96	0.1597	10	LGM
HPAFA113D	A	M1	1	1	62.13	0.1589	10	LGM
HPAFA211D	A	M2	1	2	66.21	0.1489	10	M(A,L)GM
HPAFA212D	A	M2	1	2	60.91	0.1592	10	LGM
HPAFA213D	A	M2	1	2	63.80	0.1579	10	M(A,L)GM
HPAFB111D	B	M1	2	1	62.91	0.1578	10	LGM
HPAFB112D	B	M1	2	1	65.11	0.1585	10	LGM
HPAFB113D	B	M1	2	1	64.60	0.1562	10	M(A,L)GM
HPAFB212D	B	M2	2	2	63.82	0.1568	10	LGM
HPAFB213D	B	M2	2	2	64.28	0.1599	10	LGM
HPAFB214D	B	M2	2	2	63.89	0.1601	10	LGM
HPAFC111D	C	M1	3	1	65.16	0.1529	10	LGM
HPAFC112D	C	M1	3	1	63.02	0.1545	10	M(A,L)GM
HPAFC113D	C	M1	3	1	64.16	0.1557	10	M(A,L)GM
HPAFC211D	C	M2	3	2	63.92	0.1529	10	LGM
HPAFC212D	C	M2	3	2	62.28	0.1543	10	LGM
HPAFC213D	C	M2	3	2	62.58	0.1541	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0158	65.05
0.0160	60.66
0.0159	65.81
0.0149	65.71
0.0159	64.62
0.0158	67.16
0.0158	66.16
0.0158	68.80
0.0156	67.29
0.0157	66.71
0.0160	68.53
0.0160	68.19
0.0153	66.43
0.0154	64.90
0.0156	66.57
0.0153	65.15
0.0154	64.08
0.0154	64.29

Average 63.19
Standard Dev. 2.052
Coeff. of Var. [%] 3.248
Min. 56.96
Max. 66.21
Number of Spec. 18

Average_{norm} 0.0156 65.89
Standard Dev._{norm} 1.923
Coeff. of Var. [%]_{norm} 2.918
Min. 0.0149 60.66
Max. 0.0160 68.80
Number of Spec. 18 18



4.17 “25/50/25” Filled-Hole Tension 1 Properties (FHT1)

**Laminate Filled-Hole Tension Properties (FHT1)--CTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

 t_{ply} [in]

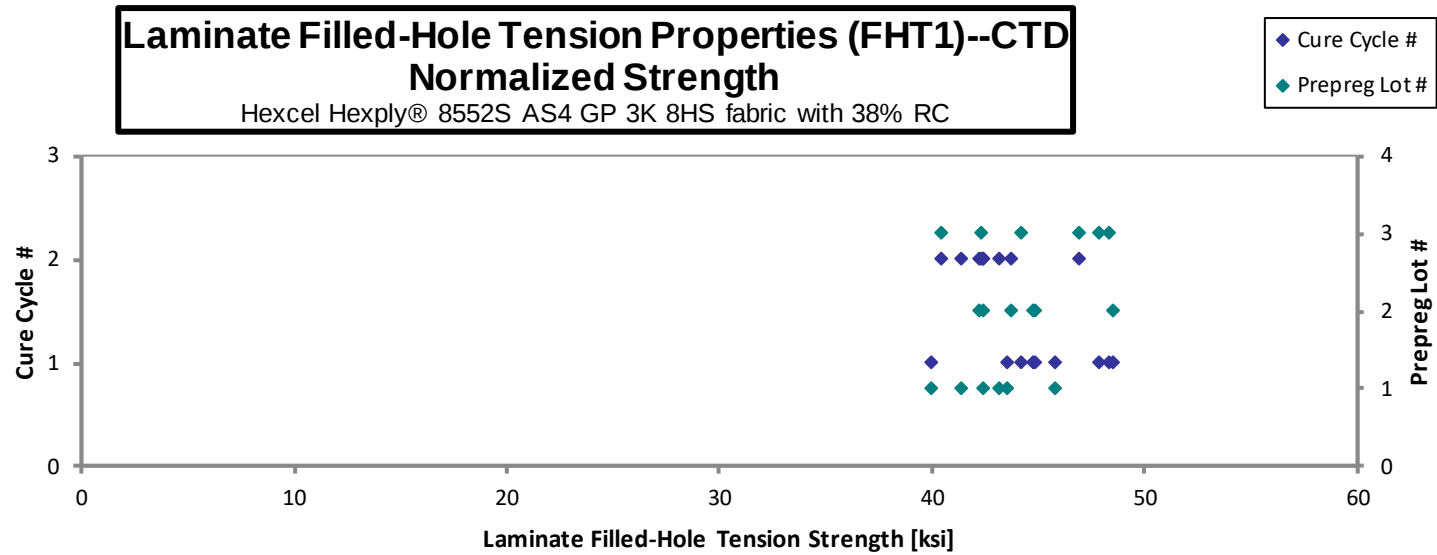
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA4A111B	A	M1	1	1	40.79	0.1282	8	LGM
HPA4A112B	A	M1	1	1	43.33	0.1269	8	LGM
HPA4A113B	A	M1	1	1	44.16	0.1088	8	LGM
HPA4A211B	A	M2	1	2	44.34	0.1121	8	LGM
HPA4A212B	A	M2	1	2	42.19	0.1207	8	LGM
HPA4A213B	A	M2	1	2	41.41	0.1250	8	LGM
HPA4B111B	B	M1	2	1	41.25	0.1306	8	LGM
HPA4B112B	B	M1	2	1	45.37	0.1284	8	LGM
HPA4B113B	B	M1	2	1	47.78	0.1124	8	LGM
HPA4B211B	B	M2	2	2	40.95	0.1282	8	LGM
HPA4B212B	B	M2	2	2	40.26	0.1266	8	LGM
HPA4B213B	B	M2	2	2	44.41	0.1142	8	LGM
HPA4C111B	C	M1	3	1	45.27	0.1268	8	LGM
HPA4C112B	C	M1	3	1	46.26	0.1255	8	LGM
HPA4C113B	C	M1	3	1	47.04	0.1127	8	LGM
HPA4C211B	C	M2	3	2	41.21	0.1234	8	LGM
HPA4C212B	C	M2	3	2	45.92	0.1227	8	LGM
HPA4C213B	C	M2	3	2	42.41	0.1143	8	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0160	43.58
0.0159	45.82
0.0136	40.02
0.0140	41.41
0.0151	42.44
0.0156	43.14
0.0163	44.88
0.0161	48.56
0.0140	44.73
0.0160	43.74
0.0158	42.46
0.0143	42.25
0.0159	47.85
0.0157	48.36
0.0141	44.19
0.0154	42.37
0.0153	46.95
0.0143	40.40

Average 43.58
 Standard Dev. 2.361
 Coeff. of Var. [%] 5.417
 Min. 40.26
 Max. 47.78
 Number of Spec. 18

Average_{norm} 0.0152 44.06
 Standard Dev._{norm} 2.600
 Coeff. of Var. [%]_{norm} 5.901
 Min. 0.0136 40.02
 Max. 0.0163 48.56
 Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Tension Properties (FHT1)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

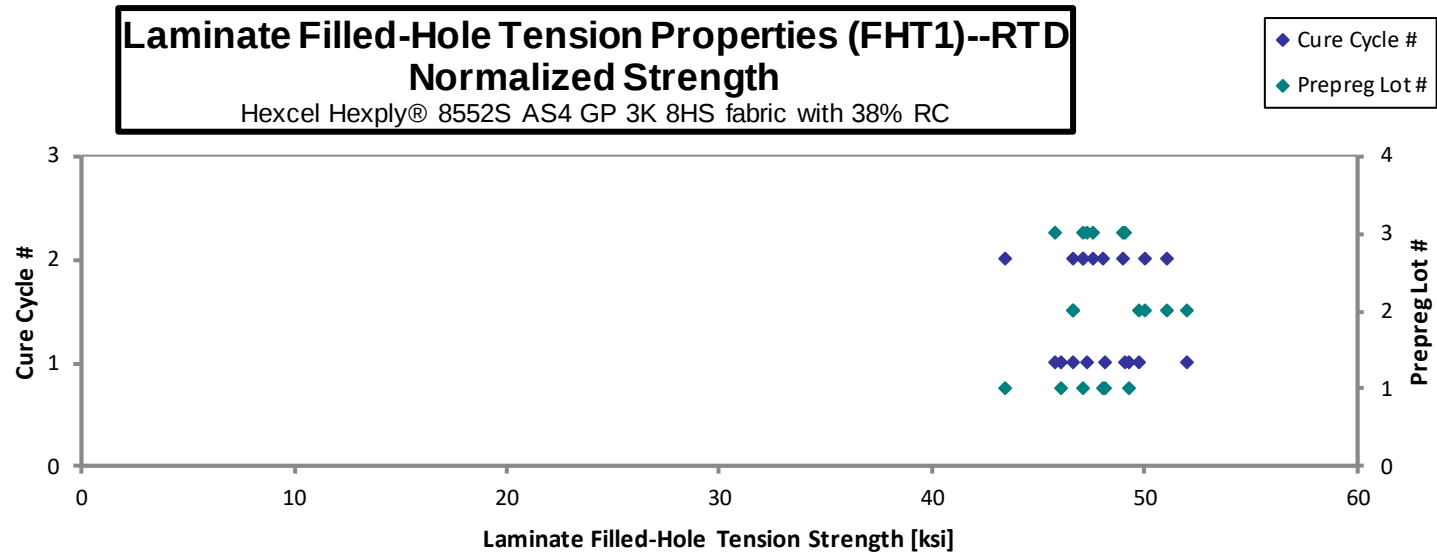
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA4A111A	A	M1	1	1	52.43	0.1103	8	LGM
HPA4A112A	A	M1	1	1	48.32	0.1224	8	LGM
HPA4A113A	A	M1	1	1	43.55	0.1271	8	LGM
HPA4A211A	A	M2	1	2	46.28	0.1127	8	LGM
HPA4A212A	A	M2	1	2	47.63	0.1212	8	LGM
HPA4A213A	A	M2	1	2	45.37	0.1246	8	LGM
HPA4B111A	B	M1	2	1	51.08	0.1169	8	LGM
HPA4B112A	B	M1	2	1	45.26	0.1237	8	LGM
HPA4B113A	B	M1	2	1	48.40	0.1290	8	LGM
HPA4B211A	B	M2	2	2	53.48	0.1146	8	LGM
HPA4B212A	B	M2	2	2	48.79	0.1231	8	LGM
HPA4B213A	B	M2	2	2	44.09	0.1271	8	LGM
HPA4C111A	C	M1	3	1	48.61	0.1131	8	LGM
HPA4C112A	C	M1	3	1	46.13	0.1231	8	LGM
HPA4C113A	C	M1	3	1	46.51	0.1266	8	LGM
HPA4C211A	C	M2	3	2	51.50	0.1141	8	LGM
HPA4C212A	C	M2	3	2	46.88	0.1206	8	LGM
HPA4C213A	C	M2	3	2	46.33	0.1233	8	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0138	48.17
0.0153	49.28
0.0159	46.11
0.0141	43.46
0.0151	48.09
0.0156	47.11
0.0146	49.74
0.0155	46.66
0.0161	52.04
0.0143	51.05
0.0154	50.03
0.0159	46.68
0.0141	45.81
0.0154	47.33
0.0158	49.06
0.0143	48.98
0.0151	47.10
0.0154	47.59

Average 47.81
Standard Dev. 2.811
Coeff. of Var. [%] 5.879
Min. 43.55
Max. 53.48
Number of Spec. 18

Average_{norm} 0.0151 48.02
Standard Dev._{norm} 2.048
Coeff. of Var. [%]_{norm} 4.264
Min. 0.0138 43.46
Max. 0.0161 52.04
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Tension Properties (FHT1)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

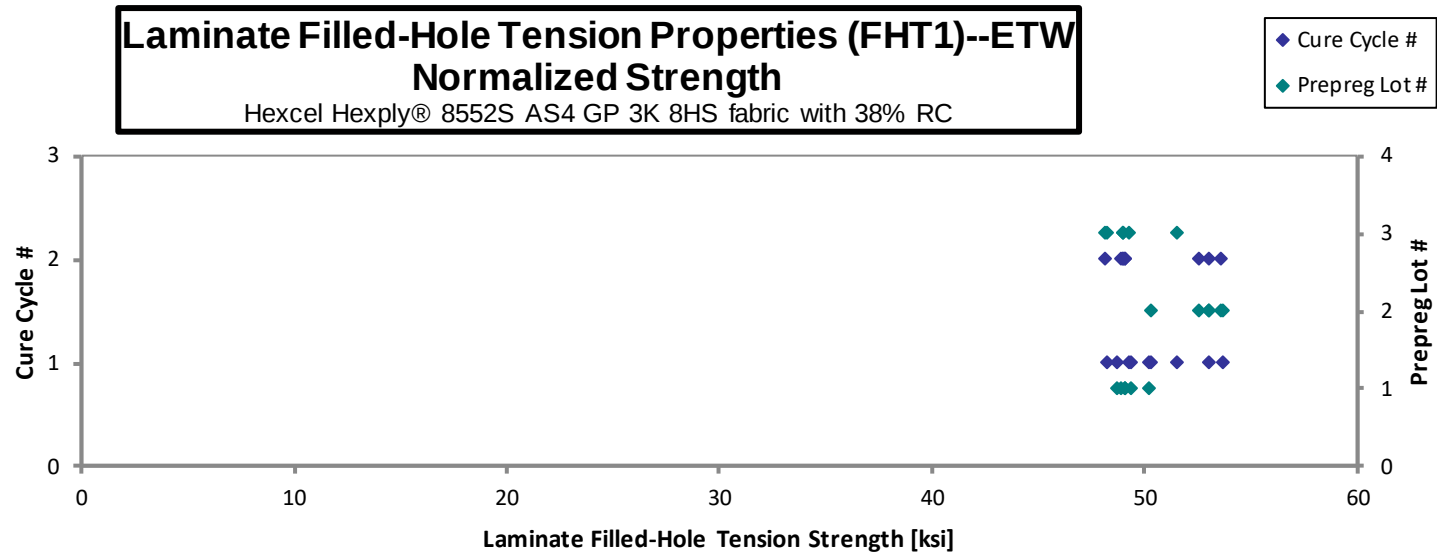
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA4A111D	A	M1	1	1	48.14	0.1253	8	M(A,L)GM
HPA4A112D	A	M1	1	1	46.32	0.1262	8	M(A,L)GM
HPA4A113D	A	M1	1	1	47.15	0.1257	8	M(A,L)GM
HPA4A211D	A	M2	1	2	46.48	0.1268	8	M(A,L)GM
HPA4A212D	A	M2	1	2	46.48	0.1267	8	M(A,L)GM
HPA4A213D	A	M2	1	2	47.25	0.1242	8	M(A,L)GM
HPA4B111D	B	M1	2	1	49.46	0.1286	8	M(A,L)GM
HPA4B112D	B	M1	2	1	50.39	0.1279	8	M(A,L)GM
HPA4B113D	B	M1	2	1	48.08	0.1255	8	M(A,L)GM
HPA4B211D	B	M2	2	2	50.26	0.1256	8	M(A,L)GM
HPA4B212D	B	M2	2	2	50.77	0.1268	8	M(A,L)GM
HPA4B213D	B	M2	2	2	50.08	0.1272	8	M(A,L)GM
HPA4C111D	C	M1	3	1	45.91	0.1262	8	M(A,L)GM
HPA4C112D	C	M1	3	1	48.95	0.1263	8	M(A,L)GM
HPA4C113D	C	M1	3	1	47.35	0.1250	8	M(A,L)GM
HPA4C211D	C	M2	3	2	47.02	0.1230	8	M(A,L)GM
HPA4C212D	C	M2	3	2	47.49	0.1239	8	M(A,L)GM
HPA4C213D	C	M2	3	2	47.57	0.1236	8	M(A,L)GM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0157	50.25
0.0158	48.71
0.0157	49.37
0.0158	49.10
0.0158	49.09
0.0155	48.89
0.0161	53.02
0.0160	53.68
0.0157	50.28
0.0157	52.60
0.0159	53.65
0.0159	53.06
0.0158	48.29
0.0158	51.51
0.0156	49.30
0.0154	48.18
0.0155	49.05
0.0155	49.00

Average 48.06
Standard Dev. 1.548
Coeff. of Var. [%] 3.220
Min. 45.91
Max. 50.77
Number of Spec. 18

Average_{norm} 0.0157 50.39
Standard Dev._{norm} 1.961
Coeff. of Var. [%]_{norm} 3.891
Min. 0.0154 48.18
Max. 0.0161 53.68
Number of Spec. 18 18



4.18 “10/80/10” Filled-Hole Tension 2 Properties (FHT2)

**Laminate Filled-Hole Tension Properties (FHT2)--CTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

 t_{ply} [in]

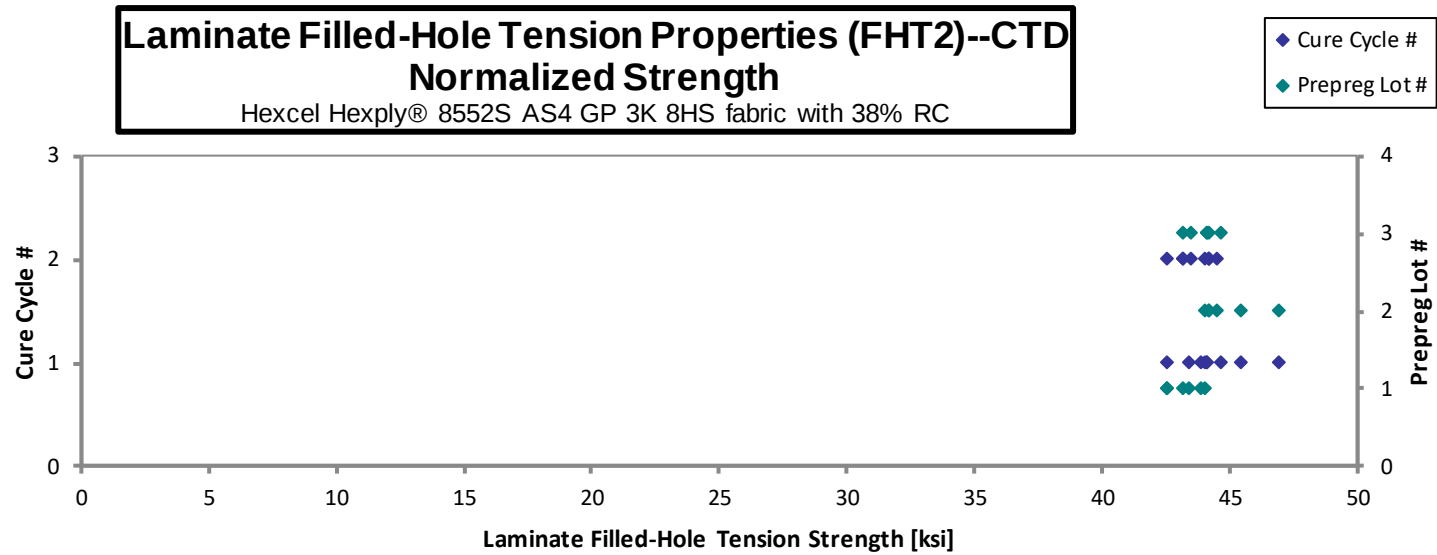
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA5A111B	A	M1	1	1	41.34	0.1577	10	AGM
HPA5A112B	A	M1	1	1	41.05	0.1554	10	M(A,L) GM
HPA5A113B	A	M1	1	1	43.72	0.1505	10	AGM
HPA5A211B	A	M2	1	2	39.81	0.1603	10	M(A,L) GM
HPA5A212B	A	M2	1	2	41.53	0.1591	10	M(A,L) GM
HPA5A213B	A	M2	1	2	42.01	0.1542	10	M(A,L) GM
HPA5B111B	B	M1	2	1	44.19	0.1594	10	M(A,L) GM
HPA5B112B	B	M1	2	1	42.90	0.1589	10	M(A,L) GM
HPA5B113B	B	M1	2	1	46.46	0.1423	10	M(A,L) GM
HPA5B211B	B	M2	2	2	41.19	0.1610	10	M(A,L) GM
HPA5B212B	B	M2	2	2	41.79	0.1587	10	M(A,L) GM
HPA5B213B	B	M2	2	2	43.69	0.1529	10	M(A,L) GM
HPA5C111B	C	M1	3	1	42.36	0.1561	10	M(A,L) GM
HPA5C112B	C	M1	3	1	43.48	0.1541	10	M(A,L) GM
HPA5C113B	C	M1	3	1	47.23	0.1402	10	M(A,L) GM
HPA5C211B	C	M2	3	2	41.40	0.1577	10	AGM
HPA5C212B	C	M2	3	2	41.34	0.1568	10	AGM
HPA5C213B	C	M2	3	2	46.39	0.1428	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0158	43.45
0.0155	42.52
0.0150	43.87
0.0160	42.55
0.0159	44.06
0.0154	43.20
0.0159	46.95
0.0159	45.45
0.0142	44.08
0.0161	44.20
0.0159	44.20
0.0153	44.54
0.0156	44.09
0.0154	44.68
0.0140	44.15
0.0158	43.51
0.0157	43.20
0.0143	44.17

Average 42.88
 Standard Dev. 2.087
 Coeff. of Var. [%] 4.867
 Min. 39.81
 Max. 47.23
 Number of Spec. 18

Average_{norm} 0.0154 44.05
 Standard Dev._{norm} 1.023
 Coeff. of Var. [%]_{norm} 2.322
 Min. 0.0140 42.52
 Max. 0.0161 46.95
 Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Tension Properties (FHT2)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

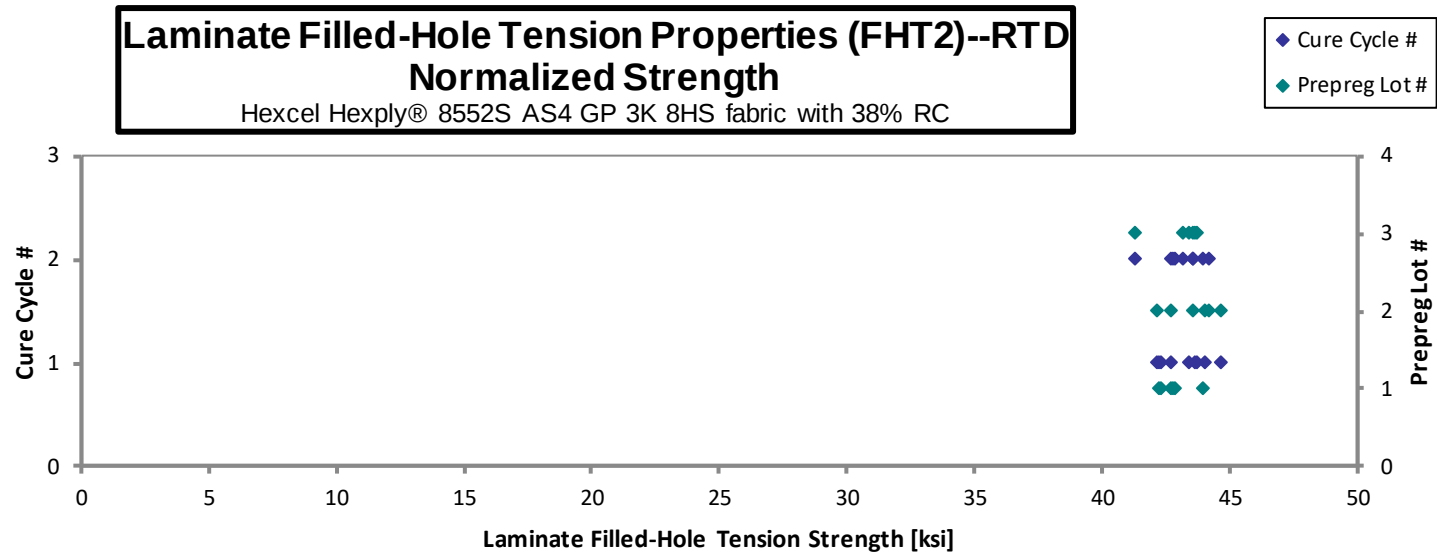
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA5A111A	A	M1	1	1	45.10	0.1407	10	M(A,L) GM
HPA5A112A	A	M1	1	1	41.61	0.1523	10	M(A,L) GM
HPA5A113A	A	M1	1	1	40.49	0.1584	10	AGM
HPA5A211A	A	M2	1	2	45.81	0.1400	10	M(A,L) GM
HPA5A212A	A	M2	1	2	42.51	0.1513	10	M(A,L) GM
HPA5A213A	A	M2	1	2	41.97	0.1570	10	AGM
HPA5B111A	B	M1	2	1	44.63	0.1416	10	M(A,L) GM
HPA5B112A	B	M1	2	1	42.54	0.1554	10	M(A,L) GM
HPA5B113A	B	M1	2	1	42.07	0.1592	10	M(A,L) GM
HPA5B211A	B	M2	2	2	45.64	0.1404	10	M(A,L) GM
HPA5B212A	B	M2	2	2	43.28	0.1509	10	AGM
HPA5B213A	B	M2	2	2	42.26	0.1570	10	M(A,L) GM
HPA5C111A	C	M1	3	1	46.00	0.1417	10	M(A,L) GM
HPA5C112A	C	M1	3	1	43.17	0.1517	10	M(A,L) GM
HPA5C113A	C	M1	3	1	42.11	0.1557	10	M(A,L) GM
HPA5C211A	C	M2	3	2	44.29	0.1400	10	AGM
HPA5C212A	C	M2	3	2	43.18	0.1515	10	AGM
HPA5C213A	C	M2	3	2	41.65	0.1556	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0141	42.29
0.0152	42.23
0.0158	42.75
0.0140	42.76
0.0151	42.86
0.0157	43.93
0.0142	42.13
0.0155	44.07
0.0159	44.66
0.0140	42.72
0.0151	43.54
0.0157	44.23
0.0142	43.45
0.0152	43.66
0.0156	43.70
0.0140	41.33
0.0151	43.59
0.0156	43.19

Average 43.24
Standard Dev. 1.635
Coeff. of Var. [%] 3.781
Min. 40.49
Max. 46.00
Number of Spec. 18

Average_{norm} 0.0150 43.17
Standard Dev._{norm} 0.8536
Coeff. of Var. [%]_{norm} 1.977
Min. 0.0140 41.33
Max. 0.0159 44.66
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Tension Properties (FHT2)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

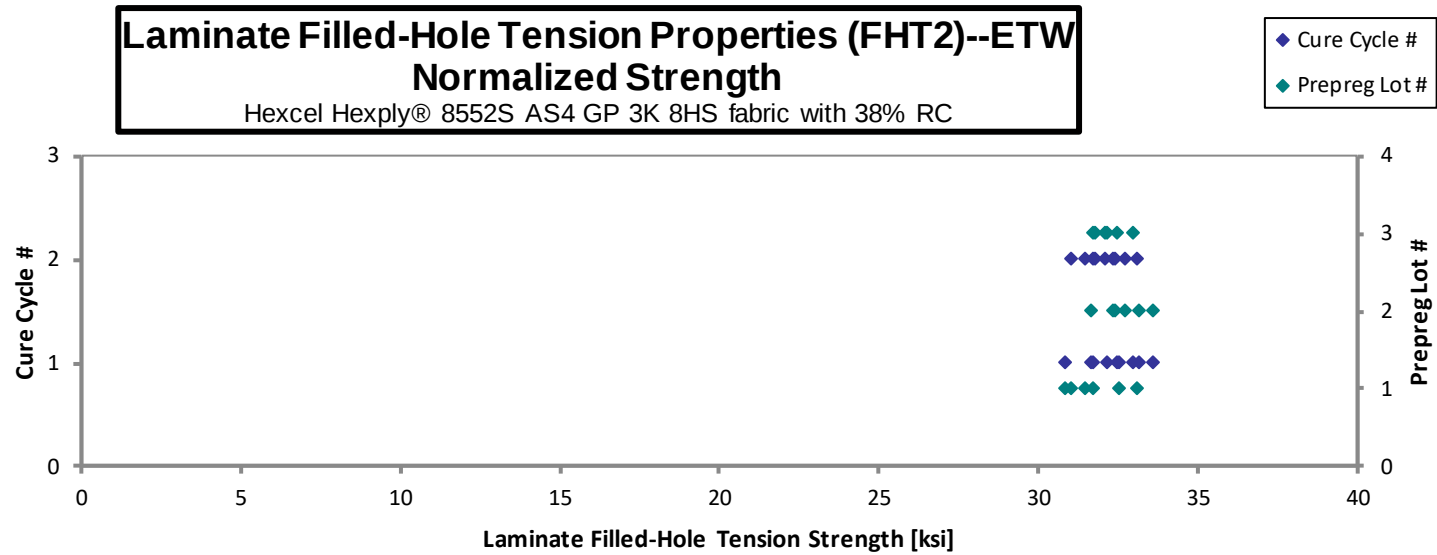
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA5A111D	A	M1	1	1	30.36	0.1525	10	AGM
HPA5A112D	A	M1	1	1	30.84	0.1581	10	AGM
HPA5A115D	A	M1	1	1	30.55	0.1556	10	AGM
HPA5A211D	A	M2	1	2	30.40	0.1531	10	AGM
HPA5A212D	A	M2	1	2	31.24	0.1588	10	AGM
HPA5A213D	A	M2	1	2	29.24	0.1615	10	AGM
HPA5B111D	B	M1	2	1	31.92	0.1580	10	AGM
HPA5B112D	B	M1	2	1	29.75	0.1596	10	AGM
HPA5B113D	B	M1	2	1	31.26	0.1591	10	AGM
HPA5B211D	B	M2	2	2	32.19	0.1526	10	AGM
HPA5B212D	B	M2	2	2	30.69	0.1584	10	AGM
HPA5B213D	B	M2	2	2	30.04	0.1614	10	AGM
HPA5C111D	C	M1	3	1	31.27	0.1559	10	AGM
HPA5C112D	C	M1	3	1	30.79	0.1566	10	AGM
HPA5C113D	C	M1	3	1	31.58	0.1567	10	AGM
HPA5C211D	C	M2	3	2	30.87	0.1543	10	AGM
HPA5C212D	C	M2	3	2	30.53	0.1562	10	AGM
HPA5C213D	C	M2	3	2	30.81	0.1562	10	AGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0153	30.87
0.0158	32.51
0.0156	31.70
0.0153	31.03
0.0159	33.08
0.0161	31.48
0.0158	33.63
0.0160	31.65
0.0159	33.15
0.0153	32.74
0.0158	32.41
0.0161	32.33
0.0156	32.49
0.0157	32.14
0.0157	32.99
0.0154	31.75
0.0156	31.79
0.0156	32.09

Average 30.80
Standard Dev. 0.7287
Coeff. of Var. [%] 2.366
Min. 29.24
Max. 32.19
Number of Spec. 18

Average_{norm} 0.0157 32.21
Standard Dev._{norm} 0.7466
Coeff. of Var. [%]_{norm} 2.318
Min. 0.0153 30.87
Max. 0.0161 33.63
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.19 “40/20/40” Filled-Hole Tension 3 Properties (FHT3)

Laminate Filled-Hole Tension Properties (FHT3)--CTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

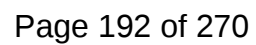
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA6A111B	A	M1	1	1	50.10	0.1595	10	LGM
HPA6A112B	A	M1	1	1	46.42	0.1573	10	LGM
HPA6A113B	A	M1	1	1	49.18	0.1410	10	LGM
HPA6A211B	A	M2	1	2	45.60	0.1638	10	LGM
HPA6A212B	A	M2	1	2	49.88	0.1422	10	LGM
HPA6A213B	A	M2	1	2	51.90	0.1503	10	LGM
HPA6B111B	B	M1	2	1	45.07	0.1594	10	LGM
HPA6B112B	B	M1	2	1	46.78	0.1580	10	LGM
HPA6B113B	B	M1	2	1	54.16	0.1437	10	LGM
HPA6B211B	B	M2	2	2	49.83	0.1572	10	LGM
HPA6B212B	B	M2	2	2	48.45	0.1564	10	LGM
HPA6B213B	B	M2	2	2	51.82	0.1538	10	LGM
HPA6C111B	C	M1	3	1	47.37	0.1572	10	LGM
HPA6C112B	C	M1	3	1	48.59	0.1560	10	LGM
HPA6C113B	C	M1	3	1	56.86	0.1421	10	LGM
HPA6C211B	C	M2	3	2	45.82	0.1574	10	LGM
HPA6C212B	C	M2	3	2	47.42	0.1547	10	LGM
HPA6C213B	C	M2	3	2	50.82	0.1438	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0159	53.25
0.0157	48.68
0.0141	46.22
0.0164	49.80
0.0142	47.30
0.0150	52.00
0.0159	47.91
0.0158	49.27
0.0144	51.88
0.0157	52.22
0.0156	50.52
0.0154	53.14
0.0157	49.63
0.0156	50.53
0.0142	53.85
0.0157	48.07
0.0155	48.91
0.0144	48.72

Average 49.23
Standard Dev. 3.108
Coeff. of Var. [%] 6.313
Min. 45.07
Max. 56.86
Number of Spec. 18

Average_{norm} 0.0153 50.11
Standard Dev._{norm} 2.211
Coeff. of Var. [%]_{norm} 4.413
Min. 0.0141 46.22
Max. 0.0164 53.85
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Tension Properties (FHT3)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

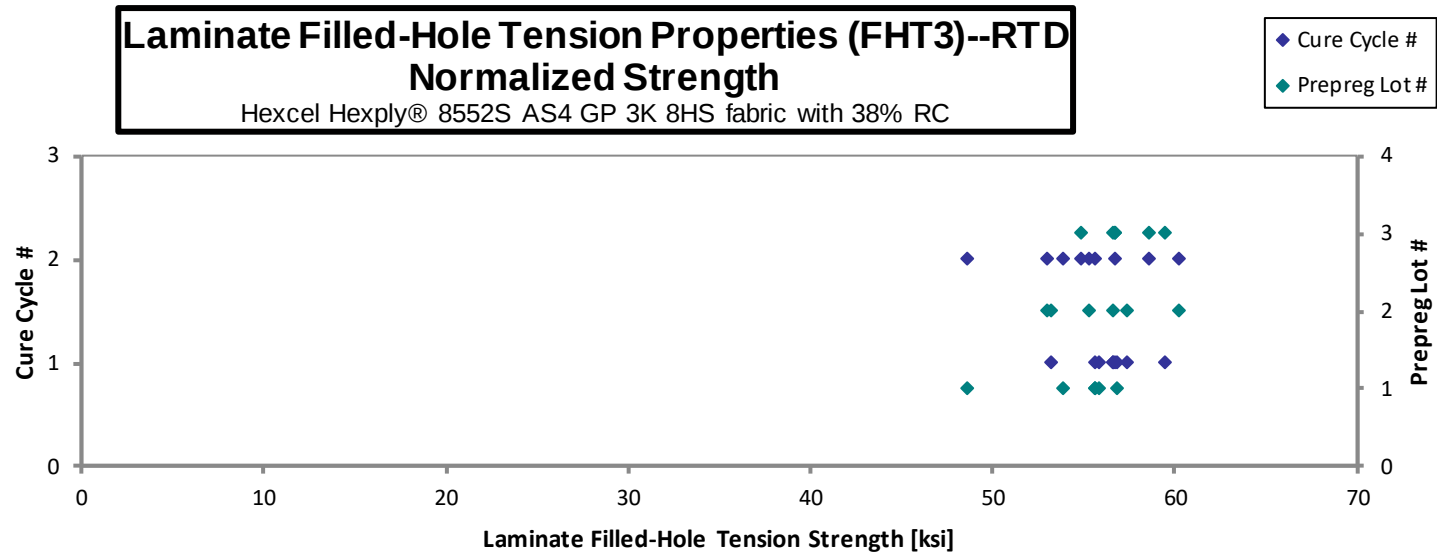
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA6A111A	A	M1	1	1	59.50	0.1432	10	LGM
HPA6A112A	A	M1	1	1	54.40	0.1533	10	LGM
HPA6A113A	A	M1	1	1	52.62	0.1591	10	LGM
HPA6A211A	A	M2	1	2	58.07	0.1438	10	LGM
HPA6A212A	A	M2	1	2	53.18	0.1520	10	LGM
HPA6A213A	A	M2	1	2	46.07	0.1582	10	LGM
HPA6B111A	B	M1	2	1	54.89	0.1454	10	LGM
HPA6B112A	B	M1	2	1	54.36	0.1562	10	LGM
HPA6B113A	B	M1	2	1	53.97	0.1595	10	LGM
HPA6B211A	B	M2	2	2	55.08	0.1445	10	LGM
HPA6B212A	B	M2	2	2	58.63	0.1541	10	LGM
HPA6B213A	B	M2	2	2	52.74	0.1574	10	LGM
HPA6C111A	C	M1	3	1	59.66	0.1427	10	LGM
HPA6C112A	C	M1	3	1	56.17	0.1513	10	LGM
HPA6C113A	C	M1	3	1	57.30	0.1558	10	LGM
HPA6C211A	C	M2	3	2	57.97	0.1421	10	LGM
HPA6C212A	C	M2	3	2	56.28	0.1511	10	LGM
HPA6C213A	C	M2	3	2	56.38	0.1560	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0143	56.80
0.0153	55.61
0.0159	55.80
0.0144	55.67
0.0152	53.89
0.0158	48.59
0.0145	53.19
0.0156	56.61
0.0160	57.39
0.0144	53.05
0.0154	60.25
0.0157	55.36
0.0143	56.76
0.0151	56.66
0.0156	59.52
0.0142	54.90
0.0151	56.71
0.0156	58.63

Average 55.41
Standard Dev. 3.220
Coeff. of Var. [%] 5.811
Min. 46.07
Max. 59.66
Number of Spec. 18

Average_{norm} 0.0151 55.85
Standard Dev._{norm} 2.649
Coeff. of Var. [%]_{norm} 4.743
Min. 0.0142 48.59
Max. 0.0160 60.25
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Tension Properties (FHT3)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

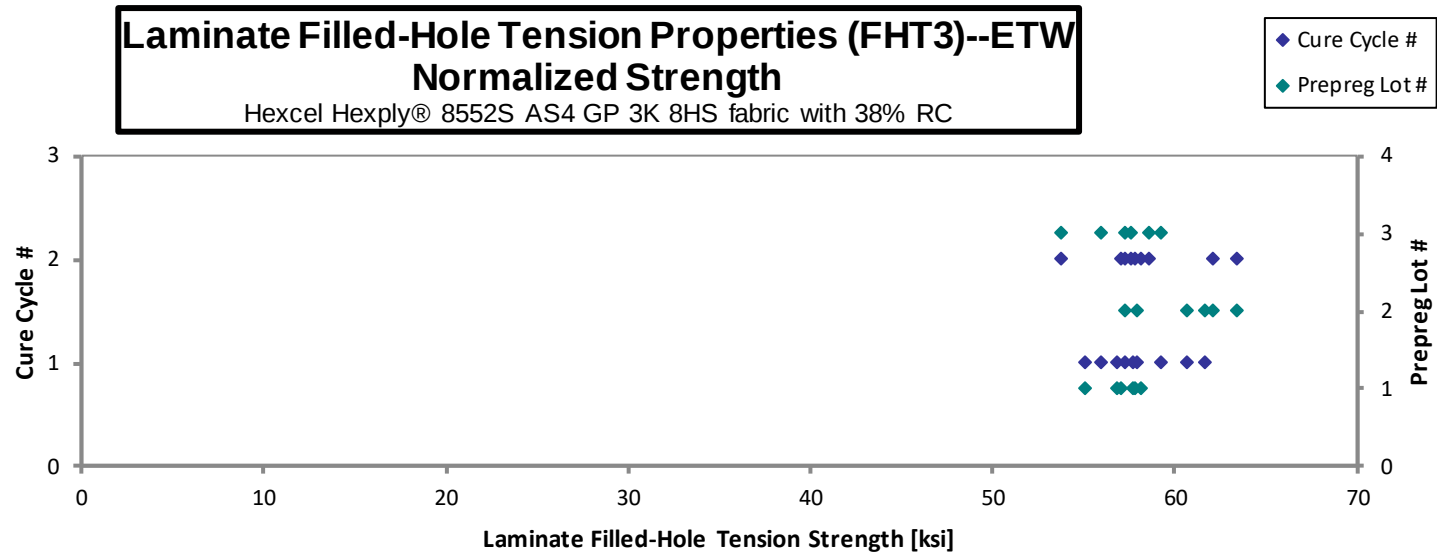
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA6A111D	A	M1	1	1	55.09	0.1572	10	LGM
HPA6A112D	A	M1	1	1	52.09	0.1587	10	LGM
HPA6A113D	A	M1	1	1	54.24	0.1571	10	LGM
HPA6A211D	A	M2	1	2	55.08	0.1584	10	LGM
HPA6A212D	A	M2	1	2	54.21	0.1600	10	LGM
HPA6A213D	A	M2	1	2	53.97	0.1588	10	LGM
HPA6B111D	B	M1	2	1	58.69	0.1576	10	LGM
HPA6B112D	B	M1	2	1	57.64	0.1580	10	LGM
HPA6B113D	B	M1	2	1	55.16	0.1577	10	LGM
HPA6B211D	B	M2	2	2	60.02	0.1552	10	LGM
HPA6B212D	B	M2	2	2	60.04	0.1584	10	LGM
HPA6B213D	B	M2	2	2	53.73	0.1600	10	LGM
HPA6C111D	C	M1	3	1	57.33	0.1552	10	LGM
HPA6C112D	C	M1	3	1	54.83	0.1566	10	LGM
HPA6C113D	C	M1	3	1	53.62	0.1565	10	LGM
HPA6C211D	C	M2	3	2	51.86	0.1554	10	LGM
HPA6C212D	C	M2	3	2	55.37	0.1562	10	LGM
HPA6C213D	C	M2	3	2	55.97	0.1571	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0157	57.72
0.0159	55.12
0.0157	56.82
0.0158	58.14
0.0160	57.82
0.0159	57.11
0.0158	61.65
0.0158	60.72
0.0158	57.97
0.0155	62.08
0.0158	63.40
0.0160	57.29
0.0155	59.30
0.0157	57.24
0.0156	55.92
0.0155	53.74
0.0156	57.66
0.0157	58.62

Average 55.50
Standard Dev. 2.393
Coeff. of Var. [%] 4.312
Min. 51.86
Max. 60.04
Number of Spec. 18

Average_{norm} 0.0157 58.24
Standard Dev._{norm} 2.447
Coeff. of Var. [%]_{norm} 4.202
Min. 0.0155 53.74
Max. 0.0160 63.40
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.20 Laminate Open-Hole Compression 1 Properties (OHC1)

Layup for laminate is [45/0/-45/90/-45/90]S

Laminate Open-Hole Compression Properties (OHC1)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

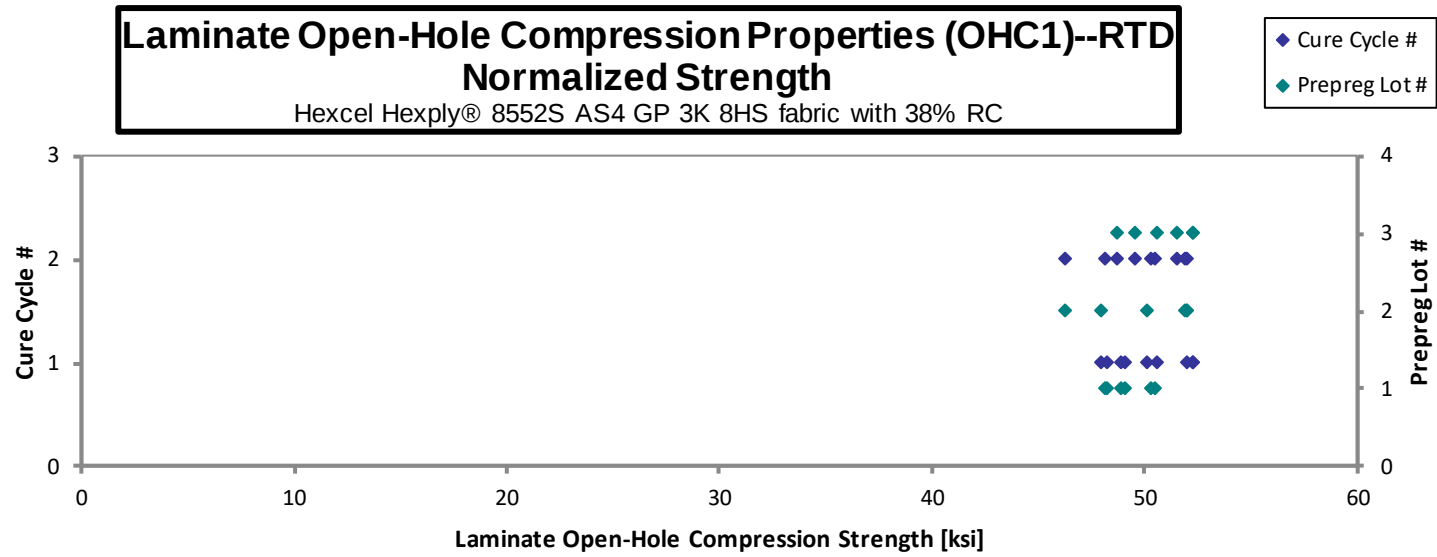
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAGA111A	A	M1	1	1	51.37	0.1721	12	M(L,A)GM
HPAGA112A	A	M1	1	1	49.47	0.1780	12	M(L,A)GM
HPAGA113A	A	M1	1	1	47.58	0.1826	12	M(L,A)GM
HPAGA211A	A	M2	1	2	51.72	0.1677	12	AGM
HPAGA212A	A	M2	1	2	50.20	0.1811	12	M(L,A)GM
HPAGA213A	A	M2	1	2	48.55	0.1867	12	M(L,A)GM
HPAGB111A	B	M1	2	1	50.65	0.1706	12	M(L,A)GM
HPAGB112A	B	M1	2	1	50.75	0.1843	12	M(L,A)GM
HPAGB113A	B	M1	2	1	47.60	0.1895	12	M(L,A)GM
HPAGB211A	B	M2	2	2	47.43	0.1757	12	M(L,A)GM
HPAGB212A	B	M2	2	2	49.47	0.1893	12	M(L,A)GM
HPAGB213A	B	M2	2	2	51.03	0.1831	12	M(L,A)GM
HPAGC111A	C	M1	3	1	50.92	0.1850	12	M(L,A)GM
HPAGC112A	C	M1	3	1	50.67	0.1799	12	M(L,A)GM
HPAGC113A	C	M1	3	1	55.35	0.1700	12	M(L,A)GM
HPAGC211A	C	M2	3	2	51.75	0.1695	12	M(L,A)GM
HPAGC212A	C	M2	3	2	51.07	0.1816	12	M(L,A)GM
HPAGC213A	C	M2	3	2	47.79	0.1867	12	M(L,A)GM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0143	49.11
0.0148	48.92
0.0152	48.26
0.0140	48.19
0.0151	50.50
0.0156	50.36
0.0142	48.00
0.0154	51.96
0.0158	50.12
0.0146	46.29
0.0158	52.03
0.0153	51.90
0.0154	52.32
0.0150	50.63
0.0142	52.28
0.0141	48.74
0.0151	51.51
0.0156	49.58

Average 50.19
Standard Dev. 1.972
Coeff. of Var. [%] 3.930
Min. 47.43
Max. 55.35
Number of Spec. 18

Average_{norm} 0.0150 50.04
Standard Dev._{norm} 1.766
Coeff. of Var. [%]_{norm} 3.530
Min. 0.0140 46.29
Max. 0.0158 52.32
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Compression Properties (OHC1)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

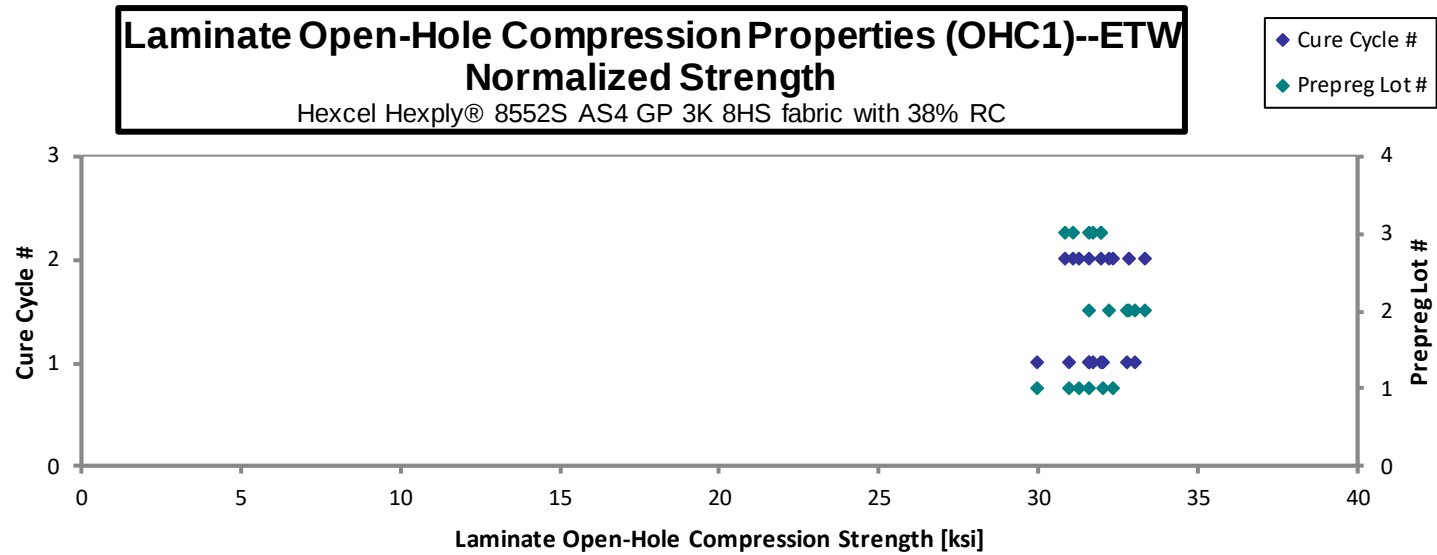
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAGA111D	A	M1	1	1	31.87	0.1693	12	M(A,L)GM
HPAGA112D	A	M1	1	1	32.24	0.1790	12	M(A,L)GM
HPAGA113D	A	M1	1	1	30.50	0.1826	12	M(A,L)GM
HPAGA211D	A	M2	1	2	30.64	0.1900	12	M(A,L)GM
HPAGA212D	A	M2	1	2	33.08	0.1703	12	M(A,L)GM
HPAGA213D	A	M2	1	2	31.26	0.1820	12	M(A,L)GM
HPAGB111D	B	M1	2	1	33.20	0.1713	12	LGM
HPAGB112D	B	M1	2	1	31.98	0.1859	12	LGM
HPAGB113D	B	M1	2	1	30.77	0.1918	12	M(A,L)GM
HPAGB211D	B	M2	2	2	31.27	0.1893	12	M(A,L)GM
HPAGB212D	B	M2	2	2	31.26	0.1921	12	LGM
HPAGB213D	B	M2	2	2	30.26	0.1917	12	LGM
HPAGC111D	C	M1	3	1	30.73	0.1873	12	M(A,L)GM
HPAGC112D	C	M1	3	1	30.44	0.1878	12	LGM
HPAGC113D	C	M1	3	1	30.68	0.1853	12	LGM
HPAGC211D	C	M2	3	2	33.53	0.1715	12	LGM
HPAGC212D	C	M2	3	2	30.93	0.1809	12	LGM
HPAGC213D	C	M2	3	2	29.85	0.1860	12	M(A,L)GM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0141	29.97
0.0149	32.06
0.0152	30.95
0.0158	32.34
0.0142	31.29
0.0152	31.60
0.0143	31.58
0.0155	33.03
0.0160	32.78
0.0158	32.89
0.0160	33.37
0.0160	32.22
0.0156	31.97
0.0157	31.75
0.0154	31.57
0.0143	31.95
0.0151	31.09
0.0155	30.84

Average 31.36
Standard Dev. 1.071
Coeff. of Var. [%] 3.415
Min. 29.85
Max. 33.53
Number of Spec. 18

Average_{norm} 0.0152 31.85
Standard Dev._{norm} 0.8597
Coeff. of Var. [%]_{norm} 2.699
Min. 0.0141 29.97
Max. 0.0160 33.37
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.21 “10/80/10” Open-Hole Compression 2 Properties (OHC2)

Laminate Open-Hole Compression Properties (OHC2)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

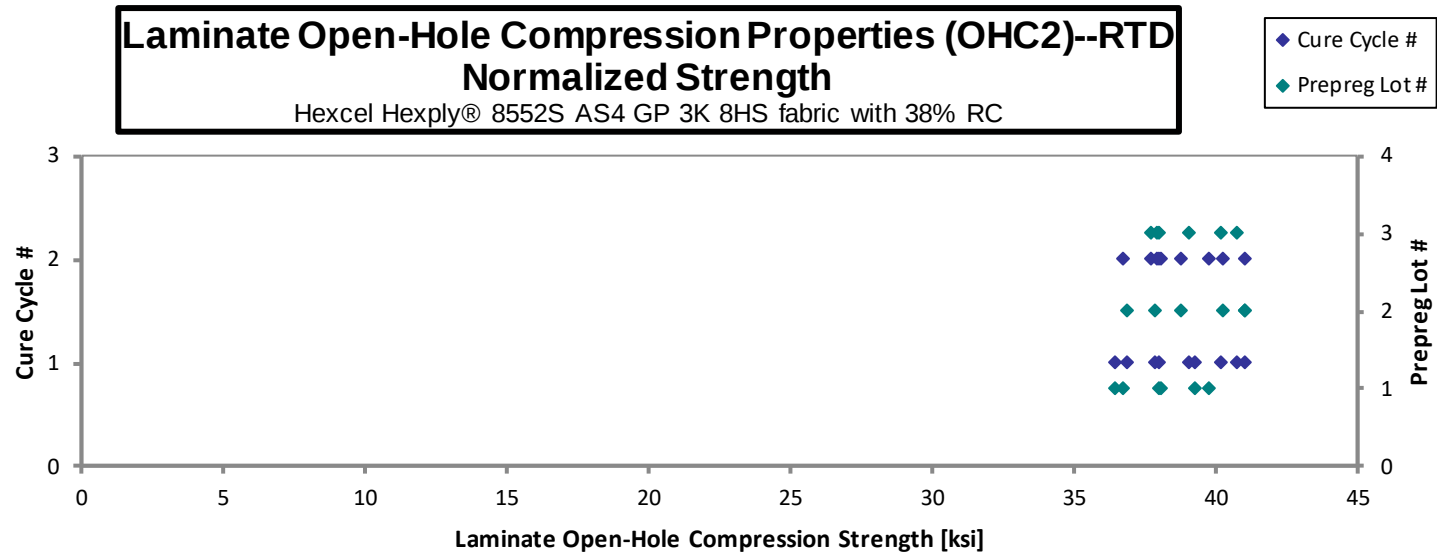
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAHA111A	A	M1	1	1	40.01	0.1367	10	AGM
HPAHA112A	A	M1	1	1	38.91	0.1465	10	AGM
HPAHA113A	A	M1	1	1	38.19	0.1543	10	AGM
HPAHA211A	A	M2	1	2	38.96	0.1415	10	AGM
HPAHA212A	A	M2	1	2	37.79	0.1513	10	AGM
HPAHA213A	A	M2	1	2	37.56	0.1588	10	AGM
HPAHB111A	B	M1	2	1	40.07	0.1382	10	AGM
HPAHB112A	B	M1	2	1	37.49	0.1517	10	AGM
HPAHB113A	B	M1	2	1	38.82	0.1585	10	AGM
HPAHB211A	B	M2	2	2	41.36	0.1407	10	AGM
HPAHB212A	B	M2	2	2	39.25	0.1540	10	AGM
HPAHB213A	B	M2	2	2	38.73	0.1591	10	AGM
HPAHC111A	C	M1	3	1	41.56	0.1410	10	AGM
HPAHC112A	C	M1	3	1	39.81	0.1514	10	AGM
HPAHC113A	C	M1	3	1	39.30	0.1556	10	AGM
HPAHC211A	C	M2	3	2	40.85	0.1395	10	AGM
HPAHC212A	C	M2	3	2	38.79	0.1461	10	M(A,L)GM
HPAHC213A	C	M2	3	2	37.33	0.1527	10	M(A,L)GM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0137	36.46
0.0146	37.99
0.0154	39.28
0.0141	36.75
0.0151	38.10
0.0159	39.77
0.0138	36.92
0.0152	37.91
0.0159	41.02
0.0141	38.78
0.0154	40.28
0.0159	41.08
0.0141	39.06
0.0151	40.17
0.0156	40.78
0.0139	37.98
0.0146	37.77
0.0153	38.00

Average 39.15
Standard Dev. 1.272
Coeff. of Var. [%] 3.249
Min. 37.33
Max. 41.56
Number of Spec. 18

Average_{norm} 0.0149 38.78
Standard Dev._{norm} 1.473
Coeff. of Var. [%]_{norm} 3.799
Min. 0.0137 36.46
Max. 0.0159 41.08
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Compression Properties (OHC2)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

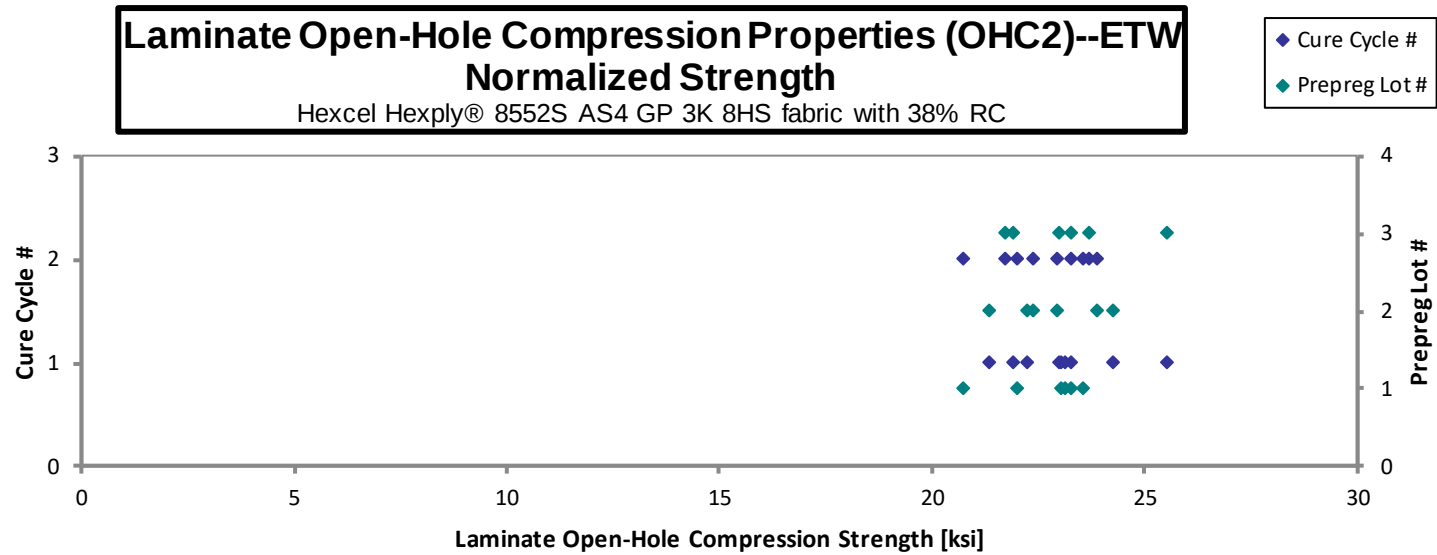
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAHA111D	A	M1	1	1	21.34	0.1620	10	AGM
HPAHA112D	A	M1	1	1	21.25	0.1634	10	M(A,L)GM
HPAHA113D	A	M1	1	1	21.93	0.1591	10	LGM
HPAHA211D	A	M2	1	2	21.54	0.1641	10	M(A,L)GM
HPAHA212D	A	M2	1	2	22.81	0.1365	10	M(A,L)GM
HPAHA213D	A	M2	1	2	21.64	0.1526	10	M(A,L)GM
HPAHB111D	B	M1	2	1	22.62	0.1609	10	M(A,L)GM
HPAHB112D	B	M1	2	1	22.99	0.1393	10	LGM
HPAHB113D	B	M1	2	1	22.19	0.1505	10	M(A,L)GM
HPAHB211D	B	M2	2	2	25.55	0.1403	10	M(A,L)GM
HPAHB212D	B	M2	2	2	21.23	0.1580	10	M(A,L)GM
HPAHB213D	B	M2	2	2	21.90	0.1573	10	LGM
HPAHC111D	C	M1	3	1	24.30	0.1576	10	M(A,L)GM
HPAHC112D	C	M1	3	1	22.96	0.1433	10	LGM
HPAHC113D	C	M1	3	1	22.73	0.1517	10	LGM
HPAHC211D	C	M2	3	2	22.23	0.1599	10	AGM
HPAHC212D	C	M2	3	2	23.32	0.1397	10	M(A,L)GM
HPAHC213D	C	M2	3	2	23.52	0.1486	10	M(A,L)GM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0162	23.05
0.0163	23.15
0.0159	23.26
0.0164	23.55
0.0137	20.76
0.0153	22.01
0.0161	24.26
0.0139	21.35
0.0150	22.26
0.0140	23.90
0.0158	22.37
0.0157	22.97
0.0158	25.53
0.0143	21.93
0.0152	22.98
0.0160	23.69
0.0140	21.72
0.0149	23.29

Average 22.56
Standard Dev. 1.132
Coeff. of Var. [%] 5.019
Min. 21.23
Max. 25.55
Number of Spec. 18

Average_{norm} 0.0152 22.89
Standard Dev._{norm} 1.136
Coeff. of Var. [%]_{norm} 4.964
Min. 0.0137 20.76
Max. 0.0164 25.53
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.22 “40/20/40” Open-Hole Compression 3 Properties (OHC3)

Laminate Open-Hole Compression Properties (OHC3)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

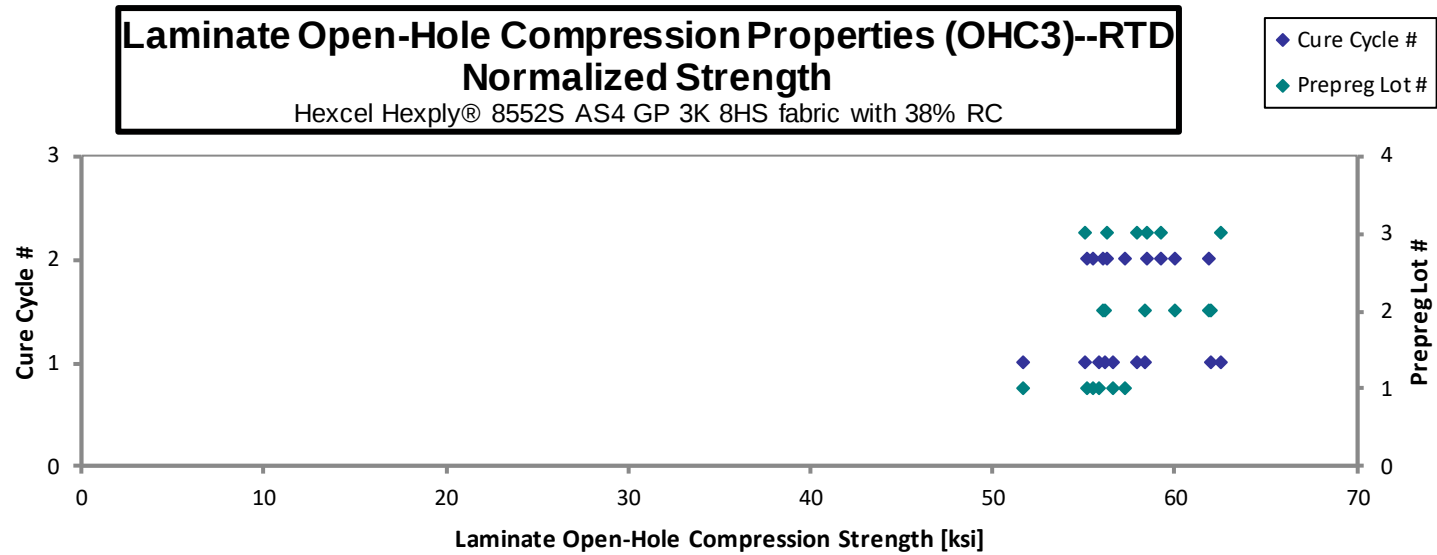
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAIA111A	A	M1	1	1	54.63	0.1419	10	LGM
HPAIA112A	A	M1	1	1	54.32	0.1543	10	LGM
HPAIA113A	A	M1	1	1	53.06	0.1601	10	LGM
HPAIA211A	A	M2	1	2	60.19	0.1383	10	LGM
HPAIA212A	A	M2	1	2	55.81	0.1541	10	LGM
HPAIA213A	A	M2	1	2	52.56	0.1576	10	LGM
HPAIB111A	B	M1	2	1	60.56	0.1392	10	M(A,L) GM
HPAIB112A	B	M1	2	1	58.54	0.1496	10	M(A,L) GM
HPAIB113A	B	M1	2	1	59.23	0.1569	10	M(A,L) GM
HPAIB211A	B	M2	2	2	61.77	0.1502	10	M(A,L) GM
HPAIB212A	B	M2	2	2	54.76	0.1536	10	M(A,L) GM
HPAIB213A	B	M2	2	2	58.40	0.1542	10	M(A,L) GM
HPAIC111A	C	M1	3	1	58.76	0.1406	10	LGM
HPAIC112A	C	M1	3	1	62.81	0.1494	10	LGM
HPAIC113A	C	M1	3	1	56.49	0.1539	10	LGM
HPAIC211A	C	M2	3	2	59.52	0.1419	10	LGM
HPAIC212A	C	M2	3	2	58.26	0.1526	10	LGM
HPAIC213A	C	M2	3	2	56.74	0.1545	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0142	51.68
0.0154	55.88
0.0160	56.64
0.0138	55.50
0.0154	57.32
0.0158	55.23
0.0139	56.18
0.0150	58.37
0.0157	61.95
0.0150	61.85
0.0154	56.07
0.0154	60.04
0.0141	55.09
0.0149	62.55
0.0154	57.94
0.0142	56.30
0.0153	59.25
0.0155	58.45

Average 57.58
Standard Dev. 2.956
Coeff. of Var. [%] 5.134
Min. 52.56
Max. 62.81
Number of Spec. 18

Average_{norm} 0.0150 57.57
Standard Dev._{norm} 2.796
Coeff. of Var. [%]_{norm} 4.857
Min. 0.0138 51.68
Max. 0.0160 62.55
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Open-Hole Compression Properties (OHC3)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

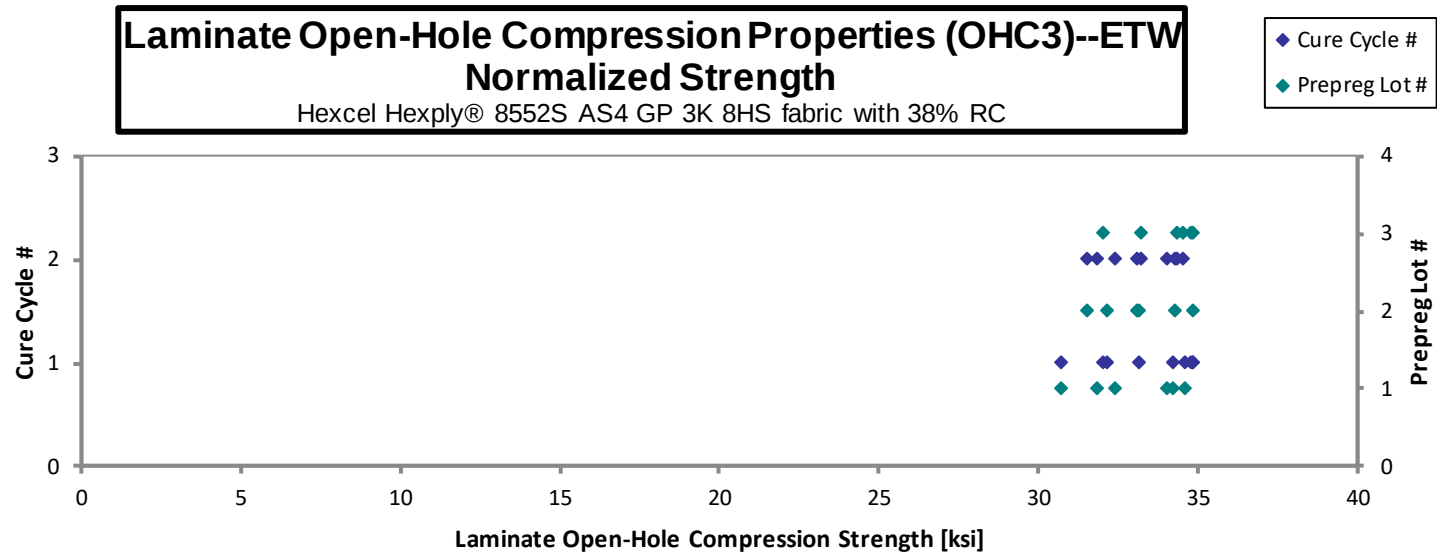
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAIA111D	A	M1	1	1	31.68	0.1621	10	LGM
HPAIA112D	A	M1	1	1	32.84	0.1582	10	LGM
HPAIA113D	A	M1	1	1	32.84	0.1405	10	LGM
HPAIA211D	A	M2	1	2	29.65	0.1640	10	LGM
HPAIA212D	A	M2	1	2	31.53	0.1621	10	LGM
HPAIA213D	A	M2	1	2	30.40	0.1570	10	LGM
HPAIB111D	B	M1	2	1	35.68	0.1396	10	LGM
HPAIB112D	B	M1	2	1	31.87	0.1512	10	LGM
HPAIB113D	B	M1	2	1	33.32	0.1569	10	LGM
HPAIB211D	B	M2	2	2	33.66	0.1406	10	LGM
HPAIB212D	B	M2	2	2	35.39	0.1403	10	LGM
HPAIB213D	B	M2	2	2	35.20	0.1462	10	LGM
HPAIC111D	C	M1	3	1	33.36	0.1568	10	LGM
HPAIC112D	C	M1	3	1	36.97	0.1413	10	LGM
HPAIC113D	C	M1	3	1	32.25	0.1489	10	LGM
HPAIC211D	C	M2	3	2	33.12	0.1564	10	LGM
HPAIC212D	C	M2	3	2	34.69	0.1437	10	LGM
HPAIC213D	C	M2	3	2	34.31	0.1503	10	LGM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0162	34.23
0.0158	34.62
0.0140	30.75
0.0164	32.42
0.0162	34.06
0.0157	31.83
0.0140	33.19
0.0151	32.14
0.0157	34.85
0.0141	31.55
0.0140	33.11
0.0146	34.31
0.0157	34.86
0.0141	34.82
0.0149	32.02
0.0156	34.52
0.0144	33.24
0.0150	34.37

Average 33.27
Standard Dev. 1.899
Coeff. of Var. [%] 5.708
Min. 29.65
Max. 36.97
Number of Spec. 18

Average_{norm} 0.0151 33.38
Standard Dev._{norm} 1.316
Coeff. of Var. [%]_{norm} 3.942
Min. 0.0140 30.75
Max. 0.0164 34.86
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.23 Laminate Filled-Hole Compression 1 Properties (FHC1)

Layup for laminate is [45/0/-45/90/-45/90]S

Laminate Filled-Hole Compression Properties (FHC1)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

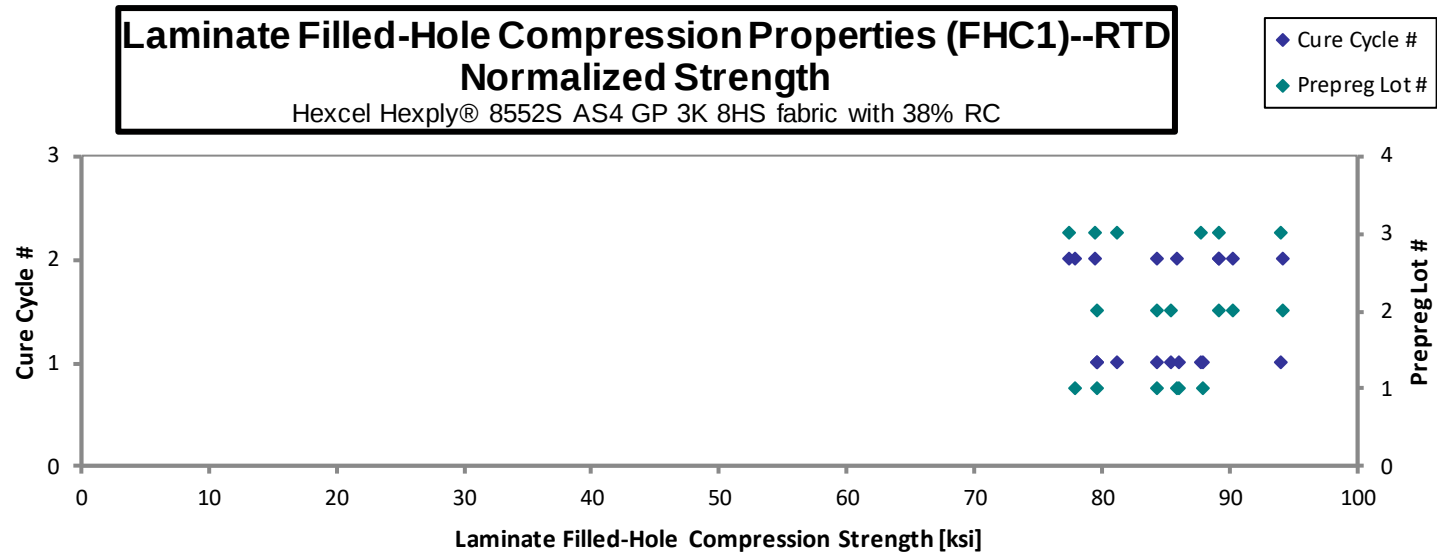
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA7A111A	A	M1	1	1	85.03	0.1686	12	LWB
HPA7A112A	A	M1	1	1	89.23	0.1775	12	LGT
HPA7A113A	A	M1	1	1	84.50	0.1834	12	M(A,L)GF
HPA7A211A	A	M2	1	2	84.69	0.1655	12	M(A,L)GF
HPA7A212A	A	M2	1	2	84.84	0.1788	12	LGB
HPA7A213A	A	M2	1	2	84.48	0.1830	12	LGF, LGB
HPA7B111A	B	M1	2	1	85.02	0.1688	12	M(A,L)GF
HPA7B112A	B	M1	2	1	83.53	0.1840	12	M(A,L)GF
HPA7B113A	B	M1	2	1	79.88	0.1899	12	M(A,L)GF
HPA7B211A	B	M2	2	2	85.90	0.1869	12	LGF, LGT
HPA7B212A	B	M2	2	2	90.84	0.1866	12	LGB
HPA7B213A	B	M2	2	2	88.96	0.1828	12	LGF, LGB
HPA7C111A	C	M1	3	1	84.69	0.1727	12	M(A,L)GF
HPA7C112A	C	M1	3	1	86.42	0.1829	12	LGF, LGT
HPA7C113A	C	M1	3	1	90.93	0.1861	12	M(A,L)GF
HPA7C211A	C	M2	3	2	82.30	0.1695	12	LGF
HPA7C212A	C	M2	3	2	79.38	0.1801	12	LGF
HPA7C213A	C	M2	3	2	86.72	0.1853	12	M(A,L)GF

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0140	79.64
0.0148	87.97
0.0153	86.10
0.0138	77.86
0.0149	84.28
0.0153	85.88
0.0141	79.71
0.0153	85.39
0.0158	84.26
0.0156	89.18
0.0156	94.19
0.0152	90.35
0.0144	81.26
0.0152	87.79
0.0155	94.00
0.0141	77.51
0.0150	79.44
0.0154	89.25

Average 85.41
Standard Dev. 3.196
Coeff. of Var. [%] 3.742
Min. 79.38
Max. 90.93
Number of Spec. 18

Average_{norm} 0.0150 85.23
Standard Dev._{norm} 5.186
Coeff. of Var. [%]_{norm} 6.086
Min. 0.0138 77.51
Max. 0.0158 94.19
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Compression Properties (FHC1)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

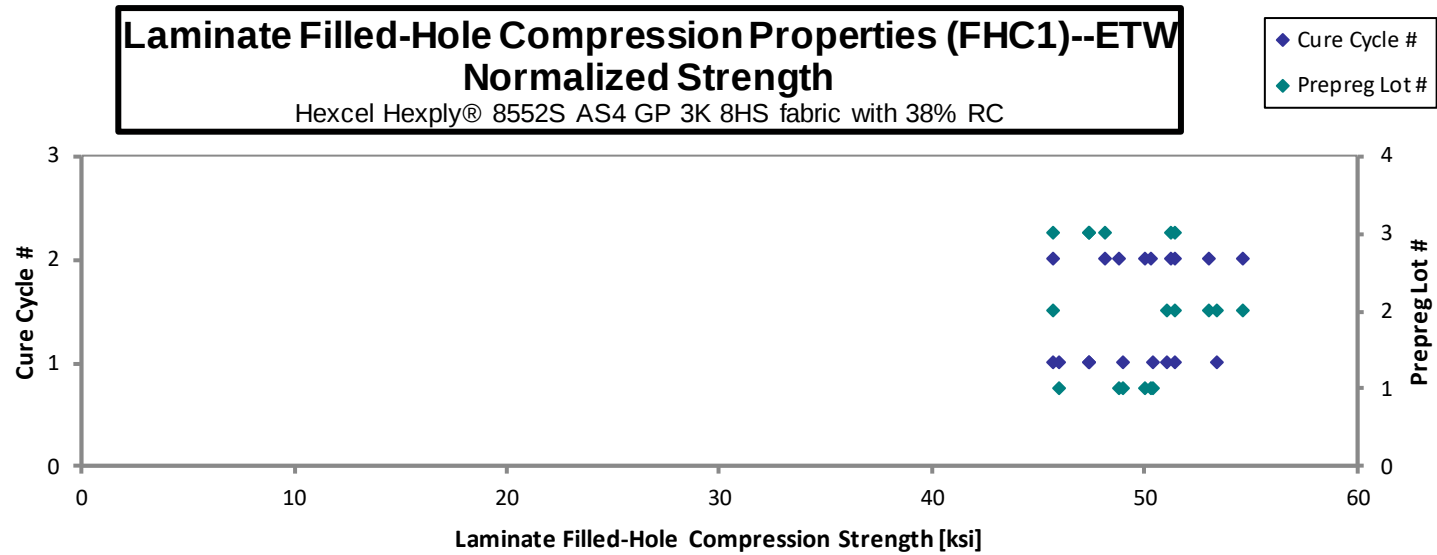
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA7A111D	A	M1	1	1	49.12	0.1686	12	LGT, LGF
HPA7A112D	A	M1	1	1	51.10	0.1775	12	LGB, LWB
HPA7A113D	A	M1	1	1	48.28	0.1827	12	LGT, LWT
HPA7A211D	A	M2	1	2	49.24	0.1840	12	LGF
HPA7A212D	A	M2	1	2	48.52	0.1857	12	LGF
HPA7A213D	A	M2	1	2	47.75	0.1838	12	LGT
HPA7B111D	B	M1	2	1	48.49	0.1696	12	LWT
HPA7B112D	B	M1	2	1	50.18	0.1831	12	LGF
HPA7B113D	B	M1	2	1	50.99	0.1887	12	LWB
HPA7B211D	B	M2	2	2	48.93	0.1893	12	LGF, LGT
HPA7B212D	B	M2	2	2	52.02	0.1891	12	LGF, LGB
HPA7B213D	B	M2	2	2	50.78	0.1881	12	LGT, LWT
HPA7C111D	C	M1	3	1	49.61	0.1868	12	M(A,L)GF
HPA7C112D	C	M1	3	1	50.07	0.1704	12	LGT, LWT
HPA7C113D	C	M1	3	1	46.88	0.1820	12	LWB
HPA7C211D	C	M2	3	2	48.85	0.1889	12	M(A,L)GF
HPA7C212D	C	M2	3	2	48.45	0.1697	12	M(A,L)WB
HPA7C213D	C	M2	3	2	48.31	0.1796	12	LGB, LGF

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0141	46.01
0.0148	50.38
0.0152	49.00
0.0153	50.34
0.0155	50.04
0.0153	48.77
0.0141	45.67
0.0153	51.06
0.0157	53.45
0.0158	51.45
0.0158	54.64
0.0157	53.06
0.0156	51.49
0.0142	47.39
0.0152	47.39
0.0157	51.26
0.0141	45.67
0.0150	48.20

Average 49.31
Standard Dev. 1.323
Coeff. of Var. [%] 2.684
Min. 46.88
Max. 52.02
Number of Spec. 18

Average_{norm} 0.0151 49.74
Standard Dev._{norm} 2.675
Coeff. of Var. [%]_{norm} 5.378
Min. 0.0141 45.67
Max. 0.0158 54.64
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.24 “10/80/10” Filled-Hole Compression 2 Properties (FHC2)

Data reported for reference only. FHC2 values are equal to or greater than UNC2 values, therefore CMH17 and NCAMP recommend the use of UNC2 values for design purposes.

Laminate Filled-Hole Compression Properties (FHC2)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

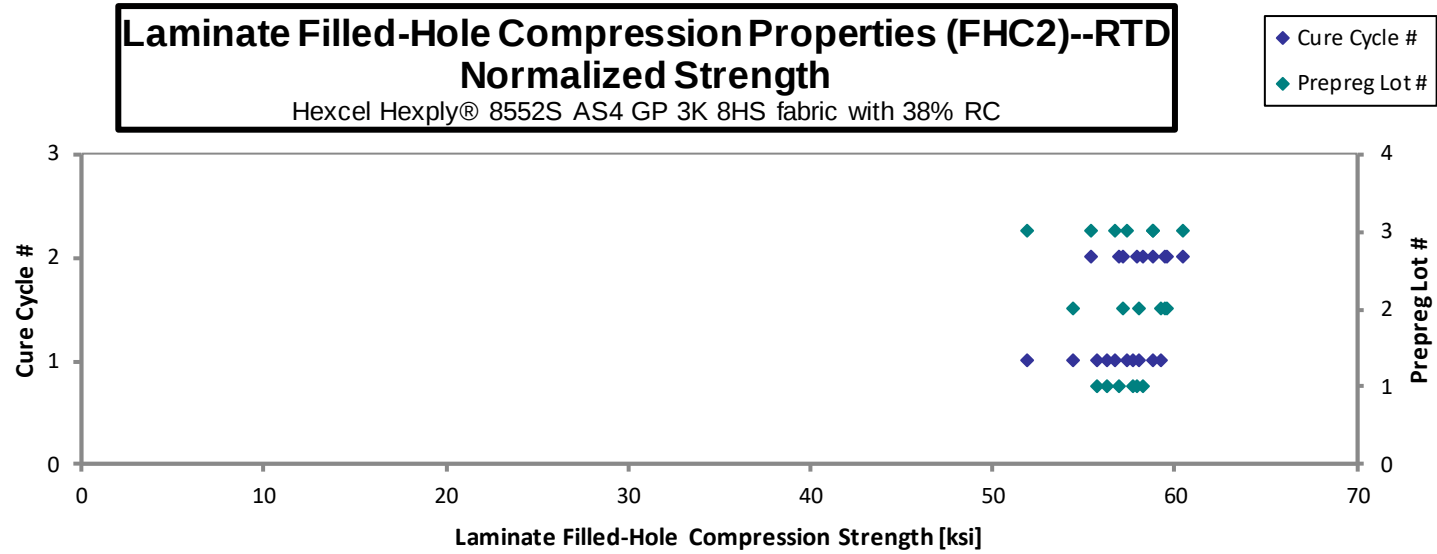
t_{ply} [in]

0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	Strength _{norm} [ksi]
HPA8A111A	A	M1	1	1	58.65	0.1427	10	AGF	0.0143	55.80
HPA8A112A	A	M1	1	1	59.04	0.1430	10	AGF	0.0143	56.27
HPA8A113A	A	M1	1	1	56.33	0.1538	10	AGF	0.0154	57.74
HPA8A211A	A	M2	1	2	60.22	0.1418	10	AGF	0.0142	56.91
HPA8A212A	A	M2	1	2	57.81	0.1502	10	AGF	0.0150	57.89
HPA8A213A	A	M2	1	2	57.33	0.1524	10	AGF	0.0152	58.23
HPA8B111A	B	M1	2	1	59.27	0.1377	10	M(A,L)GF	0.0138	54.42
HPA8B112A	B	M1	2	1	57.65	0.1509	10	M(A,L)GF	0.0151	58.00
HPA8B113A	B	M1	2	1	56.65	0.1570	10	M(A,L)GF	0.0157	59.29
HPA8B211A	B	M2	2	2	59.96	0.1430	10	M(A,L)GF	0.0143	57.17
HPA8B212A	B	M2	2	2	58.73	0.1521	10	M(A,L)GF	0.0152	59.56
HPA8B213A	B	M2	2	2	57.55	0.1551	10	M(A,L)GF	0.0155	59.51
HPA8C111A	C	M1	3	1	55.84	0.1395	10	M(A,L)GF	0.0139	51.93
HPA8C112A	C	M1	3	1	56.31	0.1513	10	M(A,L)WB	0.0151	56.78
HPA8C113A	C	M1	3	1	57.15	0.1545	10	AGF	0.0154	58.85
HPA8C114A	C	M1	3	1	55.31	0.1556	10	AGF	0.0156	57.36
HPA8C211A	C	M2	3	2	58.09	0.1431	10	M(A,L)GT	0.0143	55.40
HPA8C212A	C	M2	3	2	57.98	0.1523	10	AGF	0.0152	58.85
HPA8C213A	C	M2	3	2	57.77	0.1570	10	AGF	0.0157	60.48

Average 57.77
 Standard Dev. 1.341
 Coeff. of Var. [%] 2.320
 Min. 55.31
 Max. 60.22
 Number of Spec. 19

Average_{norm} 0.0149 57.39
 Standard Dev._{norm} 2.044
 Coeff. of Var. [%]_{norm} 3.561
 Min. 0.0138 51.93
 Max. 0.0157 60.48
 Number of Spec. 19



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Compression Properties (FHC2)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

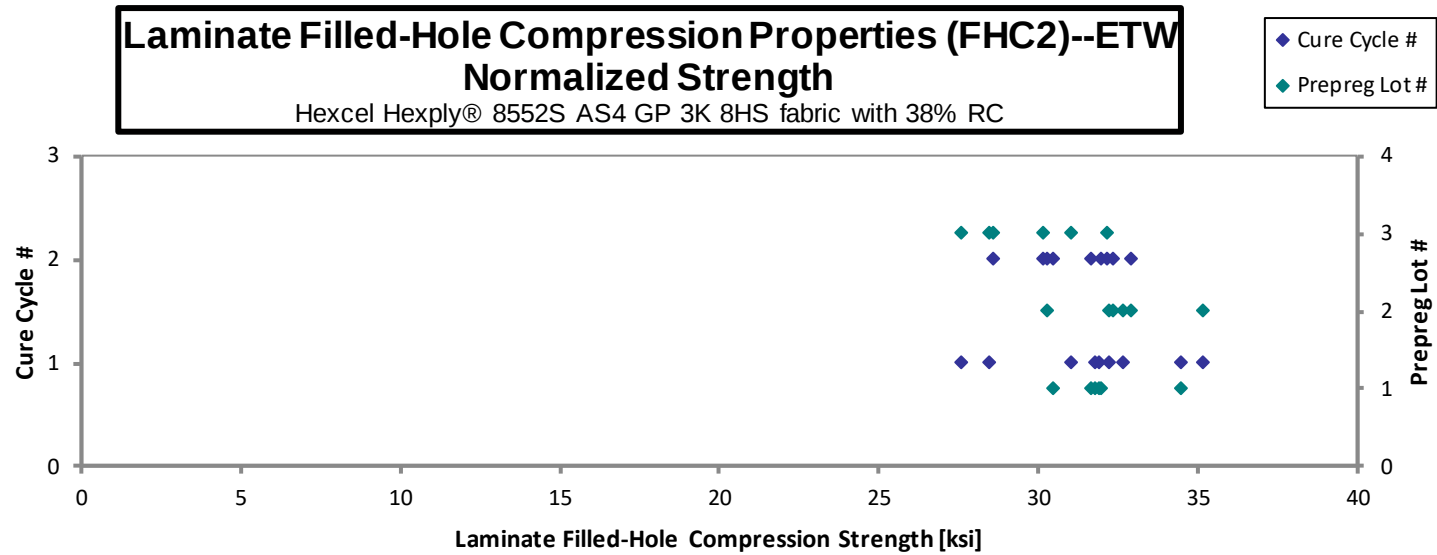
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA8A111D	A	M1	1	1	30.87	0.1551	10	M(A,L)GF, LGT
HPA8A112D	A	M1	1	1	30.85	0.1546	10	M(A,L)GB, M(A,L)WB
HPA8A113D	A	M1	1	1	33.15	0.1559	10	M(A,L)GT, M(A,L)WT
HPA8A211D	A	M2	1	2	31.92	0.1432	10	M(A,L)GT
HPA8A212D	A	M2	1	2	31.67	0.1513	10	M(A,L)GT
HPA8A213D	A	M2	1	2	30.84	0.1541	10	M(A,L)GT
HPA8B111D	B	M1	2	1	32.91	0.1604	10	M(A,L)GF, M(A,L)GB
HPA8B112D	B	M1	2	1	35.80	0.1368	10	M(A,L)GF, M(A,L)GT
HPA8B113D	B	M1	2	1	32.40	0.1493	10	M(A,L)GF, M(A,L)WT
HPA8B211D	B	M2	2	2	31.57	0.1439	10	M(A,L)GT, M(A,L)WT
HPA8B212D	B	M2	2	2	31.59	0.1536	10	M(A,L)GT
HPA8B213D	B	M2	2	2	31.45	0.1569	10	M(A,L)GT
HPA8C111D	C	M1	3	1	30.08	0.1546	10	M(A,L)GT, M(A,L)WT
HPA8C112D	C	M1	3	1	29.60	0.1400	10	M(A,L)GT, M(A,L)WT
HPA8C113D	C	M1	3	1	28.48	0.1498	10	M(A,L)GT, M(A,L)WT
HPA8C211D	C	M2	3	2	30.72	0.1569	10	M(A,L)GT, M(A,L)WT
HPA8C212D	C	M2	3	2	30.13	0.1424	10	M(A,L)GF, M(A,L)WB
HPA8C213D	C	M2	3	2	30.09	0.1502	10	M(A,L)GB, M(A,L)WB

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0155	31.91
0.0155	31.80
0.0156	34.46
0.0143	30.47
0.0151	31.96
0.0154	31.67
0.0160	35.20
0.0137	32.64
0.0149	32.24
0.0144	30.29
0.0154	32.34
0.0157	32.89
0.0155	31.01
0.0140	27.62
0.0150	28.45
0.0157	32.14
0.0142	28.60
0.0150	30.14

Average 31.34
Standard Dev. 1.612
Coeff. of Var. [%] 5.145
Min. 28.48
Max. 35.80
Number of Spec. 18

Average_{norm} 0.0151 31.44
Standard Dev._{norm} 1.958
Coeff. of Var. [%]_{norm} 6.230
Min. 0.0137 27.62
Max. 0.0160 35.20
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.25 “40/20/40” Filled-Hole Compression 3 Properties (FHC3)

Laminate Filled-Hole Compression Properties (FHC3)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

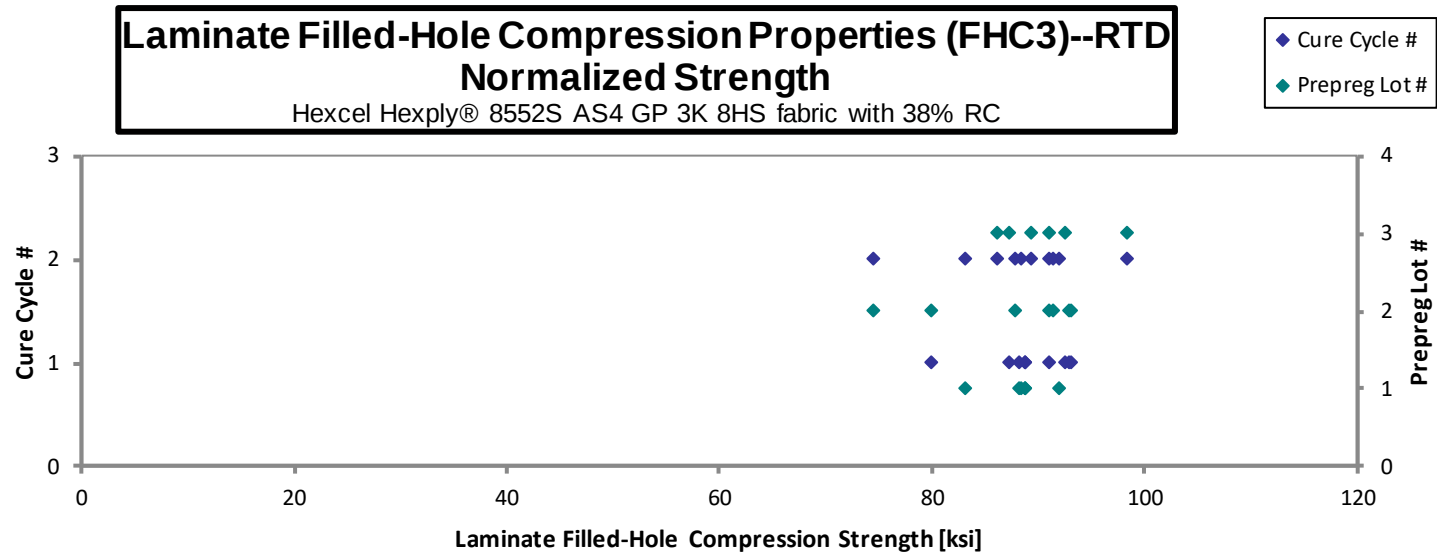
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA9A111A	A	M1	1	1	94.42	0.1410	10	LGF
HPA9A112A	A	M1	1	1	89.07	0.1494	10	LGF
HPA9A113A	A	M1	1	1	86.83	0.1524	10	LGF
HPA9A211A	A	M2	1	2	89.36	0.1395	10	LGF
HPA9A212A	A	M2	1	2	88.33	0.1502	10	LGF
HPA9A213A	A	M2	1	2	89.61	0.1541	10	LGF
HPA9B111A	B	M1	2	1	84.03	0.1426	10	LGF
HPA9B112A	B	M1	2	1	92.02	0.1518	10	LGF
HPA9B113A	B	M1	2	1	88.78	0.1571	10	LGF
HPA9B211A	B	M2	2	2	79.87	0.1398	10	LGF
HPA9B212A	B	M2	2	2	87.72	0.1503	10	LGF
HPA9B213A	B	M2	2	2	87.94	0.1553	10	LGF
HPA9B214A	B	M2	2	2	86.91	0.1579	10	LGF
HPA9C111A	C	M1	3	1	93.71	0.1398	10	LGB
HPA9C112A	C	M1	3	1	91.75	0.1488	10	LGF
HPA9C113A	C	M1	3	1	90.77	0.1530	10	LGF
HPA9C211A	C	M2	3	2	90.70	0.1424	10	LGF
HPA9C212A	C	M2	3	2	88.98	0.1508	10	LGF
HPA9C213A	C	M2	3	2	95.96	0.1539	10	LGF

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0141	88.77
0.0149	88.72
0.0152	88.23
0.0140	83.11
0.0150	88.47
0.0154	92.07
0.0143	79.88
0.0152	93.12
0.0157	93.00
0.0140	74.45
0.0150	87.91
0.0155	91.03
0.0158	91.46
0.0140	87.30
0.0149	91.02
0.0153	92.58
0.0142	86.12
0.0151	89.42
0.0154	98.45

Average 89.30
Standard Dev. 3.666
Coeff. of Var. [%] 4.105
Min. 79.87
Max. 95.96
Number of Spec. 19

Average_{norm} 0.0149 88.69
Standard Dev._{norm} 5.270
Coeff. of Var. [%]_{norm} 5.942
Min. 0.0140 74.45
Max. 0.0158 98.45
Number of Spec. 19 19



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Filled-Hole Compression Properties (FHC3)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

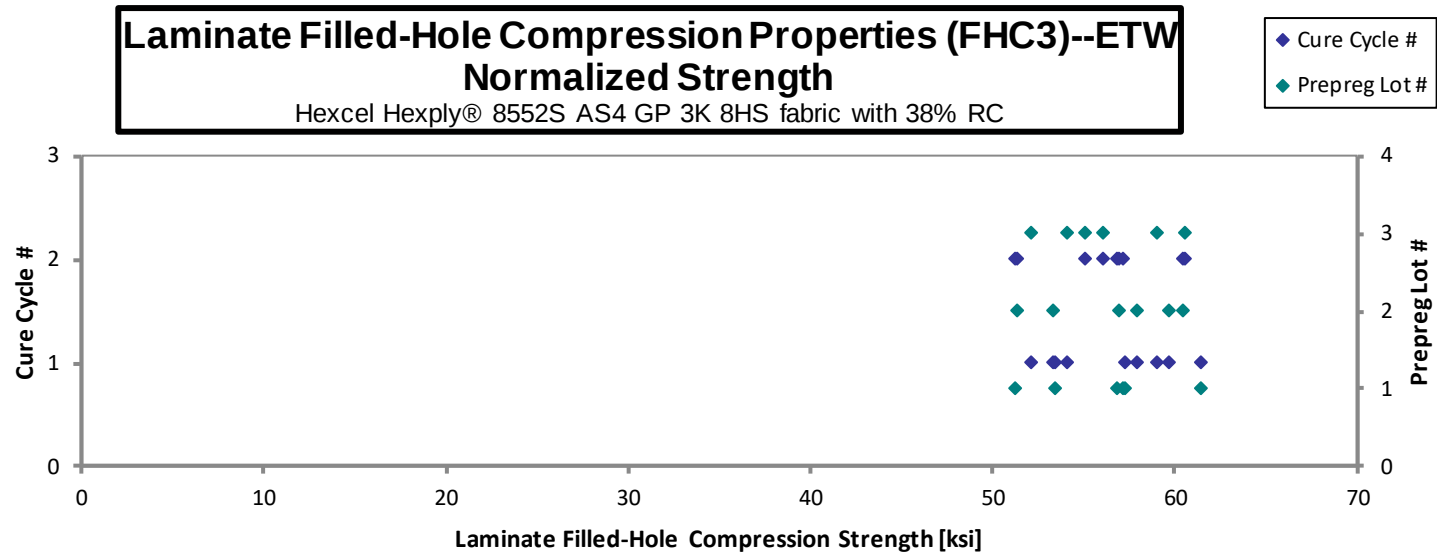
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA9A111D	A	M1	1	1	59.84	0.1540	10	LGF
HPA9A112D	A	M1	1	1	55.42	0.1550	10	LGF
HPA9A113D	A	M1	1	1	52.62	0.1523	10	LGF
HPA9A211D	A	M2	1	2	56.01	0.1373	10	LGB, LWB
HPA9A212D	A	M2	1	2	56.68	0.1504	10	M(A,L)GF
HPA9A213D	A	M2	1	2	55.00	0.1559	10	LGF
HPA9B111D	B	M1	2	1	56.48	0.1586	10	LGF
HPA9B112D	B	M1	2	1	56.33	0.1420	10	LGF
HPA9B113D	B	M1	2	1	57.82	0.1503	10	LWB
HPA9B211D	B	M2	2	2	55.18	0.1397	10	LGT, LWT
HPA9B212D	B	M2	2	2	60.32	0.1504	10	LGT, LWT
HPA9B213D	B	M2	2	2	54.63	0.1563	10	LGF
HPA9C111D	C	M1	3	1	56.68	0.1561	10	LGF
HPA9C112D	C	M1	3	1	56.41	0.1387	10	LGF
HPA9C113D	C	M1	3	1	54.84	0.1478	10	LWB
HPA9C211D	C	M2	3	2	58.75	0.1547	10	LWT
HPA9C212D	C	M2	3	2	58.47	0.1414	10	LGF
HPA9C213D	C	M2	3	2	56.39	0.1491	10	LGF, LGB

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0154	61.42
0.0155	57.26
0.0152	53.42
0.0137	51.25
0.0150	56.84
0.0156	57.16
0.0159	59.70
0.0142	53.33
0.0150	57.91
0.0140	51.40
0.0150	60.49
0.0156	56.91
0.0156	59.00
0.0139	52.16
0.0148	54.05
0.0155	60.59
0.0141	55.13
0.0149	56.03

Average 56.55
Standard Dev. 1.928
Coeff. of Var. [%] 3.409
Min. 52.62
Max. 60.32
Number of Spec. 18

Average_{norm} 0.0149 56.34
Standard Dev._{norm} 3.219
Coeff. of Var. [%]_{norm} 5.714
Min. 0.0137 51.25
Max. 0.0159 61.42
Number of Spec. 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.26 “25/50/25” Single-Shear Bearing 1 Properties (SSB1)

Laminate Single-Shear Bearing Properties (SSB1)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

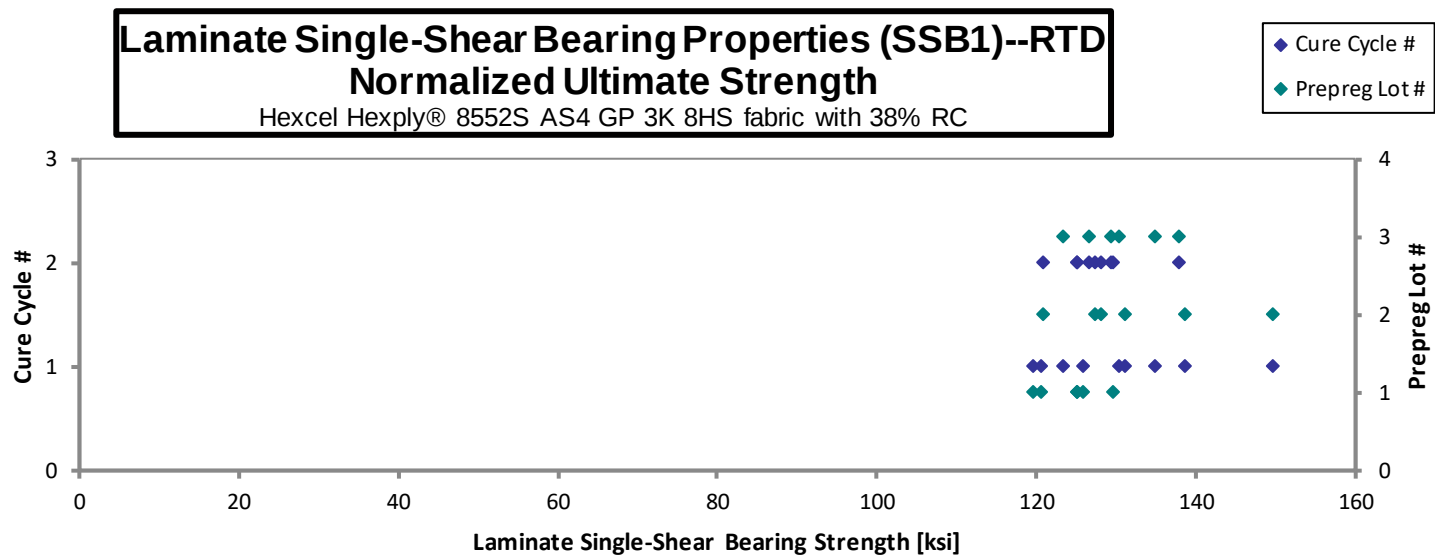
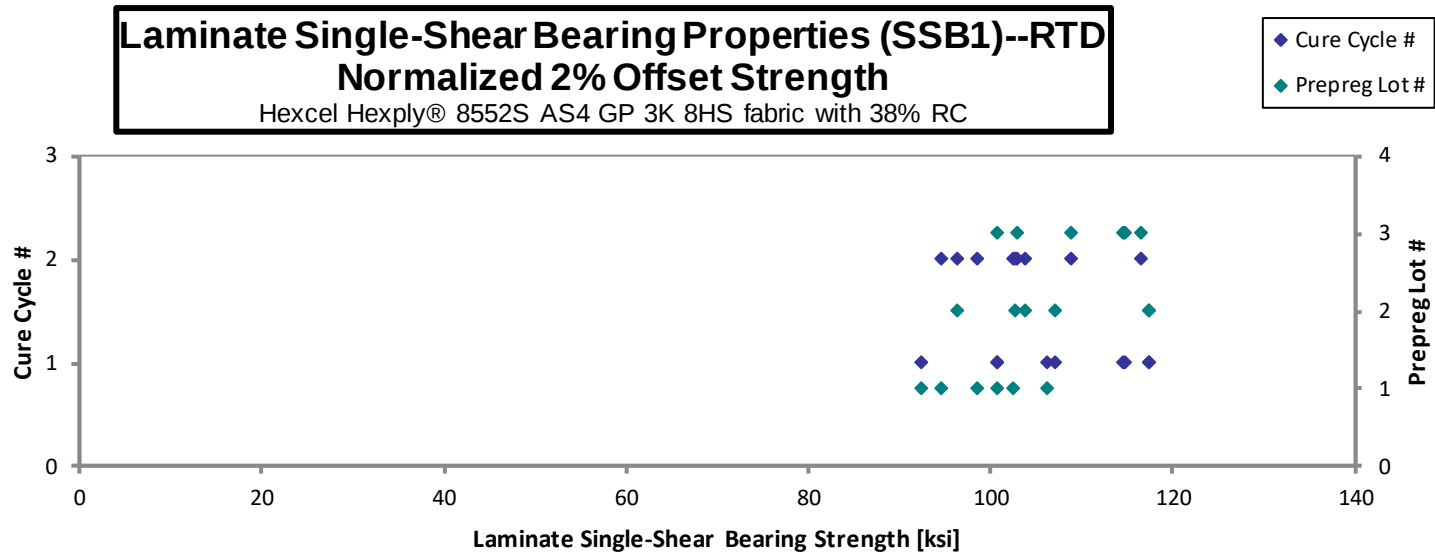
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Initial Peak Strength [ksi]	2% Offset Strength [ksi]	Ultimate Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA1A111A	A	M1	1	1	108.7	108.3	140.3	0.1023	8	B1I
HPA1A112A	A	M1	1	1		113.0	141.2	0.1070	8	B1I
HPA1A113A	A	M1	1	1	121.7	117.8	133.9	0.1082	8	B1I
HPA1A211A	A	M2	1	2		115.4	140.8	0.1066	8	B1I
HPA1A212A	A	M2	1	2	110.0	107.1	140.8	0.1104	8	B1I
HPA1A213A	A	M2	1	2	104.5	101.9	134.9	0.1114	8	B1I
HPA1B111A	B	M1	2	1		113.6	147.0	0.1133	8	B1I
HPA1B112A	B	M1	2	1		118.8	132.8	0.1185	8	B1I
HPA1B113A	B	M1	2	1		117.6	149.8	0.1199	8	B1I
HPA1B211A	B	M2	2	2		112.0	130.6	0.1112	8	B1I
HPA1B212A	B	M2	2	2		99.03	123.6	0.1244	8	B1I
HPA1B213A	B	M2	2	2		91.30	121.0	0.1265	8	B1I
HPA1C111A	C	M1	3	1		123.7	140.8	0.1111	8	B1I
HPA1C112A	C	M1	3	1		109.9	134.7	0.1100	8	B1I
HPA1C113A	C	M1	3	1		109.3	128.4	0.1261	8	B1I
HPA1C211A	C	M2	3	2	114.0	112.2	141.1	0.1100	8	B1I
HPA1C212A	C	M2	3	2	116.7	110.8	128.7	0.1180	8	B1I
HPA1C213A	C	M2	3	2		116.5	138.0	0.1199	8	B1I

Initial Peak is not included in statistical analysis due to small sample size

Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]	Ultimate Strength _{norm} [ksi]
0.0128	92.35	119.6
0.0134	100.7	125.9
0.0135	106.3	120.8
0.0133	102.5	125.1
0.0138	98.61	129.6
0.0139	94.63	125.3
0.0142	107.2	138.7
0.0148	117.4	131.2
0.0150	117.5	149.7
0.0139	103.8	121.0
0.0156	102.7	128.2
0.0158	96.25	127.5
0.0139	114.5	130.3
0.0137	100.7	123.4
0.0158	114.8	134.9
0.0137	102.8	129.3
0.0147	109.0	126.6
0.0150	116.5	137.9

Average	112.6	111.0	136.0
Standard Dev.	6.143	7.726	7.647
Coeff. of Var. [%]	5.455	6.959	5.622
Min.	104.5	91.30	121.0
Max.	121.7	123.7	149.8
Number of Spec.	6	18	18

Average _{norm}	0.0143	105.4	129.2
Standard Dev. _{norm}		7.993	7.443
Coeff. of Var. [%] _{norm}		7.580	5.763
Min.	0.0128	92.35	119.6
Max.	0.0158	117.5	149.7
Number of Spec.	18	18	18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Single-Shear Bearing Properties (SSB1)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Initial Peak Strength [ksi]	2% Offset Strength [ksi]	Ultimate Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA1A111D	A	M1	1	1		95.29	102.1	0.1108	8	B1I
HPA1A112D	A	M1	1	1		92.89	96.59	0.1191	8	B1I
HPA1A113D	A	M1	1	1		86.59	94.07	0.1229	8	B1I
HPA1A211D	A	M2	1	2		95.45	101.3	0.1094	8	B1I
HPA1A212D	A	M2	1	2	85.33	84.32	88.07	0.1231	8	B1I
HPA1A213D	A	M2	1	2		70.08	78.97	0.1265	8	B1I
HPA1B111D	B	M1	2	1		93.20	98.27	0.1129	8	B1I
HPA1B112D	B	M1	2	1		90.01	92.80	0.1231	8	B1I
HPA1B113D	B	M1	2	1		68.76	83.02	0.1242	8	B1I
HPA1B211D	B	M2	2	2	90.25	89.28	96.52	0.1154	8	B1I
HPA1B212D	B	M2	2	2		91.13	91.27	0.1288	8	B1I
HPA1B213D	B	M2	2	2			94.59	0.1308	8	B1I
HPA1C111D	C	M1	3	1		87.86	108.6	0.1104	8	B1I
HPA1C112D	C	M1	3	1	88.81	88.15	103.6	0.1220	8	B1I
HPA1C113D	C	M1	3	1		87.55	92.36	0.1245	8	B1I
HPA1C211D	C	M2	3	2		97.97	98.98	0.1104	8	B1I
HPA1C212D*	C	M2	3	2			109.3	0.1210	8	B1I
HPA1C213D	C	M2	3	2		83.14	85.98	0.1257	8	B1I
HPA1C215D*	C	M2	3	2			91.85	0.1211	8	B1I

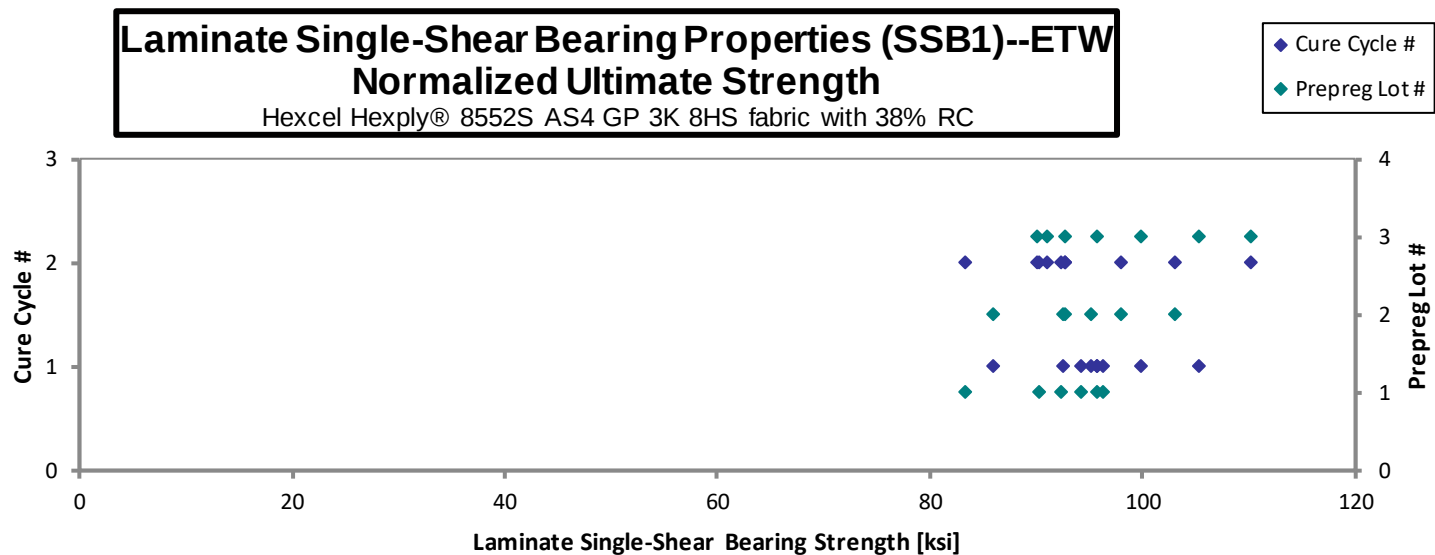
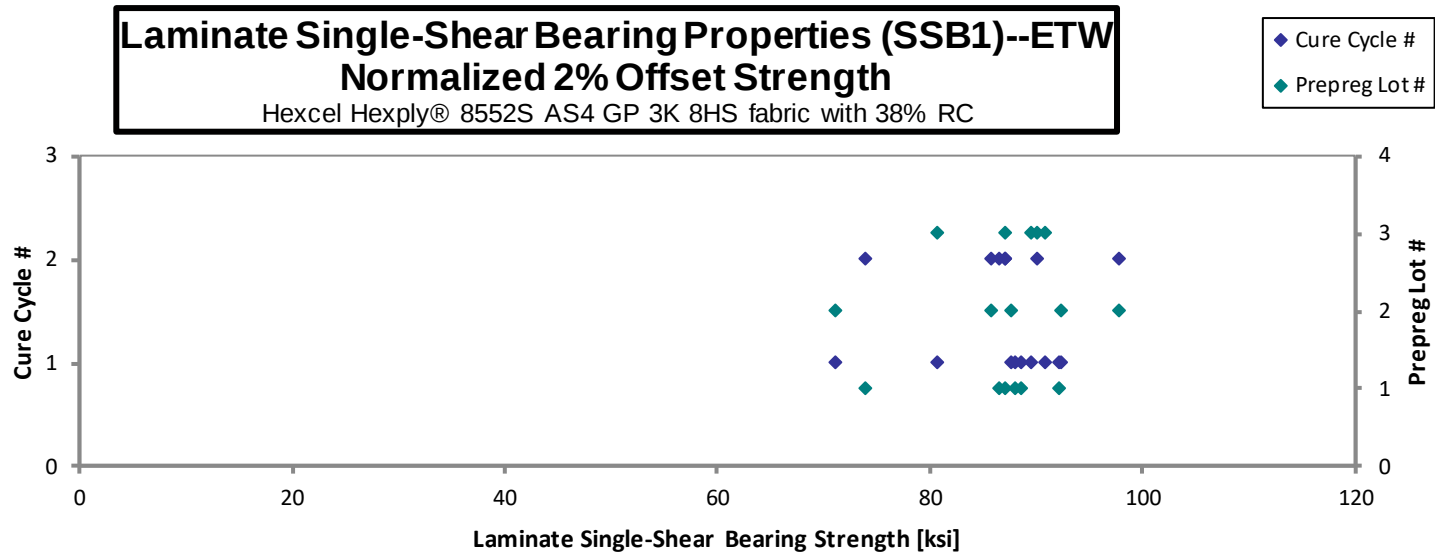
*Ultimate strength occurs before 2% offset.

Initial Peak is not included in statistical analysis due to small sample size

Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]	Ultimate Strength _{norm} [ksi]
0.0138	87.96	94.20
0.0149	92.15	95.82
0.0154	88.68	96.34
0.0137	87.02	92.32
0.0154	86.46	90.30
0.0158	73.88	83.26
0.0141	87.70	92.47
0.0154	92.32	95.18
0.0155	71.15	85.91
0.0144	85.82	92.78
0.0161	97.81	97.96
0.0164		103.1
0.0138	80.79	99.87
0.0153	89.63	105.4
0.0156	90.80	95.78
0.0138	90.14	91.07
0.0151		110.2
0.0157	87.11	90.09
0.0151		92.71

Average 88.13 87.60 95.17
Standard Dev. 2.530 8.175 7.994
Coeff. of Var. [%] 2.871 9.332 8.400
Min. 85.33 68.76 78.97
Max. 90.25 97.97 109.3

Average_{norm} 0.0150 86.84 94.99
Standard Dev_{norm} 6.685 6.445
Coeff. of Var. [%]_{norm} 7.698 6.785
Min. 0.0137 71.15 83.26
Max. 0.0164 97.81 110.2



July 16, 2025

CAM-RP-2019-057 Rev -

4.27 “10/80/10” Single-Shear Bearing 2 Properties (SSB2)

Laminate Single-Shear Bearing Properties (SSB2)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

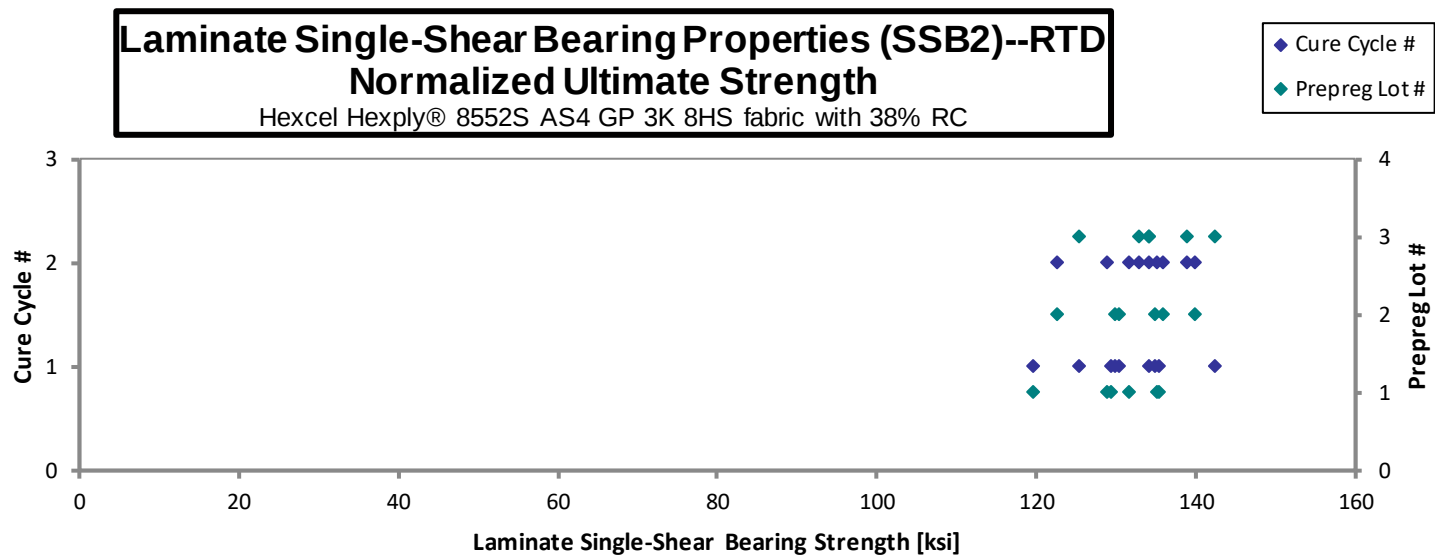
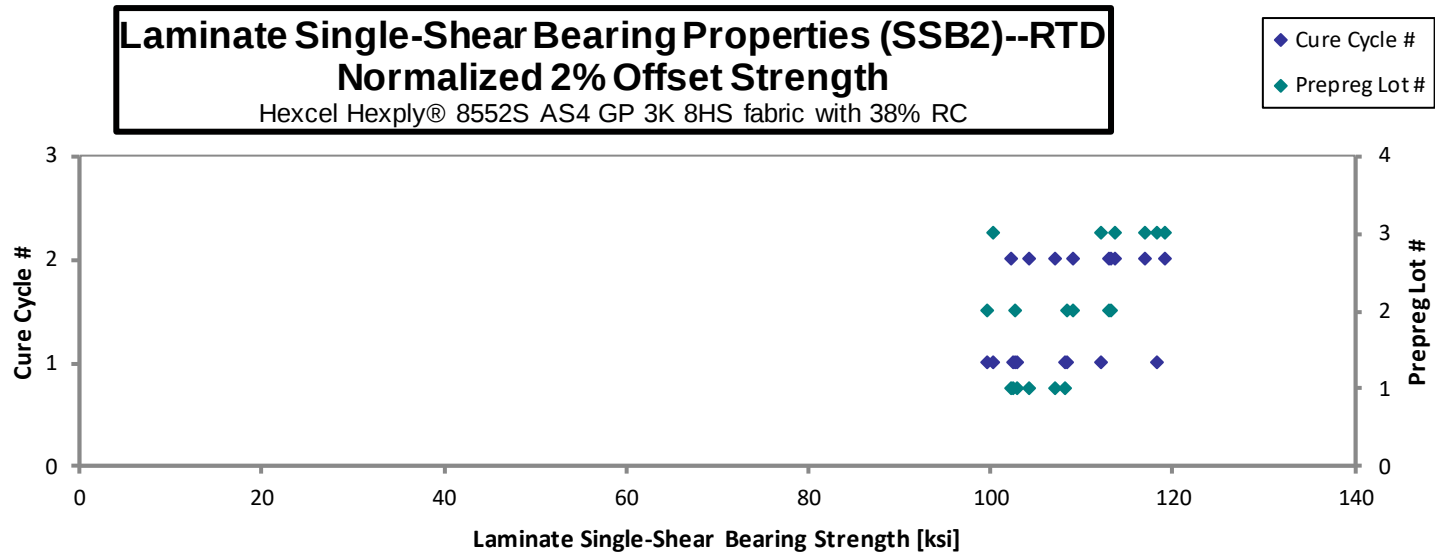
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	2% Offset Strength [ksi]	Ultimate Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA2A111A	A	M1	1	1	118.5	137.6	0.1303	10	B1I, E3S
HPA2A112A	A	M1	1	1	112.8	142.4	0.1365	10	B1I, E3S
HPA2A113A	A	M1	1	1	116.9	146.3	0.1388	10	B1I, E3S
HPA2A211A	A	M2	1	2	114.9	145.0	0.1334	10	B1I, E3S
HPA2A212A	A	M2	1	2	115.3	141.7	0.1394	10	B1I, E3S
HPA2A213A	A	M2	1	2	111.1	144.0	0.1408	10	B1I, E3S
HPA2B111A	B	M1	2	1	117.1	141.0	0.1388	10	B1I, E3S
HPA2B112A	B	M1	2	1	102.2	138.5	0.1462	10	B1I, E3S
HPA2B113A	B	M1	2	1	102.8	129.9	0.1499	10	B1I, E3S
HPA2B211A	B	M2	2	2	116.8	131.2	0.1401	10	B1I, E3S
HPA2B212A	B	M2	2	2	114.7	142.2	0.1476	10	B1I, E3S
HPA2B213A	B	M2	2	2	111.7	134.0	0.1521	10	B1I, E3S
HPA2C111A	C	M1	3	1	119.7	143.1	0.1406	10	B1I, E3S
HPA2C112A	C	M1	3	1	112.6	140.9	0.1336	10	B1I, E3S
HPA2C113A	C	M1	3	1	112.2	135.2	0.1581	10	B1I, E3S
HPA2C211A	C	M2	3	2	122.0	142.5	0.1399	10	B1I, E3S
HPA2C212A	C	M2	3	2	115.9	130.5	0.1542	10	B1I, E3S
HPA2C213A	C	M2	3	2	108.9	129.4	0.1611	10	B1I, E3S

Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]	Ultimate Strength _{norm} [ksi]
0.0130	103.0	119.6
0.0136	102.6	129.5
0.0139	108.2	135.4
0.0133	102.3	129.0
0.0139	107.2	131.7
0.0141	104.3	135.1
0.0139	108.3	130.4
0.0146	99.59	135.0
0.0150	102.7	129.8
0.0140	109.1	122.6
0.0148	112.9	139.9
0.0152	113.3	135.9
0.0141	112.2	134.1
0.0134	100.3	125.5
0.0158	118.3	142.5
0.0140	113.8	133.0
0.0154	119.1	134.2
0.0161	116.9	139.0

Average 113.7 138.6
 Standard Dev. 5.206 5.562
 Coeff. of Var. [%] 4.579 4.012
 Min. 102.2 129.4
 Max. 122.0 146.3
 Number of Spec. 18 18

Average_{norm} 0.0143 108.6 132.3
 Standard Dev_{norm} 6.279 5.862
 Coeff. of Var. [%]_{norm} 5.784 4.429
 Min. 0.0130 99.59 119.6
 Max. 0.0161 119.1 142.5
 Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Single-Shear Bearing Properties (SSB2)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

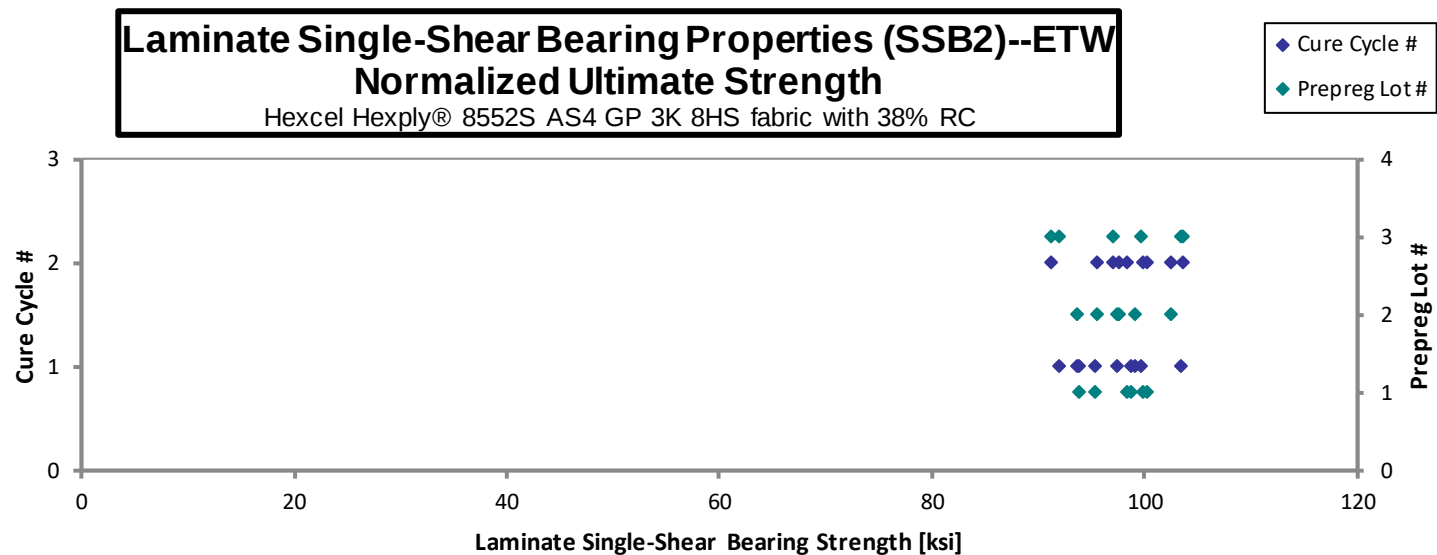
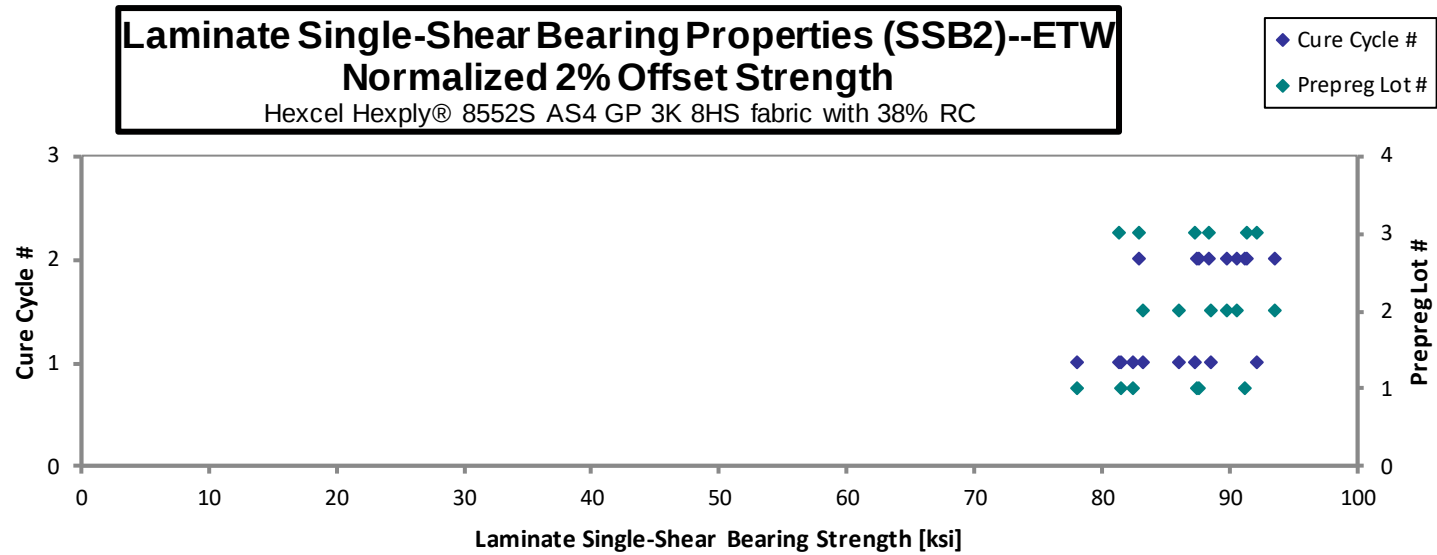
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	2% Offset Strength [ksi]	Ultimate Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA2A111D	A	M1	1	1	85.56	104.5	0.1368	10	B1I
HPA2A112D	A	M1	1	1	88.54	102.0	0.1380	10	B1I
HPA2A113D	A	M1	1	1	81.45	97.68	0.1518	10	B1I
HPA2A211D	A	M2	1	2	85.68	98.05	0.1534	10	B1I
HPA2A212D	A	M2	1	2	86.37	94.45	0.1585	10	B1I
HPA2A213D	A	M2	1	2	90.06	101.4	0.1456	10	B1I
HPA2B111D	B	M1	2	1	87.51	104.2	0.1426	10	B1I
HPA2B112D	B	M1	2	1	86.39	94.92	0.1539	10	B1I
HPA2B113D	B	M1	2	1	80.99	88.09	0.1595	10	B1I
HPA2B211D	B	M2	2	2	88.89	95.84	0.1528	10	B1I
HPA2B212D	B	M2	2	2	93.52	99.55	0.1441	10	B1I
HPA2B213D	B	M2	2	2	90.25	98.94	0.1555	10	B1I
HPA2C111D	C	M1	3	1	88.11	99.74	0.1384	10	B1I
HPA2C112D	C	M1	3	1	85.29	97.37	0.1535	10	B1I
HPA2C113D	C	M1	3	1	88.71	99.55	0.1558	10	B1I
HPA2C211D	C	M2	3	2	97.63	100.8	0.1358	10	B1I
HPA2C212D	C	M2	3	2	85.19	99.65	0.1460	10	B1I
HPA2C213D	C	M2	3	2	90.91	103.2	0.1508	10	B1I

Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]	Ultimate Strength _{norm} [ksi]
0.0137	78.01	95.29
0.0138	81.46	93.86
0.0152	82.42	98.84
0.0153	87.61	100.3
0.0158	91.25	99.80
0.0146	87.44	98.43
0.0143	83.19	99.09
0.0154	88.63	97.39
0.0160	86.12	93.68
0.0153	90.54	97.62
0.0144	89.85	95.63
0.0155	93.53	102.5
0.0138	81.29	92.01
0.0153	87.27	99.63
0.0156	92.11	103.4
0.0136	88.38	91.27
0.0146	82.91	96.99
0.0151	91.39	103.7

Average 87.84 98.89
Standard Dev. 3.957 3.957
Coeff. of Var. [%] 4.505 4.002
Min. 80.99 88.09
Max. 97.63 104.5
Number of Spec. 18 18

Average_{norm} 0.0148 86.86 97.75
Standard Dev_{norm} 4.397 3.641
Coeff. of Var. [%]_{norm} 5.063 3.725
Min. 0.0136 78.01 91.27
Max. 0.0160 93.53 103.7
Number of Spec. 18 18 18



July 16, 2025

CAM-RP-2019-057 Rev -

4.28 “40/20/40” Single-Shear Bearing 3 Properties (SSB3)

Laminate Single-Shear Bearing Properties (SSB3)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

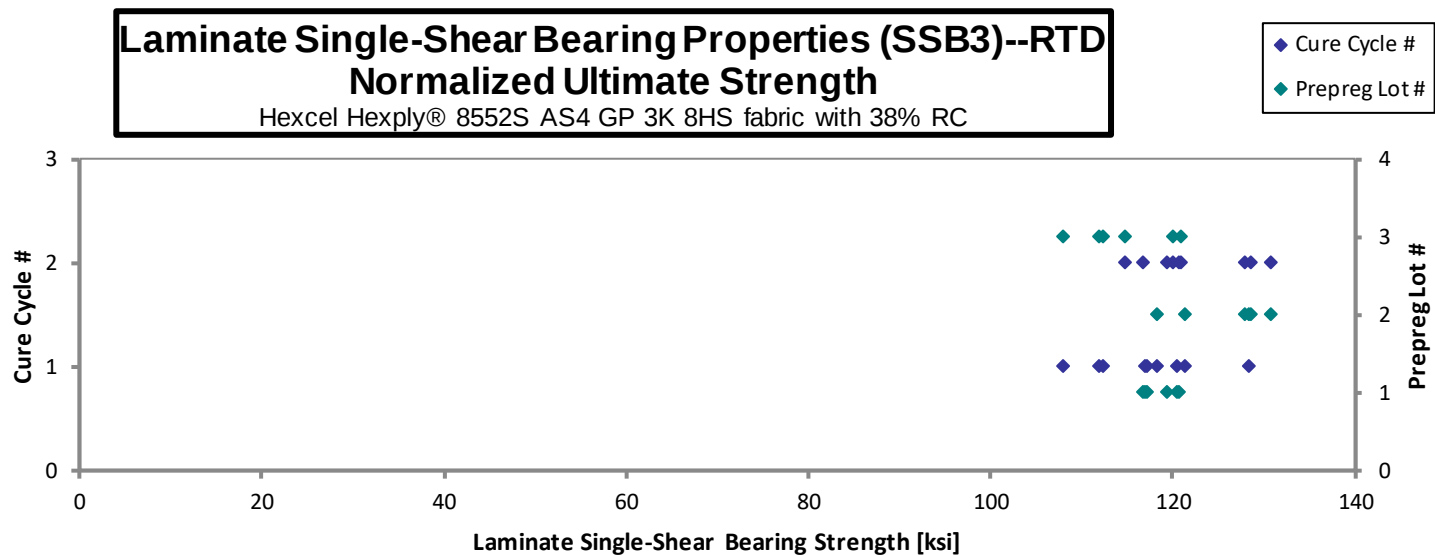
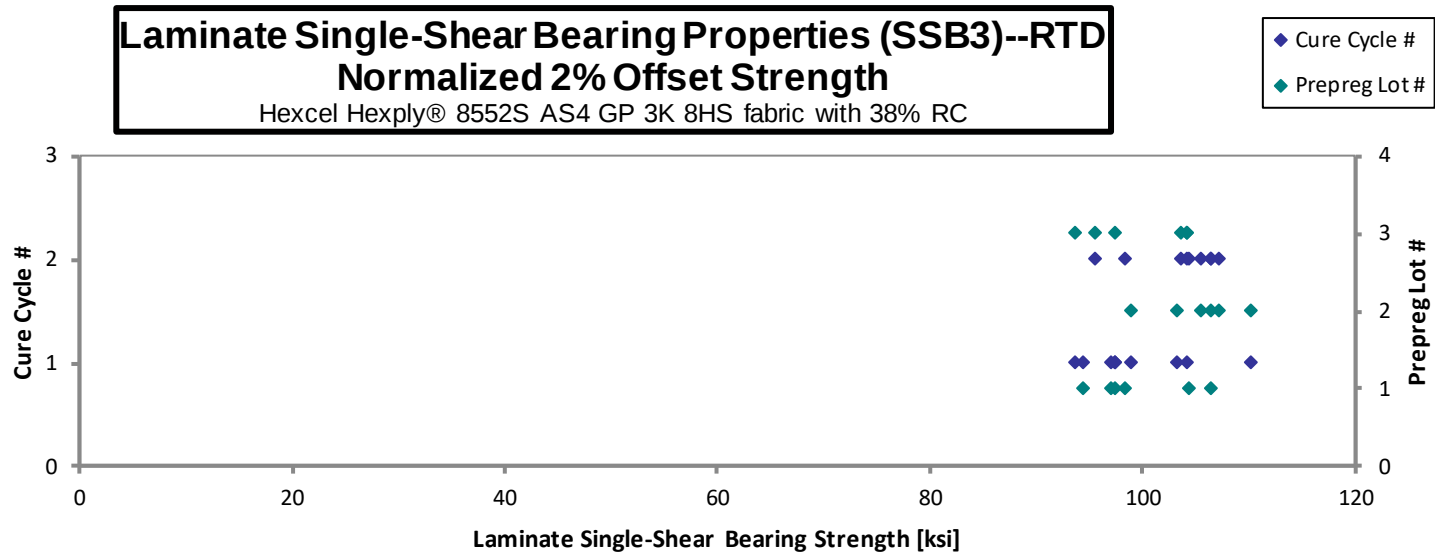
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Initial Peak Strength [ksi]	2% Offset Strength [ksi]	Ultimate Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA3A111A	A	M1	1	1		107.9	133.5	0.1314	10	B1I
HPA3A112A	A	M1	1	1		105.1	130.4	0.1386	10	B1I
HPA3A113A	A	M1	1	1	105.8	104.6	125.9	0.1397	10	B1I
HPA3A211A	A	M2	1	2		118.7	133.3	0.1345	10	B1I
HPA3A212A	A	M2	1	2		111.5	128.9	0.1404	10	B1I
HPA3A213A	A	M2	1	2	106.0	103.6	122.8	0.1425	10	B1I
HPA3B111A	B	M1	2	1	110.8	107.2	128.3	0.1384	10	B1I
HPA3B112A	B	M1	2	1		101.8	119.8	0.1520	10	B1I
HPA3B113A	B	M1	2	1		104.4	121.6	0.1583	10	B1I
HPA3B211A	B	M2	2	2		110.1	133.4	0.1438	10	B1I, E3S
HPA3B212A	B	M2	2	2		104.0	124.9	0.1545	10	B1I, E3S
HPA3B213A	B	M2	2	2		101.5	124.8	0.1572	10	B1I, E3S, D1I
HPA3C111A	C	M1	3	1		106.4	122.2	0.1374	10	B1I
HPA3C112A	C	M1	3	1	107.5	105.1	126.2	0.1336	10	B1I
HPA3C113A	C	M1	3	1		116.1	120.2	0.1346	10	B1I
HPA3C211A	C	M2	3	2		104.9	125.8	0.1368	10	B1I
HPA3C212A	C	M2	3	2		109.2	126.7	0.1432	10	B1I
HPA3C213A	C	M2	3	2		107.7	124.6	0.1444	10	B1I

Initial Peak is not included in statistical analysis due to small sample size

Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]	Ultimate Strength _{norm} [ksi]
0.0131	94.48	116.9
0.0139	97.12	120.5
0.0140	97.44	117.2
0.0134	106.4	119.5
0.0140	104.4	120.7
0.0143	98.41	116.7
0.0138	98.90	118.3
0.0152	103.2	121.4
0.0158	110.2	128.3
0.0144	105.5	127.8
0.0155	107.1	128.7
0.0157	106.4	130.9
0.0137	97.50	111.9
0.0134	93.60	112.4
0.0135	104.2	107.9
0.0137	95.65	114.7
0.0143	104.3	121.0
0.0144	103.7	120.0

Average	107.6	107.2	126.3
Standard Dev.	2.322	4.582	4.305
Coeff. of Var. [%]	2.159	4.274	3.408
Min.	105.8	101.5	119.8
Max.	110.8	118.7	133.5
Number of Spec.	4	18	18

Average _{norm}	0.0142	101.6	119.7
Standard Dev. _{norm}		4.948	6.210
Coeff. of Var. [%] _{norm}		4.871	5.187
Min.	0.0131	93.60	107.9
Max.	0.0158	110.2	130.9
Number of Spec.	18	18	18



July 16, 2025

CAM-RP-2019-057 Rev -

**Laminate Single-Shear Bearing Properties (SSB3)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

0.0150

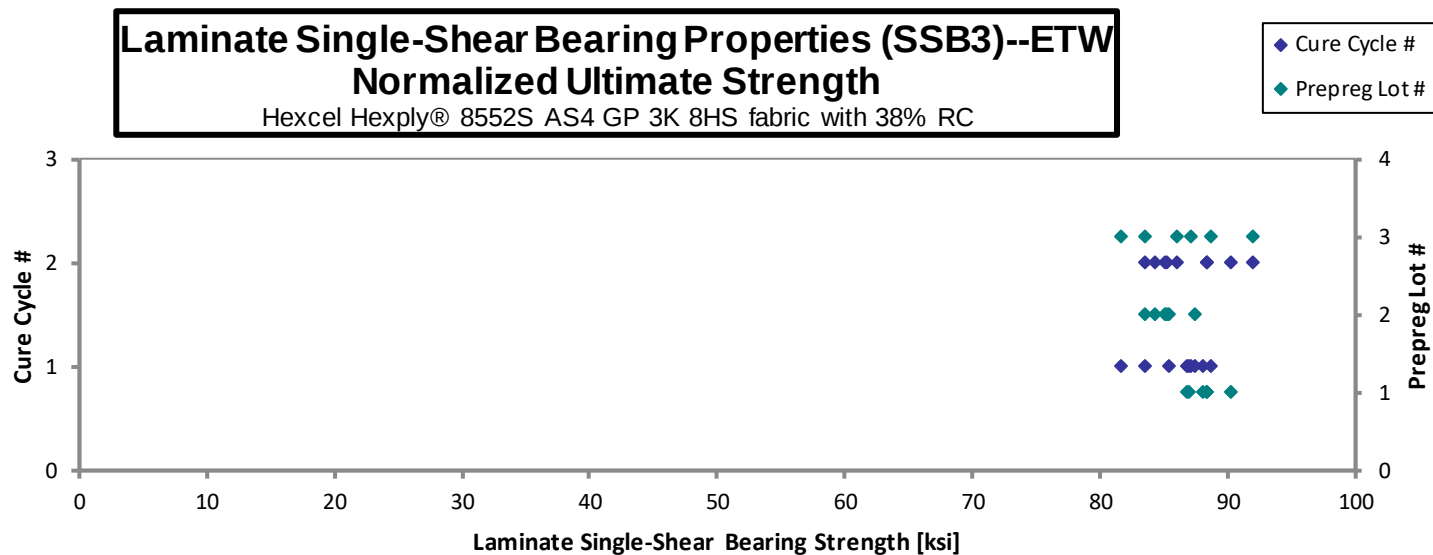
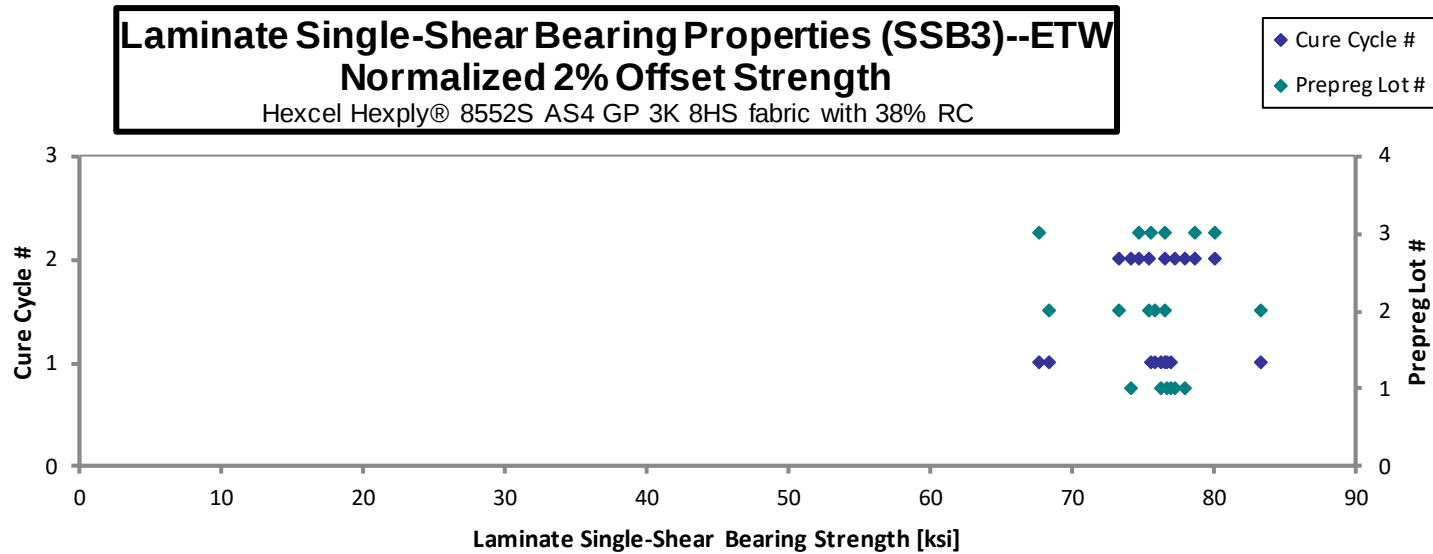
Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Initial Peak Strength [ksi]	2% Offset Strength [ksi]	Ultimate Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPA3A111D	A	M1	1	1	84.38	80.84	93.45	0.1415	10	B1I
HPA3A112D	A	M1	1	1		75.81	85.94	0.1520	10	B1I
HPA3A113D	A	M1	1	1	74.84	73.76	83.13	0.1567	10	B1I
HPA3A211D	A	M2	1	2	82.79	81.61	93.37	0.1420	10	B1I
HPA3A212D	A	M2	1	2	76.23	75.86	87.79	0.1542	10	B1I
HPA3A213D	A	M2	1	2	72.52	70.21	83.62	0.1586	10	B1I
HPA3B111D	B	M1	2	1	77.48	73.25	82.34	0.1555	10	B1I
HPA3B112D	B	M1	2	1	81.68	73.54	89.79	0.1395	10	B1I
HPA3B113D	B	M1	2	1	85.39	82.87	86.86	0.1510	10	B1I
HPA3B211D	B	M2	2	2		79.53	89.73	0.1422	10	B1I
HPA3B212D	B	M2	2	2		72.93	84.78	0.1510	10	B1I
HPA3B213D	B	M2	2	2		75.28	82.99	0.1525	10	B1I
HPA3C111D	C	M1	3	1	77.26	72.86	87.76	0.1395	10	B1I
HPA3C112D	C	M1	3	1	77.04	74.48	87.39	0.1524	10	B1I
HPA3C113D	C	M1	3	1	71.91	71.26	81.04	0.1613	10	B1I
HPA3C211D	C	M2	3	2		78.13	87.36	0.1435	10	B1I
HPA3C212D	C	M2	3	2	79.52	76.60	83.61	0.1543	10	B1I
HPA3C213D	C	M2	3	2		75.21	86.32	0.1598	10	B1I

Initial Peak is not included in statistical analysis due to small sample size

Avg. t_{ply} [in]	2% Offset Strength _{norm} [ksi]	Ultimate Strength _{norm} [ksi]
0.0142	76.27	88.16
0.0152	76.79	87.05
0.0157	77.07	86.87
0.0142	77.24	88.37
0.0154	77.96	90.22
0.0159	74.25	88.44
0.0155	75.93	85.35
0.0139	68.38	83.48
0.0151	83.41	87.43
0.0142	75.41	85.09
0.0151	73.39	85.31
0.0153	76.55	84.39
0.0140	67.76	81.62
0.0152	75.68	88.79
0.0161	76.63	87.14
0.0143	74.72	83.55
0.0154	78.78	85.99
0.0160	80.15	91.98

Average	78.42	75.78	86.52
Standard Dev.	4.411	3.565	3.535
Coeff. of Var. [%]	5.625	4.704	4.086
Min.	71.91	70.21	81.04
Max.	85.39	82.87	93.45
Number of Spec.	12	18	18

Average _{norm}	0.0150	75.91	86.62
Standard Dev. _{norm}		3.643	2.562
Coeff. of Var. [%] _{norm}		4.800	2.957
Min.	0.0139	67.76	81.62
Max.	0.0161	83.41	91.98
Number of Spec.	18	18	18



July 16, 2025

CAM-RP-2019-057 Rev -

4.29 “25/50/25” Compression After Impact 1 Properties (CAI1)

Laminate Compression After Impact 1 Properties (CAI1)--RTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

normalizing

t_{ply} [in]

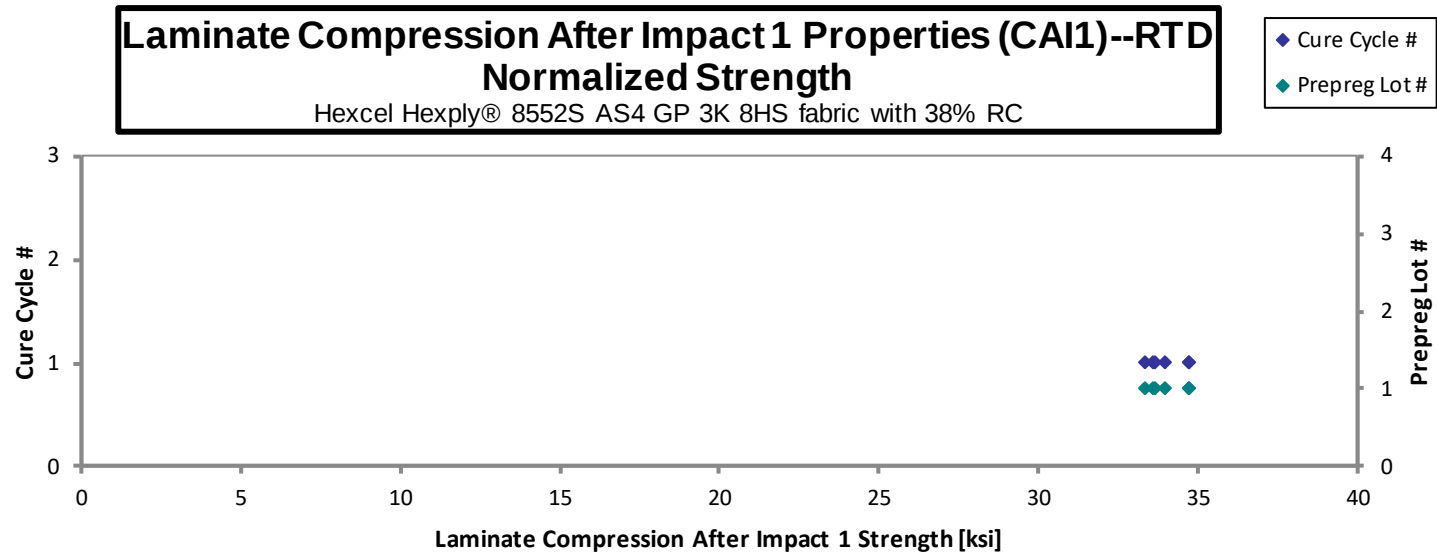
0.0150

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Measured Impact Energy [in-lbf]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode
HPAKA111A	A	M1	1	1	34.21	267.2	0.1769	12	LDM
HPAKA112A	A	M1	1	1	33.43	278.6	0.1869	12	LDM
HPAKA113A	A	M1	1	1	34.05	263.5	0.1764	12	LDM
HPAKA114A	A	M1	1	1	34.58	262.5	0.1753	12	LDM
HPAKA115A	A	M1	1	1	35.70	262.7	0.1750	12	LDM
HPAKA116A	A	M1	1	1	33.17	279.1	0.1845	12	LDM

Avg. t_{ply} [in]	Strength _{norm} [ksi]
0.0147	33.62
0.0156	34.71
0.0147	33.37
0.0146	33.68
0.0146	34.72
0.0154	33.99

Average 34.19
Standard Dev. 0.9037
Coeff. of Var. [%] 2.643
Min. 33.17
Max. 35.70
Number of Spec. 6

Average_{norm} 0.0149 34.01
Standard Dev._{norm} 0.5751
Coeff. of Var. [%]_{norm} 1.691
Min. 0.0146 33.37
Max. 0.0156 34.72
Number of Spec. 6 6



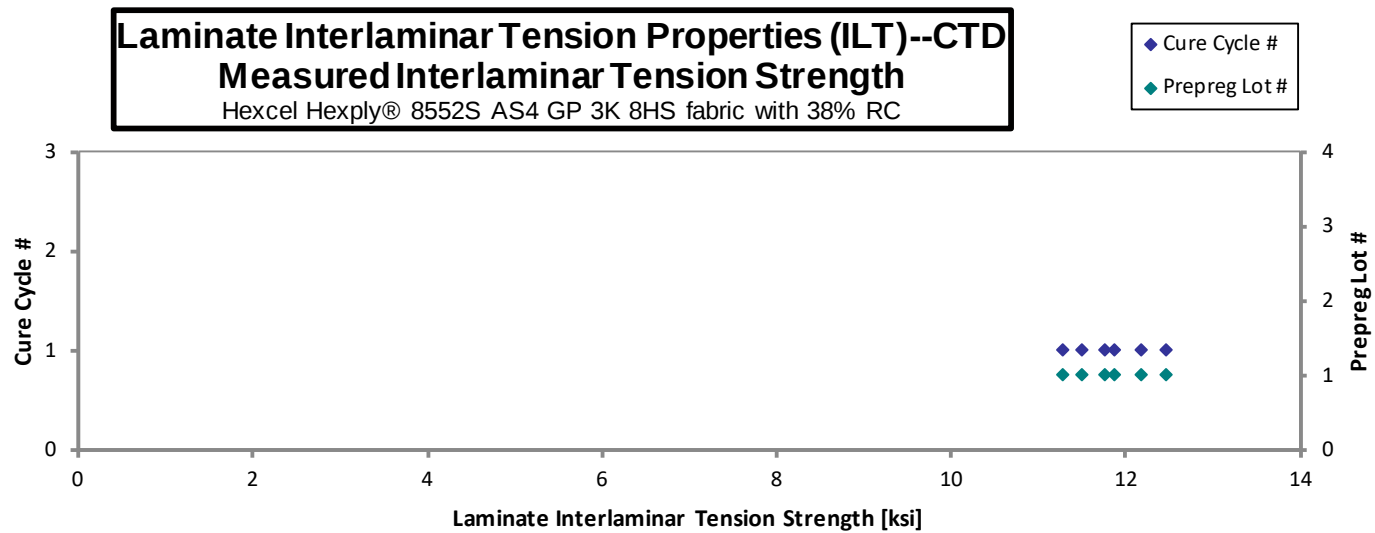
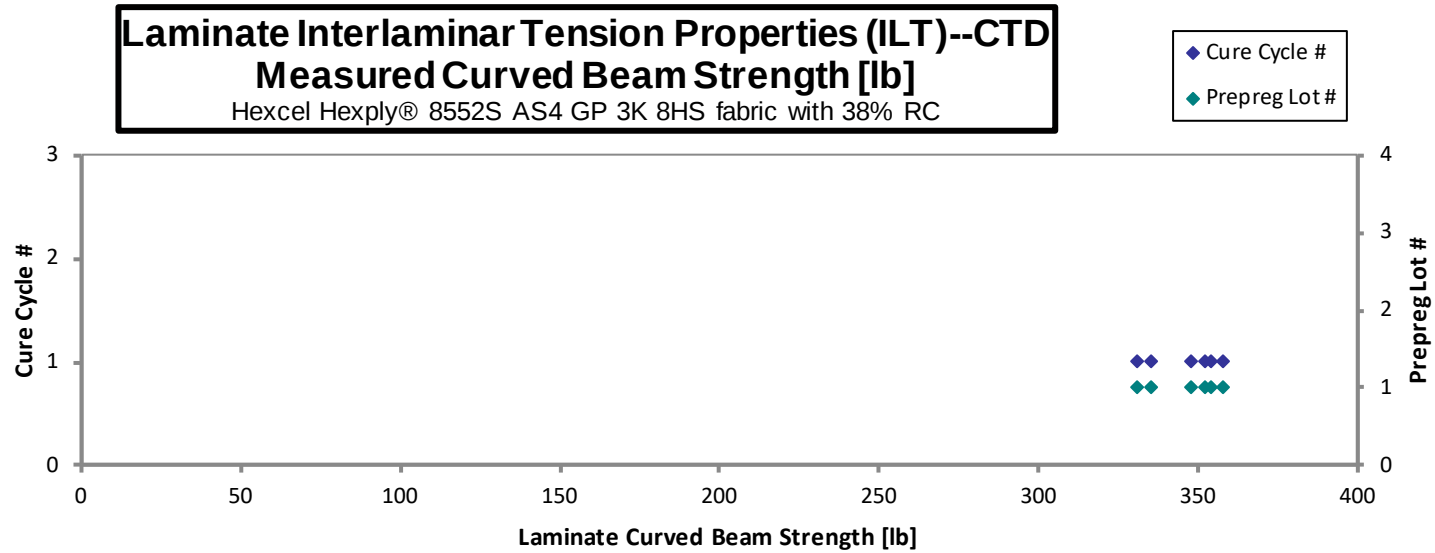
4.30 Interlaminar Tension Properties (ILT)

Laminate Interlaminar Tension Properties (ILT)--CTD Strength

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Curved Beam Strength [lb]	Interlaminar Tension Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAMA111B	A	M1	1	1	354.0	12.17	0.1398	11	0.0127	INTERLAMINAR FAILURE
HPAMA112B	A	M1	1	1	330.9	11.28	0.1408	11	0.0128	INTERLAMINAR FAILURE
HPAMA113B	A	M1	1	1	335.4	11.49	0.1402	11	0.0127	INTERLAMINAR FAILURE
HPAMA114B	A	M1	1	1	352.4	11.88	0.1421	11	0.0129	INTERLAMINAR FAILURE
HPAMA115B	A	M1	1	1	358.3	12.46	0.1384	11	0.0126	INTERLAMINAR FAILURE
HPAMA116B	A	M1	1	1	347.7	11.77	0.1416	11	0.0129	INTERLAMINAR FAILURE

Average	346.5	11.84	0.0128
Standard Dev.	10.92	0.4328	
Coeff. of Var. [%]	3.151	3.655	
Min.	330.9	11.28	0.0126
Max.	358.3	12.46	0.0129
Number of Spec.	6	6	6



July 16, 2025

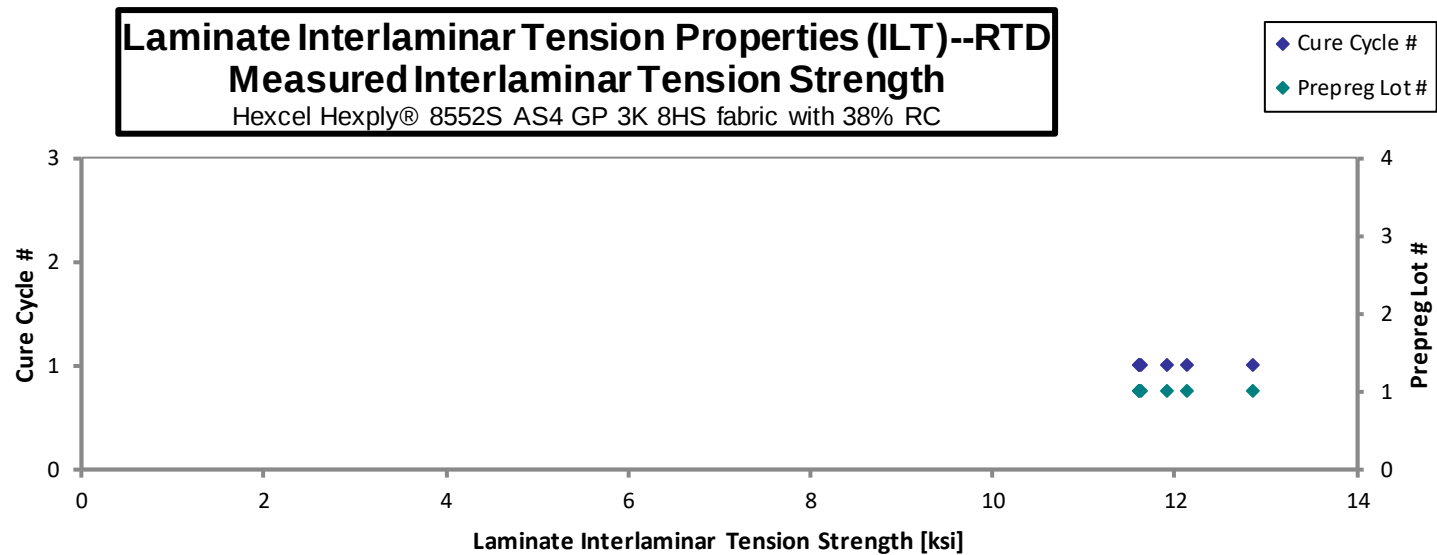
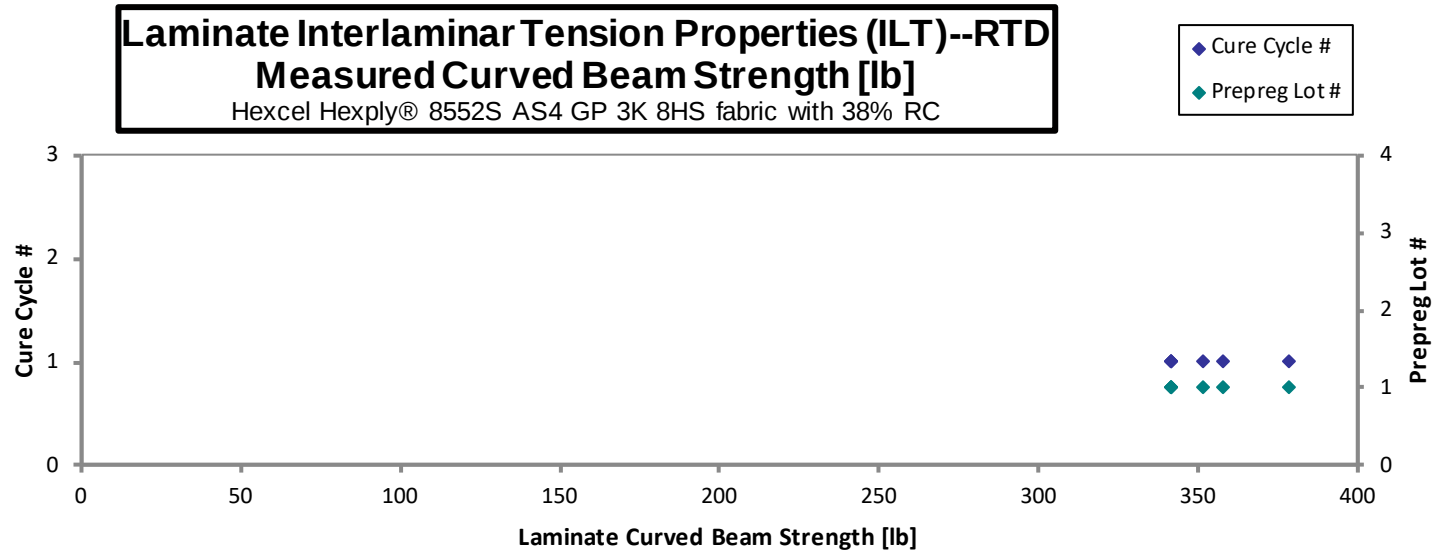
CAM-RP-2019-057 Rev -

**Laminate Interlaminar Tension Properties (ILT)--RTD
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Curved Beam Strength [lb]	Interlaminar Tension Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t _{ply} [in]	Failure Mode
HPAMA111A	A	M1	1	1	378.7	12.86	0.1413	11	0.0128	INTERLAMINAR FAILURE
HPAMA112A	A	M1	1	1	351.7	11.91	0.1416	11	0.0129	INTERLAMINAR FAILURE
HPAMA113A	A	M1	1	1	358.1	12.14	0.1414	11	0.0129	INTERLAMINAR FAILURE
HPAMA114A	A	M1	1	1	341.5	11.63	0.1409	11	0.0128	INTERLAMINAR FAILURE
HPAMA115A	A	M1	1	1	341.8	11.62	0.1411	11	0.0128	INTERLAMINAR FAILURE
HPAMA116A	A	M1	1	1	342.0	11.61	0.1413	11	0.0128	INTERLAMINAR FAILURE

Average	352.3	11.96	0.0128
Standard Dev.	14.59	0.4889	
Coeff. of Var. [%]	4.141	4.087	
Min.	341.5	11.61	0.0128
Max.	378.7	12.86	0.0129
Number of Spec.	6	6	6



July 16, 2025

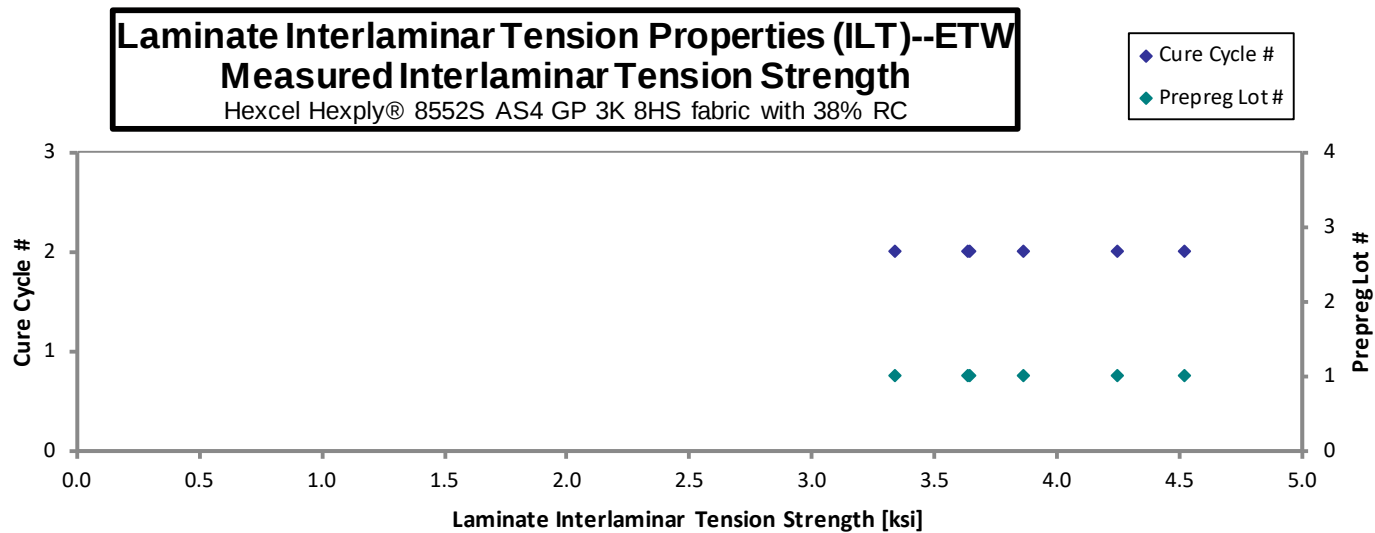
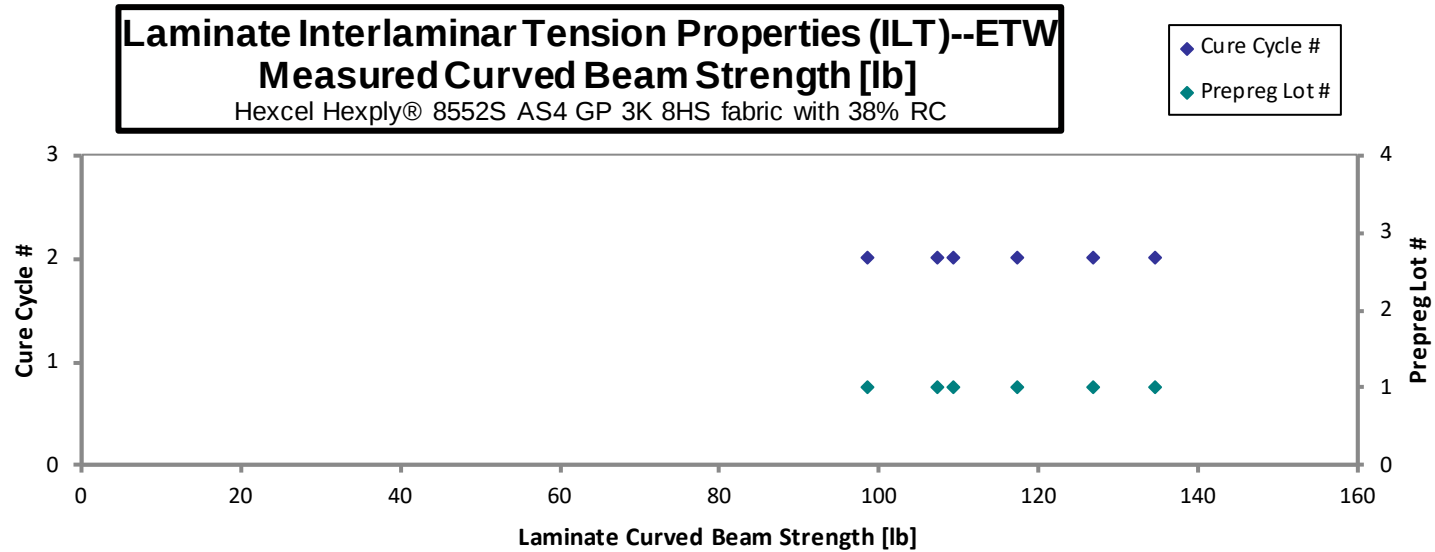
CAM-RP-2019-057 Rev -

**Laminate Interlaminar Tension Properties (ILT)--ETW
Strength**

Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

Specimen Number	Spirit Batch #	Spirit Cure Cycle	Prepreg Lot #	Cure Cycle #	Curved Beam Strength [lb]	Interlaminar Tension Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode
HPAMA211D	A	M2	1	2	107.5	3.639	0.1416	11	0.0129	INTERLAMINAR TENSILE FAILURE
HPAMA212D	A	M2	1	2	98.55	3.340	0.1415	11	0.0129	INTERLAMINAR TENSILE FAILURE
HPAMA213D	A	M2	1	2	117.3	3.863	0.1450	11	0.0132	INTERLAMINAR TENSILE FAILURE
HPAMA214D	A	M2	1	2	134.6	4.520	0.1426	11	0.0130	INTERLAMINAR TENSILE FAILURE
HPAMA215D	A	M2	1	2	109.3	3.648	0.1434	11	0.0130	INTERLAMINAR TENSILE FAILURE
HPAMA216D	A	M2	1	2	126.9	4.248	0.1430	11	0.0130	INTERLAMINAR TENSILE FAILURE

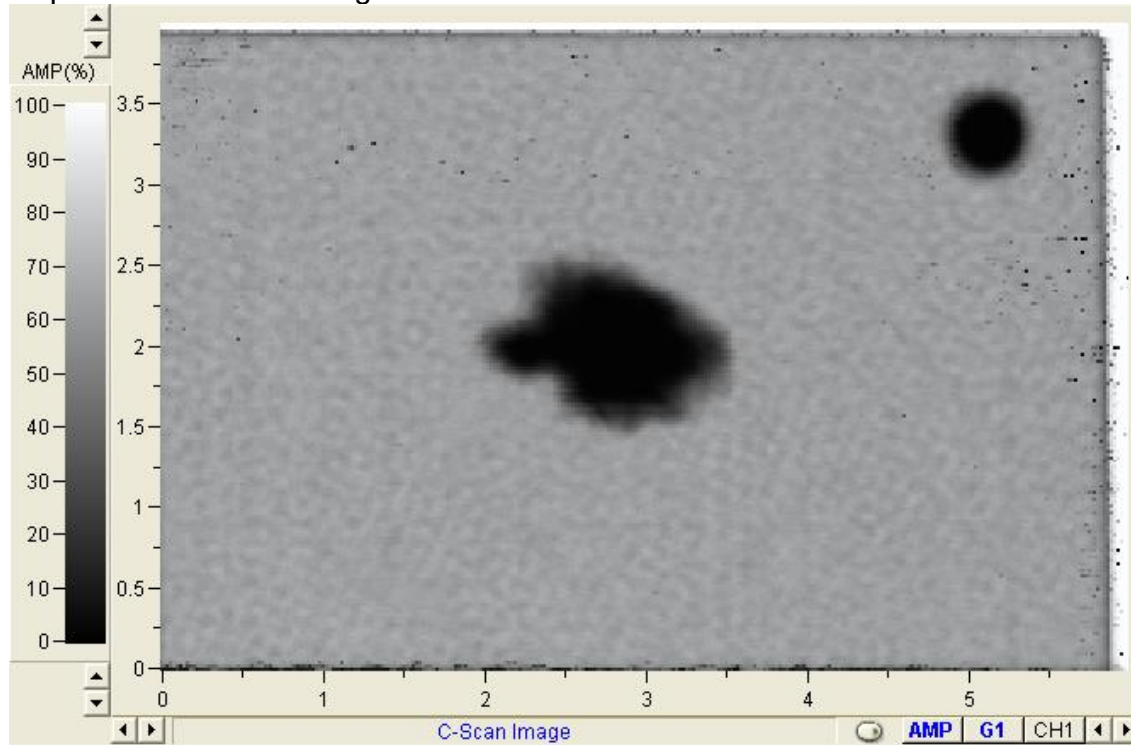
Average	115.7	3.876	0.0130
Standard Dev.	13.33	0.4356	
Coeff. of Var. [%]	11.52	11.24	
Min.	98.55	3.340	0.0129
Max.	134.6	4.520	0.0132
Number of Spec.	6	6	6



5. Additional Compression After Impact Data

Impactor Diameter: 0.625"

Representative of Damage Area :- HPAKA 112A

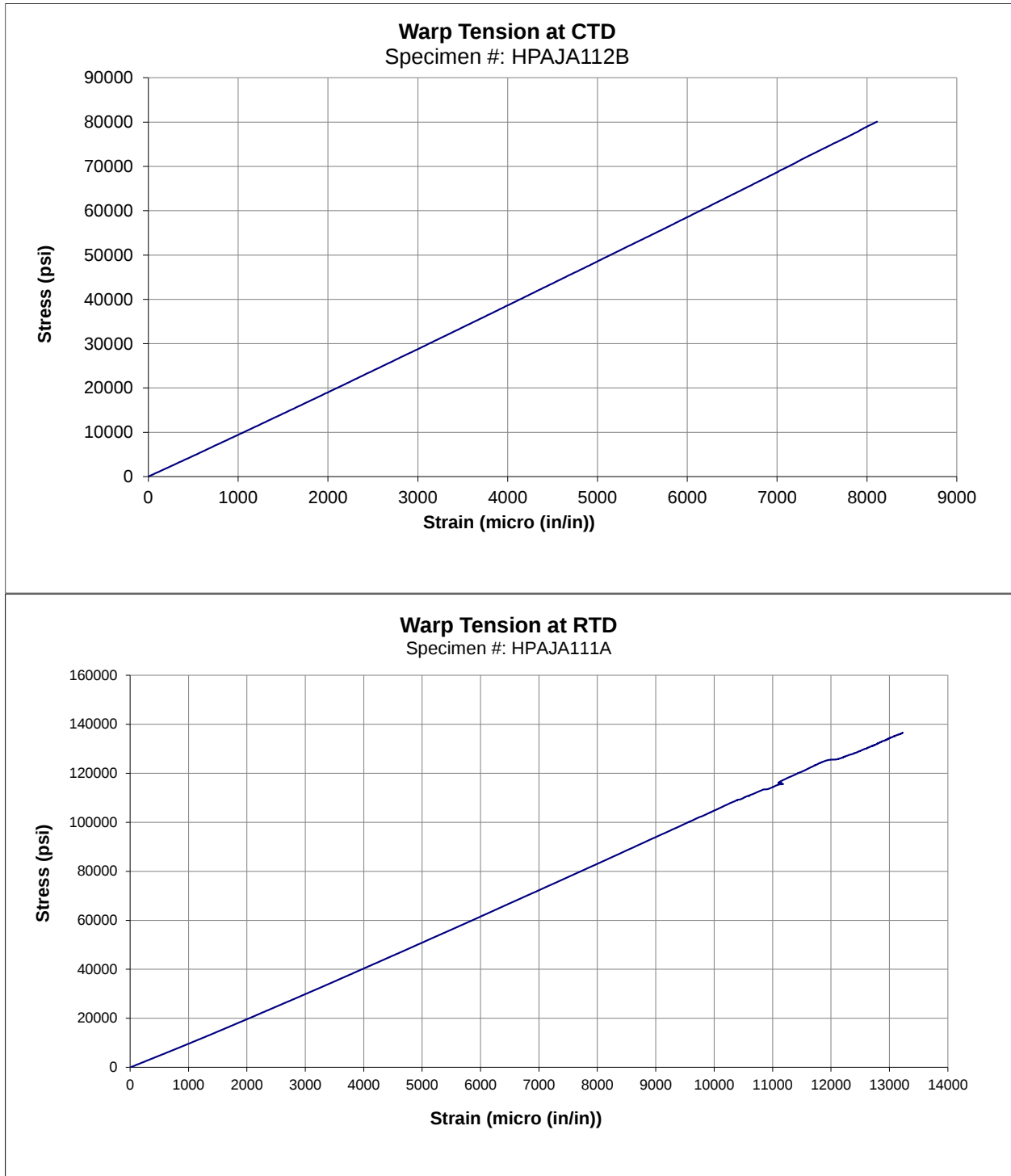


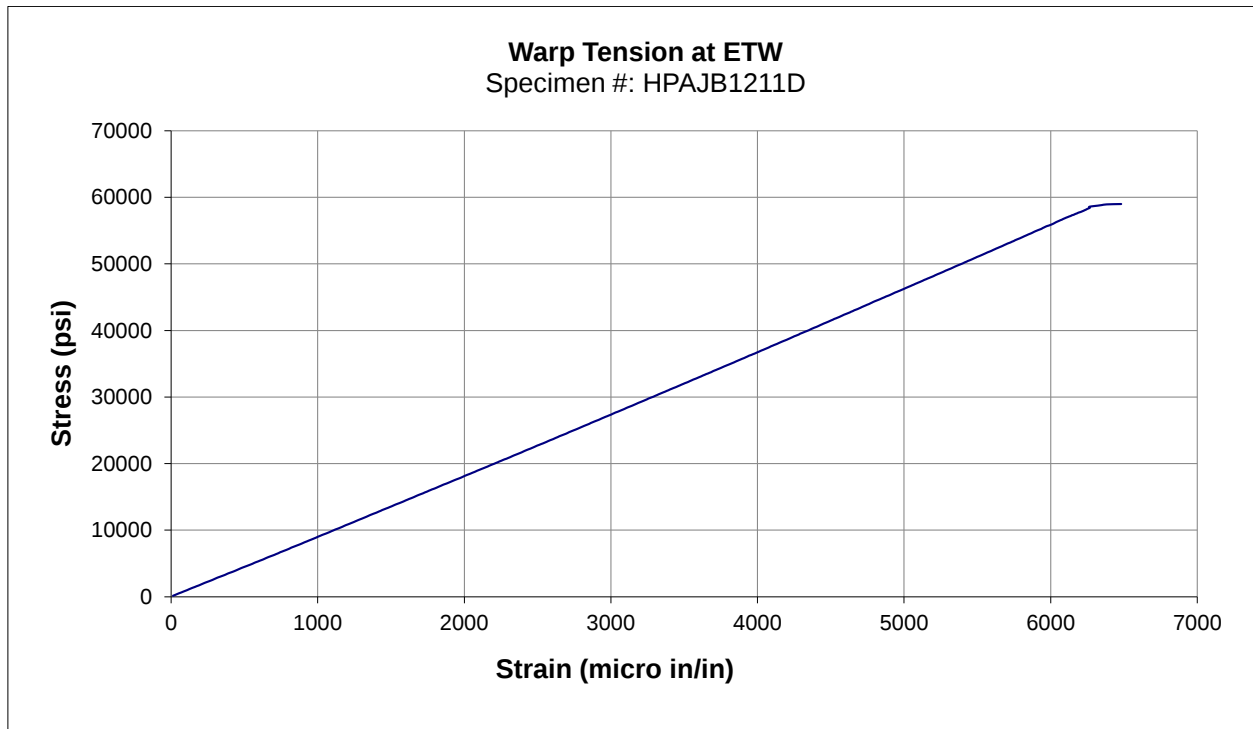
Damage Area and Dent Depth Summary:

Specimen ID	Damage Area (inch ²)	Dent Depth (inch)
HPAKA111A	0.974	0.0355
HPAKA112A	0.925	0.0345
HPAKA113A	0.800	0.0365
HPAKA114A	0.902	0.0335
HPAKA115A	0.739	0.0325
HPAKA116A	0.865	0.0420

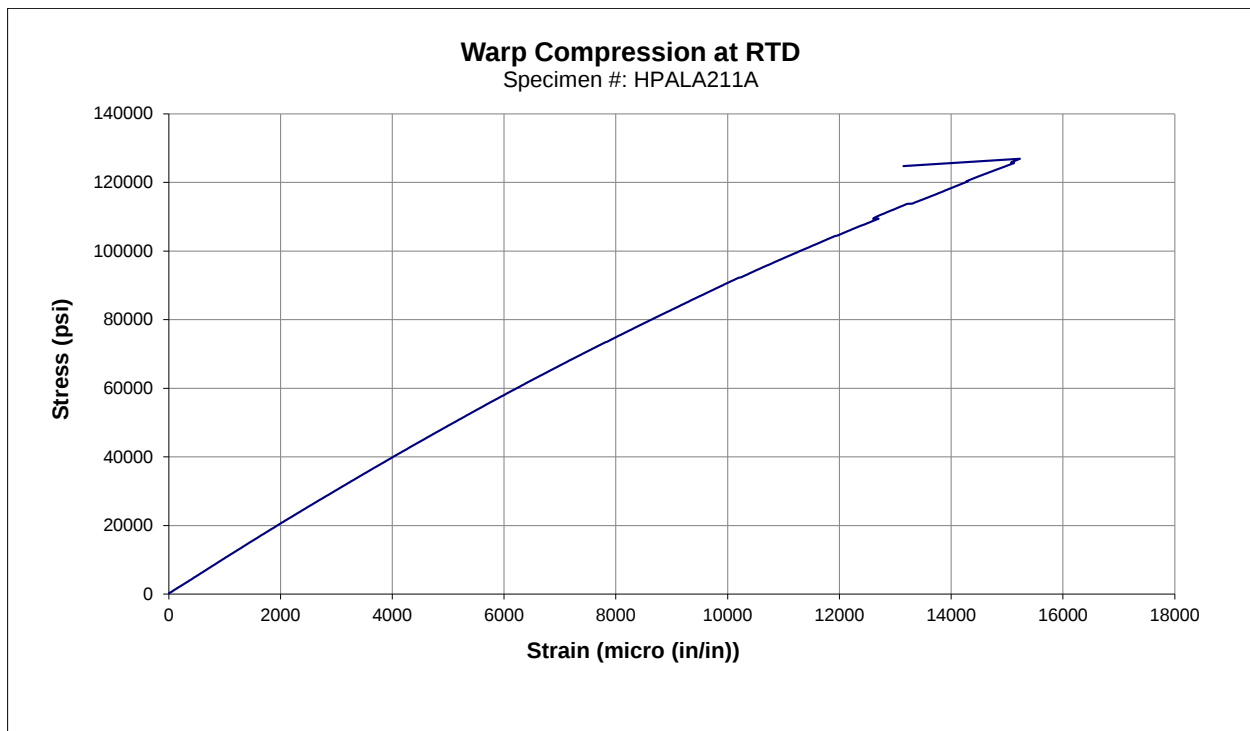
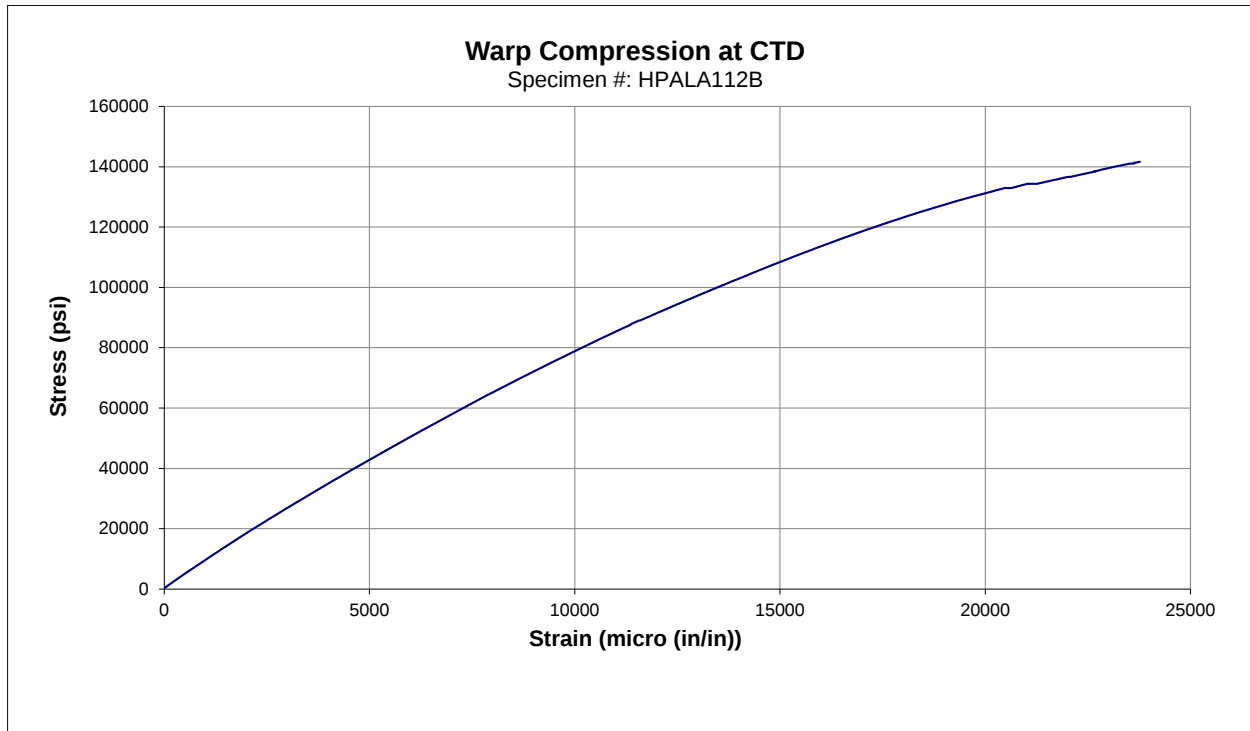
6. Stress vs. Strain Curve

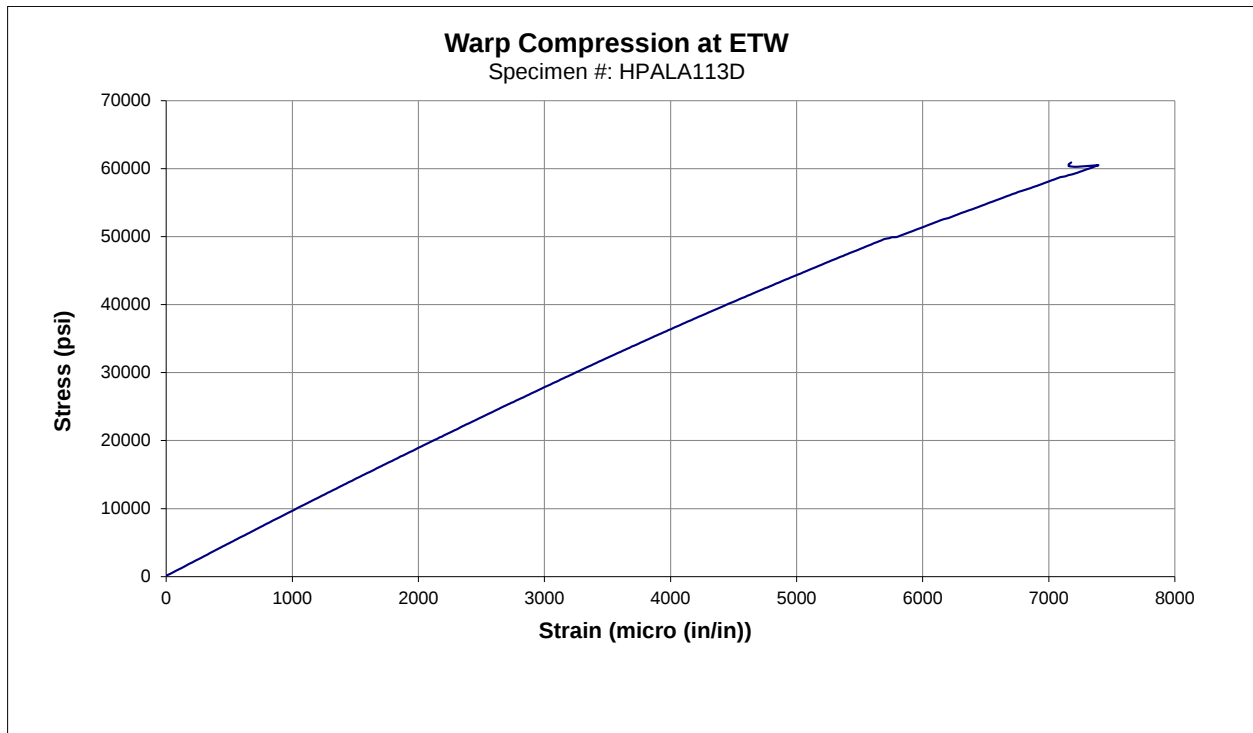
6.1 Warp Tension Properties (WT)



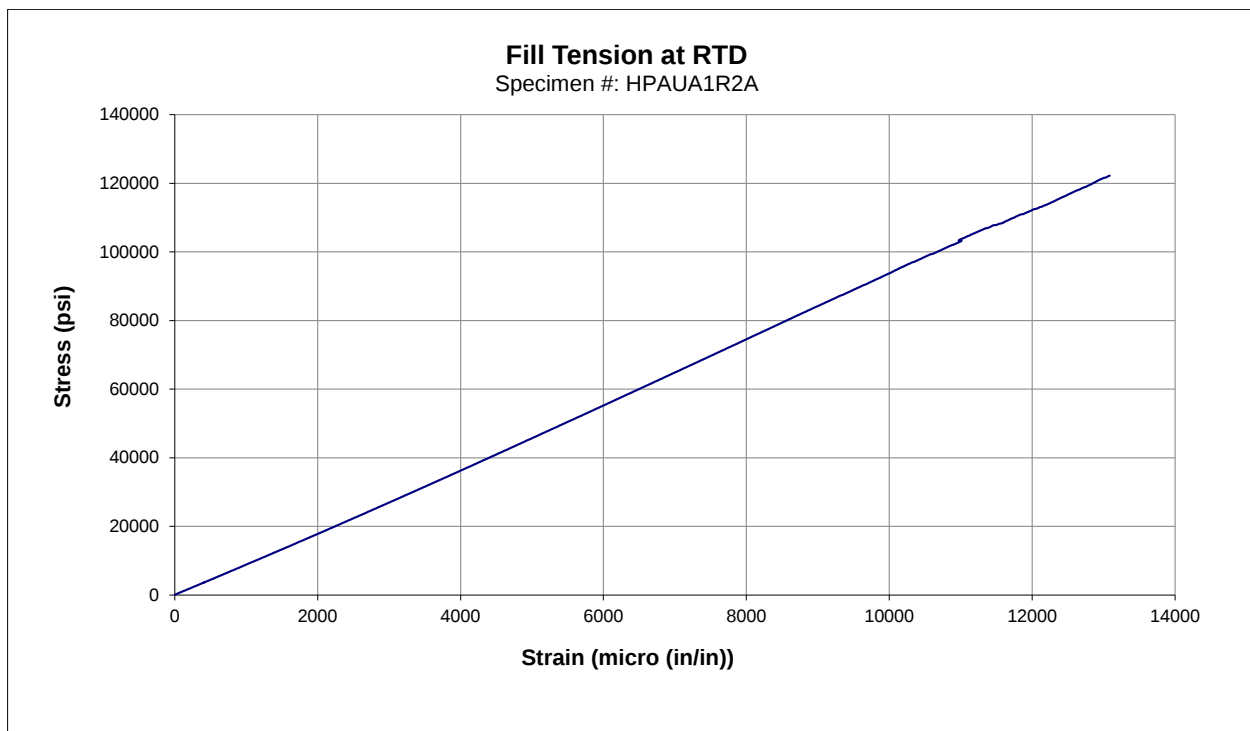
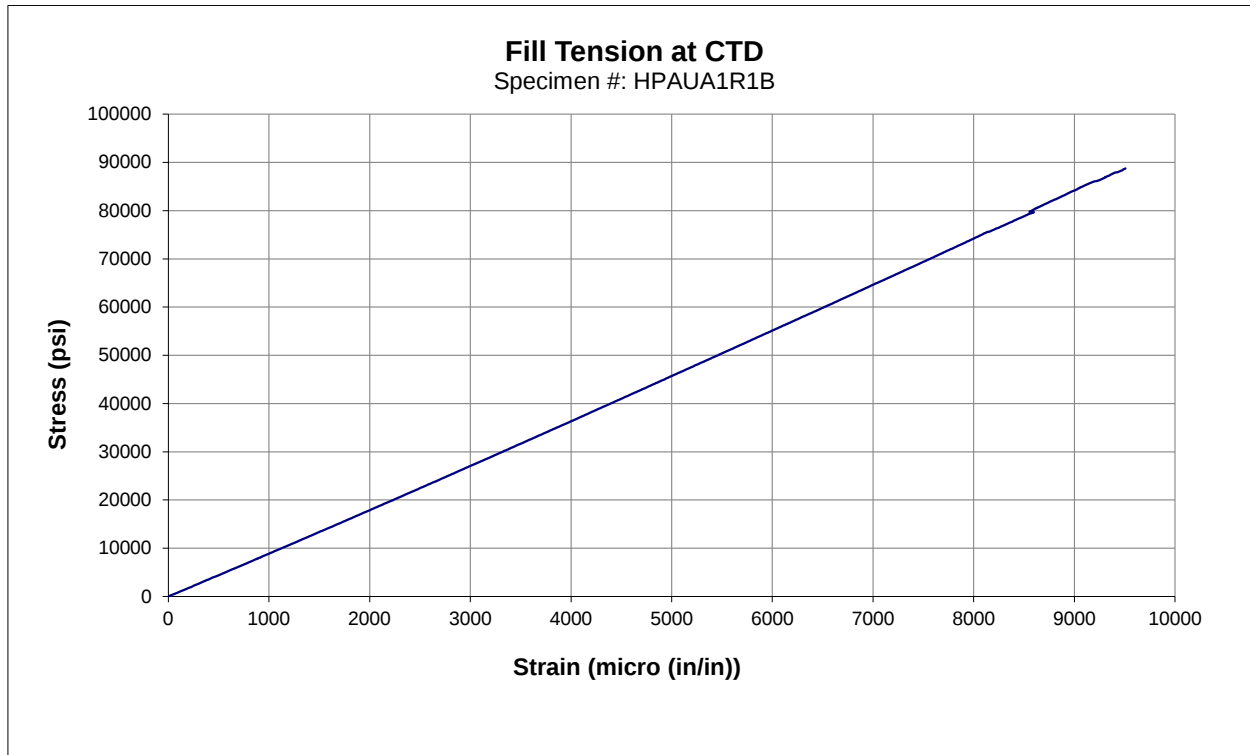


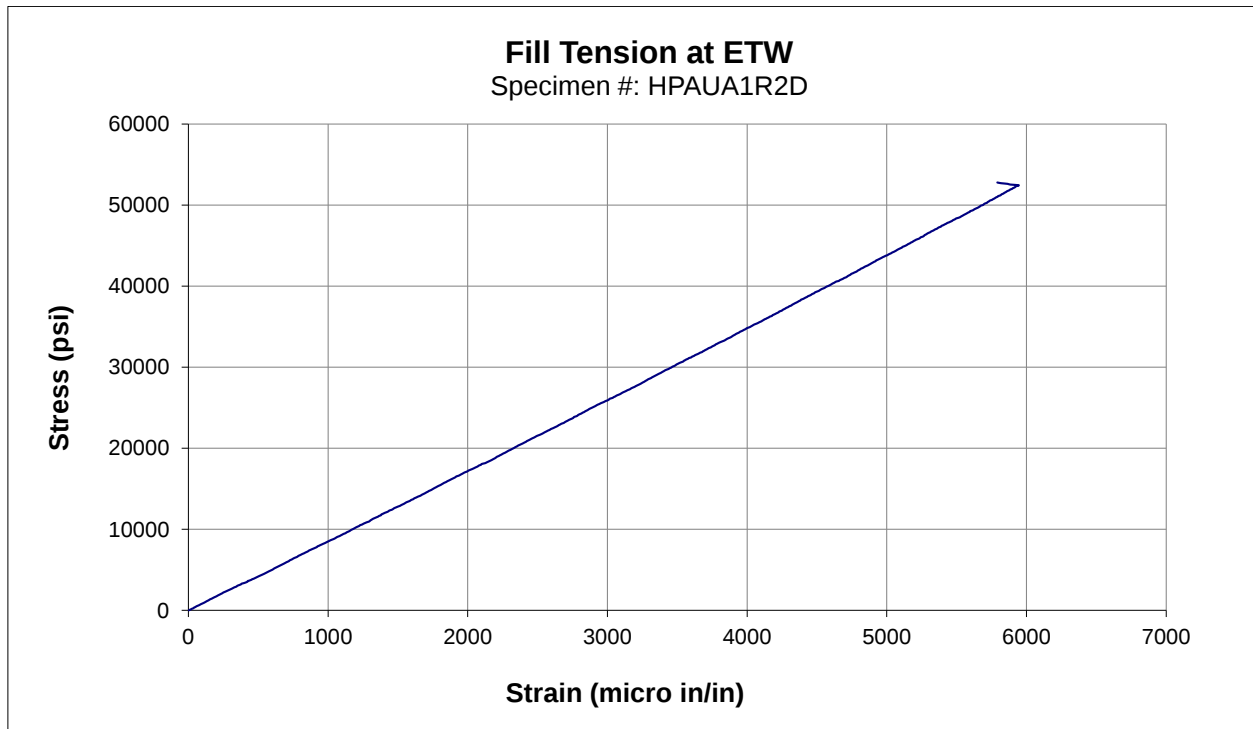
6.2 Warp Compression Properties (WC)



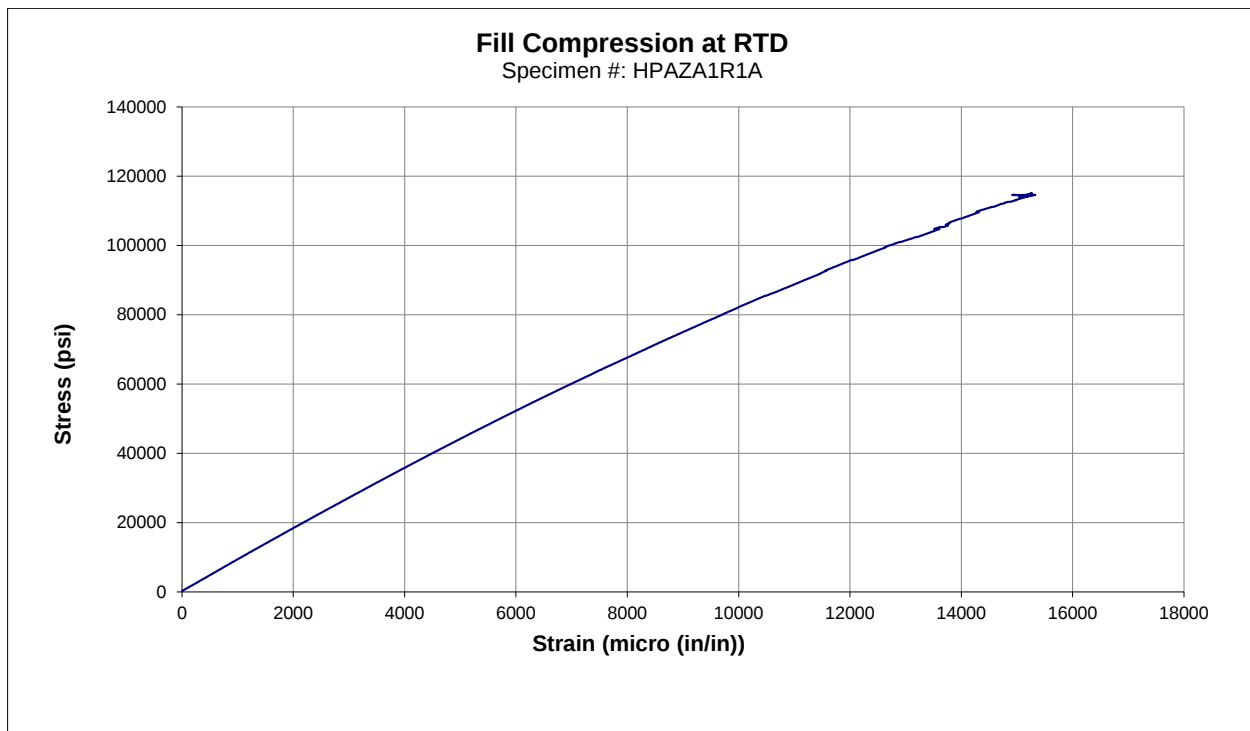
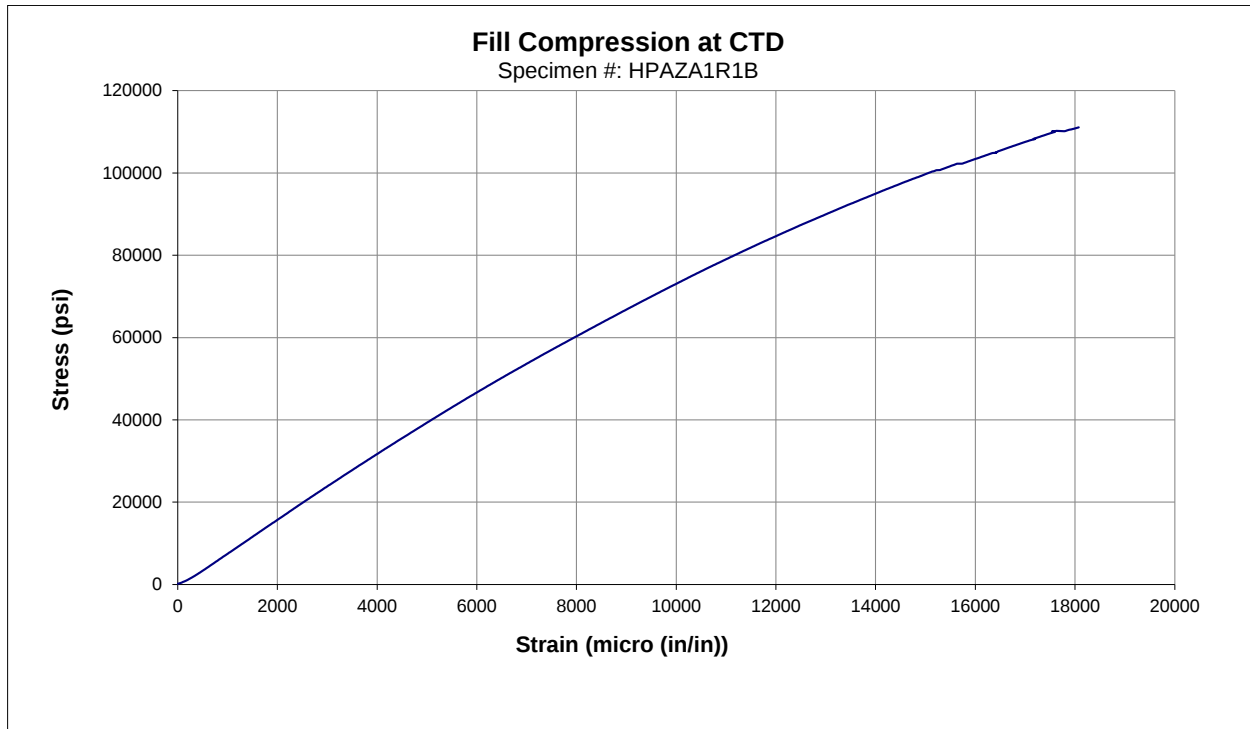


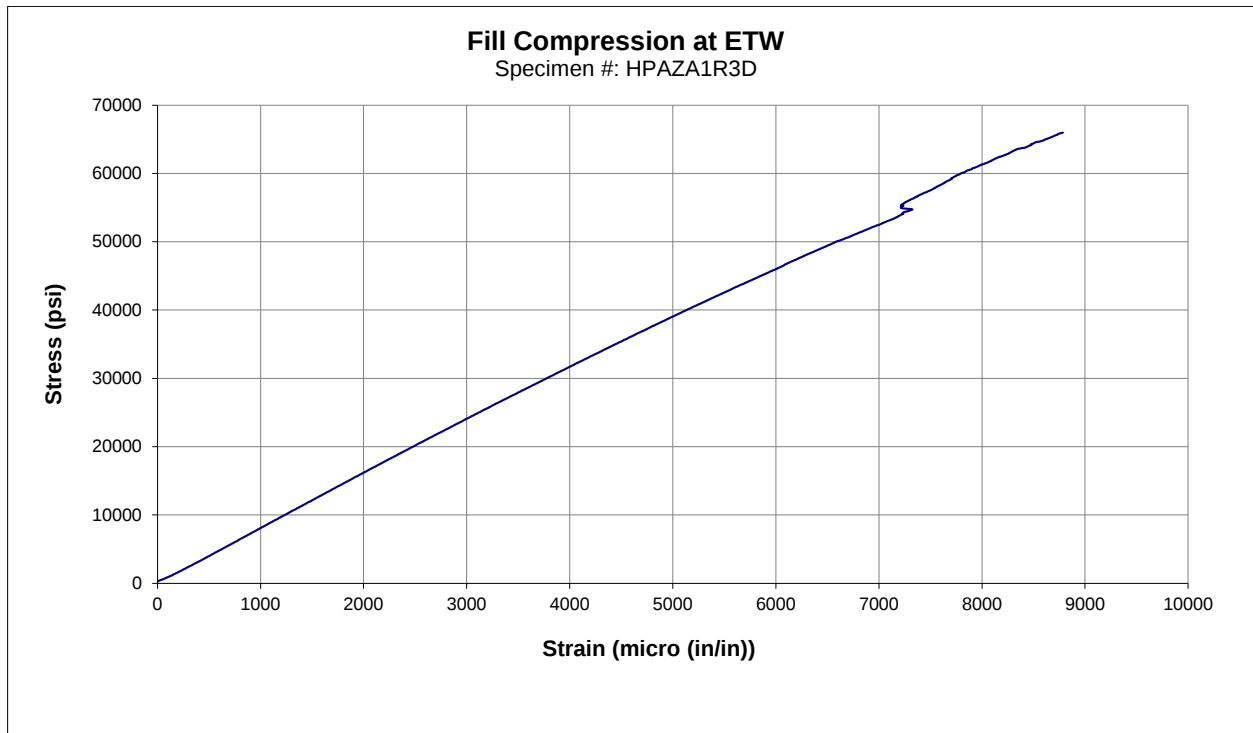
6.3 Fill Tension Properties (FT)



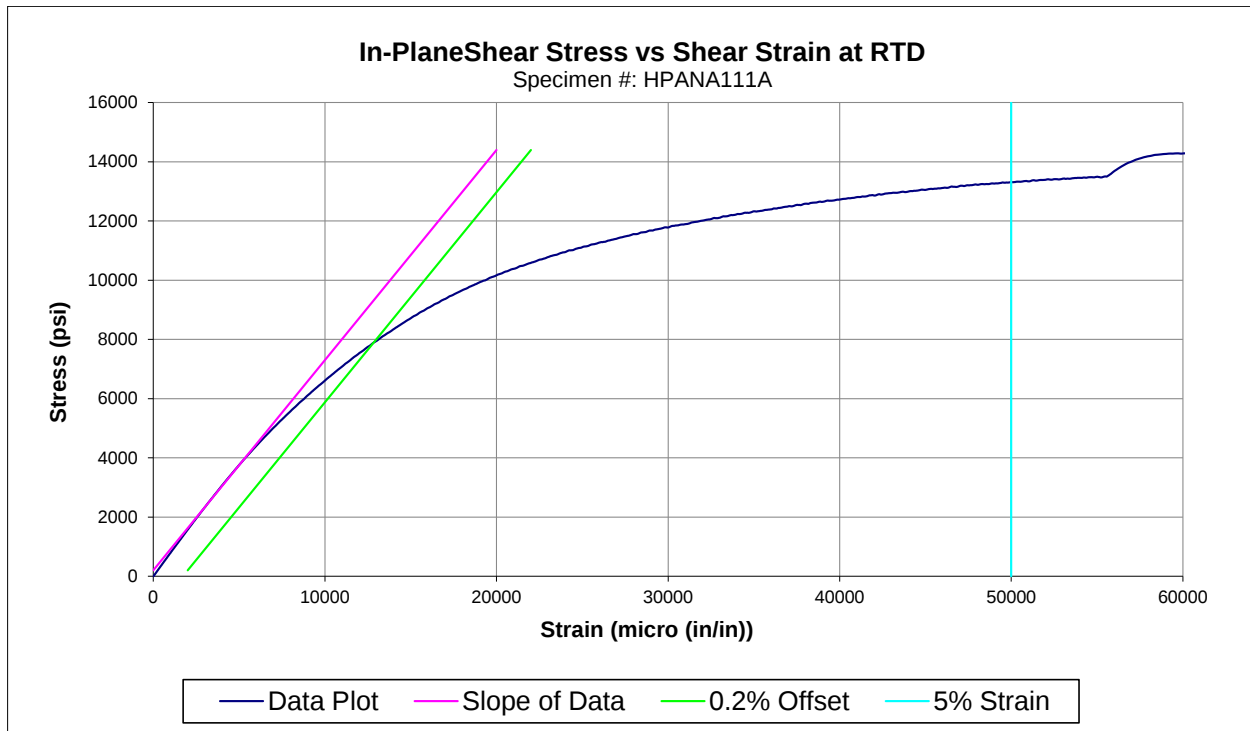
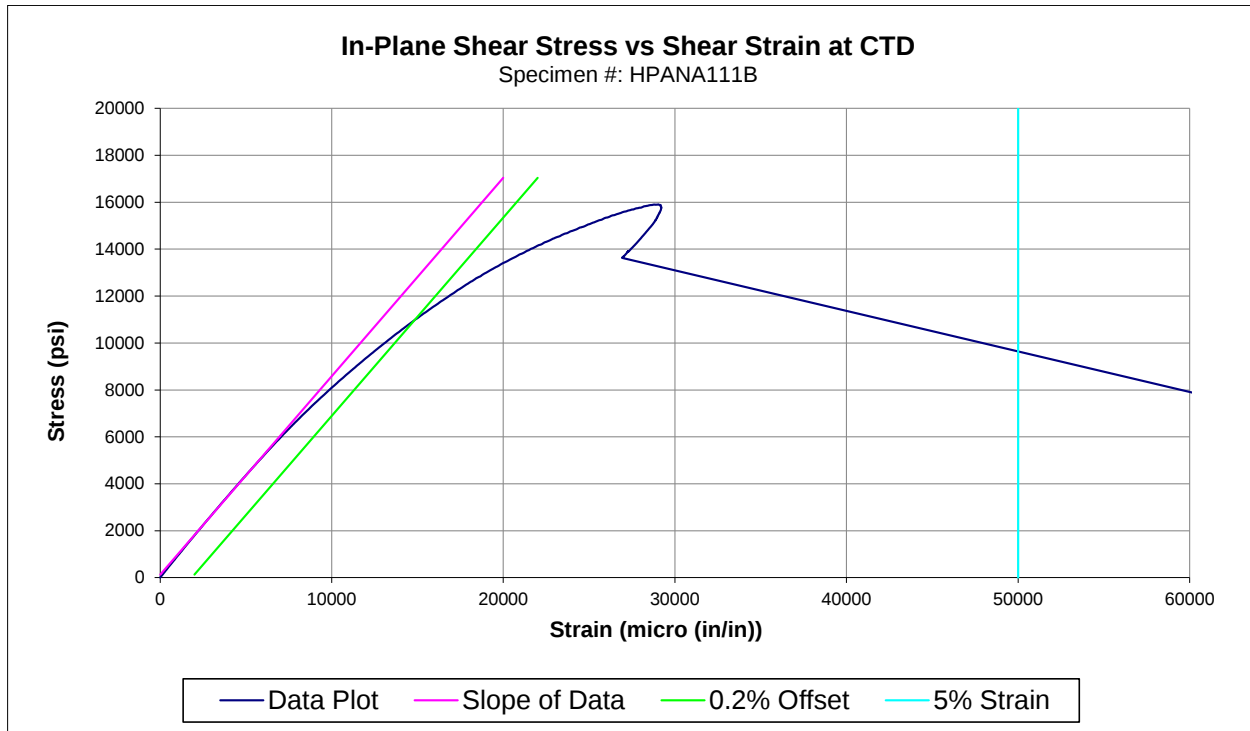


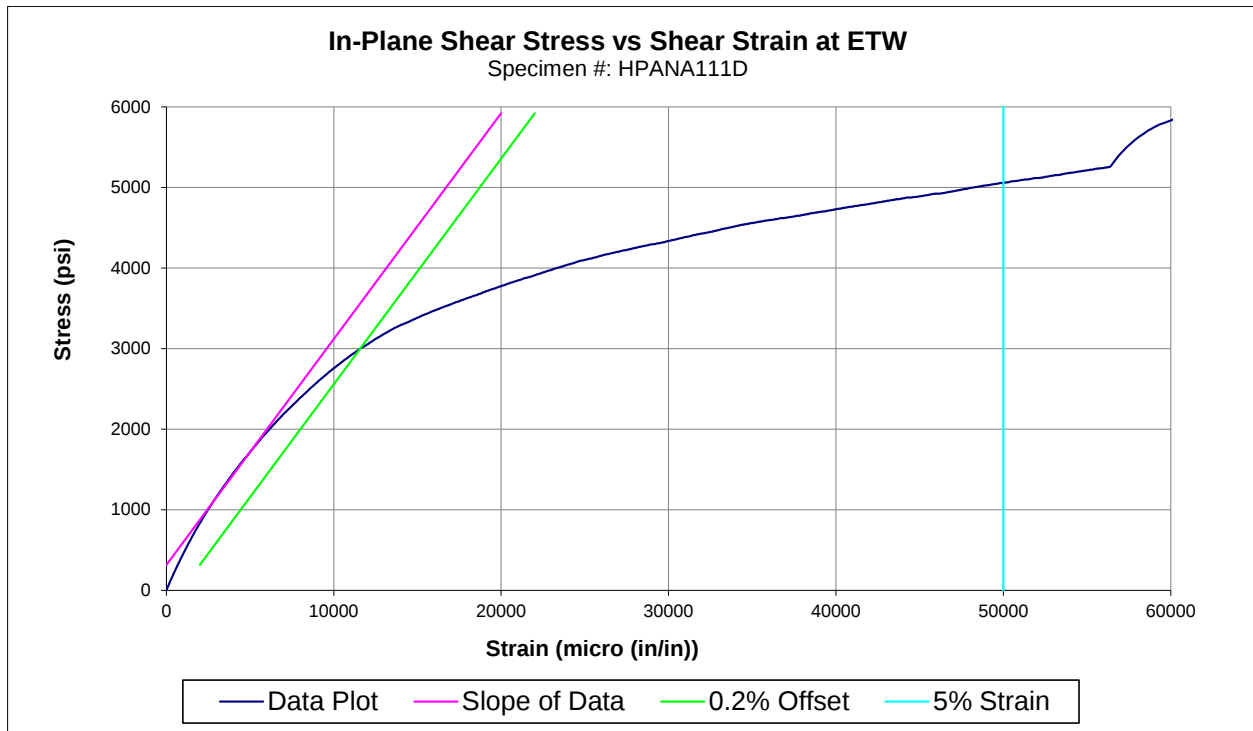
6.4 Fill Compression Properties (FC)



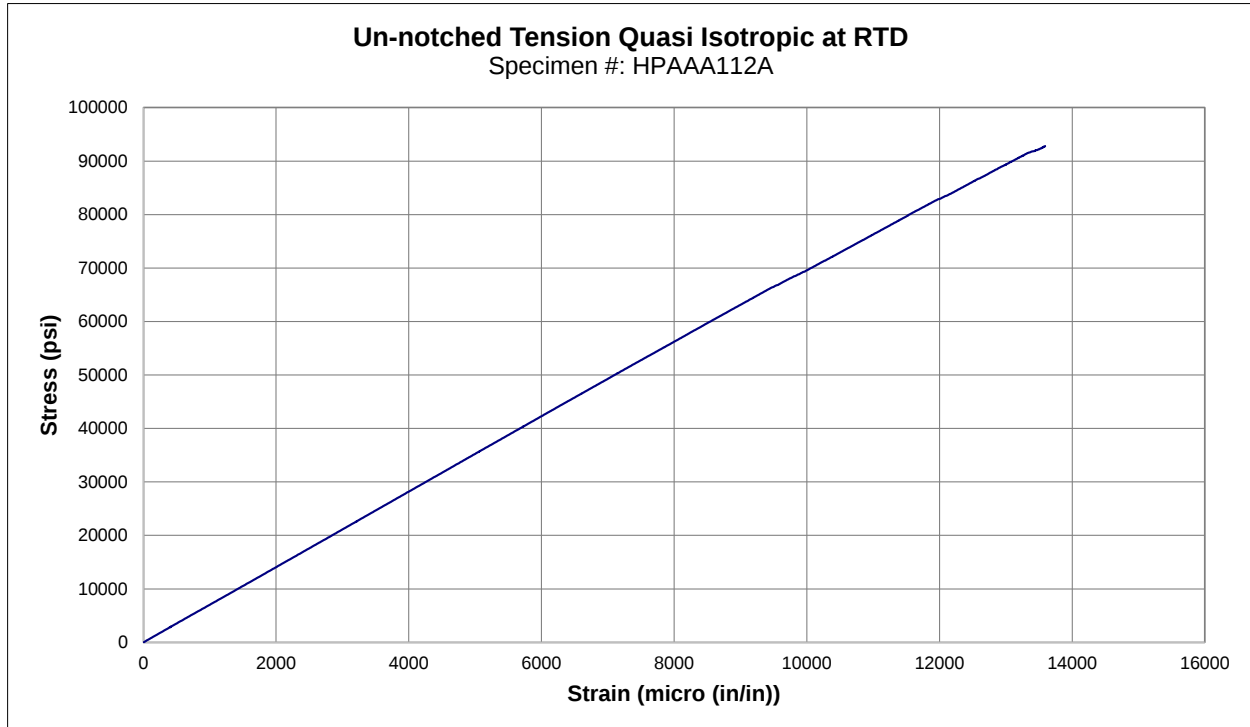
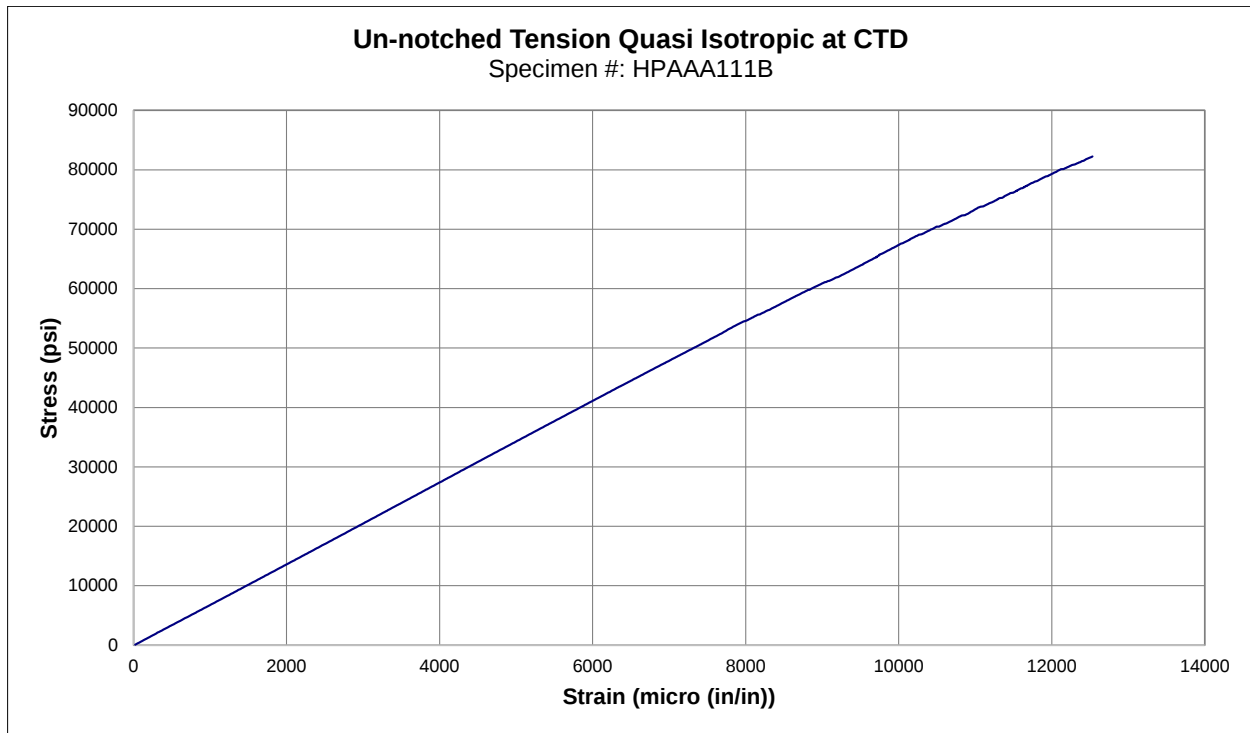


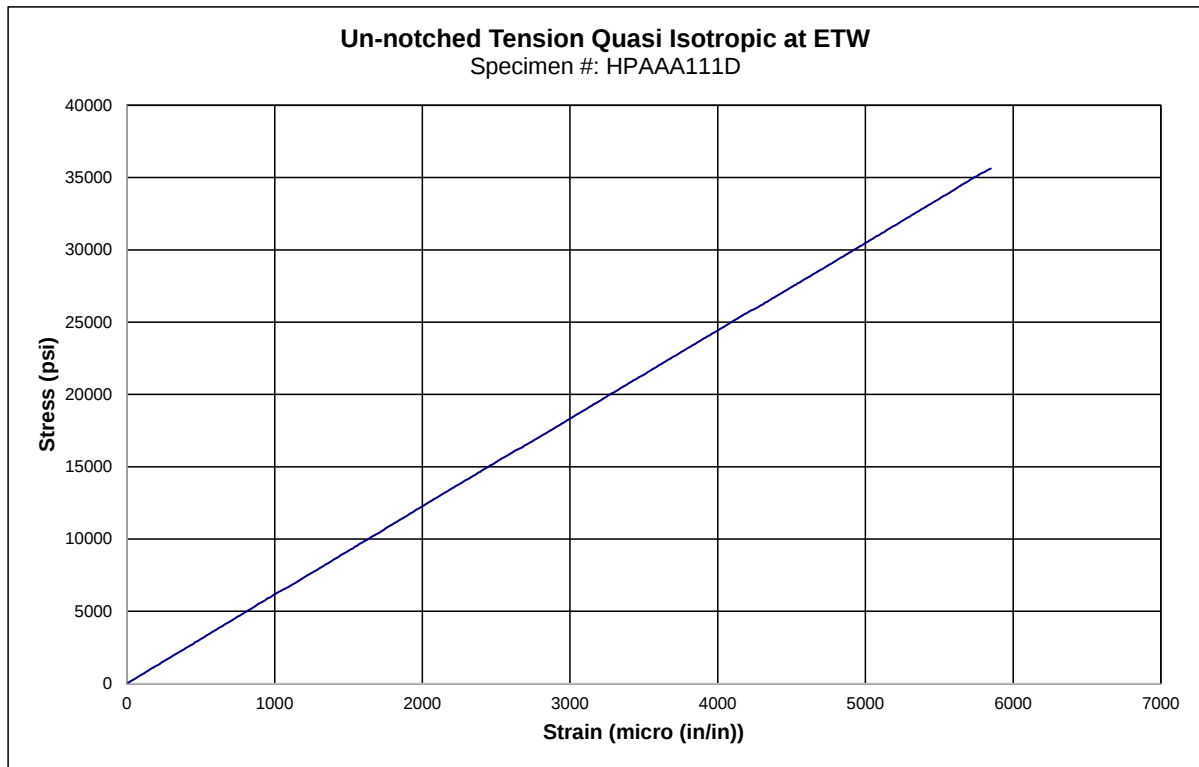
6.5 In-Plane Shear Properties (IPS)



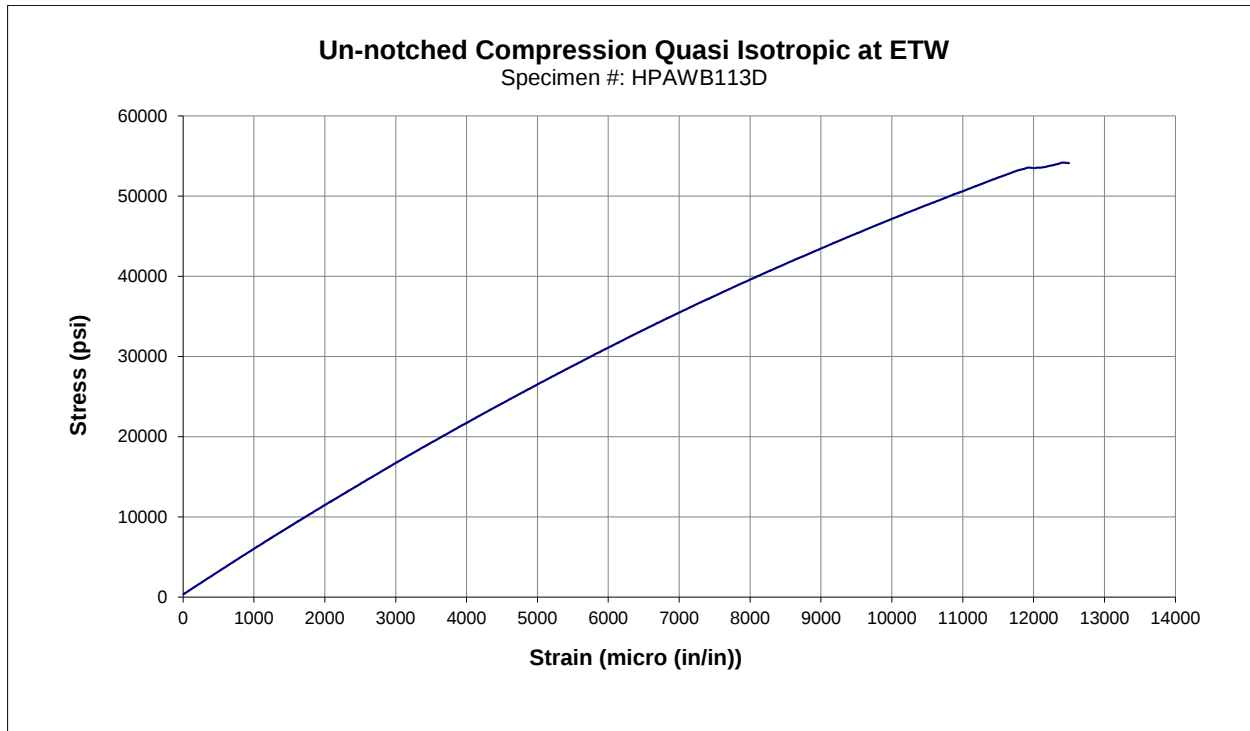
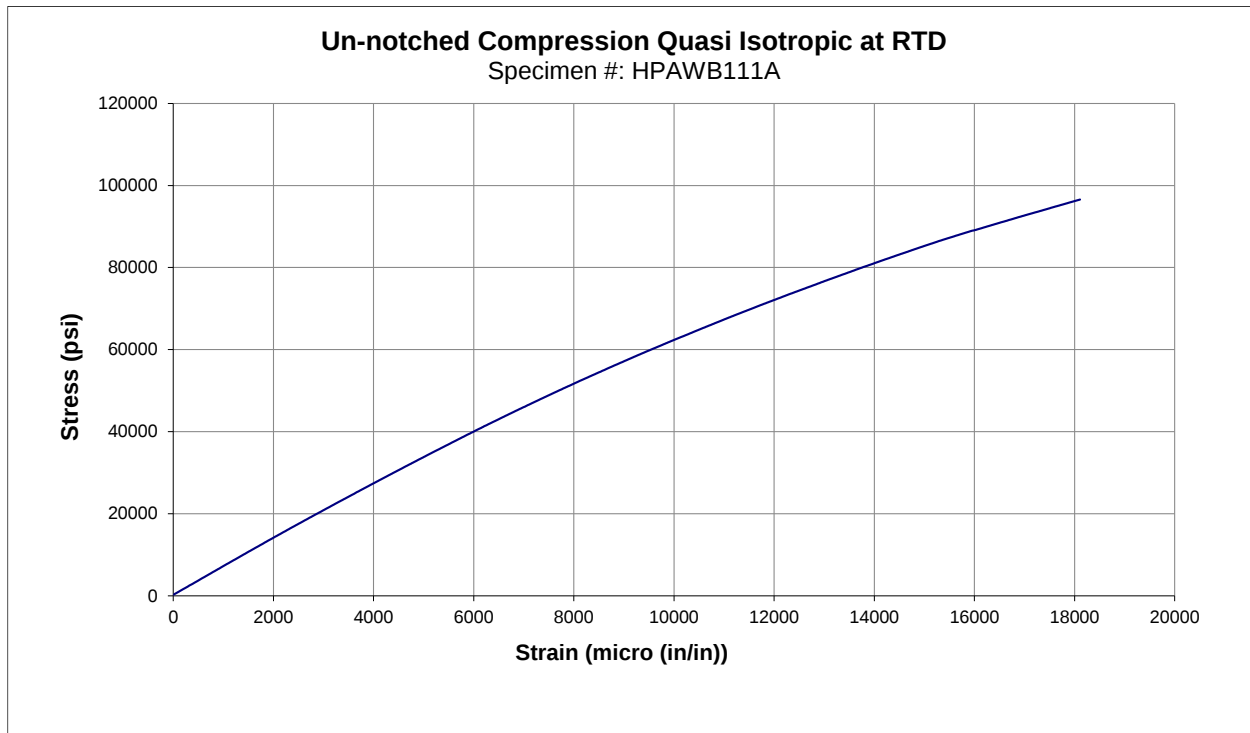


6.6 “25/50/25” Unnotched Tension 1 Properties (UNT1)





6.7 “25/50/25” Unnotched Compression 1 Properties (UNC1)



7. Fluid Sensitivity Comparison

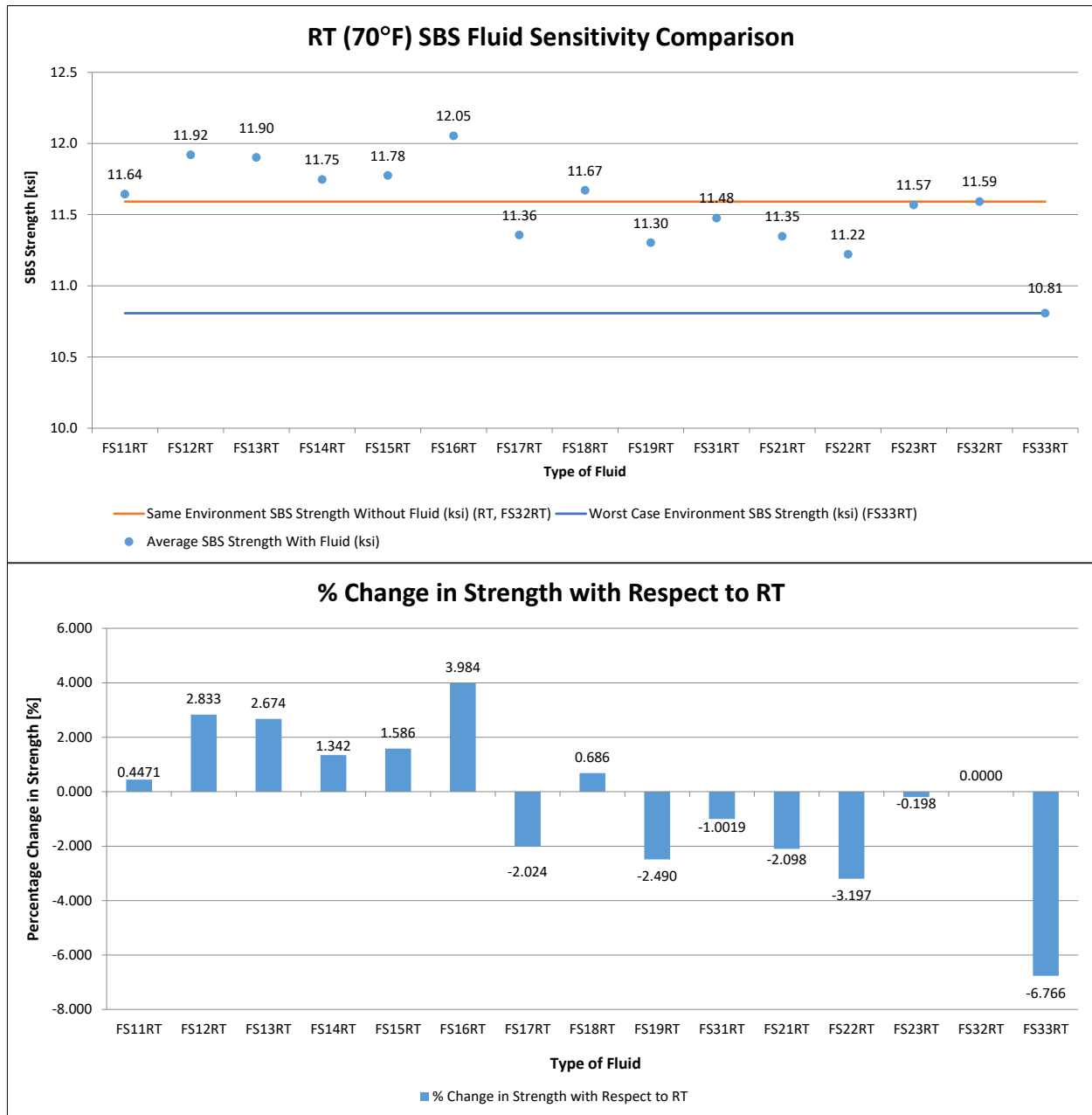
7.1 Room Temperature Test Data

Code	Type of Fluid	Exposure
FS11RT	100 Low Lead Fuel	90 days min @ 70°F ± 10F
FS12RT	Jet A Fuel	
FS13RT	MIL-PRF-5606 Hydraulic Oil	
FS14RT	MIL-PRF-83282 Hydraulic Oil	
FS15RT	MIL-PRF-7808 Engine Oil	
FS16RT	MIL-PRF-23699 Engine Oil	
FS17RT	Salt Water	
FS18RT	Skydrol LD-4	
FS19RT	50% Water w/ 50% Skydrol	
FS31RT	Distilled Water	
FS21RT	MEK washing fluid	90 mins @ 70°F ± 10F
FS22RT	Polypropylene Glycol Deicer	48±4 hrs @ 70°F ± 10F
FS23RT	Isopropyl Alcohol Deicing	
FS31ET	Distilled Water	Per Test Plan
FS32RT	Dry	
FS33RT	85% Relative Humidity	

Fluid Sensitivity Screening Short Beam Strength Properties--RT (70°F) Strength Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC
--

Fluid Code	Specimen Number	Hexcel Batch #	Hexcel Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t_{ply} [in]	Failure Mode	Average
FS11RT	HPAQA11RT2	A	C1	1	1	11.20	0.2574	18	0.0143	INTERLAMINAR SHEAR	11.64
	HPAQA11RT3	A	C1	1	1	11.50	0.2612	18	0.0145	INTERLAMINAR SHEAR	
	HPAQA11RT4	A	C1	1	1	11.87	0.2663	18	0.0148	INTERLAMINAR SHEAR	
	HPAQA11RT5	A	C1	1	1	12.00	0.2689	18	0.0149	INTERLAMINAR SHEAR	
FS12RT	HPAQA12RT1	A	C1	1	1	12.05	0.2708	18	0.0150	INTERLAMINAR SHEAR	11.92
	HPAQA12RT2	A	C1	1	1	12.06	0.2678	18	0.0149	INTERLAMINAR SHEAR	
	HPAQA12RT3	A	C1	1	1	11.97	0.2704	18	0.0150	INTERLAMINAR SHEAR	
	HPAQA12RT4	A	C1	1	1	11.87	0.2665	18	0.0148	INTERLAMINAR SHEAR	
FS13RT	HPAQA12RT5	A	C1	1	1	11.65	0.2558	18	0.0142	INTERLAMINAR SHEAR	11.90
	HPAQA13RT1	A	C1	1	1	11.87	0.2674	18	0.0149	INTERLAMINAR SHEAR	
	HPAQA13RT2	A	C1	1	1	11.93	0.2714	18	0.0151	INTERLAMINAR SHEAR	
	HPAQA13RT3	A	C1	1	1	11.75	0.2701	18	0.0150	INTERLAMINAR SHEAR	
FS14RT	HPAQA13RT4	A	C1	1	1	12.15	0.2697	18	0.0150	INTERLAMINAR SHEAR	11.75
	HPAQA13RT5	A	C1	1	1	11.81	0.2712	18	0.0151	INTERLAMINAR SHEAR	
	HPAQA14RT1	A	C1	1	1	11.76	0.2776	18	0.0154	INTERLAMINAR SHEAR	
	HPAQA14RT2	A	C1	1	1	11.84	0.2770	18	0.0154	INTERLAMINAR SHEAR	
FS15RT	HPAQA14RT3	A	C1	1	1	11.73	0.2779	18	0.0154	INTERLAMINAR SHEAR	11.78
	HPAQA14RT4	A	C1	1	1	11.55	0.2776	18	0.0154	INTERLAMINAR SHEAR	
	HPAQA14RT5	A	C1	1	1	11.85	0.2776	18	0.0154	INTERLAMINAR SHEAR	
	HPAQA15RT1	A	C1	1	1	11.92	0.2766	18	0.0154	INTERLAMINAR SHEAR	
FS16RT	HPAQA15RT2	A	C1	1	1	11.87	0.2744	18	0.0152	INTERLAMINAR SHEAR	12.05
	HPAQA15RT3	A	C1	1	1	11.61	0.2709	18	0.0150	INTERLAMINAR SHEAR	
	HPAQA15RT4	A	C1	1	1	11.86	0.2644	18	0.0147	INTERLAMINAR SHEAR	
	HPAQA15RT5	A	C1	1	1	11.62	0.2602	18	0.0145	INTERLAMINAR SHEAR	
FS17RT	HPAQA16RT1	A	C1	1	1	11.96	0.2594	18	0.0144	INTERLAMINAR SHEAR	11.36
	HPAQA16RT2	A	C1	1	1	12.00	0.2613	18	0.0145	INTERLAMINAR SHEAR	
	HPAQA16RT3	A	C1	1	1	11.97	0.2618	18	0.0145	INTERLAMINAR SHEAR	
	HPAQA16RT4	A	C1	1	1	12.20	0.2626	18	0.0146	INTERLAMINAR SHEAR	
FS18RT	HPAQA16RT5	A	C1	1	1	12.14	0.2627	18	0.0146	INTERLAMINAR SHEAR	11.67
	HPAQA17RT1	A	C1	1	1	11.55	0.2567	18	0.0143	INTERLAMINAR SHEAR	
	HPAQA17RT2	A	C1	1	1	11.02	0.2623	18	0.0146	INTERLAMINAR SHEAR	
	HPAQA17RT3	A	C1	1	1	11.45	0.2659	18	0.0148	INTERLAMINAR SHEAR	
FS19RT	HPAQA17RT4	A	C1	1	1	11.17	0.2705	18	0.0150	INTERLAMINAR SHEAR	11.30
	HPAQA17RT5	A	C1	1	1	11.60	0.2730	18	0.0152	INTERLAMINAR SHEAR	
	HPAQA18RT1	A	C1	1	1	11.87	0.2753	18	0.0153	INTERLAMINAR SHEAR	
	HPAQA18RT2	A	C1	1	1	11.75	0.2728	18	0.0152	INTERLAMINAR SHEAR	
FS20RT	HPAQA18RT3	A	C1	1	1	11.70	0.2689	18	0.0149	INTERLAMINAR SHEAR	11.35
	HPAQA18RT4	A	C1	1	1	11.56	0.2638	18	0.0147	INTERLAMINAR SHEAR	
	HPAQA18RT5	A	C1	1	1	11.47	0.2587	18	0.0144	INTERLAMINAR SHEAR	
	HPAQB19RT1	B	C1	2	1	11.25	0.2779	18	0.0154	INTERLAMINAR SHEAR	
FS21RT	HPAQB19RT2	B	C1	2	1	11.32	0.2800	18	0.0156	INTERLAMINAR SHEAR	11.22
	HPAQB19RT3	B	C1	2	1	11.55	0.2806	18	0.0156	INTERLAMINAR SHEAR	
	HPAQB19RT4	B	C1	2	1	10.99	0.2798	18	0.0155	INTERLAMINAR SHEAR	
	HPAQB19RT5	B	C1	2	1	11.41	0.2790	18	0.0155	INTERLAMINAR SHEAR	
FS22RT*	HPAQB21RT1	B	C1	2	1	11.59	0.2509	18	0.0139	INTERLAMINAR SHEAR	11.57
	HPAQB21RT2	B	C1	2	1	10.84	0.2531	18	0.0141	INTERLAMINAR SHEAR	
	HPAQB21RT3	B	C1	2	1	11.44	0.2727	18	0.0151	INTERLAMINAR SHEAR	
	HPAQB21RT4	B	C1	2	1	11.21	0.2711	18	0.0151	INTERLAMINAR SHEAR	
FS23RT	HPAQB21RT5	B	C1	2	1	11.66	0.2770	18	0.0154	INTERLAMINAR SHEAR	11.48
	HPAQB22ET1	B	C1	2	1	11.44	0.2718	18	0.0151	INTERLAMINAR SHEAR	
	HPAQB22ET2	B	C1	2	1	11.27	0.2650	18	0.0147	INTERLAMINAR SHEAR	
	HPAQB22RT3	B	C1	2	1	11.16	0.2828	18	0.0157	INTERLAMINAR SHEAR	
FS24RT	HPAQB22RT4	B	C1	2	1	10.74	0.2634	18	0.0146	INTERLAMINAR SHEAR	11.59
	HPAQB22ET5	B	C1	2	1	11.50	0.2563	18	0.0142	INTERLAMINAR SHEAR	
	HPAQB23RT1	B	C1	2	1	11.18	0.2814	18	0.0156	INTERLAMINAR SHEAR	
	HPAQB23RT2	B	C1	2	1	11.66	0.2772	18	0.0154	INTERLAMINAR SHEAR	
FS25RT	HPAQB23RT3	B	C1	2	1	11.55	0.2848	18	0.0158	INTERLAMINAR SHEAR	10.81
	HPAQB23RT4	B	C1	2	1	11.71	0.2865	18	0.0159	INTERLAMINAR SHEAR	
	HPAQB23RT5	B	C1	2	1	11.74	0.2871	18	0.0159	INTERLAMINAR SHEAR	
	HPAQB31RT1	B	C1	2	1	11.35	0.2707	18	0.0150	INTERLAMINAR SHEAR	
FS26RT	HPAQB31RT2	B	C1	2	1	11.58	0.2668	18	0.0148	INTERLAMINAR SHEAR	11.59
	HPAQB31RT3	B	C1	2	1	11.53	0.2761	18	0.0153	INTERLAMINAR SHEAR	
	HPAQB31RT4	B	C1	2	1	11.18	0.2570	18	0.0143	INTERLAMINAR SHEAR	
	HPAQB31RT5	B	C1	2	1	11.74	0.2555	18	0.0142	INTERLAMINAR SHEAR	
FS27RT	HPAQB32RT1	B	C1	2	1	11.59	0.2658	18	0.0148	INTERLAMINAR SHEAR	10.81
	HPAQB32RT2	B	C1	2	1	11.78	0.2873	18	0.0160	INTERLAMINAR SHEAR	
	HPAQB32RT3	B	C1	2	1	11.83	0.2709	18	0.0150	INTERLAMINAR SHEAR	
	HPAQB32RT4	B	C1	2	1	11.30	0.2797	18	0.0155	INTERLAMINAR SHEAR	
FS28RT	HPAQB32RT5	B	C1	2	1	11.45	0.2843	18	0.0158	INTERLAMINAR SHEAR	10.81
	HPAQB33RT1	B	C1	2	1	11.28	0.2597	18	0.0144	INTERLAMINAR SHEAR	
	HPAQB33RT2	B	C1	2	1	11.09	0.2566	18	0.0143	INTERLAMINAR SHEAR	
	HPAQB33RT3	B	C1	2	1	10.88	0.2583	18	0.0143	INTERLAMINAR SHEAR	
FS29RT	HPAQB33RT4	B	C1	2	1	10.07	0.2529	18	0.0140	INTERLAMINAR SHEAR	10.81
	HPAQB33RT5	B	C1	2	1	10.72	0.2745	18	0.0152	INTERLAMINAR SHEAR	

*specimens from ET was tested in RT condition



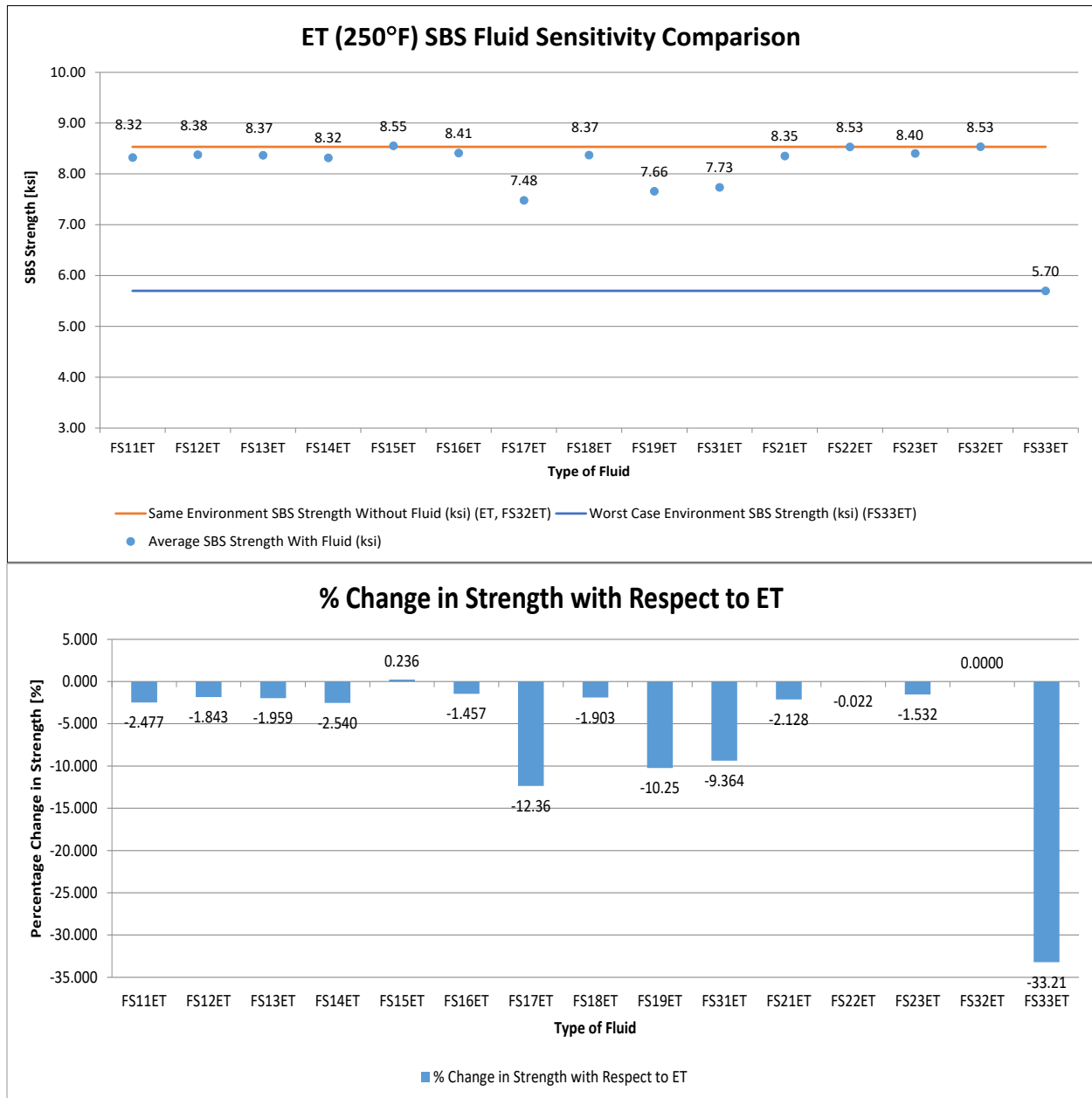
7.2 Elevated Temperature Test Data

Code	Type of Fluid	Exposure
FS11ET	100 Low lead Fuel	90 days min @ 70°F ± 10F
FS12ET	Jet A Fuel	
FS13ET	MIL-PRF-5606 Hydraulic Oil	
FS14ET	MIL-PRF-83282 Hydraulic Oil	
FS15ET	MIL-PRF-7808 Engine Oil	
FS16ET	MIL-PRF-23699 Engine Oil	
FS17ET	Salt Water	
FS18ET	Skydrol LD-4	
FS19ET	50% Water w/ 50% Skydrol	
FS31ET	Distilled Water	
FS21ET	MEK washing fluid	90 mins @ 70°F ± 10F
FS22ET	Polypropylene Glycol Deicer	
FS23ET	Isopropyl Alcohol Deicing	48±4 hrs @ 70°F ± 10F
FS31ET	Distilled Water	Per Test Plan
FS32ET	Dry	
FS33ET	85% Relative Humidity	

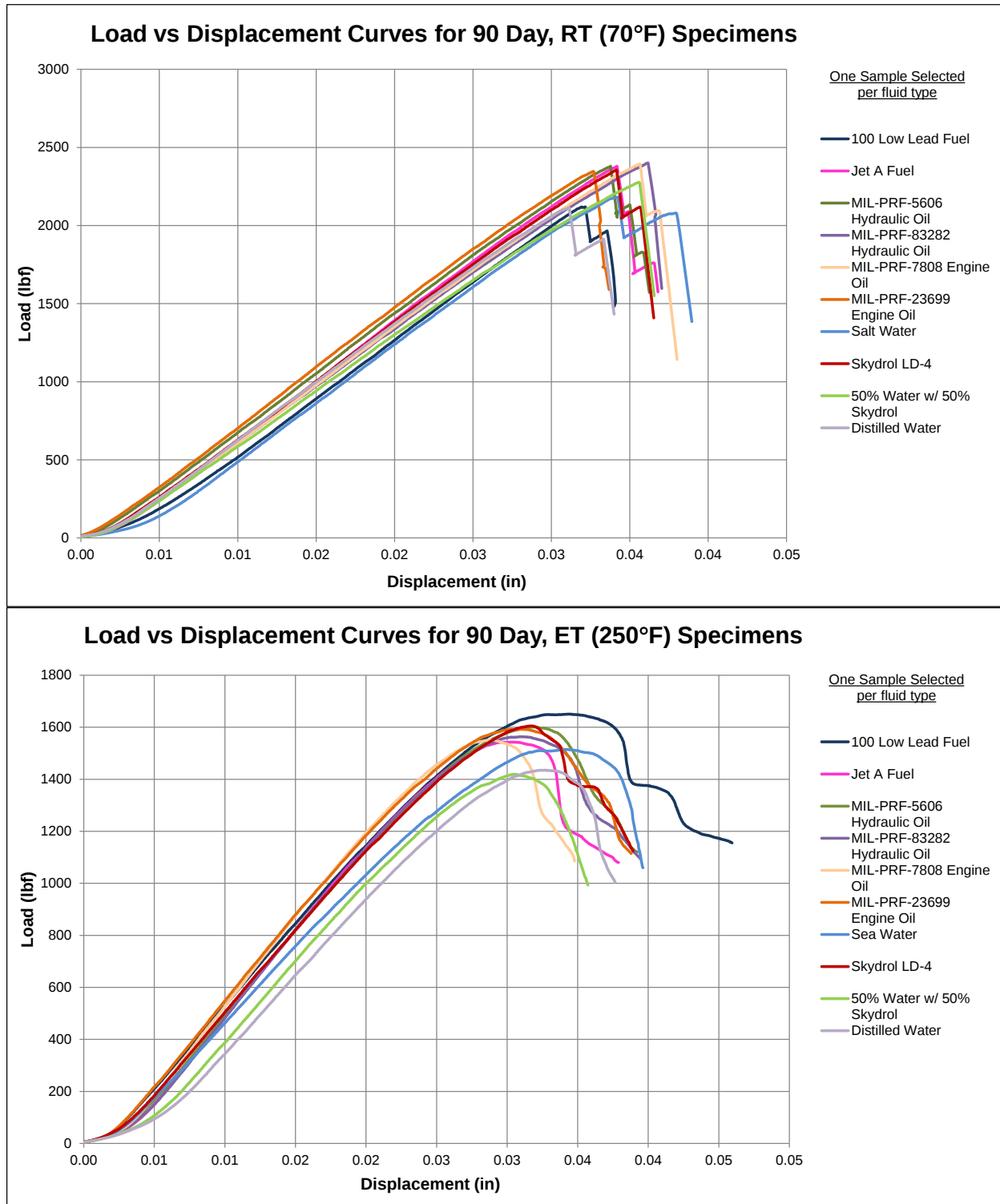
Fluid Sensitivity Screening
Short Beam Strength Properties--ET (250°F) Strength
Hexcel Hexply® 8552S AS4 GP 3K 8HS fabric with 38% RC

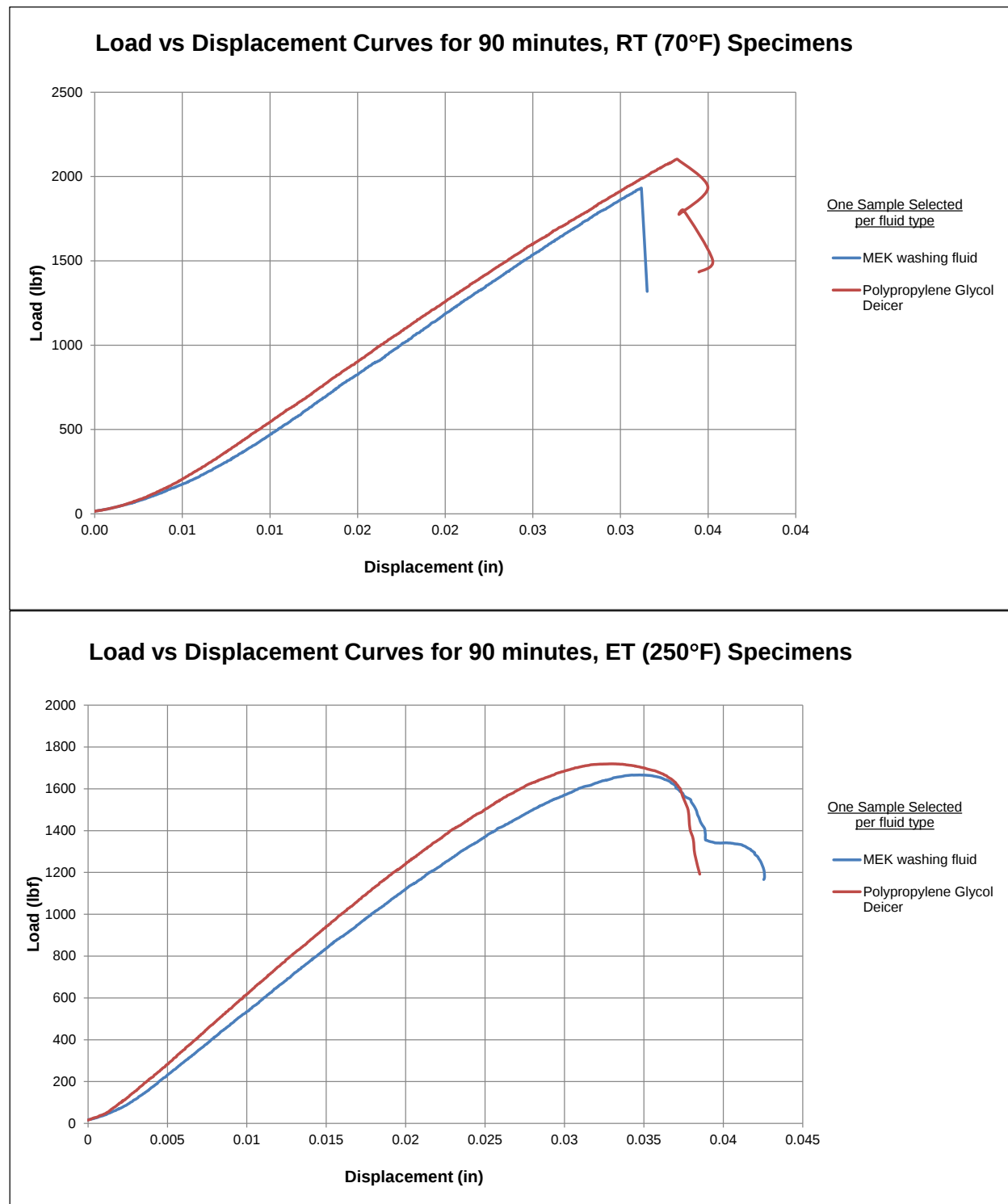
Fluid Code	Specimen Number	Hexcel Batch #	Hexcel Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Avg. t _{ply} [in]	Failure Mode	Average
FS11ET	HPAQA11ET1	A	CE	1	1	8.31	0.2701	18	0.0150	INTERLAMINAR SHEAR	8.321
	HPAQA11ET2	A	CE	1	1	8.29	0.2719	18	0.0151	INTERLAMINAR SHEAR	
	HPAQA11ET3	A	CE	1	1	8.33	0.2725	18	0.0151	INTERLAMINAR SHEAR	
	HPAQA11ET4	A	CE	1	1	8.38	0.2718	18	0.0151	INTERLAMINAR SHEAR	
	HPAQA11ET5	A	CE	1	1	8.28	0.2713	18	0.0151	INTERLAMINAR SHEAR	
FS12ET	HPAQA12ET1	A	CE	1	2	8.37	0.2509	18	0.0139	INTERLAMINAR SHEAR	8.376
	HPAQA12ET2	A	CE	1	2	8.39	0.2554	18	0.0142	INTERLAMINAR SHEAR	
	HPAQA12ET3	A	CE	1	2	8.39	0.2595	18	0.0144	INTERLAMINAR SHEAR	
	HPAQA12ET4	A	CE	1	2	8.36	0.2641	18	0.0147	INTERLAMINAR SHEAR	
	HPAQA12ET5	A	CE	1	2	8.37	0.2667	18	0.0148	INTERLAMINAR SHEAR	
FS13ET	HPAQA13ET1	A	CE	1	3	8.31	0.2710	18	0.0151	INTERLAMINAR SHEAR	8.366
	HPAQA13ET2	A	CE	1	3	8.47	0.2665	18	0.0148	INTERLAMINAR SHEAR	
	HPAQA13ET3	A	CE	1	3	8.23	0.2658	18	0.0148	INTERLAMINAR SHEAR	
	HPAQA13ET4	A	CE	1	3	8.40	0.2596	18	0.0144	INTERLAMINAR SHEAR	
	HPAQA13ET5	A	CE	1	3	8.43	0.2544	18	0.0141	INTERLAMINAR SHEAR	
FS14ET	HPAQA14ET1	A	CE	1	4	8.33	0.2553	18	0.0142	INTERLAMINAR SHEAR	8.316
	HPAQA14ET2	A	CE	1	4	8.36	0.2605	18	0.0145	INTERLAMINAR SHEAR	
	HPAQA14ET3	A	CE	1	4	8.38	0.2655	18	0.0148	INTERLAMINAR SHEAR	
	HPAQA14ET4	A	CE	1	4	8.30	0.2700	18	0.0150	INTERLAMINAR SHEAR	
	HPAQA14ET5	A	CE	1	4	8.21	0.2734	18	0.0152	INTERLAMINAR SHEAR	
FS15ET	HPAQA15ET1	A	CE	1	5	8.64	0.2422	18	0.0135	INTERLAMINAR SHEAR	8.553
	HPAQA15ET2	A	CE	1	5	8.54	0.2471	18	0.0137	INTERLAMINAR SHEAR	
	HPAQA15ET3	A	CE	1	5	8.58	0.2518	18	0.0140	INTERLAMINAR SHEAR	
	HPAQA15ET4	A	CE	1	5	8.56	0.2550	18	0.0142	INTERLAMINAR SHEAR	
	HPAQA15ET5	A	CE	1	5	8.45	0.2583	18	0.0143	INTERLAMINAR SHEAR	
FS16ET	HPAQA16ET1	A	CE	1	6	8.45	0.2599	18	0.0144	INTERLAMINAR SHEAR	8.408
	HPAQA16ET2	A	CE	1	6	8.39	0.2580	18	0.0143	INTERLAMINAR SHEAR	
	HPAQA16ET3	A	CE	1	6	8.38	0.2570	18	0.0143	INTERLAMINAR SHEAR	
	HPAQA16ET4	A	CE	1	6	8.48	0.2528	18	0.0140	INTERLAMINAR SHEAR	
	HPAQA16ET5	A	CE	1	6	8.35	0.2490	18	0.0138	INTERLAMINAR SHEAR	
FS17ET	HPAQA17ET1	A	CE	1	7	7.49	0.2751	18	0.0153	INTERLAMINAR SHEAR	7.478
	HPAQA17ET2	A	CE	1	7	7.50	0.2768	18	0.0154	INTERLAMINAR SHEAR	
	HPAQA17ET3	A	CE	1	7	7.45	0.2799	18	0.0155	INTERLAMINAR SHEAR	
	HPAQA17ET4	A	CE	1	7	7.47	0.2785	18	0.0155	INTERLAMINAR SHEAR	
	HPAQA17ET5	A	CE	1	7	7.49	0.2768	18	0.0154	INTERLAMINAR SHEAR	
FS18ET	HPAQB18ET1	B	CE	2	8	8.35	0.2529	18	0.0141	INTERLAMINAR SHEAR	8.370
	HPAQB18ET2	B	CE	2	8	8.48	0.2615	18	0.0145	INTERLAMINAR SHEAR	
	HPAQB18ET3	B	CE	2	8	8.29	0.2743	18	0.0152	INTERLAMINAR SHEAR	
	HPAQB18ET4	B	CE	2	8	8.36	0.2721	18	0.0151	INTERLAMINAR SHEAR	
	HPAQB18ET5	B	CE	2	8	8.36	0.2771	18	0.0154	INTERLAMINAR SHEAR	
FS19ET	HPAQB19ET1	B	CE	2	9	7.83	0.2541	18	0.0141	INTERLAMINAR SHEAR	7.658
	HPAQB19ET2	B	CE	2	9	7.64	0.2738	18	0.0152	INTERLAMINAR SHEAR	
	HPAQB19ET3	B	CE	2	9	7.59	0.2713	18	0.0151	INTERLAMINAR SHEAR	
	HPAQB19ET4	B	CE	2	9	7.49	0.2669	18	0.0148	INTERLAMINAR SHEAR	
	HPAQB19ET5	B	CE	2	9	7.75	0.2596	18	0.0144	INTERLAMINAR SHEAR	
FS21ET	HPAQB21ET1	B	CE	2	1	8.40	0.2817	18	0.0156	INTERLAMINAR SHEAR	8.351
	HPAQB21ET2	B	CE	2	1	8.38	0.2846	18	0.0158	INTERLAMINAR SHEAR	
	HPAQB21ET3	B	CE	2	1	8.36	0.2874	18	0.0160	INTERLAMINAR SHEAR	
	HPAQB21ET4	B	CE	2	1	8.32	0.2879	18	0.0160	INTERLAMINAR SHEAR	
	HPAQB21ET5	B	CE	2	1	8.29	0.2885	18	0.0160	INTERLAMINAR SHEAR	
FS22ET*	HPAQB22RT1	B	CR	2	2	8.67	0.2875	18	0.0160	INTERLAMINAR SHEAR	8.531
	HPAQB22RT2	B	CR	2	2	8.54	0.2857	18	0.0159	INTERLAMINAR SHEAR	
	HPAQB22ET3	B	CE	2	2	8.39	0.2560	18	0.0142	INTERLAMINAR SHEAR	
	HPAQB22ET4	B	CE	2	2	8.46	0.2640	18	0.0147	INTERLAMINAR SHEAR	
	HPAQB22RT5	B	CR	2	2	8.58	0.2598	18	0.0144	INTERLAMINAR SHEAR	
FS23ET	HPAQB23ET1	B	CE	2	3	8.41	0.2868	18	0.0159	INTERLAMINAR SHEAR	8.402
	HPAQB23ET2	B	CE	2	3	8.44	0.2863	18	0.0159	INTERLAMINAR SHEAR	
	HPAQB23ET3	B	CE	2	3	8.39	0.2835	18	0.0157	INTERLAMINAR SHEAR	
	HPAQB23ET4	B	CE	2	3	8.42	0.2801	18	0.0156	INTERLAMINAR SHEAR	
	HPAQB23ET5	B	CE	2	3	8.36	0.2530	18	0.0141	INTERLAMINAR SHEAR	
FS31ET	HPAQB31ET1	B	CE	2	1	7.77	0.2628	18	0.0146	INTERLAMINAR SHEAR	7.734
	HPAQB31ET2	B	CE	2	1	7.92	0.2418	18	0.0134	INTERLAMINAR SHEAR	
	HPAQB31ET3	B	CE	2	1	7.48	0.2901	18	0.0161	INTERLAMINAR SHEAR	
	HPAQB31ET4	B	CE	2	1	7.75	0.2627	18	0.0146	INTERLAMINAR SHEAR	
	HPAQB31ET5	B	CE	2	1	7.74	0.2679	18	0.0149	INTERLAMINAR SHEAR	
FS32ET	HPAQB32ET1	B	CE	2	2	8.61	0.2877	18	0.0160	INTERLAMINAR SHEAR	8.533
	HPAQB32ET2	B	CE	2	2	8.63	0.2568	18	0.0143	INTERLAMINAR SHEAR	
	HPAQB32ET3	B	CE	2	2	8.34	0.2408	18	0.0134	INTERLAMINAR SHEAR	
	HPAQB32ET4	B	CE	2	2	8.60	0.2728	18	0.0152	INTERLAMINAR SHEAR	
	HPAQB32ET5	B	CE	2	2	8.47	0.2464	18	0.0137	INTERLAMINAR SHEAR	
FS33ET	HPAQB33ET3	B	CE	2	3	5.76	0.2714	18	0.0151	INTERLAMINAR SHEAR	5.699
	HPAQB33ET4	B	CE	2	3	5.73	0.2753	18	0.0153	INTERLAMINAR SHEAR	
	HPAQB33ET6	B	CE	2	3	5.66	0.2778	18	0.0154	INTERLAMINAR SHEAR	
	HPAQB33ET11	3	C3	2	3	5.62	0.2760	18	0.0153	INTERLAMINAR SHEAR	
	HPAQB33ET12	3	C3	2	3	5.72	0.2742	18	0.0152	INTERLAMINAR SHEAR	

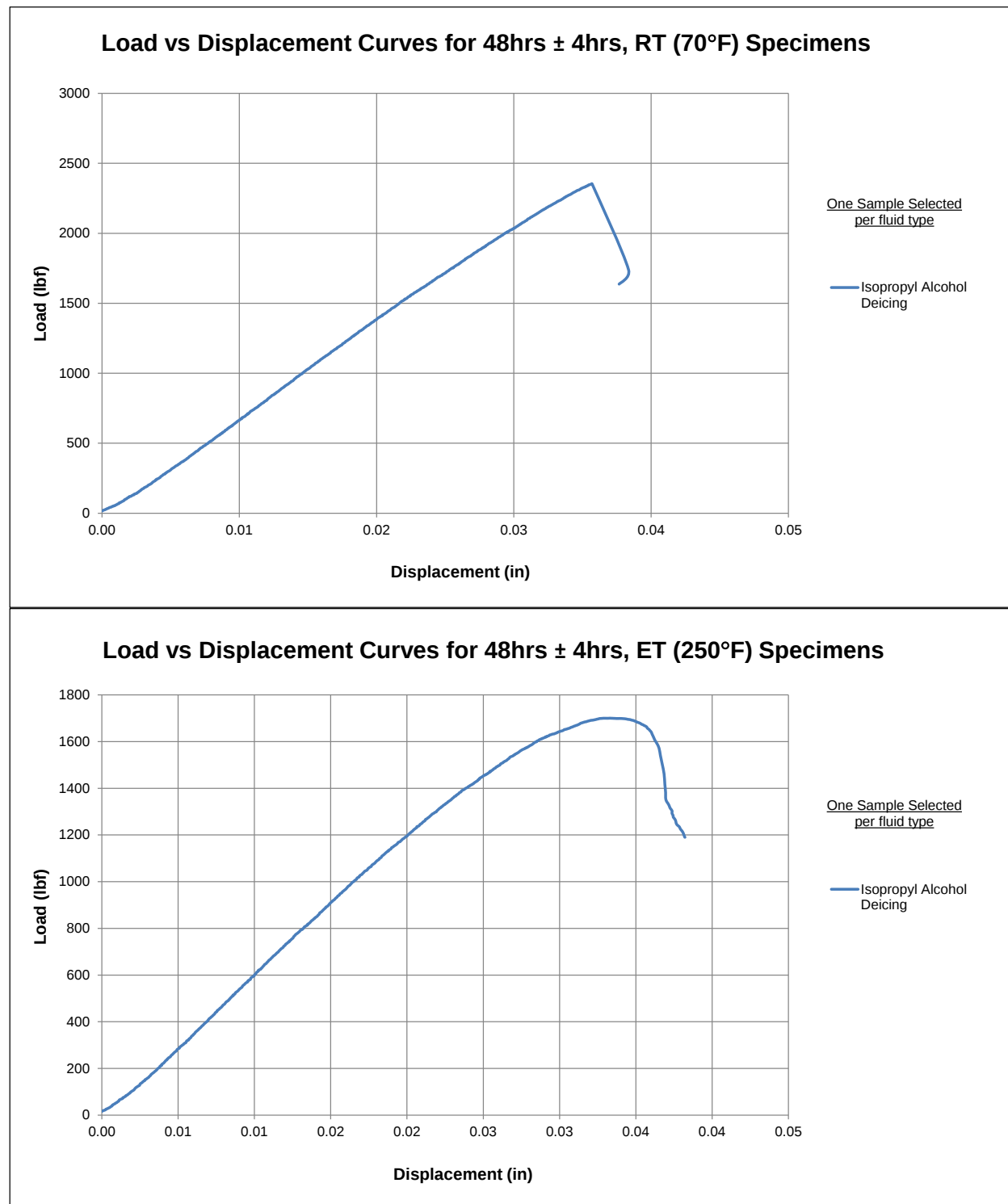
*specimens from RT was tested in ET condition

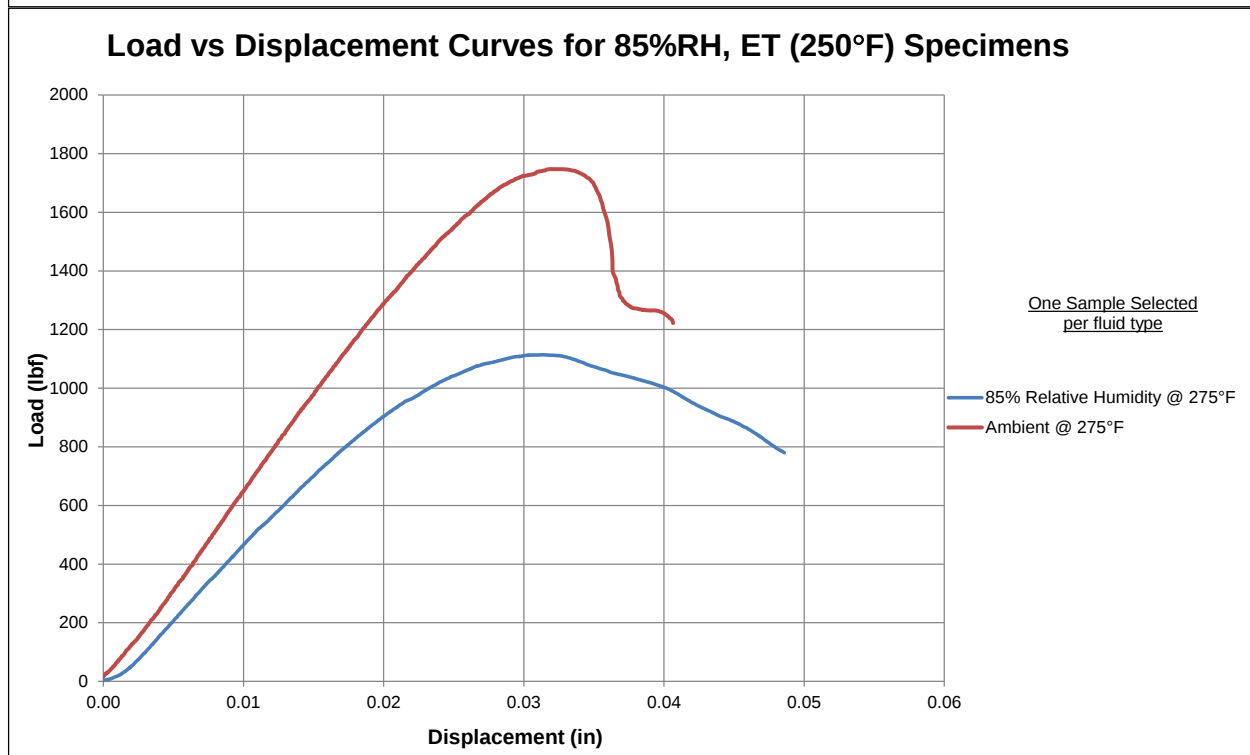
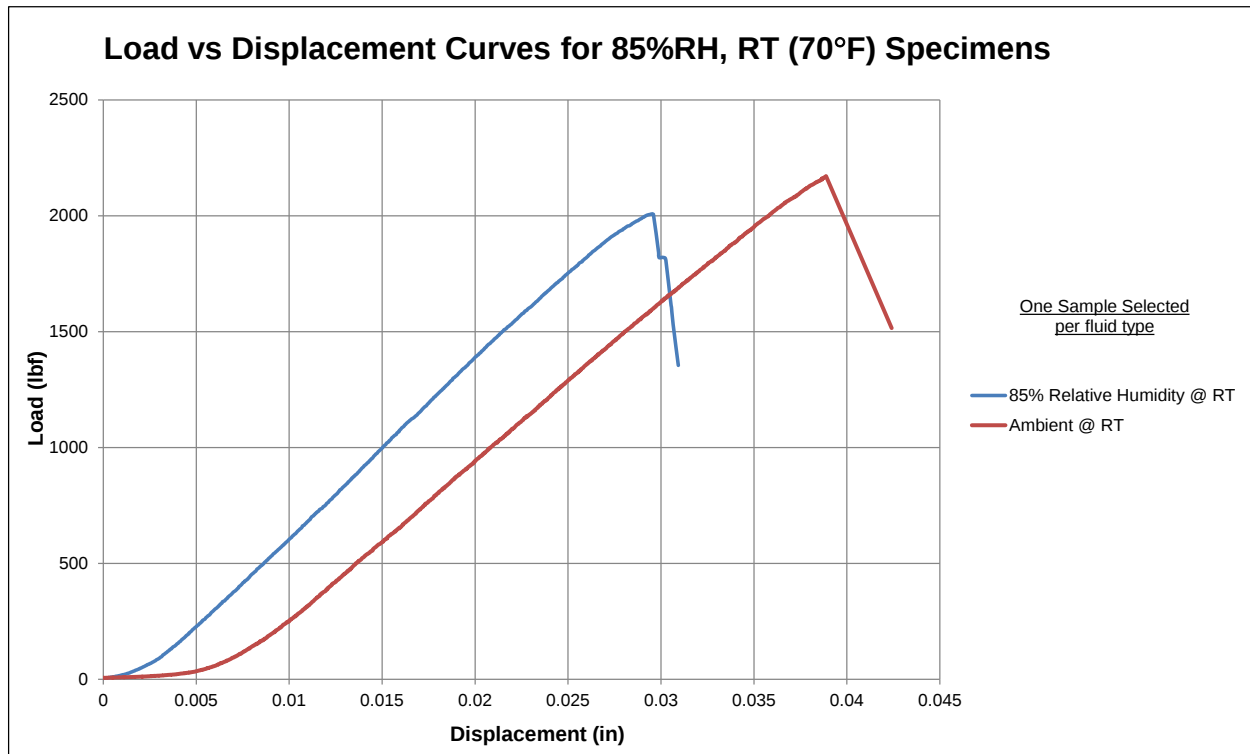


7.3 Load Displacement Curves



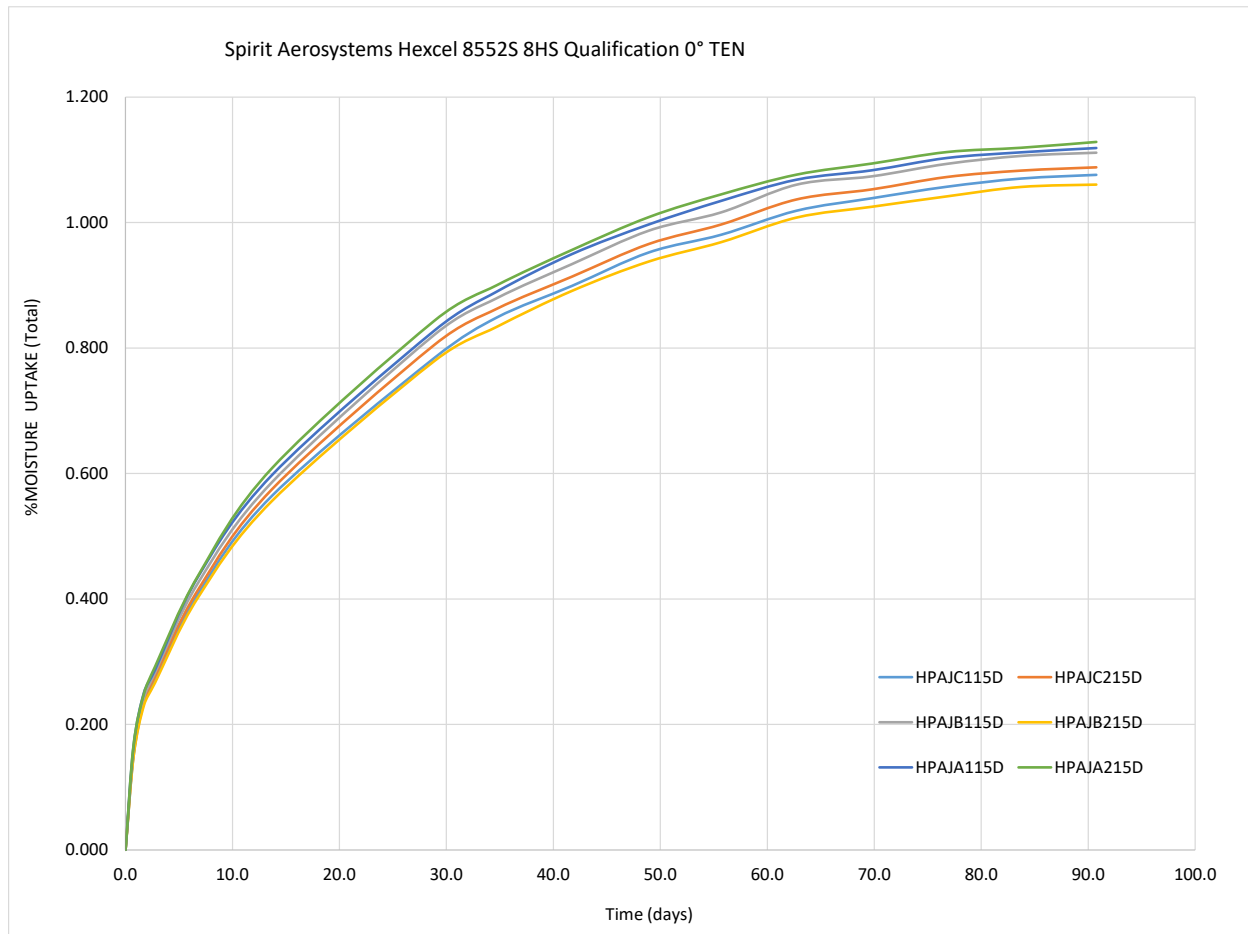




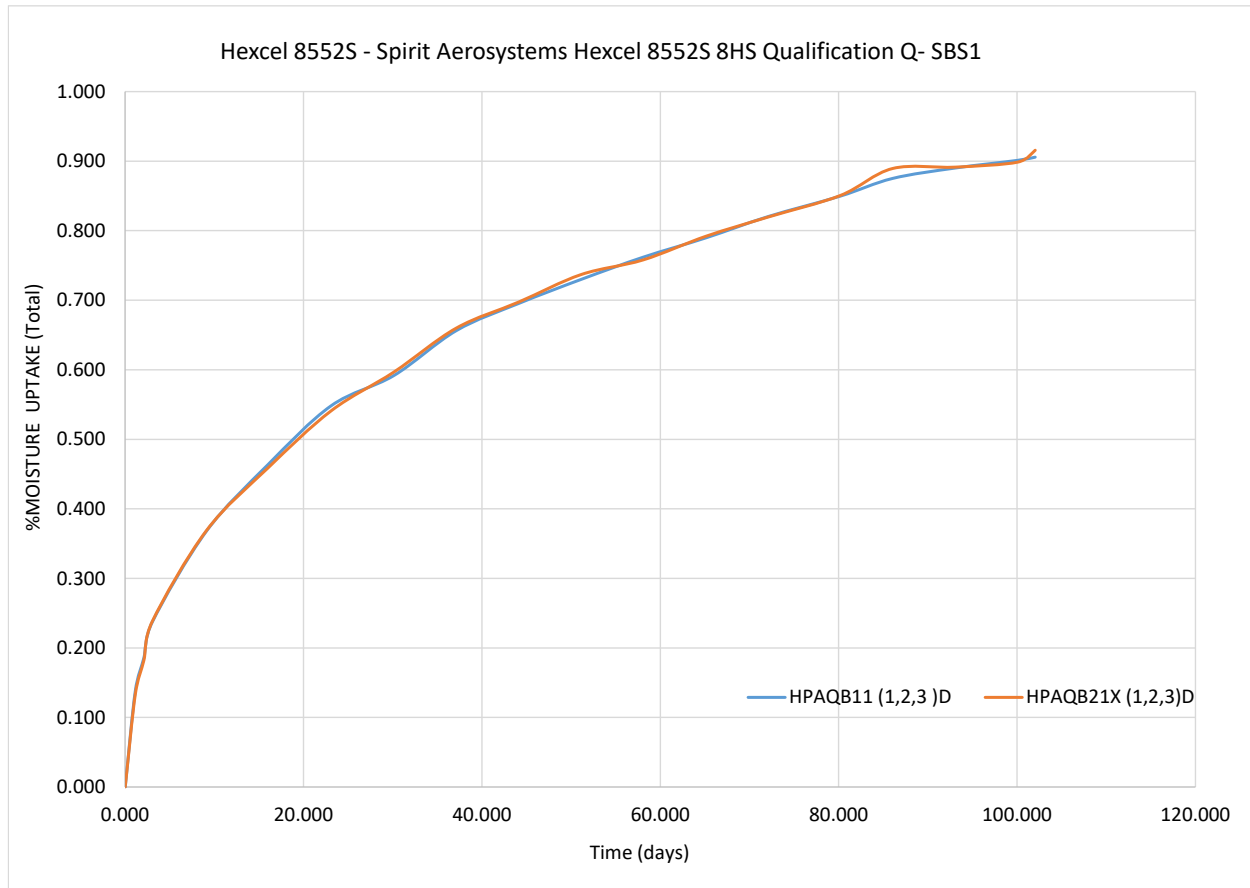


8. Moisture Conditioning Charts

8.1 Longitudinal Tension - Thinner Panel



8.2 Short-Beam Strength - Thicker Panel



9. DMA Results

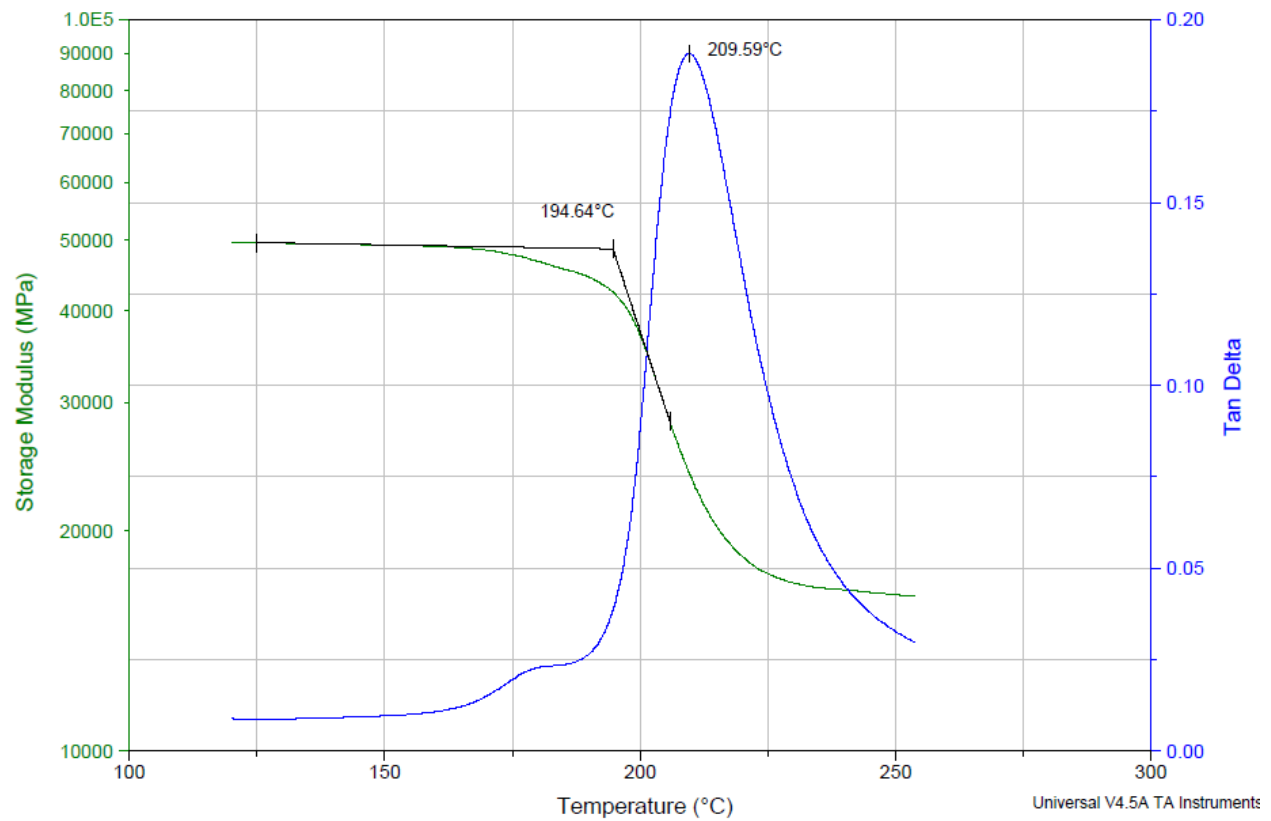
9.1 Dry DMA Data

DMA Results Summary				
Hexcel 8552S 8HS Spirit Aerosystems Qualification DMA Dry				
Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T _g [°C]	T _g [°F]	T _g [°C]	T _g [°F]
FC-A-M1-2-DMA-D	194.64	382.35	209.59	409.26
FC-A-M2-2-DMA-D	198.27	388.89	213.48	416.26
FHC1-A-M1-1-DMA-D	193.81	380.86	209.22	408.60
FHC1-A-M2-1-DMA-D	196.99	386.58	212.13	413.83
FHT1-A-M1-1-DMA-D	191.78	377.20	208.94	408.09
FHT1-A-M2-1-DMA-D	193.42	380.16	209.77	409.59
FHT1-B-M1-1-DMA-D	195.70	384.26	213.51	416.32
FHT1-C-M2-1-DMA-D	193.43	380.17	211.08	411.94
FT-A-M1-2-DMA-D	195.99	384.78	210.56	411.01
FT-A-M2-2-DMA-D	197.45	387.41	210.54	410.97
FT-B-M1-2-DMA-D	196.92	386.46	210.89	411.60
FT-B-M2-2-DMA-D	199.28	390.70	213.87	416.97
FT-C-M1-2-DMA-D	198.79	389.82	213.53	416.35
FT-C-M2-2-DMA-D	199.52	391.14	214.44	417.99
OHC1-A-M1-1-DMA-D	193.11	379.60	208.34	407.01
OHC1-B-M2-1-DMA-D	199.87	391.77	214.99	418.98
OHC1-C-M1-1-DMA-D	198.04	388.47	213.43	416.17
OHC1-C-M2-1-DMA-D	197.42	387.36	212.71	414.88
OHT1-B-M2-1-DMA-D	195.08	383.14	212.96	415.33
OHT1-C-M1-1-DMA-D	193.24	379.83	211.38	412.48
OHT1-C-M2-1-DMA-D	194.06	381.31	212.50	414.50
SBS-A-M1-1-DMA-D	194.20	381.56	206.66	403.99
SSB1-B-M1-1-DMA-D	195.79	384.42	212.92	415.26
SSB1-C-M1-1-DMA-D	194.17	381.51	212.13	413.83
SSB2-A-M1-1-DMA-D	193.23	379.81	211.43	412.57
SSB2-B-M1-1-DMA-D	195.35	383.63	213.30	415.94
SSB2-B-M2-1-DMA-D	195.67	384.21	213.59	416.46
UNT1-A-M1-1-DMA-D	193.45	380.21	209.78	409.60
UNT1-A-M2-1-DMA-D	193.31	379.96	209.59	409.26
UNT1-B-M1-1-DMA-D	196.83	386.29	213.81	416.86
UNT1-B-M2-1-DMA-D	196.09	384.96	213.56	416.41
UNT1-C-M1-1-DMA-D	195.60	384.08	212.33	414.19
UNT1-C-M2-1-DMA-D	195.33	383.59	212.33	414.19
UNT3-B-M1-2-DMA-D	194.54	382.17	209.11	408.40
UNT3-B-M2-2-DMA-D	195.67	384.21	209.94	409.89
WT-A-M1-1-DMA-D	195.43	383.77	209.80	409.64
WT-A-M2-1-DMA-D	195.07	383.13	209.21	408.58
WT-B-M1-1-DMA-D	197.25	387.05	212.42	414.36
Average	195.63	384.13	211.57	412.83
Standard Deviation	2.01	3.61	1.99	3.57

Sample: FC-A-M1-2-DMA-D
Size: 50.0000 x 13.1500 x 3.1500 mm
Method: Strain Controlled Ramp @5C/min
Comment: NCAMP Hexcel 8552S Spirit Aerosystems Qualification DMA Dry

DMA

File: Y:\...Dry\FC-A-M1-2-DMA-D.001
Operator: Ping Q800-SN0188
Run Date: 16-May-2019 15:17
Instrument: DMA Q800 V7.5 Build 127



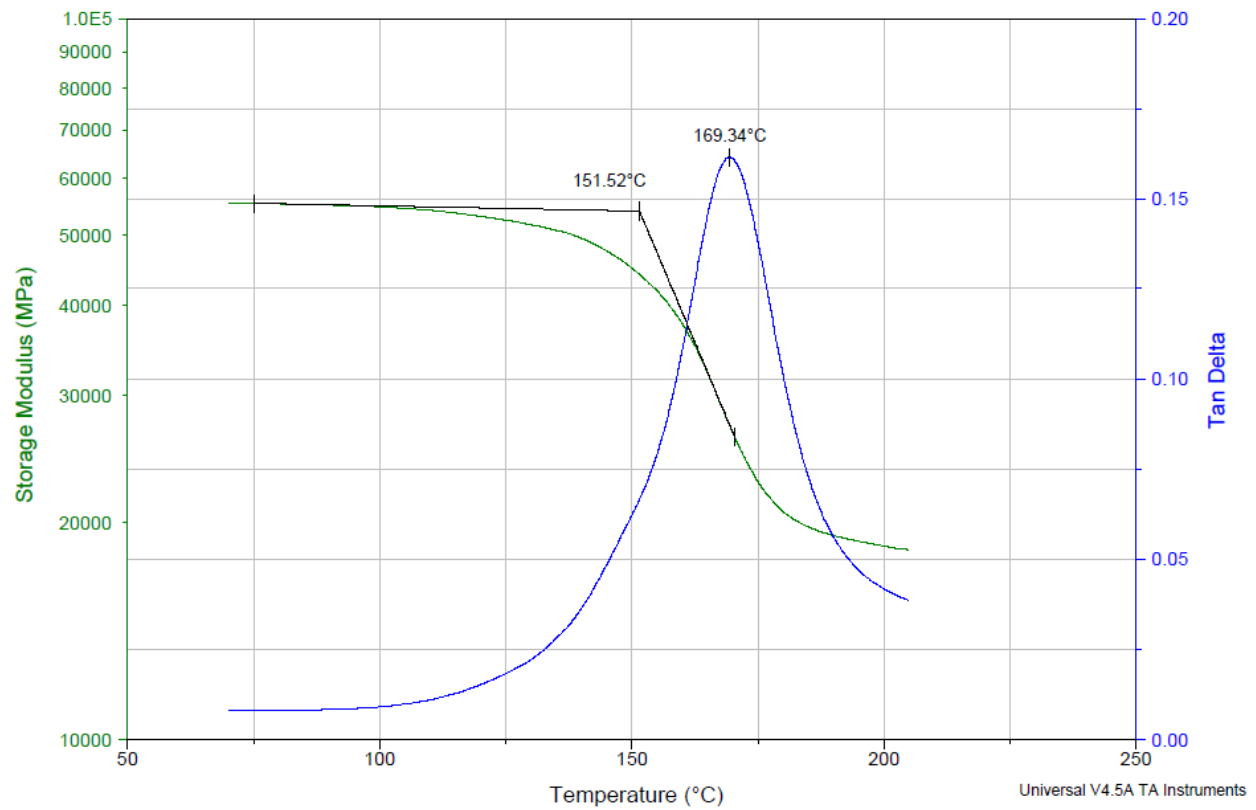
9.2 Wet DMA Data

DMA Results Summary				
Hexcel 8552S 8HS Spirit Aerosystems Qualification DMA Wet				
Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T _g [°C]	T _g [°F]	T _g [°C]	T _g [°F]
FC-A-M1-2-DMA-W	151.52	304.74	169.34	336.81
FC-B-M1-2-DMA-W	154.53	310.15	171.53	340.75
FHC1-A-M1-1-DMA-W	151.49	304.68	172.32	342.18
FHC1-A-M2-1-DMA-W	151.71	305.08	171.82	341.28
FHT1-A-M1-1-DMA-W	143.97	291.15	166.28	331.30
FHT1-A-M2-1-DMA-W	147.42	297.36	168.31	334.96
FHT1-B-M1-1-DMA-W	146.08	294.94	168.55	335.39
FHT1-C-M2-1-DMA-W	145.34	293.61	166.55	331.79
FT-A-M1-2-DMA-W	153.57	308.43	169.43	336.97
FT-A-M2-2-DMA-W	152.43	306.37	168.79	335.82
FT-B-M1-2-DMA-W	152.09	305.76	170.25	338.45
FT-B-M2-2-DMA-W	154.63	310.33	171.79	341.22
FT-C-M1-2-DMA-W	154.40	309.92	171.43	340.57
FT-C-M2-2-DMA-W	154.54	310.17	170.79	339.42
OHC1-A-M1-1-DMA-W	153.39	308.10	172.21	341.98
OHC1-B-M2-1-DMA-W	152.67	306.81	173.15	343.67
OHC1-C-M1-1-DMA-W	151.03	303.85	171.15	340.07
OHC1-C-M2-1-DMA-W	152.40	306.32	171.32	340.38
OHT1-B-M2-1-DMA-W	146.89	296.40	169.40	336.92
OHT1-C-M1-1-DMA-W	147.34	297.21	167.94	334.29
OHT1-C-M2-1-DMA-W	146.62	295.92	168.78	335.80
SBS-A-M1-1-DMA-W	151.11	304.00	171.58	340.84
SSB1-B-M1-1-DMA-W	147.76	297.97	169.71	337.48
SSB1-C-M1-1-DMA-W	145.44	293.79	166.84	332.31
SSB2-A-M1-1-DMA-W	143.78	290.80	170.20	338.36
SSB2-B-M1-1-DMA-W	144.65	292.37	170.29	338.52
SSB2-B-M2-1-DMA-W	144.78	292.60	170.36	338.65
UNT1-A-M1-1-DMA-W	150.08	302.14	170.59	339.06
UNT1-A-M2-1-DMA-W	146.44	295.59	168.01	334.42
UNT1-B-M1-1-DMA-W	148.04	298.47	170.04	338.07
UNT1-B-M2-1-DMA-W	147.46	297.43	170.20	338.36
UNT1-C-M1-1-DMA-W	147.45	297.41	169.18	336.52
UNT1-C-M2-1-DMA-W	146.97	296.55	168.72	335.70
UNT3-B-M1-2-DMA-W	152.43	306.37	170.87	339.57
UNT3-B-M2-2-DMA-W	153.41	308.14	170.64	339.15
WT-A-M1-1-DMA-W	152.51	306.52	169.20	336.56
WT-A-M2-1-DMA-W	152.39	306.30	168.54	335.37
WT-B-M1-1-DMA-W	153.32	307.98	169.84	337.71
Average	149.79	301.62	169.89	337.81
Standard Deviation	3.47	6.24	1.62	2.91

Sample: FC-A-M1-2-DMA-W
Size: 50.0000 x 13.1600 x 3.1700 mm
Method: Strain Controlled Ramp @5C/min
Comment: NCAMP Hexcel 8552S Spirit Aerosystems Qualification DMA Wet

DMA

File: Y:\...Wet\FC-A-M1-2-DMA-W.001
Operator: Ping Q800-SN0188
Run Date: 13-Sep-2019 17:41
Instrument: DMA Q800 V7.5 Build 127



10. Deviations

N/A