Laminate Repair of Solvay (Formerly Cytec) 5320-1 T650 3k-PW fabric with 36% RC Material Property Data Report (Qualification and Equivalency)

NCAMP Project Number: NPN 031801

NCAMP Test Report Number: CAM-RP-2018-056 Rev N/C

Report Date: February 10, 2021

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REVISIONS:

Rev	By	Date	Pages Revised or Added
N/C	Evelyn Lian	2/10/2021	Document Initial Release

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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-17-1G—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 provide the test results for a 3-batch qualification and a single batch equivalency of the laminate repair of Solvay 5320-1 T650 3k plain weave fabric prepreg using Solvay FM®300-2M Adhesive Film 0.06psf. The NCAMP Test Plan NTP 5325QR1 was used for this 3-batch qualification and a single batch equivalency of laminate repair program.

This report contains material property data only.

Statistical analysis of the 3-batch qualification laminate repair data including the calculations of b-basis values is given in a separate report, The 3-batch qualification and a single batch equivalency of the laminate repair statistical analysis data is given in NCP-RP-2020-010 Rev N/C.

Both qualification and equivalency material was procured to NCAMP Material Specification NMS 532/6 Rev A dated September 19, 2016. Both qualification and equivalency laminate repair test panels fabrication consisted of the parent test panels and repair test panels. The parent test panels are fabricated per NCAMP Process Specification NPS 85321 using baseline “C” cure cycle. The repair test panels are repaired according to NCAMP Process Specification NPS 80530R using Solvay

FM®300-2M Adhesive Film 0.06psf was procured to Solvay PN 70446700, an equivalent NCAMP Material Specification NMS 300/1 has been created.

A single batch equivalency statistical analysis data for the Laminate Repair Prepreg Batch of Solvay 5320-1 T650 3k-PW fabric with 36% RC is given in NCP-RP-2018-017 Rev N/C and engineering basis values generated from original material qualification testing can be obtained from NCP-RP-2012-023 Rev N/C. The equivalency material was procured to NCAMP Material Specification NMS 532/6 Rev A dated September 19, 2016. The equivalency test panels were cured in accordance with NCAMP Process Specification NPS 85321 Rev C dated May 31, 2018 using baseline “C” Cure Cycle.

NIAR has demonstrated that capable of processing the Solvay 5320-1 T650 3k-PW fabric with 36% RC material and producing test panels with properties equivalent to those of the original qualification per NTP 5326Q1, the data generated from material qualification testing can be obtained from CAM-RP-2012-017 Rev N/C. The single batch material for process equivalency data of the Laminate Repair Prepreg, Solvay 5320-1 T650 3k-PW fabric with 36% RC is reported in CAM-RP-2019-045 Rev N/C.

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-17-1G. 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-17-1G, are adequate for the given program.

Aircraft companies should not use the data published in this report without specifying NCAMP Material Specification NMS 532/6 (Solvay 5320-1 T650 3k-PW) and NMS 300/1 (FM300-2M 0.06psf). NMS 532/6 and NMS 300/1 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 532/6 and NMS 300/1.* NMS 532/6, NMS 300/1 and NPS 80530R are 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 Nomenclature

Symbols

F_p^{tu}	ultimate tensile strength, based on parent laminate thickness
F_r^{tu}	ultimate tensile strength, based on repair laminate thickness
N_j	ultimate joint running force per repair ply

Superscripts

t	tension
tu	tension ultimate

Subscripts

p	parent laminate
r	repair laminate
j	joint

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

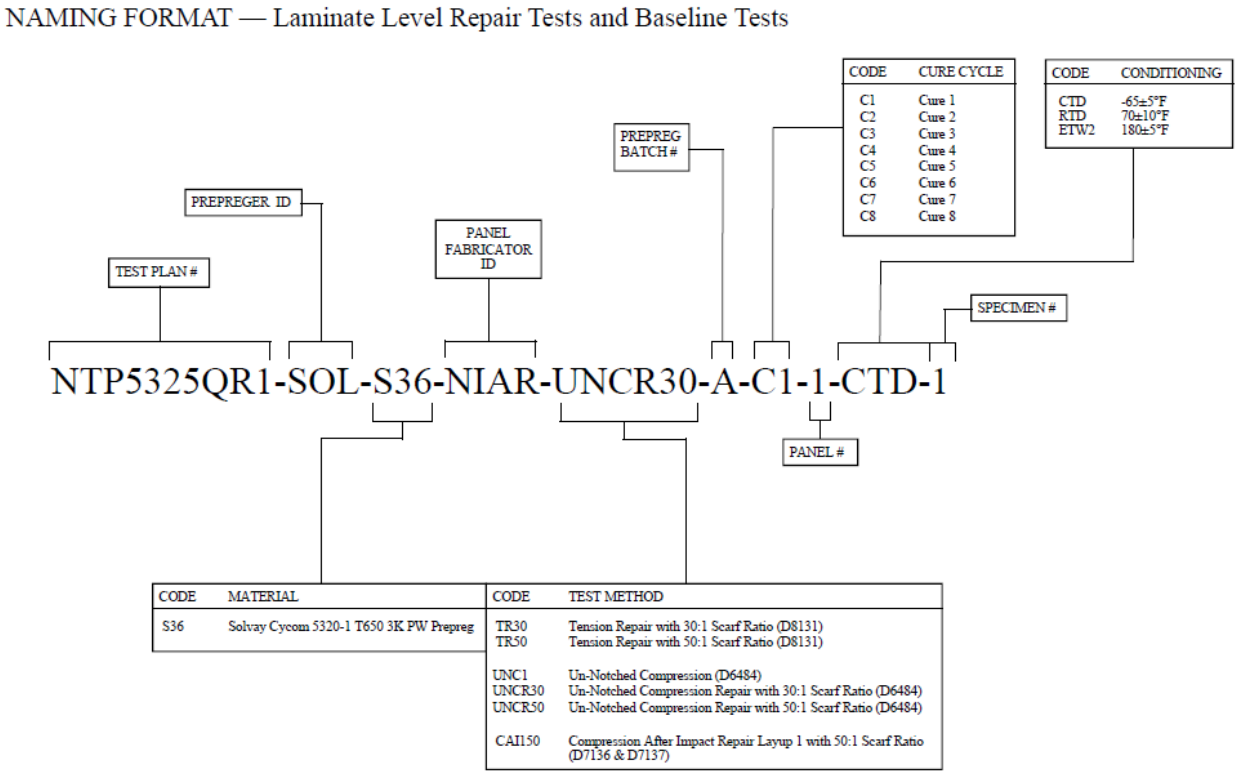


Figure 1-1: Specimen Naming Format – Laminate Level Repair Tests (Qualification and Equivalency) and Baseline Tests of UNC1

NAMING FORMAT — Fluid Sensitivity Un-Notched Compression

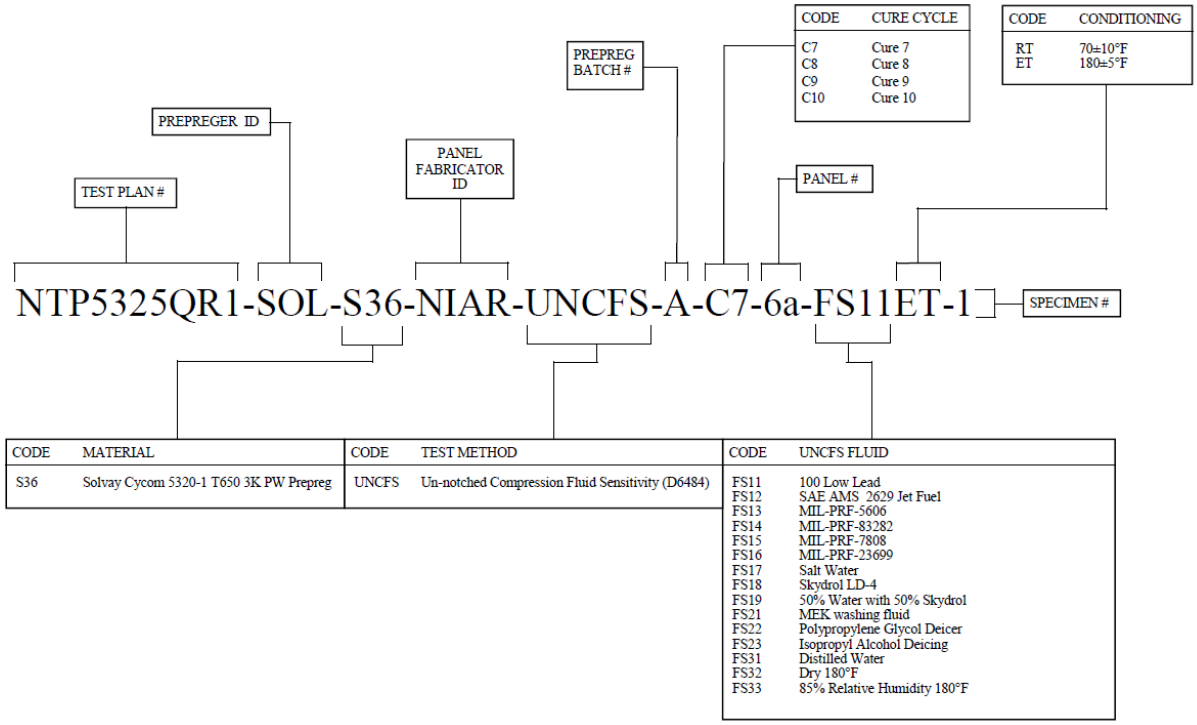


Figure 1-2: Specimen Naming Format – Fluid Sensitivity

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 D6484/D6484M-14 – Standard Test Method for Open-Hole Compressive Strength of Polymer Matrix Composite Laminates
- ASTM D7028-07(2015) – Standard Test Method for Glass Transition Temperature (DMA Tg) of Polymer Matrix Composites by Dynamic Mechanical Analysis (DMA)
- ASTM D7136/D7136M-15 – Standard Test Method for Measuring the Damage Resistance of a Fiber-Reinforced Polymer Matrix Composite to a Drop-Weight Impact Event
- ASTM D7137/D7137M-17 – Standard Test Method for Compressive Residual Strength Properties of Damaged Polymer Matrix Composite Plates
- ASTM D8131/D8131M-17e1 – Standard Test Method for Tensile Properties of Tapered and Stepped Joints of Polymer Matrix Composite Laminates

1.5 Methodology

1.5.1 Process Definition

For each combination of test, batch and condition, the specimens were selected from a minimum of two separate panels cured separately as shown in Figure 1-3 for qualification laminate repair program and Figure 1-4 for a single batch of equivalency laminate repair program unless otherwise specified.

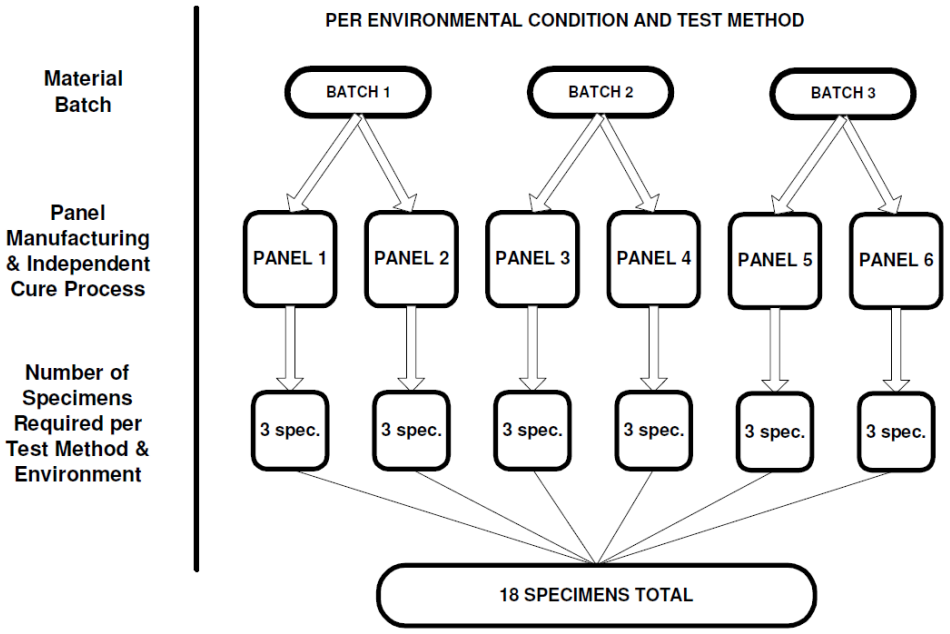


Figure 1-3: Specimen Selection Methodology – Qualification Laminate Repair and Baseline Tests of UNC1

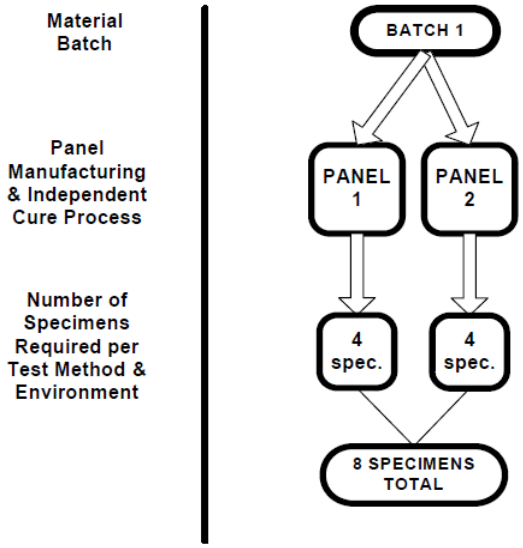


Figure 1-4: Specimen Selection Methodology – Equivalency Laminate Repair

All parent panels were fabricated in accordance with NCAMP Process Specification NPS 85321 “C” Cure Cycle. The repair test panels are repaired to NCAMP Process Specification NPS 80530R using Solvay FM®300-2M Adhesive Film 0.06psf was procured to Solvay PN 70446700, an equivalent NCAMP Material Specification NMS 300/1 has been created. These panels were used for both the manufacture of the repair qualification and equivalency specimens.

In order to facilitate individual specimen traceability, individual specimen numbering and/or skewed lines were written or drawn across each sub-panel as shown in Figure 1-5.

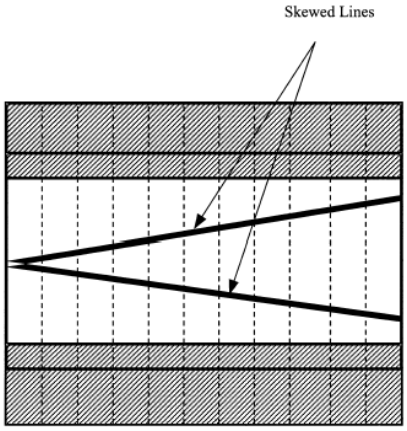


Figure 1-5: Specimen Traceability Line

1.5.2 Specimen & Testing Details

1.5.2.1 Tabbing

Laminate Tension Repair specimens were tabbed with Solvay FM 300-2M and ±45° beveled Glass tabstock at 250°F for 90 minutes.

1.5.2.2 Specimen Strain Device Used

Corresponding Gage ID can be obtained from Appendix 1 of NTP 5325QR1.

Uniaxial gages were used on:

All conditions (CTD, RTD and ETW2) of Tension Repair specimens

Two RTD Un-notched Compression Repair specimens for detecting buckling

One CAI un-impacted specimen for balancing

1.5.3 Test Matrix

1.5.3.1 Baseline Tests

Table 1-1 summarizes the test to establish the additional baseline strength property that will be compared to UNCR in Table 1-2 and Table 1-3.

Unlike the UNC1 and OHC1 properties from Qualification NTP5326Q1, Table 1-1 test matrix is to be tested with ASTM D6484 with no hole using similar parent layup with UNCR in Table 1-2 and Table 1-3.

Note: UNC1 in Qualification NTP5326Q1 has a different layup and were tested with ASTM D6641 and OHC1 were tested with ASTM D6484 with a hole.

(%0º/%±45º/%90º) Actual Test Type	Test Type and Layup (2)	Property	Number of Batches x Number of Panels x Number of Test Specimens		
			Test Temperature/ Moisture Condition		
			CTD (-65°F)	RTD (70°F)	ETW2 (180°F)
(25/50/25 - QI) UNC1	ASTM D6484 Un-Notched Compression [45/0/-45/90/45/0/-45/90/-45/90]S	Strength	3x2x3	3x2x3 (1)	3x2x3

Note 1: Back-to-back strain gages are needed on the first two specimens. 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: Loading direction in generally along the 0-degree direction.

Table 1-1: Baseline Tests of UNC1

1.5.3.2 Laminate Level Repair Tests (Design Guidance Properties)

The tables below show the lay-ups and test matrices used for laminate level repair testing on design guidance properties. Table 1-2 shows the repair qualification tests with scarf ratio of 50:1, which is seen commonly at the large industry carried, and most sponsored repair test programs. Table 1-3 shows a reduced sampling of repair equivalency test with scarf ratio of 30:1, to evaluate the difference in test properties exists between the scarf ratios of 50:1 and 30:1. Additionally, the scarf ratio of 30:1 is seen more frequently in small general aviation aircraft.

1.5.3.3 Laminate Level Repair Test Matrix (Scarf Ratio of 50:1)

Panel thickness measurements were taken utilizing ASTM D5687 as a guide to determine the overall panel thickness and CPT. Continuous scarf the parent laminate panel with the applicable scarf ratio based on panel thickness. The repair ply overlaps are 0.5 inch and the film adhesive is Solvay FM-300-2. Repair panel layups may vary depending on the parent panel layup, actual repair panel layups are listed in Table 1-2 Laminate Level Repair Test Matrix (Scarf Ratio of 50:1). Both scarf length and scarf angle are calculated based on the scarf ratio and average panel thickness. Detailed of the repair process specification is available in NPS 80530R.

Figure 1-6: Scarf Ratio of (50:1)

(%0º/%±45º/%90º) Actual Test Type	Test Type and Layup (2)(3)	Property	Number of Batches x Number of Panels x Number of Test Specimens		
			Test Temperature/ Moisture Condition		
			CTD (-65°F)	RTD (70°F)	ETW2 (180°F)
(25/50/25 - QI) TR	ASTM D8131 Tension Repair [45/0/-45/90/45/0/-45/90/-45/90]S	Strength & Modulus	3x2x3	3x2x3	3x2x3
(25/50/25 – QI) UNCR	ASTM D6484 Un-Notched Compression Repair [45/0/-45/90/45/0/-45/90/-45/90]S	Strength	3x2x3	3x2x3 (1)	3x2x3
(25/50/25 - QI) CAIR	ASTM D7136 & D7137 Compression After Impact (1500 in.lb/in) [45/0/-45/90/45/0/-45/90/-45/90]S	Strength	3x2x3	3x2x3 (1)	3x2x3

Note 1: Back-to-back strain gages are needed on the first two specimens. 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: Loading direction in generally along the 0-degree direction. Shimming is allowed if required.

Note 3: NDI via C-scan will be performed on all repair panels. Any anomalies should be brought to the NCAMP so a determination of the anomaly severity and determination of use for test.

Table 1-2: Laminate Level Repair Test Matrix (Scarf Ratio of 50:1)

1.5.3.4 Laminate Level Repair Test Matrix (Scarf Ratio of 30:1)

Panel thickness measurements were taken utilizing ASTM D5687 as a guide to determine the overall panel thickness and CPT. Continuous scarf the parent laminate panel with the applicable scarf ratio based on panel thickness. The repair ply overlaps are 0.5 inch and the film adhesive is Solvay FM-300-2. Repair panel layups may vary depending on the parent panel layup, actual repair panel layups are listed in Table 1-3 Laminate Level Repair Test Matrix (Scarf Ratio of 30:1). Both scarf length and scarf angle are calculated based on the scarf ratio and average panel thickness. Detailed of the repair process specification is available in NPS 80530R.

Figure 1-7: Scarf Ratio of (30:1)

(%0º/%±45º/%90º) Actual Test Type	Test Type and Layup (2)(3)	Property	Number of Batches x Number of Panels x Number of Test Specimens		
			Test Temperature/ Moisture Condition		
			CTD (-65°F)	RTD (70°F)	ETW2 (180°F)
(25/50/25 - QI) TR	ASTM D8131 Tension Repair [45/0/-45/90/45/0/-45/90/-45/90]S	Strength & Modulus	1x2x4	1x2x4	1x2x4
(25/50/25 – QI) UNCR	ASTM D6484 Un-Notched Compression Repair [45/0/-45/90/45/0/-45/90/-45/90]S	Strength	1x2x4	1x2x4 (1)	1x2x4

Note 1: Back-to-back strain gages are needed on the first two specimens. 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: Loading direction in generally along the 0-degree direction. Shimming is allowed if required.

Note 3: NDI via C-scan will be performed on all repair panels. Any anomalies should be brought to the NCAMP so a determination of the anomaly severity and determination of use for test.

Table 1-3: Laminate Level Repair Test Matrix (Scarf Ratio of 30:1)

1.5.4 Cured Laminate Repair Physical Testing

The properties in Table 1-4 were determined for each laminate repair panel used for test specimens 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 D3171-11	All data from mechanical test specimens
Laminate Density	ASTM D792-08	3
Fiber Volume, % by Volume	ASTM D3171-11 (Note 2)	3
Resin Content, % by Weight	ASTM D3171-11 (Note 2)	3
Ultrasonic Through Transmission, C-Scan	MIL-HDBK-787A (Note 3)	1
Glass Transition Temperature, Tg Parent Section Repair Section Scarf Section	Dry and Wet – ASTM D7028	1 Dry, 1 Wet (Note 4)

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 a total of 18 dry and 18 wet for each material system (Qualification, 50:1 Scarf Ratio). Minimum a total of 4 dry and 4 wet for each material system (Equivalency, 30:1 Scarf Ratio).

Table 1-4: Physical Testing Matrix

1.5.5 Environmental Conditioning

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

Test environments are defined as:

CTD = -65±5°F, dry
RTD = 70±10°F, dry
ETW2 = 180±5°F, wet*

*ETW2 test temperature is reduced from 250±5°F (used in the baseline Solvay 5320-1 T650 3k-PW qualification) to 180±5°F in this program due to the Wet Tg of the FM® 300-2M film adhesive.

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 250°F±5°F for at least 24 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 250°F±5°F for a minimum of 24 hours before being conditioned to equilibrium at 160°F±5°F and 85% ± 5%. 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 passed 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-gauged specimens were removed from the controlled environment for a maximum of 2 hours for application of gauges 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 ±5°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 ±5°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 1-5 lists the requirements for fluid sensitivity screening, which requires ASTM D6484 Un-Notched Compression testing on [45/0/-45/90/45/0/-45/90/-45/90]S Laminate Repair level specimens dried at 250°F±5°F for 24 hours minimum 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.

Extended Contact:	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	180°F	FS11ET
SAE AMS 2629 Jet Reference Fluid (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	180°F	FS12ET
MIL-PRF-5606 Hydraulic Oil	90 days min. @ 70°F±10°F	70°F	FS13RT
	90 days min. @ 70°F±10°F	180°F	FS13ET
MIL-PRF-83282 Hydraulic Oil	90 days min. @ 70°F±10°F	70°F	FS14RT
	90 days min. @ 70°F±10°F	180°F	FS14ET
MIL-PRF-7808 Engine Oil	90 days min. @ 70°F±10°F	70°F	FS15RT
	90 days min. @ 70°F±10°F	180°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	180°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	180°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	180°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	180°F	FS19ET
Short Duration Contact:			
MEK washing fluid. ASTM D740	90 minutes min. @ 70°F±10°F	70°F	FS21RT
	90 minutes min. @ 70°F±10°F	180°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	180°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	180°F	FS23ET
Control Tests:			
Distilled Water	90 days min. at 70°F±10°F	70°F	FS31RT
	90 days min. at 70°F±10°F	180°F	FS31ET
Dry	Dry per section 6.1	70°F	FS32RT
	Dry per section 6.1	180°F	FS32ET
85% Relative Humidity	Per section 6.1	70°F	FS33RT
	Per section 6.1	180°F	FS33ET

Table 1-5: Fluid Sensitivity Matrix

1.5.8 Inspection Verification

The 3-batch qualification and 1-batch equivalency laminate repair 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. Test setup and witnessing was delegated to an NCAMP AER. Mechanical testing was carried out at the National Institute for Aviation Research, Wichita State University.

1.5.9 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. Material Property Test Results

2.1 Baseline Test of Un-Notched Compression

Prepreg Material: Solvay 5320-1 T650 3k-PW fabric with 36% RC
Material Specification: NMS 532/6
Process Specification: NPS 85321 Baseline Cure Cycle
Fabric: T650 3k PW **Resin:** Cycom 5320-1

Solvay 5320-1 T650 3k-PW fabric with 36% RC Baseline Test of UNC1 Summary

Tg(dry): 390.43°F **Tg(wet):** 320.95°F **Tg METHOD:** DMA (ASTM D7028)

LAMINATE MECHANICAL PROPERTY SUMMARY
Data reported as: Normalized & Measured
(Normalized by CPT= 0.0077 inch)

Property	CTD (-65°F) Mean		RTD (70°F) Mean		ETW2 (180°F) Mean	
	Normalized	Measured	Normalized	Measured	Normalized	Measured
UNC1 Strength [ksi]	90.59	90.26	79.76	79.81	66.80	66.57

Table 2-1: Baseline Test of Un-Notched Compression Summary Data

2.2 Laminate Level Repair (Scarf Ratio of 50:1) Test Summary - Qualification

Prepreg Material: Solvay 5320-1 T650 3k-PW fabric with 36% RC
Material Specification: NMS 532/6 (Solvay 5320-1 T650 3k-PW)
NMS 300/1 (FM300-2M 0.06psf)
Process Specification: NPS 85321 Baseline Cure Cycle (Parent)
NPS 80530R Baseline Cure Cycle (Repair)

Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair Laminate Repair (Scarf Ratio of 50:1) Properties Summary - Qualification

Fabric: T650 3k PW
Resin: Cycom 5320-1

	Tg(dry)	Tg(wet)
Parent Section:	394.46°F	318.74°F
Repair Section:	384.96°F	311.46°F
Scarf Section, Adhesive:	289.84°F	226.04°F
Scarf Section, Laminate:	391.42°F	320.86°F

Tg METHOD: DMA (ASTM D7028)

LAMINATE REPAIR (Scarf Ratio of 50:1) MECHANICAL PROPERTY SUMMARY
Data reported as: Normalized & Measured
(Normalized by parent material $CPT_{5320\text{-}1\ 3k\text{-}PW}$=0.0077 inch)

Scarf Ratio	Test Type	Property	CTD (-65°F) Mean		RTD (70°F) Mean		ETW2 (180°F) Mean	
			Normalized	Measured	Normalized	Measured	Normalized	Measured
50:1	Tensile Repair (TR50)	N_j [lb/in/ply]		553.3		655.6		528.1
		F_p^{tu} [ksi]	76.83	72.03	92.19	85.10	74.35	68.57
		F_r^{tu} [ksi]	75.15	70.46	89.83	82.92	72.41	66.79
		Modulus I [Msi]	7.42	6.958	7.261	6.702	7.122	6.577
		Modulus II [Msi]	7.38	6.921	7.295	6.733	7.184	6.634
	Un-Notched Compression (UNCR50)	N_j [lb/in/ply]		671.1		637.1		498.6
		Strength [ksi]	87.15	82.80	82.74	77.62	64.76	60.94
	Compression After Impact (CAI150)	N_j [lb/in/ply]		268.9		248.9		222.6
		Strength [ksi]	34.92	33.01	32.32	30.31	28.91	27.50

Modulus I (bag side) and Modulus II (tool side).

Table 2-2: Laminate Level Repair (Scarf Ratio of 50:1) Summary Data – Qualification

2.3 Laminate Level Repair (Scarf Ratio of 30:1) Test Summary - Equivalency

Prepreg Material: Solvay 5320-1 T650 3k-PW fabric with 36% RC
Material Specification: NMS 532/6 (Solvay 5320-1 T650 3k-PW)
NMS 300/1 (FM300-2M 0.06psf)
Process Specification: NPS 85321 Baseline Cure Cycle (Parent)
NPS 80530R Baseline Cure Cycle (Repair)

Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair Laminate Repair (Scarf Ratio of 30:1) Properties Summary - Equivalency

Fabric: T650 3k PW
Resin: Cycom 5320-1

Tg METHOD: DMA (ASTM D7028)

	Tg(dry)	Tg(wet)
Parent Section:	393.40°F	322.71°F
Repair Section:	381.75°F	316.11°F
Scarf Section, Adhesive:	287.64°F	228.93°F
Scarf Section, Laminate:	390.70°F	321.91°F

LAMINATE REPAIR (Scarf Ratio of 30:1) MECHANICAL PROPERTY SUMMARY
Data reported as: Normalized & Measured
(Normalized by parent material $CPT_{5320\text{-}1\ 3k\text{-}PW}$=0.0077 inch)

Scarf Ratio	Test Type	Property	CTD (-65°F) Mean		RTD (70°F) Mean		ETW2 (180°F) Mean	
			Normalized	Measured	Normalized	Measured	Normalized	Measured
30:1	Tensile Repair (TR30)	N_j [lb/in/ply]		546.8		656.9		422.0
		F_p^{tu} [ksi]	74.21	70.03	90.61	84.13	58.92	54.17
		F_r^{tu} [ksi]	73.64	69.51	89.11	82.74	59.18	54.41
		Modulus I [Msi]	7.224	6.820	7.254	6.737	7.169	6.586
		Modulus II [Msi]	7.273	6.866	7.114	6.605	7.264	6.672
	Un-Notched Compression (UNCR30)	N_j [lb/in/ply]		693.3		635.2		450.2
		Strength [ksi]	90.04	85.65	82.49	77.35	58.47	54.25

Modulus I (bag side) and Modulus II (tool side).

Table 2-3: Laminate Level Repair (Scarf Ratio of 30:1) Summary Data - Equivalency

2.4 Individual Test Summaries

2.4.1 Baseline Test for Un-Notched Compression

Material:	Solvay 5320-1 T650 3k-PW fabric with 36% RC							**Un-Notched Compression (UNC1)** Solvay 5320-1 T650 3k-PW fabric with 36% RC [45/0/-45/90/45/0/-45/90/-45/90]S	
Resin content:	36.03 %wt	**Comp. density:**	1.546 g/cc						
Fiber volume:	55.87 %vol								
Ply count:	20								
Test method:	ASTM D6484-14								
Normalized by:	0.007700 in. CPT								
		CTD		**RTD**		**ETW2**			
Test Temperature [°F]		-65		70		180			
Moisture Conditioning		Dry		Dry		Equilibrium			
Equilibrium at T, RH						160 F,85%			
Source code prefixed by:	NTP5325QRI-SOL-S36-NIAR-	UNC1-X-CX-1-CTD-X		UNC1-X-CX-1-RTD-X		UNC1-X-CX-1-ETW2-X			
		Normalized	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**		
	Mean	90.59	90.26	79.76	79.81	66.80	66.57		
	Minimum	79.66	78.02	72.46	71.14	57.96	56.62		
Un-Notched Compression Strength [ksi]	**Maximum**	97.52	97.39	86.57	86.39	71.19	71.82		
	C.V.(%)	5.954	6.654	4.252	4.660	5.257	6.138		
	No. Specimens	18		18		18			
	No. Prepreg Lots	3		3		3			

2.4.2 Laminate Level Repair (Scarf Ratio of 50:1) - Qualification

2.4.2.1 Tensile Repair Test with Scarf Ratio of 50:1 (TR50)

Material: Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

Resin content: 36.56 %wt (Parent), 39.87 %wt (Scarf), 35.21 %wt (Repair)
Fiber volume: 55.53 %vol (Parent), 52.38 %vol (Scarf), 55.79 %vol (Repair)
Comp. density: 1.549 g/cc (Parent), 1.542 g/cc (Scarf), 1.524 g/cc (Repair)

Ply count: 20
Test method: ASTM D8131-17 **Modulus calculation:** 1000-3000 microstrain
Normalized by: 0.007700 in. CPT (Parent Material, Solvay 5320-1 T650 3k-PW)

Tension Repair (TR50)
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M
0.06psf Adhesive Film Repair
[45/0/-45/90/45/0/-45/90/-45/90]S

		CTD		RTD		ETW2	
Test Temperature [°F]		-65		70		180	
Moisture Conditioning		Dry		Dry		Equilibrium	
Equilibrium at T, RH						160 F,85%	
Source code prefixed by: NTP5325QRI-SOL-S36-NIAR-		TR50-X-CX-1-CTD-X		TR50-X-CX-1-RTD-X		TR50-X-CX-1-ETW2-X	
	Scarf Ratio of 50:1	**Normalized**	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**
TR50 Ultimate Joint Running Force per Repair Ply, Nj [lb/in/ply]	**Mean**		553.3		655.6		528.1
	Minimum		476.5		632.6		333.3
	Maximum		603.8		685.6		722.6
	C.V.(%)		5.605		2.433		24.81
	No. Specimens		18		18		22
	No. Prepreg Lots		3		3		3
TR50 F_p^{tu} [ksi]	**Mean**	76.83	72.03	92.19	85.10	74.35	68.57
	Minimum	65.70	61.32	86.64	80.61	45.88	42.82
	Maximum	83.67	78.64	97.99	88.82	105.3	95.50
	C.V.(%)	5.356	5.501	3.402	2.800	26.27	25.68
	No. Specimens		18		18		22
	No. Prepreg Lots		3		3		3
TR50 F_r^{tu} [ksi]	**Mean**	75.15	70.46	89.83	82.92	72.41	66.79
	Minimum	64.04	59.77	85.35	79.41	44.46	41.49
	Maximum	83.23	78.22	93.79	85.65	101.0	91.59
	C.V.(%)	5.740	6.101	2.625	2.184	26.06	25.50
	No. Specimens		18		18		22
	No. Prepreg Lots		3		3		3
TR50 Modulus I [Msi]	**Mean**	7.422	6.958	7.261	6.702	7.122	6.577
	Minimum	7.190	6.696	6.781	6.284	6.963	6.427
	Maximum	7.625	7.261	7.597	6.958	7.358	6.747
	C.V.(%)	2.247	2.368	2.645	2.280	1.783	1.353
	No. Specimens		18		18		22
	No. Prepreg Lots		3		3		3
TR50 Modulus II [Msi]	**Mean**	7.382	6.921	7.295	6.733	7.184	6.634
	Minimum	7.158	6.680	7.009	6.499	6.924	6.443
	Maximum	7.540	7.192	7.574	7.051	7.456	6.805
	C.V.(%)	1.458	1.888	2.474	2.592	2.036	1.514
	No. Specimens		18		17		22
	No. Prepreg Lots		3		3		3

Modulus I (bag side) and Modulus II (tool side).

2.4.2.2 Un-Notched Compression Repair Test with Scarf Ratio of 50:1 (UNCR50)

Material:	Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Resin content:	36.40 %wt (Parent), 36.66 %wt (Scarf), 37.46 %wt (Repair)
Fiber volume:	55.78 %vol (Parent), 55.03 %vol (Scarf), 54.34 %vol (Repair)
Comp. density:	1.552 g/cc (Parent), 1.538 g/cc (Scarf), 1.538 g/cc (Repair)
Ply count:	20
Test method:	ASTM D6484-14
Normalized by:	0.007700 in. CPT (Parent Material, Solvay 5320-1 T650 3k-PW)

Un-Notched Compression Repair (UNCR50)
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
[45/0/-45/90/45/0/-45/90/-45/90]S

		CTD		RTD		ETW2	
Test Temperature [°F]		-65		70		180	
Moisture Conditioning		Dry		Dry		Equilibrium	
Equilibrium at T, RH						160 F,85%	
Source code prefixed by: NTP5325QRI-SOL-S36-NIAR-		UNCR50-X-CX-1-CTD-X		UNCR50-X-CX-1-RTD-X		UNCR50-X-CX-1-ETW2-X	
Scarf Ratio of 50:1		**Normalized**	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**
UNCR50 Ultimate Joint Running Force per Repair Ply, Nj [lb/in/ply]	**Mean**		671.1		637.1		498.6
	Minimum		576.4		596.4		458.2
	Maximum		773.9		689.4		526.7
	C.V.(%)		7.220		3.913		3.885
	No. Specimens	18		18		21	
	No. Prepreg Lots	3		3		3	
UNCR50 Strength [ksi]	**Mean**	87.15	82.80	82.74	77.62	64.76	60.94
	Minimum	74.86	72.62	77.46	71.14	59.50	56.28
	Maximum	100.5	95.93	89.53	83.84	68.40	64.94
	C.V.(%)	7.220	6.957	3.913	4.276	3.885	3.833
	No. Specimens	18		18		21	
	No. Prepreg Lots	3		3		3	

2.4.2.3 Compression After Impact Repair Test with Scarf Ratio of 50:1 (CAI150)

Material:	Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Resin content:	36.43 %wt (Parent), 40.25 %wt (Scarf), 34.70 %wt (Repair)
Fiber volume:	55.49%vol (Parent), 51.99 %vol (Scarf), 56.86 %vol (Repair)
Comp. density:	1.545 g/cc (Parent), 1.540 g/cc (Scarf), 1.541 g/cc (Repair)
Ply count:	20
Test method:	ASTM D7136-15/D7137-17
Normalized by:	0.0077 in. CPT (Parent Material, Solvay 5320-1 T650 3k-PW)

Compression After Impact Repair (CAI150)
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
[45/0/-45/90/45/0/-45/90/-45/90]S

		CTD		RTD		ETW2	
Test Temperature [°F]		-65		70		180	
Moisture Conditioning		Dry		Dry		Equilibrium	
Equilibrium at T, RH						160 F,85%	
Source code prefixed by: NTP-5325QRI-SOL-S36-NIAR-		CAI150-X-CX-1-CTD-X		CAI150-X-CX-1-RTD-X		CAI150-X-CX-1-ETW-X	
Scarf Ratio of 50:1		**Normalized**	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**
CAI150 Ultimate Joint Running Force per Repair Ply, Nj [lb/in/ply]	**Mean**		268.9		248.9		222.6
	Minimum		255.3		227.8		206.1
	Maximum		286.3		269.4		237.2
	C.V.(%)		3.225		4.221		4.046
	No. Specimens		18		18		24
	No. Prepreg Lots		4		4		4
CAI150 Strength [ksi] (1500 in.lb/in)	**Mean**	34.92	33.01	32.32	30.31	28.91	27.50
	Minimum	33.16	30.99	29.58	27.40	26.76	25.55
	Maximum	37.18	36.15	34.99	33.36	30.81	30.01
	C.V.(%)	3.225	4.039	4.221	5.079	4.046	3.927
	No. Specimens		18		18		24
	No. Prepreg Lots		4		4		4

Note: All ETW2 specimens are identified as ETW instead of ETW2 per test plan.

2.4.3 Laminate Level Repair (Scarf Ratio of 30:1) - Equivalency

2.4.3.1 Tensile Repair Tests with Scarf Ratio of 30:1 (TR30)

Material: Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

Resin content: 36.60 %wt (Parent), 38.83 %wt (Scarf), 35.82 %wt (Repair)
Fiber volume: 55.60 %vol (Parent), 53.52 %vol (Scarf), 55.88 %vol (Repair)
Comp. density: 1.552 g/cc (Parent), 1.549 g/cc (Scarf), 1.541 g/cc (Repair)

Ply count: 20
Test method: ASTM D8131-17 **Modulus calculation:** 1000-3000 microstrain
Normalized by: 0.007700 in. CPT (Parent Material, Solvay 5320-1 T650 3k-PW)

Tension Repair (TR30)
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
[45/0/-45/90/45/0/-45/90/-45/90]S

		CTD		RTD		ETW2	
Test Temperature [°F]		-65		70		180	
Moisture Conditioning		Dry		Dry		Equilibrium	
Equilibrium at T, RH						160 F,85%	
Source code prefixed by: NTP5325QRI-SOL-S36-NIAR-		TR30-D-CX-1-CTD-X		TR30-D-CX-1-RTD-X		TR30r-A-CX-1-ETW2-X	
	Scarf Ratio of 30:1	**Normalized**	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**
TR30 Ultimate Joint Running Force per Repair Ply, Nj [lb/in/ply]	**Mean**		546.8		656.9		422.0
	Minimum		487.2		631.9		360.7
	Maximum		598.2		679.7		509.5
	C.V.(%)		6.617		2.409		11.91
	No. Specimens	8		8		10	
	No. Prepreg Lots	1		1		1	
TR30 F_p^{tu} [ksi]	**Mean**	74.21	70.03	90.61	84.13	58.92	54.17
	Minimum	65.89	62.52	86.48	81.19	51.06	46.74
	Maximum	83.33	76.62	94.72	87.16	70.44	65.97
	C.V.(%)	7.482	6.707	3.425	2.351	10.76	11.62
	No. Specimens	8		8		10	
	No. Prepreg Lots	1		1		1	
TR30 F_r^{tu} [ksi]	**Mean**	73.64	69.51	89.11	82.74	59.18	54.41
	Minimum	66.11	62.73	84.69	79.50	50.32	46.00
	Maximum	81.62	76.16	92.66	85.27	71.38	66.85
	C.V.(%)	6.895	6.520	3.206	2.215	12.52	13.35
	No. Specimens	8		8		10	
	No. Prepreg Lots	1		1		1	
TR30 Modulus I [Msi]	**Mean**	7.224	6.820	7.254	6.737	7.169	6.586
	Minimum	7.019	6.642	7.041	6.641	6.979	6.484
	Maximum	7.487	7.080	7.565	6.962	7.286	6.806
	C.V.(%)	2.461	1.857	2.232	1.603	1.463	1.547
	No. Specimens	8		8		10	
	No. Prepreg Lots	1		1		1	
TR30 Modulus II [Msi]	**Mean**	7.273	6.866	7.114	6.605	7.264	6.672
	Minimum	7.089	6.748	6.849	6.469	7.125	6.536
	Maximum	7.452	6.970	7.557	6.891	7.383	6.760
	C.V.(%)	1.876	1.027	3.237	2.192	1.065	0.9816
	No. Specimens	8		8		10	
	No. Prepreg Lots	1		1		1	

Modulus I (bag side) and Modulus II (tool side).

2.4.3.2 Un-Notched Compression Repair Test with Scarf Ratio of 30:1 (UNCR30)

Material:	Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Resin content:	36.87 %wt (Parent), 38.97 %wt (Scarf), 35.03 %wt (Repair)
Fiber volume:	55.34 %vol (Parent), 53.38 %vol (Scarf), 56.53 %vol (Repair)
Comp. density:	1.552 g/cc (Parent), 1.548 g/cc (Scarf), 1.540 g/cc (Repair)
Ply count:	20
Test method:	ASTM D6484-14
Normalized by:	0.007700 in. CPT (Parent Material, Solvay 5320-1 T650 3k-PW)

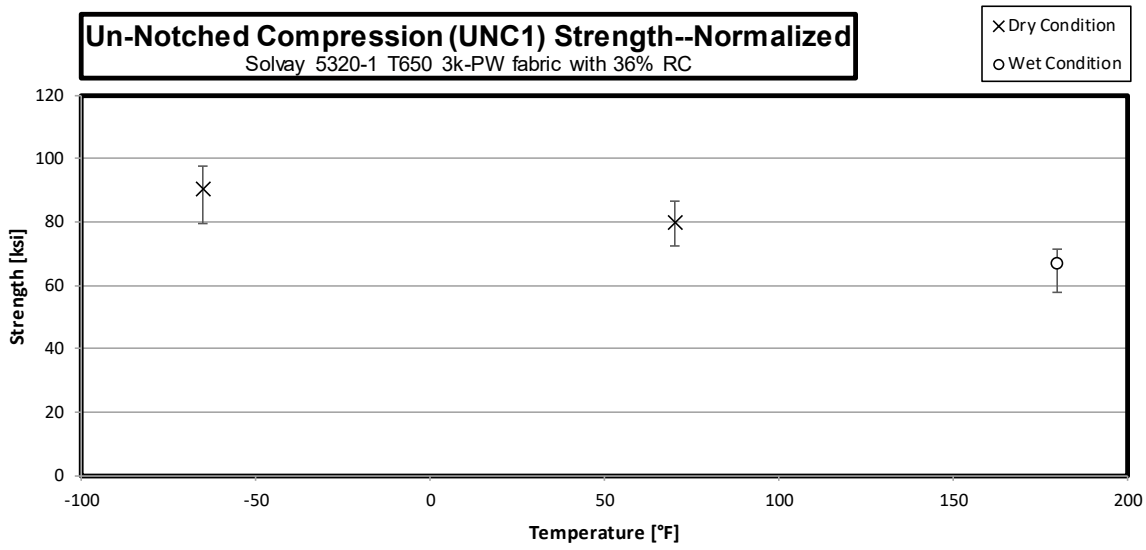
Un-Notched Compression Repair (UNCR30)
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
[45/0/-45/90/45/0/-45/90/-45/90]S

		CTD		RTD		ETW2			
Test Temperature [°F]		-65		70		180			
Moisture Conditioning		Dry		Dry		Equilibrium			
Equilibrium at T, RH						160 F,85%			
Source code prefixed by: NTP5325QRI-SOL-S36-NIAR-		UNCR30-D-CX-1-CTD-X		UNCR30-D-CX-1-RTD-X		UNCR30r-A-CX-1-ETW2-X			
Scarf Ratio of 30:1		**Normalized**	**Measured**	**Normalized**	**Measured**	**Normalized**	**Measured**		
UNCR30 Ultimate Joint Running Force per Repair Ply, Nj [lb/in/ply]	**Mean**		693.3		635.2		450.2		
	Minimum		638.7		579.1		434.4		
	Maximum		759.9		694.9		463.3		
	C.V.(%)		6.207		6.681		2.456		
	No. Specimens		8		8		8		
	No. Prepreg Lots		1		1		1		
UNCR30 Strength [ksi]	**Mean**	90.04	85.65	82.49	77.35	58.47	54.25		
	Minimum	82.95	79.84	75.21	71.23	56.41	52.26		
	Maximum	98.69	90.59	90.25	84.14	60.17	56.42		
	C.V.(%)	6.207	4.503	6.681	5.651	2.456	3.127		
	No. Specimens		8		8		8		
	No. Prepreg Lots		1		1		1		

3. Individual Material Property Test Charts

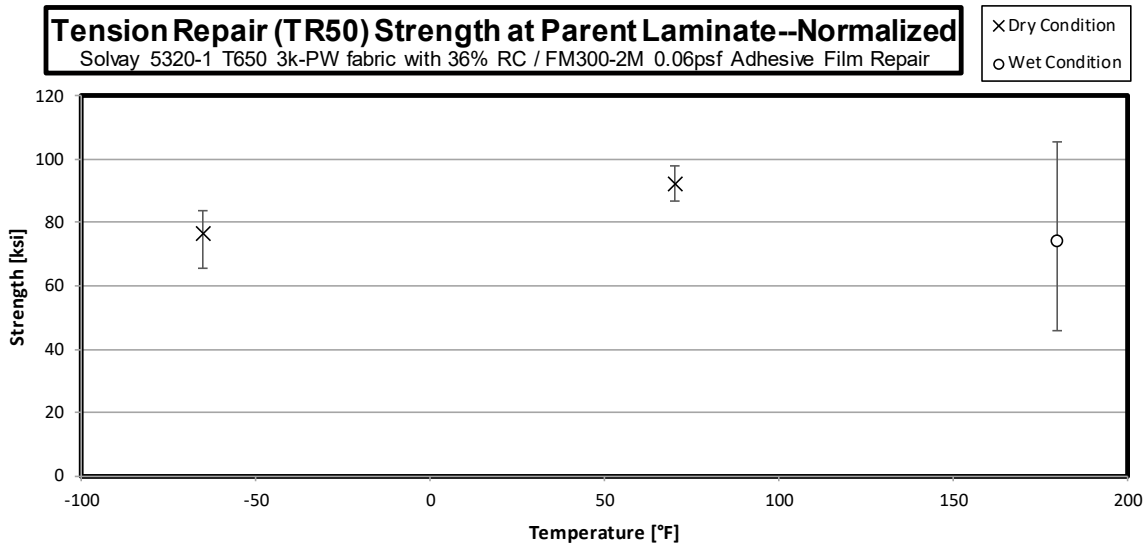
These charts combine all data and plot the minimum and maximum modulus and strength range based on the test temperature.

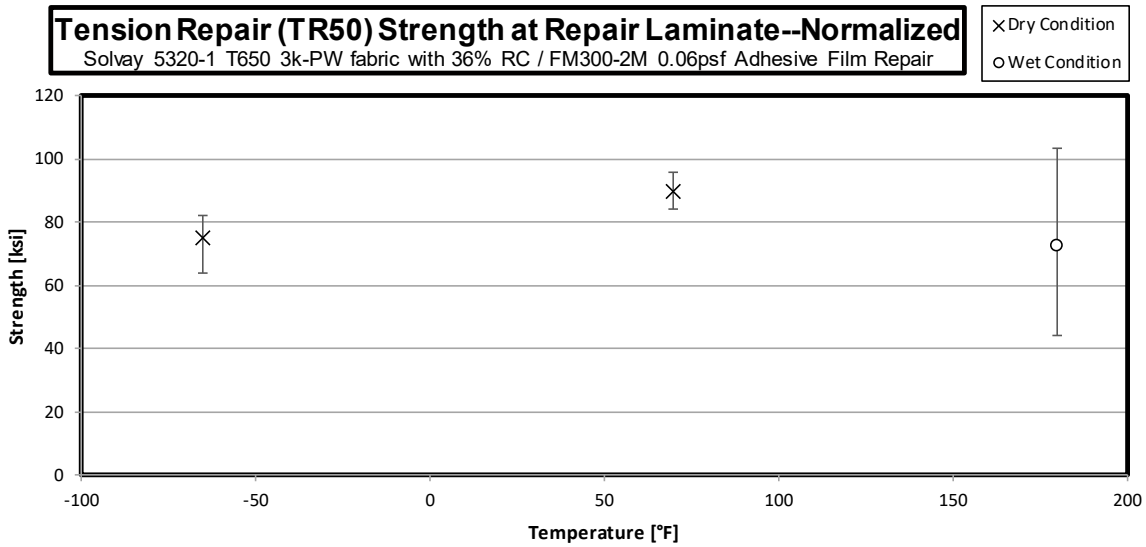
3.1 Baseline Test for Un-Notched Compression

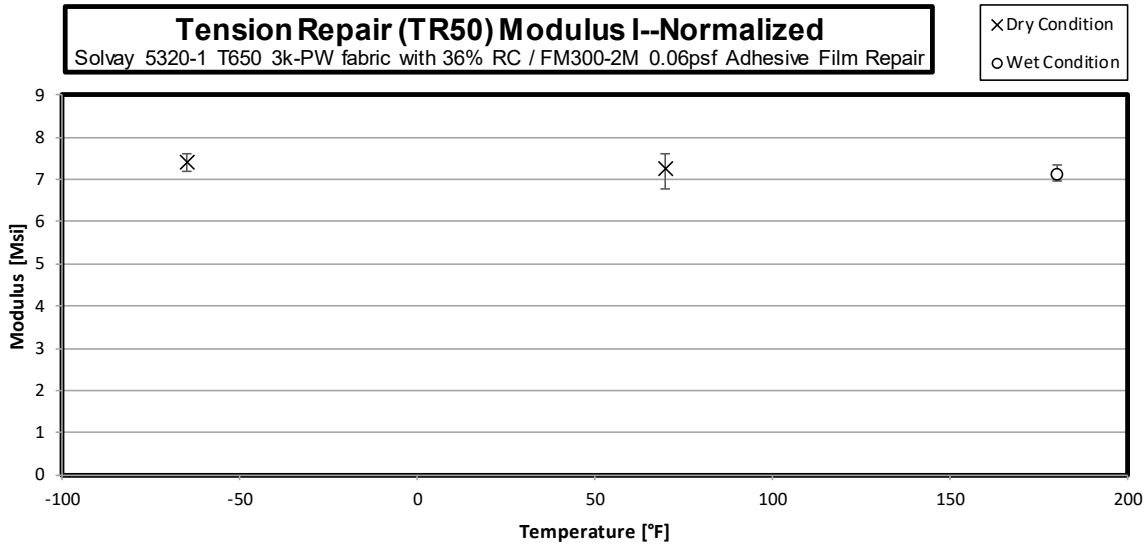


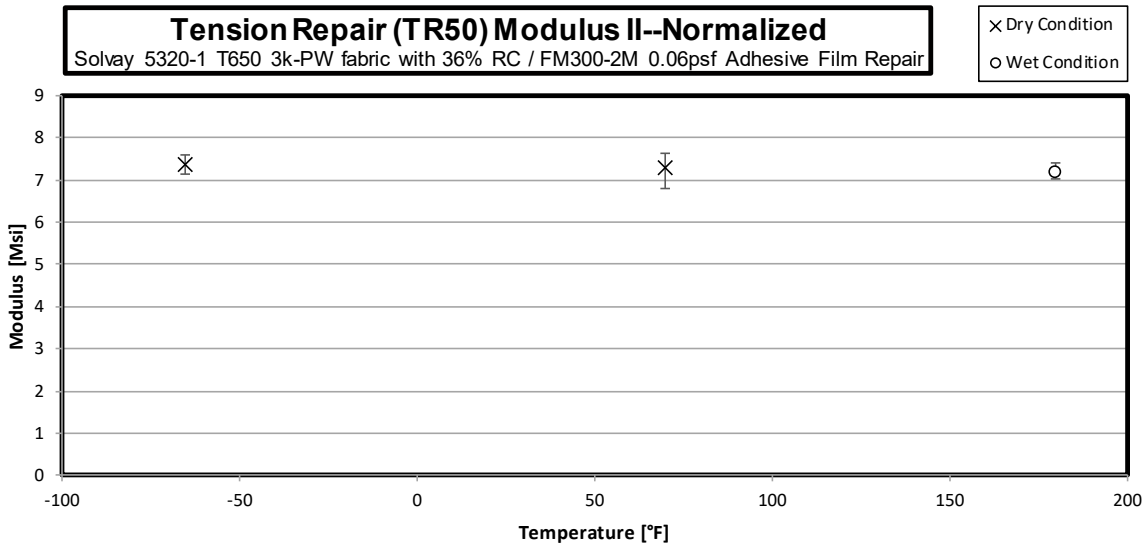
3.2 Laminate Level Repair (Scarf Ratio of 50:1) - Qualification

3.2.1 Tensile Repair Test with Scarf Ratio of 50:1 (TR50)

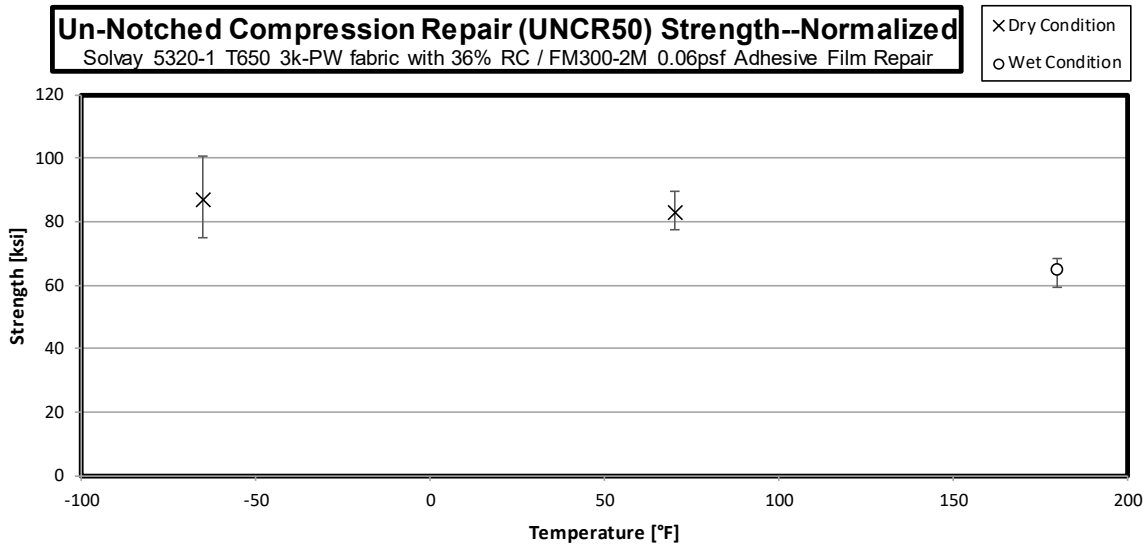




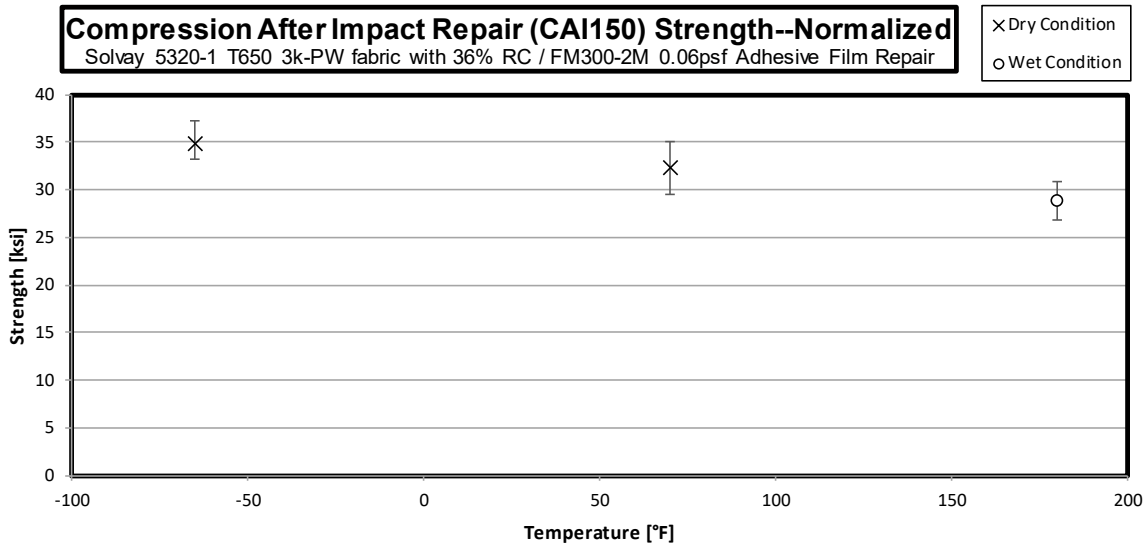

Tension Repair (TR50) Modulus I--Normalized
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Dry Condition
Wet Condition
Modulus [Msi]
0
1
2
3
4
5
6
7
8
9
-100
-50
0
50
100
150
200
Temperature [°F]


Tension Repair (TR50) Modulus II--Normalized
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Dry Condition
Wet Condition
Modulus [Msi]
0
1
2
3
4
5
6
7
8
9
-100
-50
0
50
100
150
200
Temperature [°F]

3.2.2 Un-Notched Compression Repair Test with Scarf Ratio of 50:1 (UNCR50)

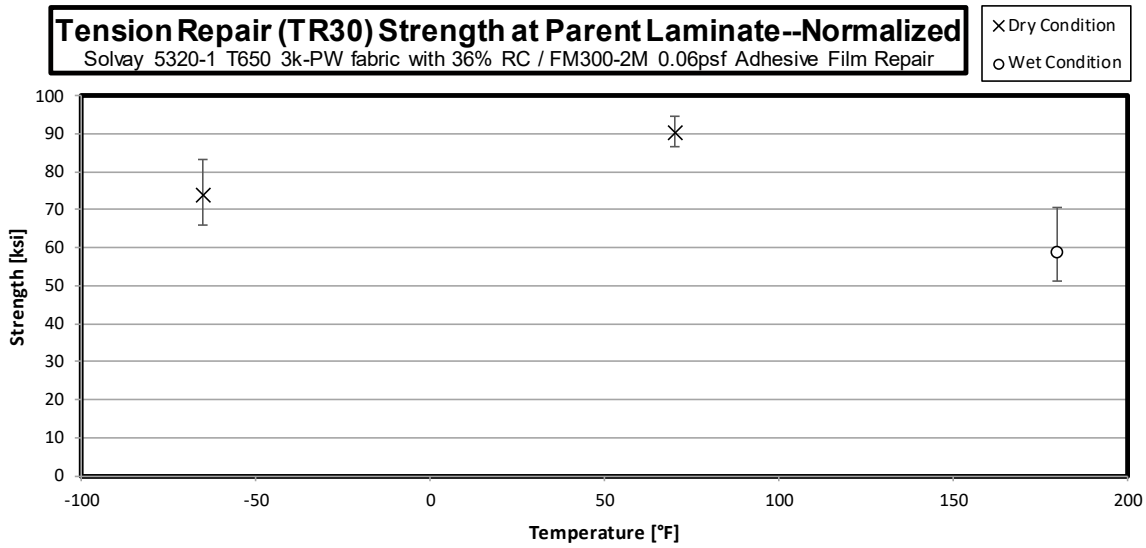


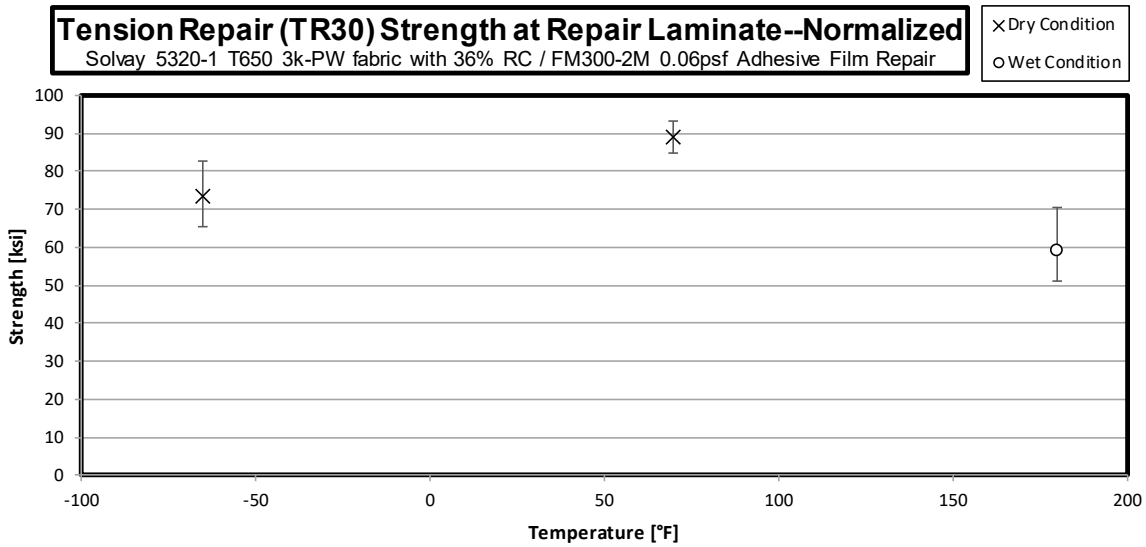
3.2.3 Compression After Impact Repair Test with 50:1 Scarf Ratio (CAI150)

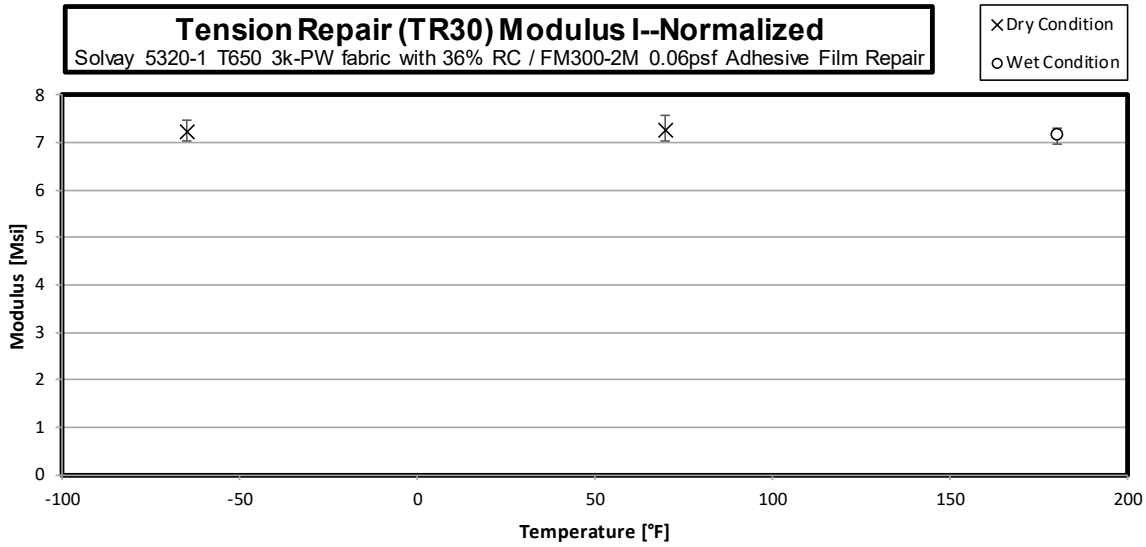


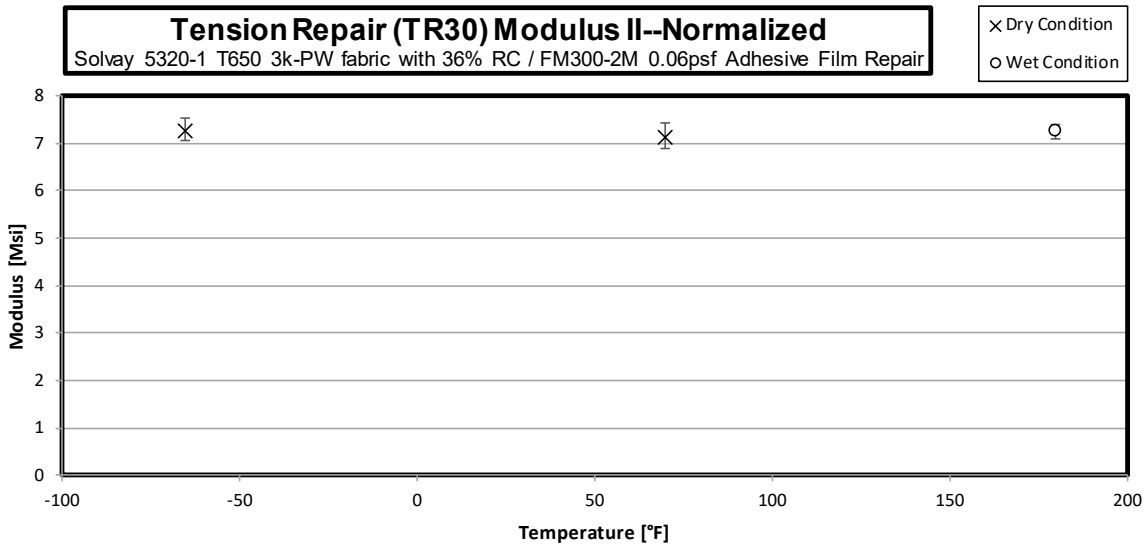
3.3 Laminate Level Repair (Scarf Ratio of 30:1) - Equivalency

3.3.1 Tensile Repair Tests with Scarf Ratio of 30:1 (TR30)

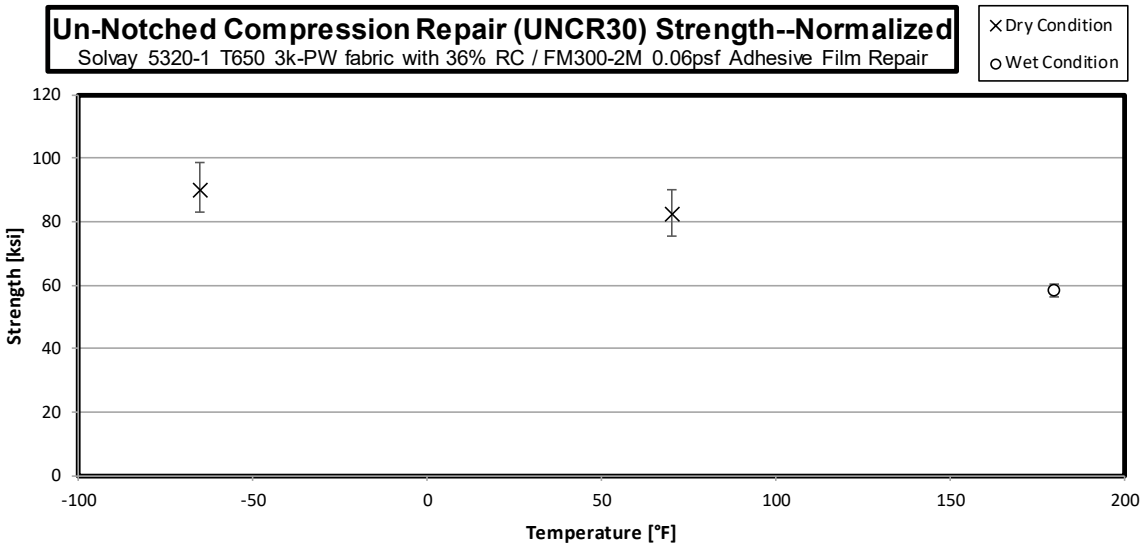





Tension Repair (TR30) Modulus I--Normalized
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Dry Condition
Wet Condition
Modulus [Msi]
0
1
2
3
4
5
6
7
8
-100
-50
0
50
100
150
200
Temperature [°F]


Tension Repair (TR30) Modulus II--Normalized
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Dry Condition
Wet Condition
Modulus [Msi]
0
1
2
3
4
5
6
7
8
-100
-50
0
50
100
150
200
Temperature [°F]

3.3.2 Un-Notched Compression Repair Test with Scarf Ratio of 30:1 (UNCR30)



4. Raw Data

4.1 Baseline Test for Un-Notched Compression

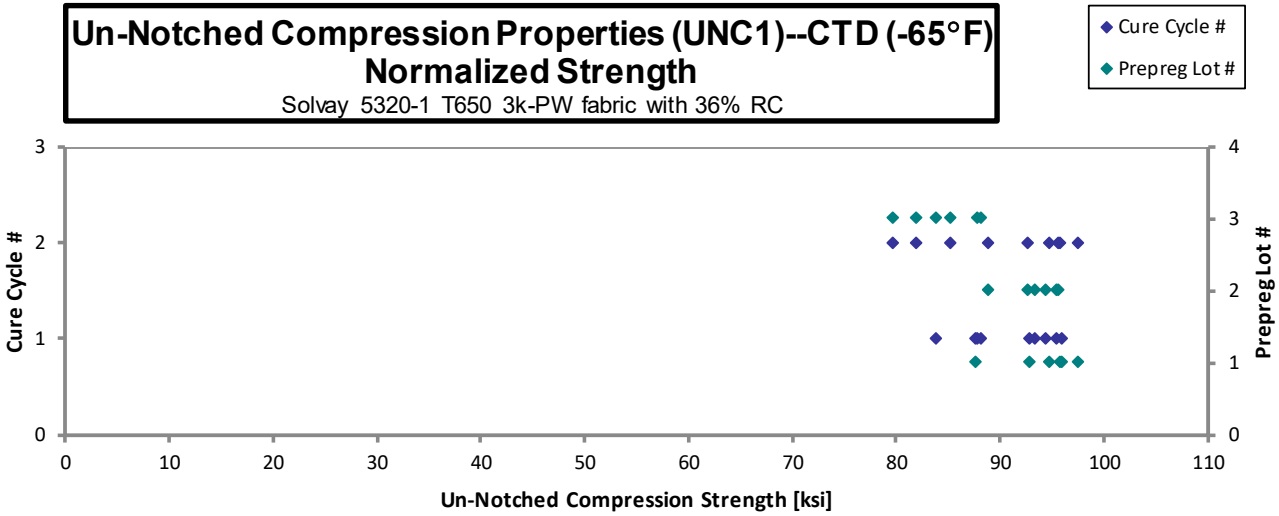
Un-Notched Compression Properties (UNC1)--CTD (-65°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-CTD-1	A	C1	1	1	86.52	0.1558	20	M(A,L)WT	0.007791	87.54
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-CTD-2	A	C1	1	1	92.60	0.1543	20	M(A,L)GM	0.007713	92.76
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-CTD-3	A	C1	1	1	95.34	0.1549	20	LWB	0.007743	95.87
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-CTD-1	A	C2	1	2	94.51	0.1543	20	M(A,L)GM	0.007715	94.70
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-CTD-2	A	C2	1	2	97.39	0.1542	20	M(A,L)GM	0.007710	97.52
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-CTD-3	A	C2	1	2	95.41	0.1544	20	M(A,L)GM	0.007722	95.68
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-CTD-1	B	C1	2	1	94.20	0.1526	20	M(A,L)GM	0.007629	93.34
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-CTD-2	B	C1	2	1	95.27	0.1526	20	M(A,L)GM	0.007630	94.41
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-CTD-3	B	C1	2	1	96.23	0.1527	20	M(A,L)GM	0.007633	95.38
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-CTD-1	B	C2	2	2	92.03	0.1549	20	M(A,L)GM	0.007744	92.56
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-CTD-2	B	C2	2	2	96.22	0.1530	20	M(A,L)GM	0.007648	95.58
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-CTD-3	B	C2	2	2	89.22	0.1532	20	M(A,L)WT	0.007661	88.76
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-CTD-1	C	C1	3	1	86.99	0.1555	20	M(A,L)GM	0.007773	87.82
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-CTD-2	C	C1	3	1	87.19	0.1558	20	M(A,L)GM	0.007790	88.20
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-CTD-3	C	C1	3	1	82.70	0.1560	20	LWT	0.007798	83.75
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-CTD-1	C	C2	3	2	84.14	0.1560	20	M(A,L)WT	0.007798	85.21
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-CTD-2	C	C2	3	2	80.68	0.1563	20	LWT	0.007813	81.87
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-CTD-3	C	C2	3	2	78.02	0.1572	20	M(A,L)GM	0.007862	79.66

	Strength [ksi]
Average	90.26
Standard Dev.	6.006
Coeff. of Var. [%]	6.654
Min.	78.02
Max.	97.39
Number of Spec.	18

	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
$Average_{norm}$	0.007732	90.59
$Standard\ Dev._{norm}$		5.394
$Coeff.\ of\ Var.\ [\%]_{norm}$		5.954
Min.	0.007629	79.66
Max.	0.007862	97.52
Number of Spec.	18	18

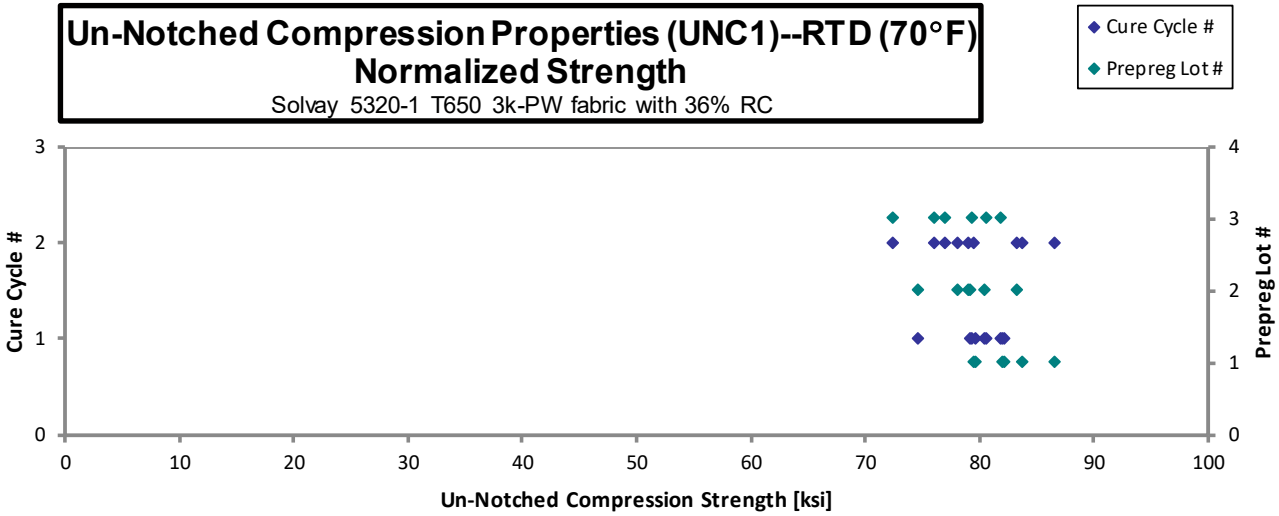

Un-Notched Compression Properties (UNC1)--CTD (-65°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Strength [ksi]
0
10
20
30
40
50
60
70
80
90
100
110
0
1
2
3
4

Un-Notched Compression Properties (UNC1)--RTD (70°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC

normalizing t_{ply} [in]: 0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-RTD-1	A	C1	1	1	82.10	0.1539	20	M(A,L)GM	0.007693	82.02
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-RTD-2	A	C1	1	1	82.79	0.1529	20	M(A,L)GM	0.007646	82.21
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-RTD-3	A	C1	1	1	79.16	0.1549	20	LGM	0.007743	79.61
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-RTD-1	A	C2	1	2	84.09	0.1533	20	M(A,L)GM	0.007667	83.72
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-RTD-2	A	C2	1	2	86.39	0.1543	20	LGM	0.007717	86.57
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-RTD-3	A	C2	1	2	79.36	0.1542	20	M(A,L)GM	0.007710	79.46
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-RTD-1	B	C1	2	1	82.06	0.1510	20	LGM, LWT	0.007549	80.45
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-RTD-2	B	C1	2	1	76.15	0.1510	20	M(A,L)WT	0.007552	74.68
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-RTD-3	B	C1	2	1	80.27	0.1519	20	M(A,L)WT	0.007595	79.18
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-RTD-1	B	C2	2	2	80.34	0.1515	20	M(A,L)WT, M(A,L)GM	0.007575	79.04
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-RTD-2	B	C2	2	2	84.12	0.1524	20	LWT	0.007622	83.26
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-RTD-3	B	C2	2	2	78.53	0.1531	20	M(A,L)GM	0.007654	78.06
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-RTD-1	C	C1	3	1	78.59	0.1555	20	M(A,L)GM	0.007775	79.36
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-RTD-2	C	C1	3	1	81.31	0.1552	20	M(A,L)WT	0.007758	81.92
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-RTD-3	C	C1	3	1	79.52	0.1560	20	LGM	0.007798	80.53
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-RTD-1	C	C2	3	2	75.17	0.1577	20	M(A,L)WB	0.007883	76.96
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-RTD-2	C	C2	3	2	75.42	0.1554	20	M(A,L)WB	0.007770	76.11
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-RTD-3	C	C2	3	2	71.14	0.1569	20	M(A,L)WB	0.007843	72.46

	Strength [ksi]		$Strength_{norm}$ [ksi]
Average	79.81	$Average_{norm}$	0.007697	79.76
Standard Dev.	3.719	$Standard\ Dev._{norm}$		3.391
Coeff. of Var. [%]	4.660	Coeff. of Var. $[\%]_{norm}$		4.252
Min.	71.14	Min.	0.007549	72.46
Max.	86.39	Max.	0.007883	86.57
Number of Spec.	18	Number of Spec.	18	18

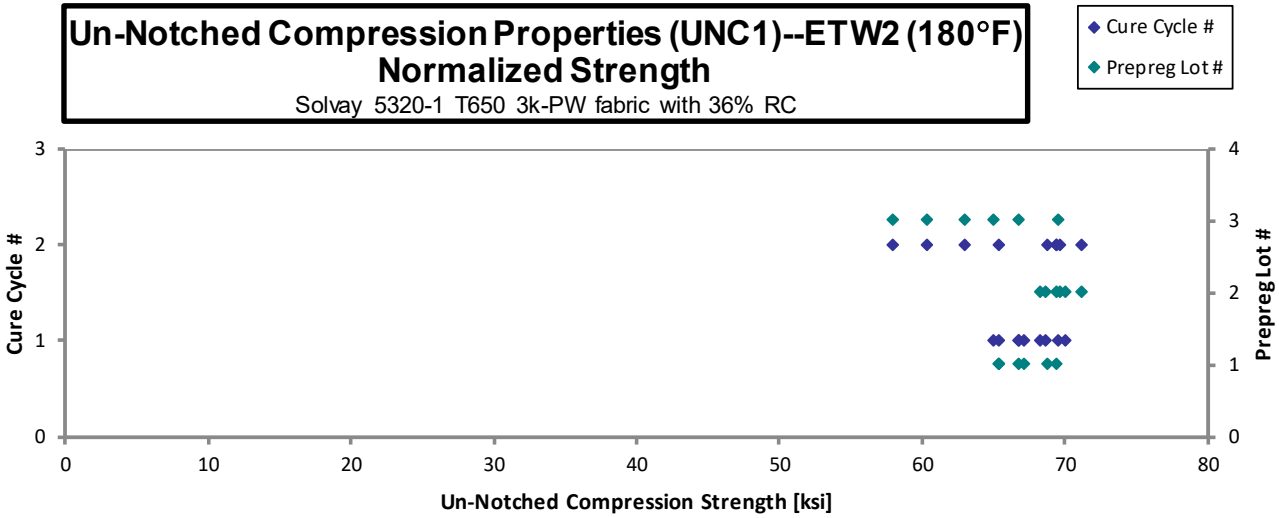

Un-Notched Compression Properties (UNC1)--RTD (70°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Strength [ksi]
0
10
20
30
40
50
60
70
80
90
100
0
1
2
3
4

Un-Notched Compression Properties (UNC1)--ETW2 (180°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC

normalizing t_{ply} [in]: 0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-ETW2-1	A	C1	1	1	66.58	0.1551	20	LWT	0.007756	67.07
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-ETW2-2	A	C1	1	1	65.04	0.1548	20	M(A,L)GM	0.007739	65.37
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-ETW2-3	A	C1	1	1	65.85	0.1562	20	M(A,L)GM	0.007809	66.79
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-ETW2-1	A	C2	1	2	65.10	0.1545	20	M(A,L)GM	0.007727	65.33
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-ETW2-2	A	C2	1	2	68.64	0.1543	20	M(A,L)WT	0.007715	68.77
NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-ETW2-3	A	C2	1	2	69.40	0.1540	20	LWT	0.007698	69.39
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-ETW2-1	B	C1	2	1	68.92	0.1526	20	M(A,L)GM	0.007630	68.30
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-ETW2-2	B	C1	2	1	69.29	0.1527	20	LWT	0.007633	68.68
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-ETW2-3	B	C1	2	1	71.05	0.1518	20	LWT	0.007591	70.04
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-1	B	C2	2	2	71.82	0.1526	20	LWT	0.007632	71.19
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-2	B	C2	2	2	70.05	0.1530	20	M(A,L)GM	0.007649	69.58
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-3	B	C2	2	2	69.87	0.1529	20	M(A,L)WT	0.007643	69.35
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-ETW2-1	C	C1	3	1	65.84	0.1560	20	M(A, L)GM	0.007802	66.70
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-ETW2-2	C	C1	3	1	68.58	0.1561	20	M(A, L)GM	0.007806	69.53
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-ETW2-3	C	C1	3	1	64.48	0.1551	20	M(A,L)WT	0.007755	64.94
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-ETW2-1	C	C2	3	2	56.62	0.1577	20	LWB	0.007883	57.96
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-ETW2-2	C	C2	3	2	59.39	0.1565	20	LWB	0.007825	60.35
NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-ETW2-3	C	C2	3	2	61.73	0.1572	20	LWT	0.007860	63.01

	Strength	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
Average	**66.57**	**0.007731**	**66.80**
Standard Dev.	**4.086**		**3.511**
Coeff. of Var. [%]	**6.138**		**5.257**
Min.	**56.62**	**0.007591**	**57.96**
Max.	**71.82**	**0.007883**	**71.19**
Number of Spec.	**18**	**18**	**18**


Un-Notched Compression Properties (UNC1)--ETW2 (180°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Strength [ksi]
0
10
20
30
40
50
60
70
80
0
1
2
3
4

4.2 Laminate Level Repair (Scarf Ratio of 50:1) - Qualification

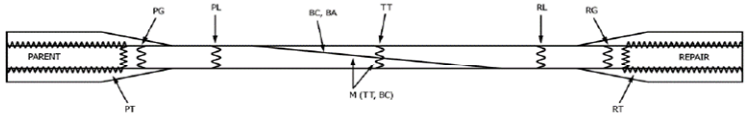
4.2.1 Tensile Repair Test with Scarf Ratio of 50:1 (TR50)

Tension Repair (50:1) Properties (TR50)--CTD (-65°F)
Strength & Modulus
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

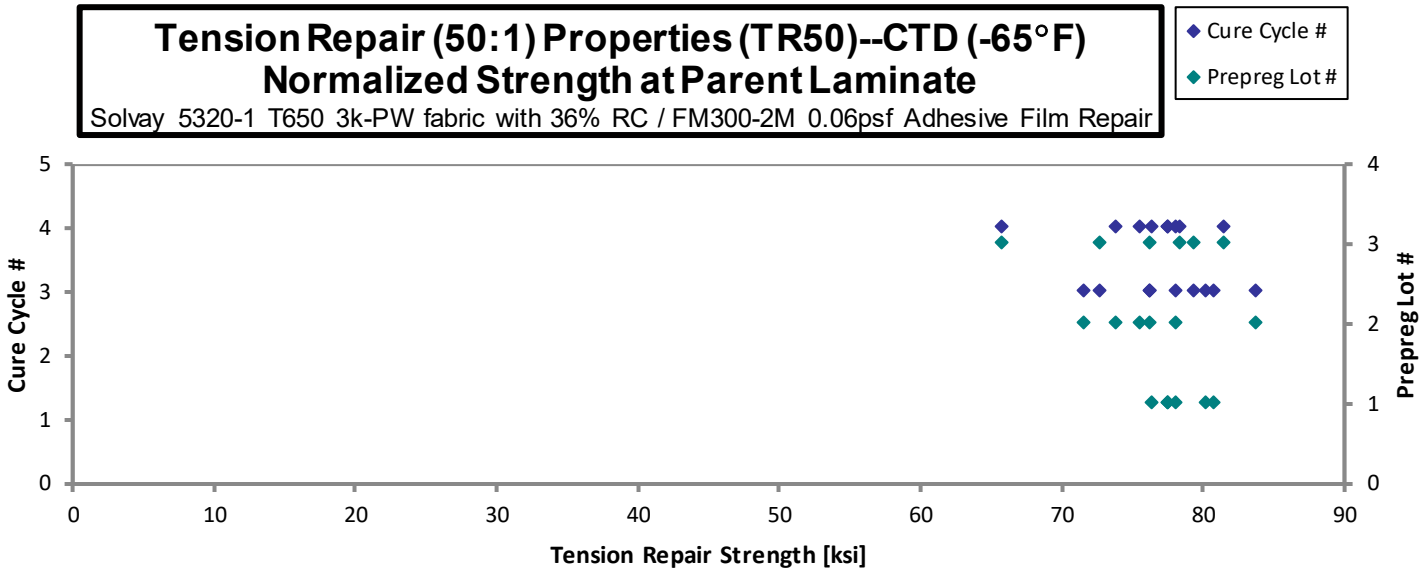
normalizing t_{ply} [in]: 0.007700

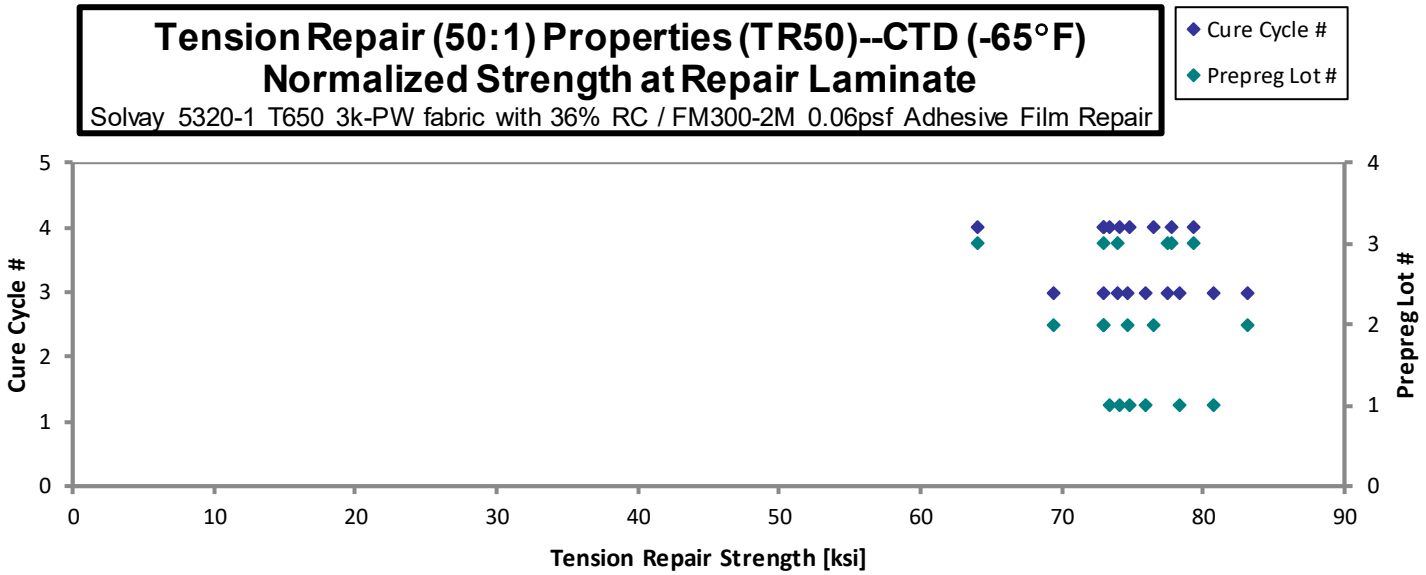
Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength at Parent Laminate [ksi]	Strength at Repair Laminate [ksi]	Modulus I [Msi]	Modulus II [Msi]	Avg. Specimen Thickness: Scarf Section [in]	Avg. Specimen Thickness: Parent Section [in]	Avg. Specimen Thickness: Repair Section [in]	# Plies in Laminate	Failure Mode (a)	Avg. t_{ply} [in]	$Strength_{norm}$ at Parent Laminate [ksi]	$Strength_{norm}$ at Repair Laminate [ksi]	$Modulus_{norm}$ I [Msi]	$Modulus_{norm}$ II [Msi]
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-CTD-1	A	C3	1	3	595.5	77.29	77.27	7.023	7.192	0.1610	0.1541	0.1542	20	PT	0.008049	80.80	80.77	7.342	7.519
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-CTD-2	A	C3	1	3	577.7	74.84	73.11	6.752	7.013	0.1650	0.1544	0.1580	20	PT	0.008248	80.17	78.31	7.233	7.512
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-CTD-3	A	C3	1	3	558.8	73.05	71.15	6.916	6.918	0.1645	0.1530	0.1571	20	PT	0.008225	78.03	76.00	7.388	7.389
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-CTD-1	A	C4	1	4	548.1	72.70	71.25	7.261	7.023	0.1617	0.1508	0.1538	20	PT	0.008084	76.32	74.81	7.623	7.373
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-CTD-2	A	C4	1	4	542.5	72.12	68.28	7.094	6.950	0.1655	0.1504	0.1589	20	RT	0.008276	77.52	73.39	7.625	7.470
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-CTD-3	A	C4	1	4	540.8	71.15	67.99	6.995	6.924	0.1677	0.1520	0.1591	20	RT	0.008385	77.48	74.03	7.617	7.540
NTP5325QR1-SOL-S36-NIAR-TR50-B-C3-1-CTD-1	B	C3	2	3	603.8	78.64	78.22	7.115	6.890	0.1639	0.1536	0.1544	20	TT	0.008193	83.67	83.23	7.570	7.331
NTP5325QR1-SOL-S36-NIAR-TR50-B-C3-1-CTD-2	B	C3	2	3	542.8	70.34	68.95	6.762	6.903	0.1668	0.1544	0.1575	20	RT	0.008338	76.16	74.66	7.322	7.475
NTP5325QR1-SOL-S36-NIAR-TR50-B-C3-1-CTD-3	B	C3	2	3	508.6	66.35	64.31	6.883	6.833	0.1662	0.1533	0.1582	20	RT	0.008308	71.59	69.39	7.427	7.373
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-CTD-1	B	C4	2	4	532.9	69.82	68.98	7.204	6.982	0.1629	0.1527	0.1545	20	RT	0.008145	73.86	72.97	7.621	7.385
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-CTD-2	B	C4	2	4	553.9	72.86	71.37	7.005	6.706	0.1651	0.1521	0.1552	20	TT, PT, RT	0.008254	78.10	76.51	7.509	7.188
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-CTD-3	B	C4	2	4	537.9	70.93	68.59	7.102	6.942	0.1639	0.1517	0.1568	20	RT	0.008196	75.50	73.01	7.560	7.389
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-CTD-1	C	C3	3	3	545.4	70.04	70.29	6.946	7.079	0.1598	0.1558	0.1552	20	RT	0.007991	72.68	72.95	7.209	7.346
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-CTD-2	C	C3	3	3	577.7	74.33	72.66	6.741	6.971	0.1643	0.1555	0.1590	20	M(TT, BC), PT, RT	0.008213	79.28	77.49	7.190	7.434
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-CTD-3	C	C3	3	3	553.5	70.91	68.85	6.696	6.813	0.1655	0.1561	0.1608	20	RL, PT	0.008277	76.22	74.00	7.198	7.323
NTP5325QR1-SOL-S36-NIAR-TR50-C-C4-1-CTD-1	C	C4	3	4	573.2	73.89	73.43	6.787	7.015	0.1632	0.1551	0.1561	20	RT	0.008162	78.32	77.83	7.194	7.436
NTP5325QR1-SOL-S36-NIAR-TR50-C-C4-1-CTD-2	C	C4	3	4	476.5	61.32	59.77	7.019	6.680	0.1650	0.1554	0.1594	20	RT	0.008250	65.70	64.04	7.520	7.158
NTP5325QR1-SOL-S36-NIAR-TR50-C-C4-1-CTD-3	C	C4	3	4	590.4	75.87	73.83	6.932	6.743	0.1654	0.1556	0.1599	20	RT	0.008272	81.50	79.31	7.447	7.243
Average					**553.3**	**72.03**	**70.46**	**6.958**	**6.921**						**Average$_{norm}$**	**0.008215**	**76.83**	**75.15**	**7.422**	**7.382**
Standard Dev.					**31.01**	**3.962**	**4.299**	**0.1647**	**0.1306**						**Standard Dev.$_{norm}$**		**4.115**	**4.313**	**0.1668**	**0.1077**
Coeff. of Var. [%]					**5.605**	**5.501**	**6.101**	**2.368**	**1.888**						**Coeff. of Var. [%]$_{norm}$**		**5.356**	**5.740**	**2.247**	**1.458**
Min.					**476.5**	**61.32**	**59.77**	**6.696**	**6.680**						**Min.**	**0.007991**	**65.70**	**64.04**	**7.190**	**7.158**
Max.					**603.8**	**78.64**	**78.22**	**7.261**	**7.192**						**Max.**	**0.008385**	**83.67**	**83.23**	**7.625**	**7.540**
Number of Spec.					**18**	**18**	**18**	**18**	**18**						**Number of Spec.**	**18**	**18**	**18**	**18**	**18**

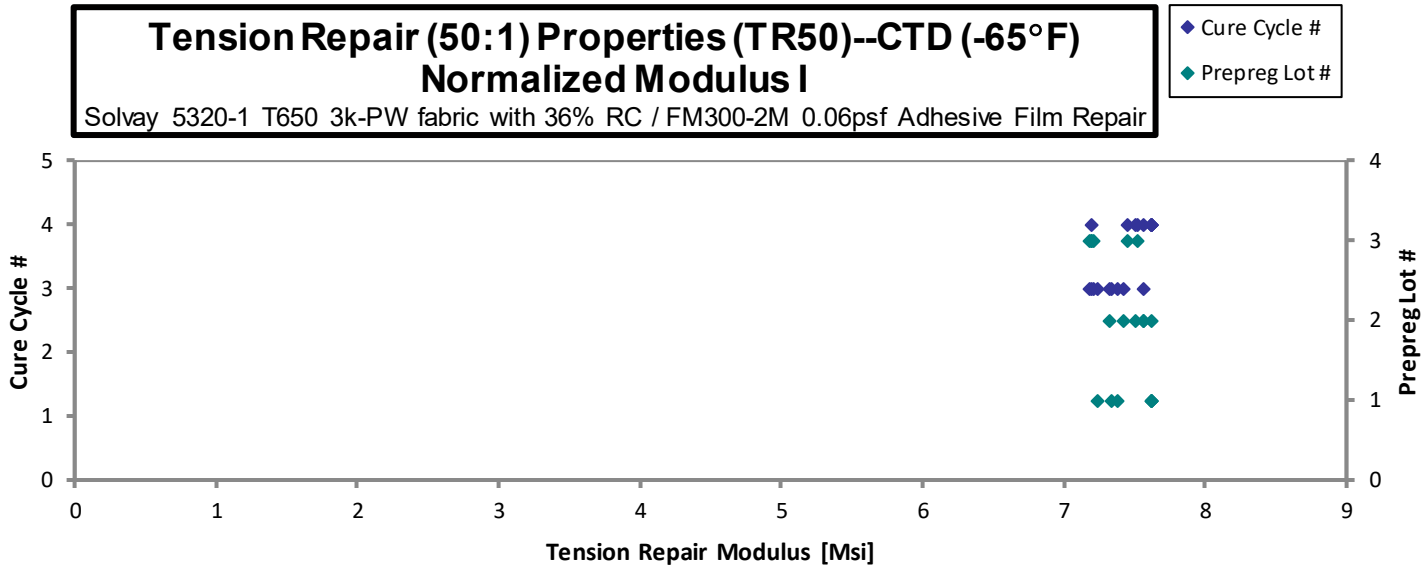
Modulus I (bag side) and Modulus II (tool side).
Note: Specimen thickness taken from scarf section are used for data reduction.

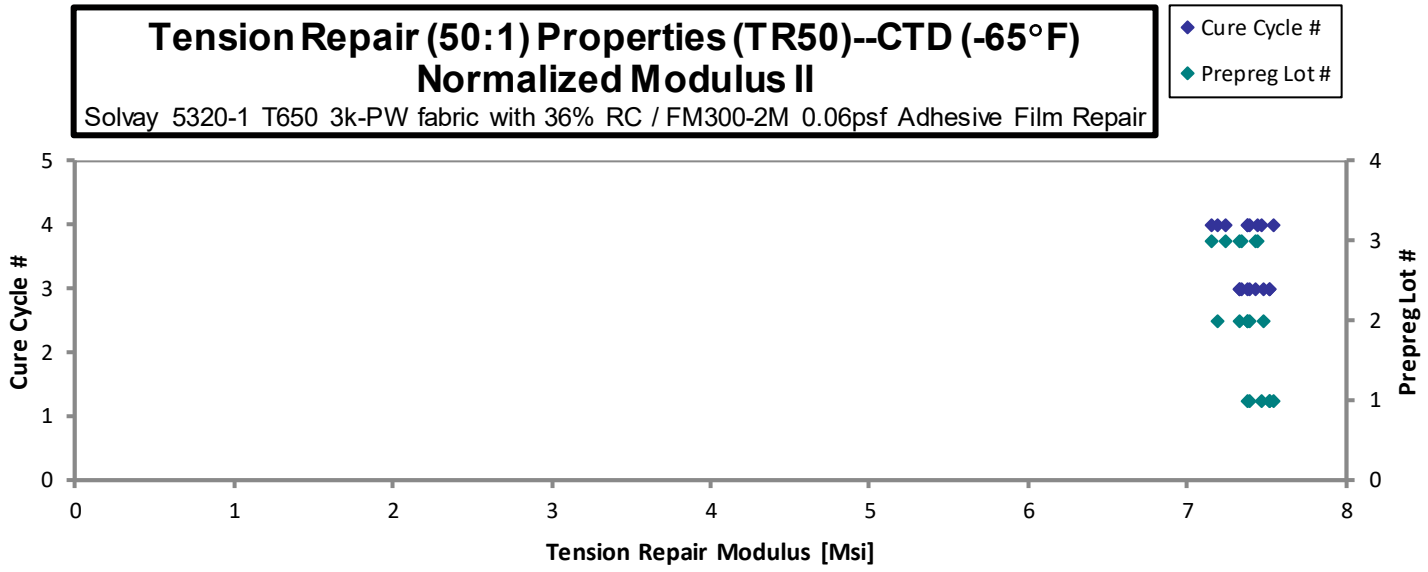


(a) Failure Modes - defined by the test standard
BA = Bondline/Shear Failure - Adhesive
BC = Bondline/Shear Failure - Cohesive
PL = Parent Laminate through Thickness Failure (Gage Area)
PG = Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT = Parent Laminate Tab Area Failure (Tabbed Specimen)
RL = Repair Laminate through Thickness Failure (Gage Area)
RG – Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT = Repair Laminate Tab Area Failure (Tabbed Specimen)
TT – Through Thickness Failure in Repair Joint Area
M = Multiple Failure Locations, list each code in parentheses, for example, M (TT,BC)


Tension Repair (50:1) Properties (TR50)--CTD (-65°F)
Normalized Strength at Parent Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
90
0
1
2
3
4
5


Tension Repair (50:1) Properties (TR50)--CTD (-65°F)
Normalized Strength at Repair Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
90
0
1
2
3
4
5


Tension Repair (50:1) Properties (TR50)--CTD (-65°F)
Normalized Modulus I
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8
9

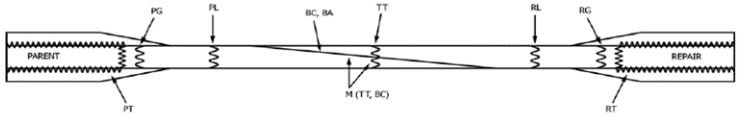

Tension Repair (50:1) Properties (TR50)--CTD (-65°F)
Normalized Modulus II
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

Tension Repair (50:1) Properties (TR50)--RTD (70°F)
Strength & Modulus
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

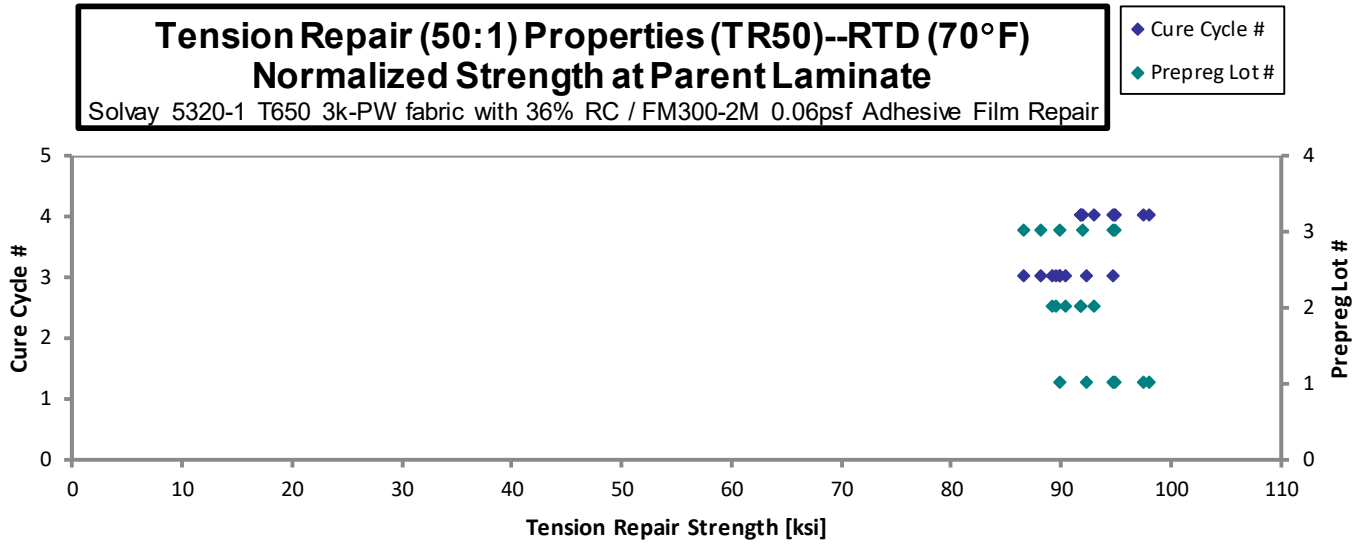
normalizing t_{ply} [in]: 0.007700

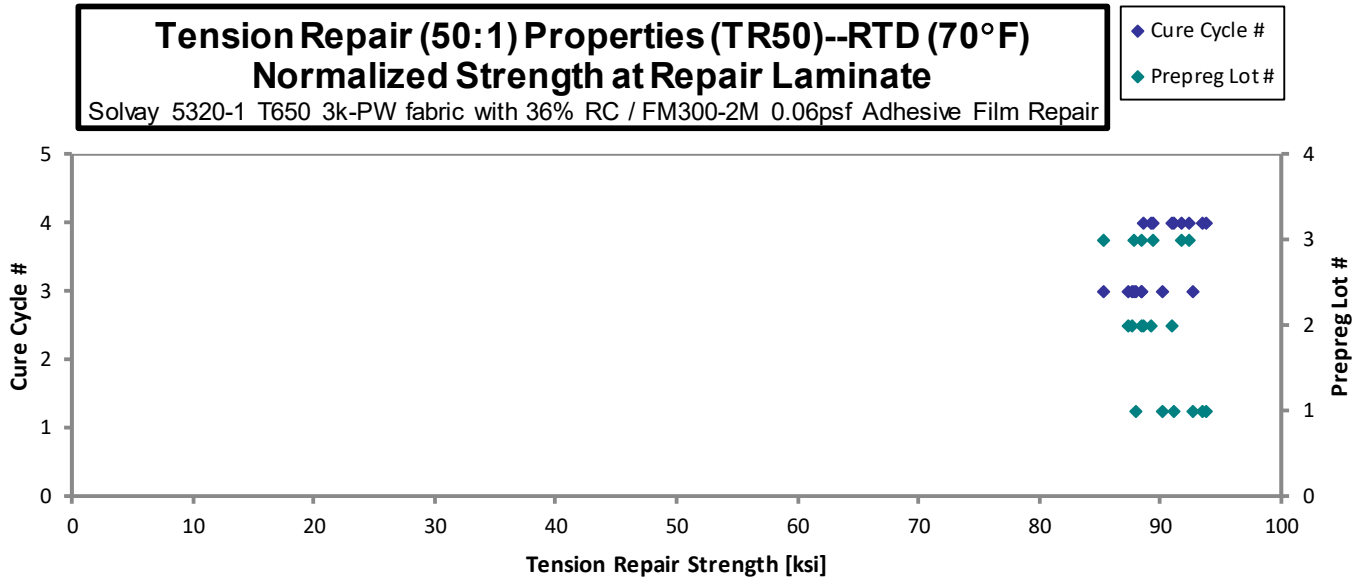
Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength at Parent Laminate [ksi]	Strength at Repair Laminate [ksi]	Modulus I [Msi]	Modulus II [Msi]	Avg. Specimen Thickness: Scarf Section [in]	Avg. Specimen Thickness: Parent Section [in]	Avg. Specimen Thickness: Repair Section [in]	# Plies in Laminate	Failure Mode (a)	Avg. t_{ply} [in]	$Strength_{norm}$ at Parent Laminate [ksi]	$Strength_{norm}$ at Repair Laminate [ksi]	$Modulus_{norm}$ I [Msi]	$Modulus_{norm}$ II [Msi]
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-RTD-1*	A	C3	1	3	659.1	85.70	83.69	6.624		0.1659	0.1538	0.1575	20	TT, RL	0.008293	92.30	90.13	7.134	
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-RTD-2	A	C3	1	3	673.5	87.58	85.65	6.792	6.690	0.1666	0.1538	0.1573	20	TT	0.008330	94.74	92.66	7.348	7.238
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-RTD-3	A	C3	1	3	642.3	83.32	81.56	6.636	6.900	0.1662	0.1542	0.1575	20	TT	0.008308	89.89	88.00	7.160	7.444
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-RTD-1	A	C4	1	4	671.6	88.64	84.57	6.771	6.671	0.1702	0.1515	0.1588	20	TT	0.008512	97.99	93.48	7.485	7.374
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-RTD-2	A	C4	1	4	674.3	88.82	85.41	6.759	6.748	0.1691	0.1518	0.1579	20	PL, RL	0.008455	97.52	93.79	7.422	7.410
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-RTD-3	A	C4	1	4	650.4	85.98	82.63	6.711	6.503	0.1698	0.1513	0.1574	20	M(TT, BC), PL, RT	0.008491	94.81	91.12	7.400	7.171
NTP5325QR1-SOL-S36-NIAR-TR50-B-C3-1-RTD-1	B	C3	2	3	639.4	82.98	81.20	6.801	6.657	0.1663	0.1541	0.1575	20	TT	0.008313	89.59	87.67	7.343	7.187
NTP5325QR1-SOL-S36-NIAR-TR50-B-C3-1-RTD-2	B	C3	2	3	635.3	82.65	81.01	6.284	6.800	0.1662	0.1538	0.1569	20	TT	0.008310	89.19	87.43	6.781	7.338
NTP5325QR1-SOL-S36-NIAR-TR50-B-C3-1-RTD-3	B	C3	2	3	644.4	83.63	81.82	6.835	6.674	0.1665	0.1541	0.1575	20	TT	0.008326	90.43	88.48	7.390	7.216
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-RTD-1	B	C4	2	4	650.2	85.49	83.05	6.770	7.051	0.1654	0.1521	0.1566	20	PL, RL	0.008272	91.84	89.22	7.272	7.574
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-RTD-2	B	C4	2	4	660.0	86.44	84.54	6.724	6.973	0.1658	0.1527	0.1561	20	PL, RL	0.008288	93.04	91.00	7.238	7.506
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-RTD-3	B	C4	2	4	644.4	84.67	81.70	6.697	6.935	0.1670	0.1522	0.1578	20	PL, RL	0.008348	91.79	88.57	7.260	7.518
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-RTD-1	C	C3	3	3	646.7	82.48	82.13	6.658	6.674	0.1647	0.1568	0.1575	20	TT, RL	0.008234	88.20	87.82	7.120	7.137
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-RTD-2	C	C3	3	3	632.6	80.61	79.41	6.634	6.524	0.1655	0.1569	0.1593	20	RT	0.008276	86.64	85.35	7.130	7.011
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-RTD-3	C	C3	3	3	653.4	83.17	81.95	6.611	6.734	0.1663	0.1571	0.1595	20	PT, RT	0.008316	89.82	88.50	7.140	7.273
NTP5325QR1-SOL-S36-NIAR-TR50-C-C4-1-RTD-1	C	C4	3	4	685.6	87.86	85.12	6.891	6.499	0.1661	0.1561	0.1611	20	PL, RT	0.008304	94.75	91.80	7.431	7.009
NTP5325QR1-SOL-S36-NIAR-TR50-C-C4-1-RTD-2	C	C4	3	4	682.0	87.52	85.20	6.486	6.918	0.1671	0.1559	0.1601	20	PL, RL	0.008356	94.97	92.46	7.038	7.507
NTP5325QR1-SOL-S36-NIAR-TR50-C-C4-1-RTD-3	C	C4	3	4	655.9	84.23	81.94	6.958	6.507	0.1682	0.1557	0.1601	20	RT	0.008408	91.97	89.46	7.597	7.105
Average					**655.6**	**85.10**	**82.92**	**6.702**	**6.733**						**Average$_{norm}$**	**0.008341**	**92.19**	**89.83**	**7.261**	**7.295**
Standard Dev.					**15.95**	**2.383**	**1.811**	**0.1528**	**0.1745**						**Standard Dev.$_{norm}$**		**3.136**	**2.358**	**0.1920**	**0.1805**
Coeff. of Var. [%]					**2.433**	**2.800**	**2.184**	**2.280**	**2.592**						**Coeff. of Var. [%]$_{norm}$**		**3.402**	**2.625**	**2.645**	**2.474**
Min.					**632.6**	**80.61**	**79.41**	**6.284**	**6.499**						**Min.**	**0.008234**	**86.64**	**85.35**	**6.781**	**7.009**
Max.					**685.6**	**88.82**	**85.65**	**6.958**	**7.051**						**Max.**	**0.008512**	**97.99**	**93.79**	**7.597**	**7.574**
Number of Spec.					**18**	**18**	**18**	**18**	**17**						**Number of Spec.**	**18**	**18**	**18**	**18**	**17**

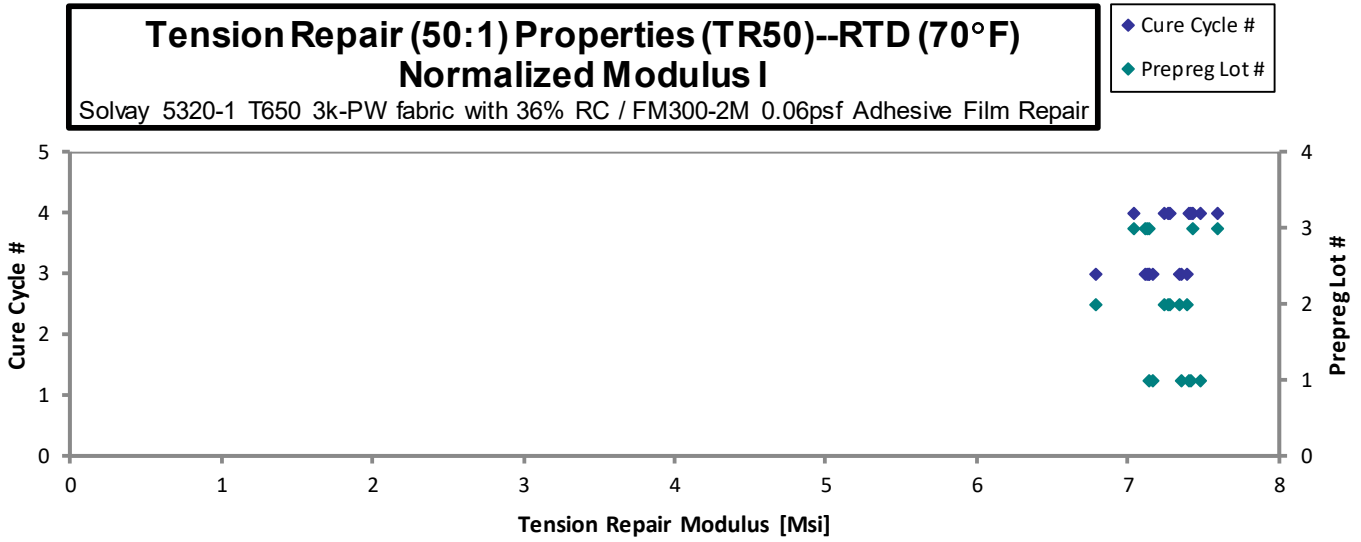
* Modulus II not reported due to strain gage error.
Modulus I (bag side) and Modulus II (tool side).
Note: Specimen thickness taken from scarf section are used for data reduction.

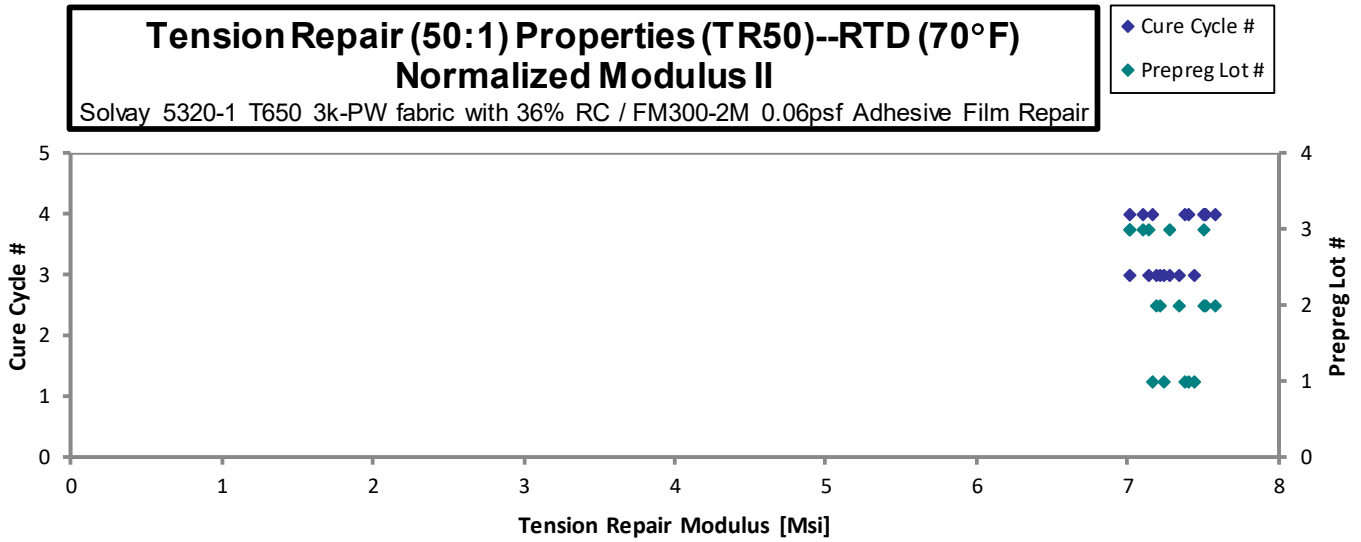


(a) Failure Modes - defined by the test standard
BA = Bondline/Shear Failure - Adhesive
BC = Bondline/Shear Failure - Cohesive
PL = Parent Laminate through Thickness Failure (Gage Area)
PG = Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT = Parent Laminate Tab Area Failure (Tabbed Specimen)
RL = Repair Laminate through Thickness Failure (Gage Area)
RG = Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT = Repair Laminate Tab Area Failure (Tabbed Specimen)
TT = Through Thickness Failure in Repair Joint Area
M = Multiple Failure Locations, list each code in parentheses, for example, M (TT,BC)


Tension Repair (50:1) Properties (TR50)--RTD (70°F)
Normalized Strength at Parent Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90 100 110
0 1 2 3 4 5


Tension Repair (50:1) Properties (TR50)--RTD (70°F)
Normalized Strength at Repair Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cyde #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90 100
0 1 2 3 4 5


Tension Repair (50:1) Properties (TR50)--RTD (70°F)
Normalized Modulus I
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

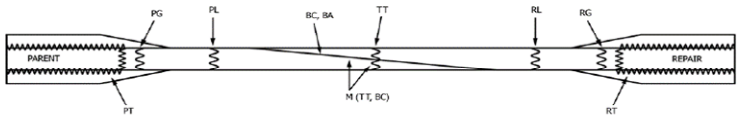

Tension Repair (50:1) Properties (TR50)--RTD (70°F)
Normalized Modulus II
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

Tension Repair (50:1) Properties (TR50)--ETW2 (180°F)
Strength & Modulus
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

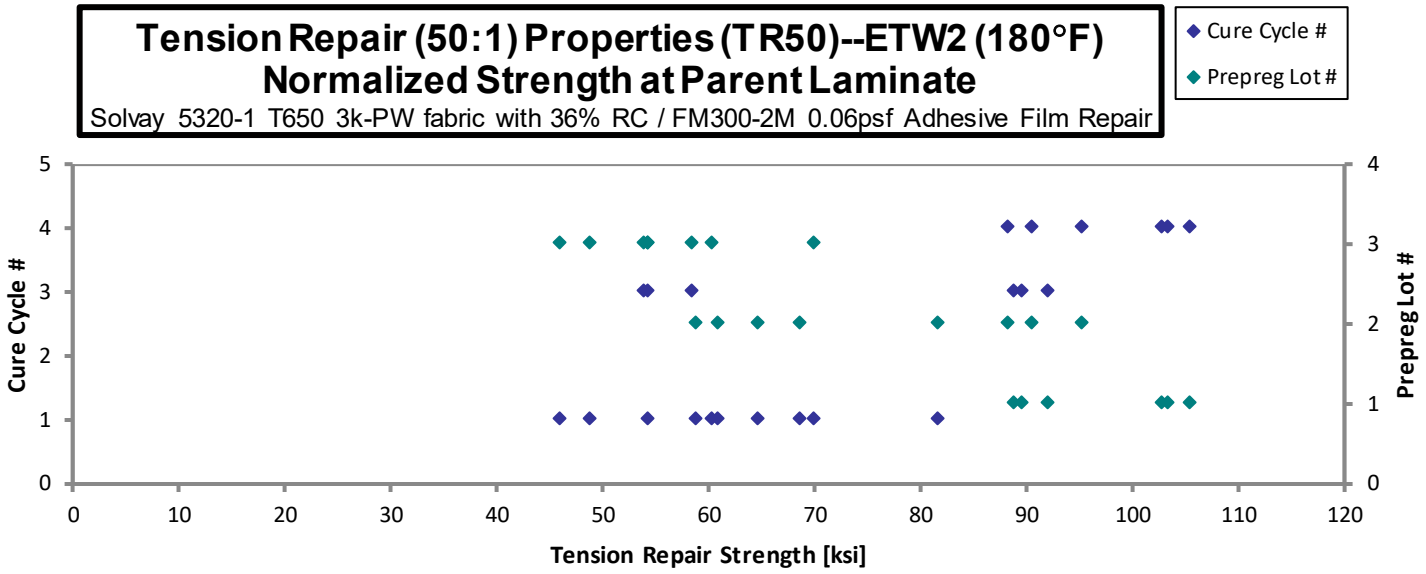
normalizing t_{ply} [in]: 0.007700

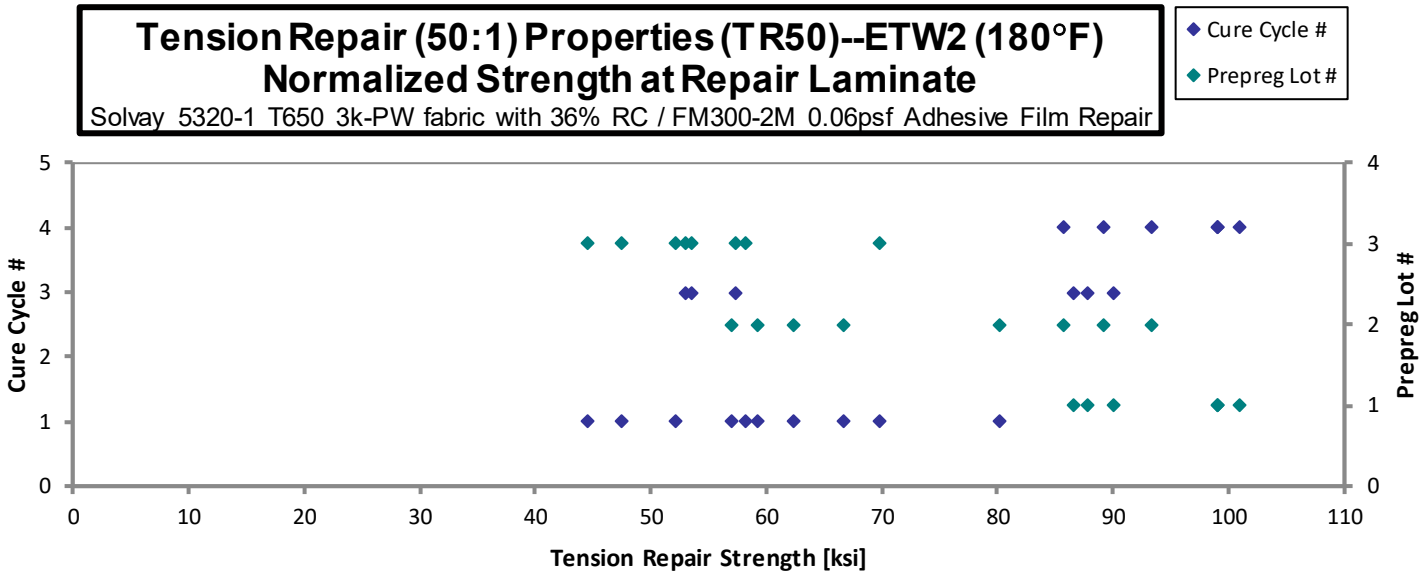
Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength at Parent Laminate [ksi]	Strength at Repair Laminate [ksi]	Modulus I [Msi]	Modulus II [Msi]	Avg. Specimen Thickness: Scarf Section [in]	Avg. Specimen Thickness: Parent Section [in]	Avg. Specimen Thickness: Repair Section [in]	# Plies in Laminate	Failure Mode (a)	Avg. t_{ply} [in]	$Strength_{norm}$ at Parent Laminate [ksi]	$Strength_{norm}$ at Repair Laminate [ksi]	$Modulus_{norm}$ I [Msi]	$Modulus_{norm}$ II [Msi]
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-ETW2-1	A	C3	1	3	632.5	82.02	79.90	6.427	6.599	0.1669	0.1542	0.1583	20	BA, BC, TT	0.008343	88.87	86.58	6.964	7.150
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-ETW2-2	A	C3	1	3	656.2	84.78	83.04	6.512	6.480	0.1671	0.1548	0.1581	20	TT, BC	0.008353	91.96	90.08	7.063	7.030
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-ETW2-3	A	C3	1	3	637.3	82.60	80.87	6.528	6.616	0.1670	0.1543	0.1576	20	BA, BC, TT	0.008352	89.59	87.71	7.080	7.176
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-ETW2-1	A	C4	1	4	722.6	95.50	91.59	6.671	6.744	0.1699	0.1513	0.1578	20	TT, RL	0.008493	105.3	101.0	7.358	7.439
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-ETW2-2	A	C4	1	4	711.1	93.73	90.44	6.684	6.805	0.1687	0.1517	0.1573	20	TT, RL	0.008436	102.7	99.08	7.323	7.456
NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-ETW2-3	A	C4	1	4	709.6	93.84	89.94	6.676	6.640	0.1697	0.1512	0.1578	20	TT, RL	0.008483	103.4	99.09	7.355	7.315
NTP5325QR1-SOL-S36-NIAR-TR50r-B-C1-1-ETW2-1	B	C1	2	1	585.2	75.60	74.24	6.747	6.731	0.1662	0.1548	0.1576	20	M(TT, BA, BC)	0.008308	81.57	80.11	7.280	7.262
NTP5325QR1-SOL-S36-NIAR-TR50r-B-C1-1-ETW2-2	B	C1	2	1	459.0	59.29	57.26	6.682	6.610	0.1678	0.1548	0.1603	20	M(TT, BA)	0.008388	64.60	62.38	7.279	7.201
NTP5325QR1-SOL-S36-NIAR-TR50r-B-C1-1-ETW2-3	B	C1	2	1	418.8	54.03	52.37	6.632	6.558	0.1676	0.1550	0.1600	20	M(TT, BA)	0.008382	58.82	57.00	7.219	7.138
NTP5325QR1-SOL-S36-NIAR-TR50r-B-C1-1-ETW2-4	B	C1	2	1	434.9	56.07	54.52	6.609	6.721	0.1672	0.1551	0.1595	20	M(TT, BA)	0.008362	60.89	59.21	7.177	7.299
NTP5325QR1-SOL-S36-NIAR-TR50r-B-C1-1-ETW2-5	B	C1	2	1	486.8	62.95	61.16	6.576	6.699	0.1678	0.1547	0.1592	20	M(TT, BA)	0.008390	68.59	66.64	7.166	7.299
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-ETW2-1	B	C4	2	4	670.0	87.51	85.81	6.474	6.725	0.1675	0.1531	0.1562	20	RT, TT, BC, BA	0.008373	95.16	93.31	7.040	7.312
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-ETW2-2	B	C4	2	4	621.5	81.60	79.41	6.539	6.752	0.1663	0.1523	0.1565	20	BA, TT	0.008317	88.13	85.77	7.062	7.293
NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-ETW2-3	B	C4	2	4	642.6	83.66	82.41	6.488	6.610	0.1666	0.1536	0.1560	20	BA, TT	0.008332	90.52	89.17	7.020	7.152
NTP5325QR1-SOL-S36-NIAR-TR50r-C-C1-1-ETW2-1	C	C1	3	1	513.4	66.51	66.27	6.707	6.637	0.1620	0.1544	0.1549	20	M(TT, BA)	0.008100	69.97	69.71	7.056	6.982
NTP5325QR1-SOL-S36-NIAR-TR50r-C-C1-1-ETW2-2	C	C1	3	1	432.6	56.04	54.15	6.600	6.583	0.1656	0.1544	0.1598	20	M(TT, BA)	0.008282	60.28	58.24	7.099	7.080
NTP5325QR1-SOL-S36-NIAR-TR50r-C-C1-1-ETW2-3	C	C1	3	1	389.8	50.26	48.33	6.578	6.443	0.1663	0.1551	0.1613	20	M(TT, BA)	0.008315	54.27	52.19	7.103	6.958
NTP5325QR1-SOL-S36-NIAR-TR50r-C-C1-1-ETW2-4	C	C1	3	1	353.5	45.45	44.20	6.491	6.455	0.1652	0.1556	0.1600	20	M(TT, BA)	0.008260	48.76	47.42	6.963	6.924
NTP5325QR1-SOL-S36-NIAR-TR50r-C-C1-1-ETW2-5	C	C1	3	1	333.3	42.82	41.49	6.572	6.562	0.1650	0.1557	0.1607	20	M(TT, BA)	0.008250	45.88	44.46	7.041	7.031
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-ETW2-1	C	C3	3	3	422.7	53.95	52.99	6.470	6.566	0.1668	0.1567	0.1595	20	BA, TT	0.008341	58.44	57.40	7.008	7.113
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-ETW2-2	C	C3	3	3	394.2	50.40	49.67	6.520	6.675	0.1657	0.1565	0.1587	20	BA, TT	0.008286	54.23	53.45	7.016	7.183
NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-ETW2-3	C	C3	3	3	390.6	50.00	49.21	6.519	6.746	0.1657	0.1562	0.1588	20	BA, TT	0.008284	53.80	52.94	7.013	7.258
Average					**528.1**	**68.57**	**66.79**	**6.577**	**6.634**						**0.008338**	**74.35**	**72.41**	**7.122**	**7.184**
Standard Dev.					**131.0**	**17.61**	**17.03**	**0.08900**	**0.1005**							**19.53**	**18.87**	**0.1270**	**0.1463**
Coeff. of Var. [%]					**24.81**	**25.68**	**25.50**	**1.353**	**1.514**							**26.27**	**26.06**	**1.783**	**2.036**
Min.					**333.3**	**42.82**	**41.49**	**6.427**	**6.443**						**0.008100**	**45.88**	**44.46**	**6.963**	**6.924**
Max.					**722.6**	**95.50**	**91.59**	**6.747**	**6.805**						**0.008493**	**105.3**	**101.0**	**7.358**	**7.456**
Number of Spec.					**22**	**22**	**22**	**22**	**22**						**22**	**22**	**22**	**22**	**22**

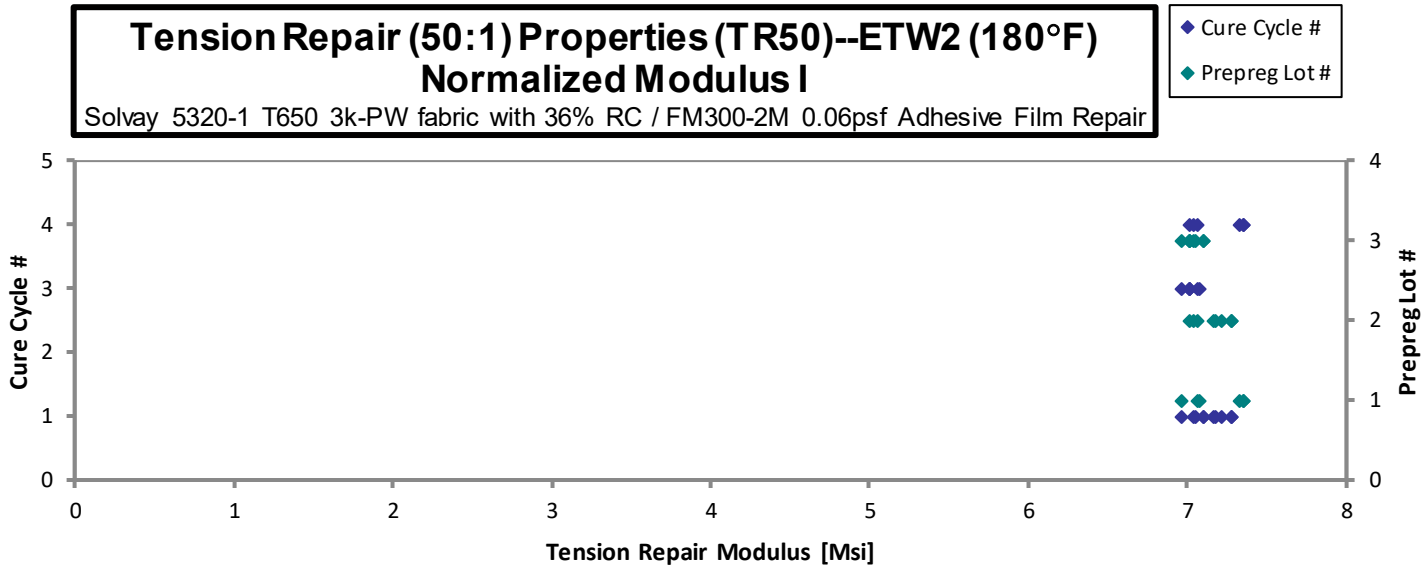
Modulus I (bag side) and Modulus II (tool side).
Note: Specimen thickness taken from scarf section are used for data reduction.

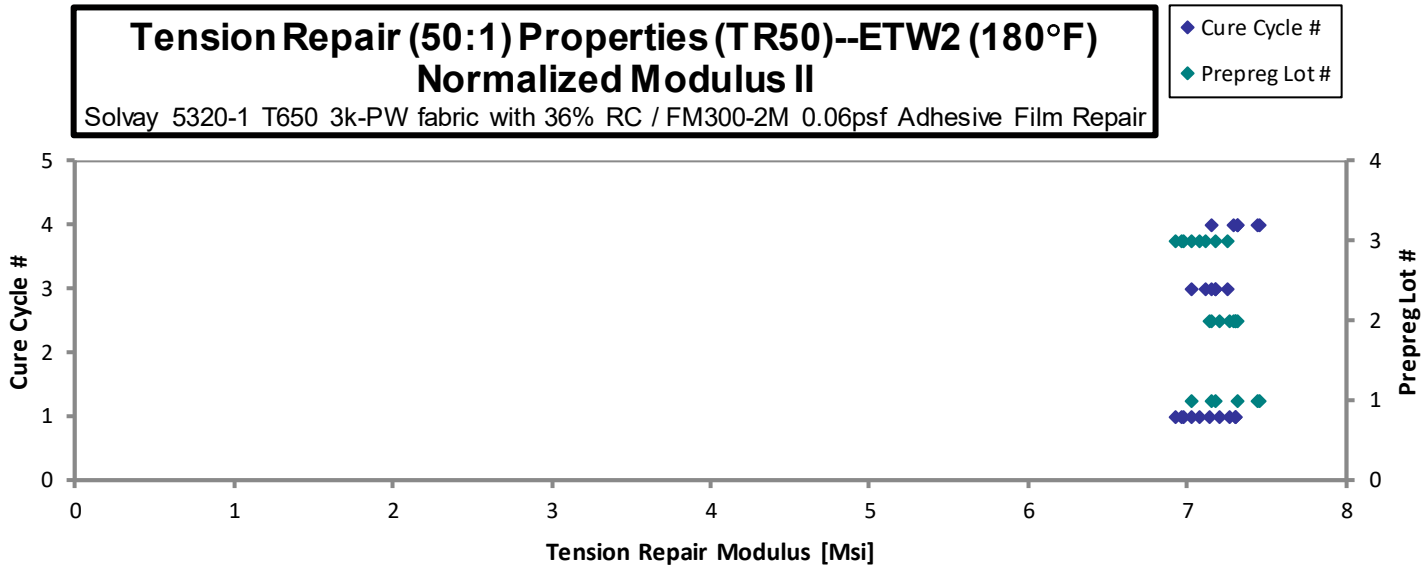


(a) Failure Modes - defined by the test standard
BA = Bondline/Shear Failure - Adhesive
BC = Bondline/Shear Failure - Cohesive
PL = Parent Laminate through Thickness Failure (Gage Area)
PG = Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT = Parent Laminate Tab Area Failure (Tabbed Specimen)
RL = Repair Laminate through Thickness Failure (Gage Area)
RG = Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT = Repair Laminate Tab Area Failure (Tabbed Specimen)
TT = Through Thickness Failure in Repair Joint Area
M = Multiple Failure Locations, list each code in parentheses, for example, M (TT,BC)


Tension Repair (50:1) Properties (TR50)--ETW2 (180°F)
Normalized Strength at Parent Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90 100 110 120
0 1 2 3 4 5
0 1 2 3 4


Tension Repair (50:1) Properties (TR50)--ETW2 (180°F)
Normalized Strength at Repair Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90 100 110
0 1 2 3 4 5
0 1 2 3 4


Tension Repair (50:1) Properties (TR50)--ETW2 (180°F)
Normalized Modulus I
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8


Tension Repair (50:1) Properties (TR50)--ETW2 (180°F)
Normalized Modulus II
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

4.2.2 Un-Notched Compression Repair Test with Scarf Ratio of 50:1 (UNCR50)

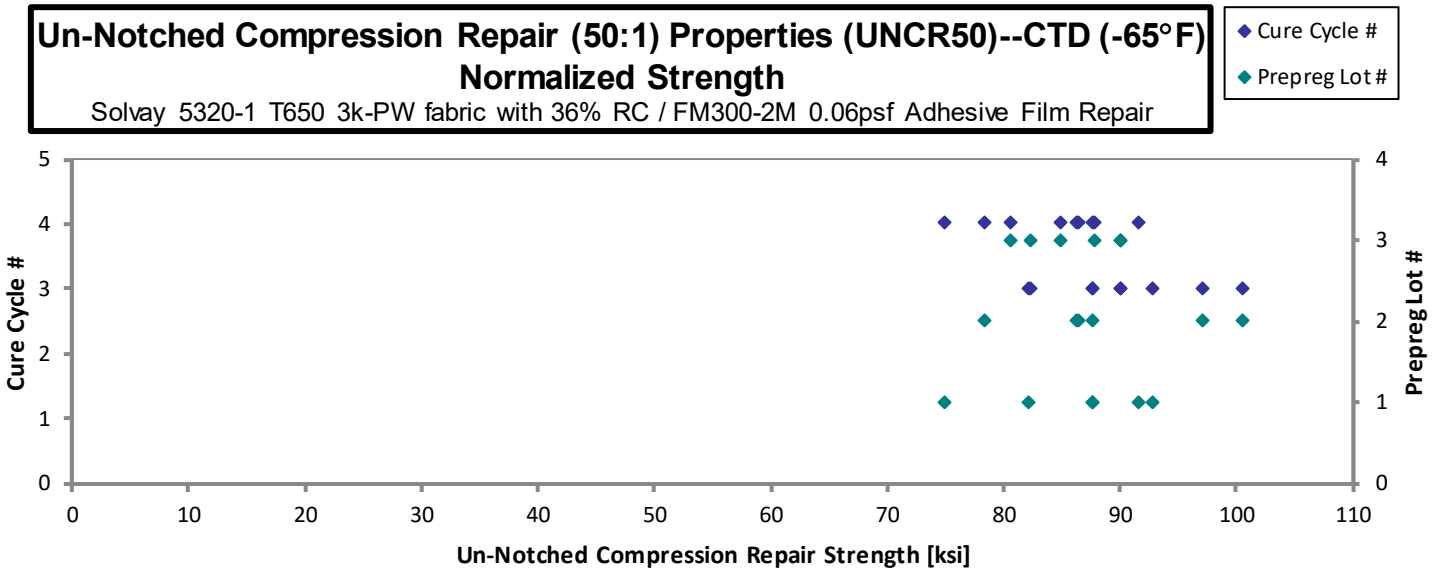
Un-Notched Compression Repair (50:1) Properties (UNCR50)--CTD (-65°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C3-1-CTD-1	A	C3	1	3	632.90	77.95	0.1624	20	M(A,L)GM	0.008119	82.20
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C3-1-CTD-2	A	C3	1	3	675.38	81.72	0.1653	20	M(A,L)WT	0.008264	87.71
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C3-1-CTD-3	A	C3	1	3	714.55	87.04	0.1642	20	M(A,L)WT	0.008209	92.80
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C4-1-CTD-1	A	C4	1	4	576.39	72.62	0.1588	20	M(A,L)WB	0.007938	74.86
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C4-1-CTD-2	A	C4	1	4	675.38	82.99	0.1628	20	M(A,L)GM	0.008138	87.71
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C4-1-CTD-3	A	C4	1	4	704.75	86.74	0.1625	20	M(A,L)WB	0.008125	91.53
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-CTD-1	B	C3	2	3	674.55	85.05	0.1586	20	M(A,L)WT	0.007931	87.60
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-CTD-2	B	C3	2	3	773.88	95.93	0.1614	20	M(A,L)AT	0.008068	100.5
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-CTD-3	B	C3	2	3	747.78	92.26	0.1621	20	M(A,L)WT	0.008105	97.11
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-CTD-1	B	C4	2	4	666.18	85.66	0.1555	20	M(A,L)WT	0.007777	86.52
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-CTD-2	B	C4	2	4	663.71	83.92	0.1582	20	M(A,L)GM	0.007909	86.20
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-CTD-3	B	C4	2	4	603.45	76.56	0.1577	20	M(A,L)GM	0.007883	78.37
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-CTD-1	C	C3	3	3	633.46	78.23	0.1620	20	M(A,L)GM	0.008098	82.27
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-CTD-2	C	C3	3	3	693.99	84.16	0.1649	20	M(A,L)GM	0.008246	90.13
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-CTD-3	C	C3	3	3	692.77	83.58	0.1658	20	M(A,L)GM	0.008288	89.97
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-CTD-1	C	C4	3	4	620.31	75.99	0.1633	20	LGM	0.008163	80.56
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-CTD-2	C	C4	3	4	653.81	79.15	0.1652	20	M(A,D,L)WB	0.008260	84.91
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-CTD-3	C	C4	3	4	676.17	80.84	0.1673	20	M(A,L)WT	0.008364	87.81

Average	**671.1**	**82.80**
Standard Dev.	**48.45**	**5.761**
Coeff. of Var. [%]	**7.220**	**6.957**
Min.	**576.4**	**72.62**
Max.	**773.9**	**95.93**
Number of Spec.	**18**	**18**

$Average_{norm}$	**0.008105**	**87.15**
Standard $Dev._{norm}$		**6.293**
Coeff. of Var. $[\%]_{norm}$		**7.220**
Min.	**0.007777**	**74.86**
Max.	**0.008364**	**100.5**
Number of Spec.	**18**	**18**


Un-Notched Compression Repair (50:1) Properties (UNCR50)--CTD (-65°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
90
100
110
0
1
2
3
4
5

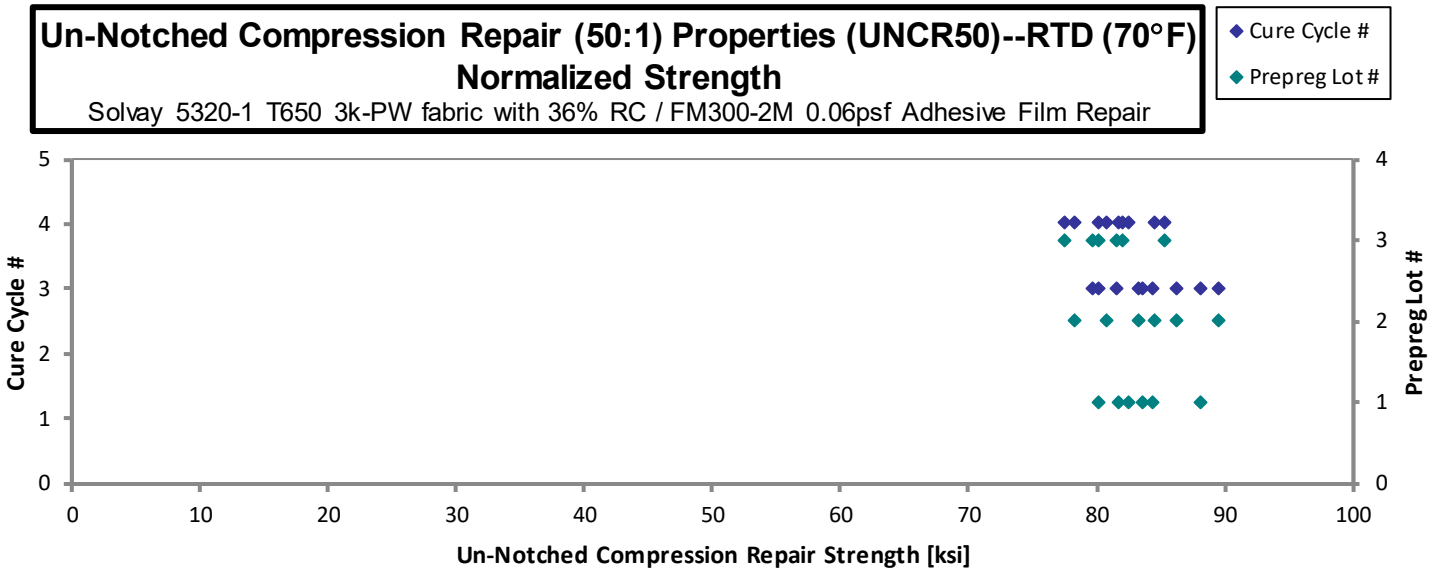
Un-Notched Compression Repair (50:1) Properties (UNCR50)--RTD (70°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C3-1-RTD-1	A	C3	1	3	649.2	79.29	0.1637	20	M(A,L)WB	0.008187	84.31
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C3-1-RTD-2	A	C3	1	3	643.9	78.64	0.1638	20	M(A,L)WB	0.008188	83.62
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C3-1-RTD-3	A	C3	1	3	678.6	82.77	0.1640	20	M(A,L)GM	0.008198	88.13
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C4-1-RTD-1	A	C4	1	4	617.7	75.50	0.1636	20	M(A,L)GM	0.008181	80.22
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C4-1-RTD-2	A	C4	1	4	635.8	77.49	0.1641	20	LGM	0.008204	82.57
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C4-1-RTD-3	A	C4	1	4	628.7	77.00	0.1633	20	M(A,L)GM	0.008166	81.65
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-RTD-1	B	C3	2	3	664.5	81.51	0.1631	20	M(A,D,L)GM	0.008153	86.30
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-RTD-2	B	C3	2	3	689.4	83.84	0.1645	20	M(A,L)WB	0.008223	89.53
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-RTD-3	B	C3	2	3	640.8	77.94	0.1644	20	M(A,L)WB	0.008222	83.23
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-RTD-1	B	C4	2	4	602.9	75.63	0.1594	20	M(A,L)WB	0.007972	78.30
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-RTD-2	B	C4	2	4	622.4	77.67	0.1603	20	M(A,L)GM	0.008013	80.83
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-RTD-3	B	C4	2	4	650.8	81.44	0.1598	20	M(A,L)GM	0.007992	84.52
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-RTD-1	C	C3	3	3	617.4	74.49	0.1658	20	M(A,L)GM	0.008288	80.18
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-RTD-2	C	C3	3	3	628.0	75.34	0.1667	20	LWB	0.008336	81.56
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-RTD-3	C	C3	3	3	613.2	73.80	0.1662	20	LGM	0.008308	79.63
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-RTD-1	C	C4	3	4	596.4	71.14	0.1677	20	LGM	0.008384	77.46
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-RTD-2	C	C4	3	4	657.0	78.68	0.1670	20	LWB	0.008349	85.32
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-RTD-3	C	C4	3	4	631.1	75.02	0.1683	20	LGM	0.008413	81.96

Average	**637.1**	**77.62**
Standard Dev.	**24.93**	**3.319**
Coeff. of Var. [%]	**3.913**	**4.276**
Min.	**596.4**	**71.14**
Max.	**689.4**	**83.84**
Number of Spec.	**18**	**18**

$Average_{norm}$	**0.008210**	**82.74**
Standard $Dev._{norm}$		**3.237**
Coeff. of Var. $[\%]_{norm}$		**3.913**
Min.	**0.007972**	**77.46**
Max.	**0.008413**	**89.53**
Number of Spec.	**18**	**18**


Un-Notched Compression Repair (50:1) Properties (UNCR50)--RTD (70°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
90
100
0
1
2
3
4
5

Un-Notched Compression Repair (50:1) Properties (UNCR50)--ETW2 (180°F) Strength

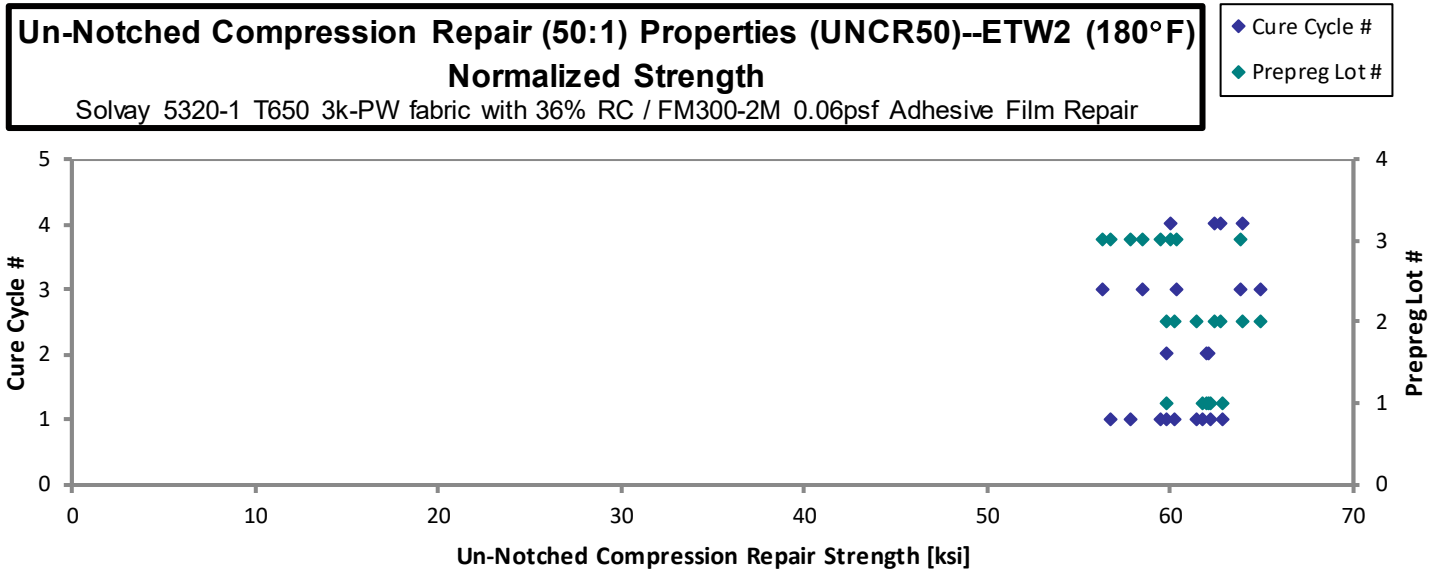
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C1-1-ETW2-1	A	C1	1	1	495.7	61.78	0.1605	20	LWB	0.008023	64.37
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C1-1-ETW2-2	A	C1	1	1	524.2	62.93	0.1666	20	LWB, M(A,L)GM	0.008330	68.08
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C1-1-ETW2-3	A	C1	1	1	519.9	62.19	0.1672	20	M(A,L)WB	0.008359	67.52
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C2-1-ETW2-1	A	C2	1	2	476.3	59.78	0.1593	20	LGM	0.007967	61.85
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C2-1-ETW2-2	A	C2	1	2	508.0	62.02	0.1638	20	LGM	0.008190	65.97
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C2-1-ETW2-3	A	C2	1	2	515.1	62.15	0.1658	20	LGM	0.008288	66.90
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C1-1-ETW2-1	B	C1	2	1	479.2	59.79	0.1603	20	LGM	0.008014	62.23
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C1-1-ETW2-2	B	C1	2	1	494.0	60.28	0.1639	20	M(L,A)GM	0.008196	64.16
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C1-1-ETW2-3	B	C1	2	1	502.9	61.44	0.1637	20	LGM	0.008186	65.31
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-ETW2-4	B	C3	2	3	526.7	64.94	0.1622	20	LWT	0.008110	68.40
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-ETW2-1	B	C4	2	4	509.6	62.79	0.1623	20	M(L,A)WT	0.008116	66.18
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-ETW2-2	B	C4	2	4	507.0	62.47	0.1623	20	LAB	0.008115	65.84
NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-ETW2-3	B	C4	2	4	513.2	63.95	0.1605	20	LGM	0.008025	66.65
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C1-1-ETW2-1	C	C1	3	1	458.2	56.81	0.1613	20	LGM	0.008065	59.50
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C1-1-ETW2-2	C	C1	3	1	475.1	57.82	0.1643	20	LGM	0.008217	61.70
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C1-1-ETW2-3	C	C1	3	1	488.8	59.46	0.1644	20	M(L,A)WT	0.008221	63.49
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-ETW2-1	C	C3	3	3	484.3	58.52	0.1655	20	LGM	0.008277	62.90
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-ETW2-2	C	C3	3	3	473.0	56.28	0.1681	20	M(L,A)WT	0.008404	61.43
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-ETW2-3	C	C3	3	3	500.7	60.37	0.1659	20	M(L,A)WT	0.008293	65.02
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-ETW2-4	C	C3	3	3	525.9	63.83	0.1648	20	M(L,A)WB	0.008238	68.30
NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-ETW2-4	C	C4	3	4	493.3	60.08	0.1642	20	LWT	0.008212	64.07

Average	**498.6**	**60.94**
Standard Dev.	**19.37**	**2.336**
Coeff. of Var. [%]	**3.885**	**3.833**
Min.	**458.2**	**56.28**
Max.	**526.7**	**64.94**
Number of Spec.	**21**	**21**

$Average_{norm}$	**0.008183**	**64.76**
Standard $Dev._{norm}$		**2.516**
Coeff. of Var. $[\%]_{norm}$		**3.885**
Min.	**0.007967**	**59.50**
Max.	**0.008404**	**68.40**
Number of Spec.	**21**	**21**


Un-Notched Compression Repair (50:1) Properties (UNCR50)--ETW2 (180°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
5
0
10
20
30
40
50
60
70
Un-Notched Compression Repair Strength [ksi]

4.2.3 Compression After Impact Repair Test with Scarf Ratio of 50:1 (CAI150)

Compression After Impact Repair (50:1) Properties (CAI150)--CTD (-65°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

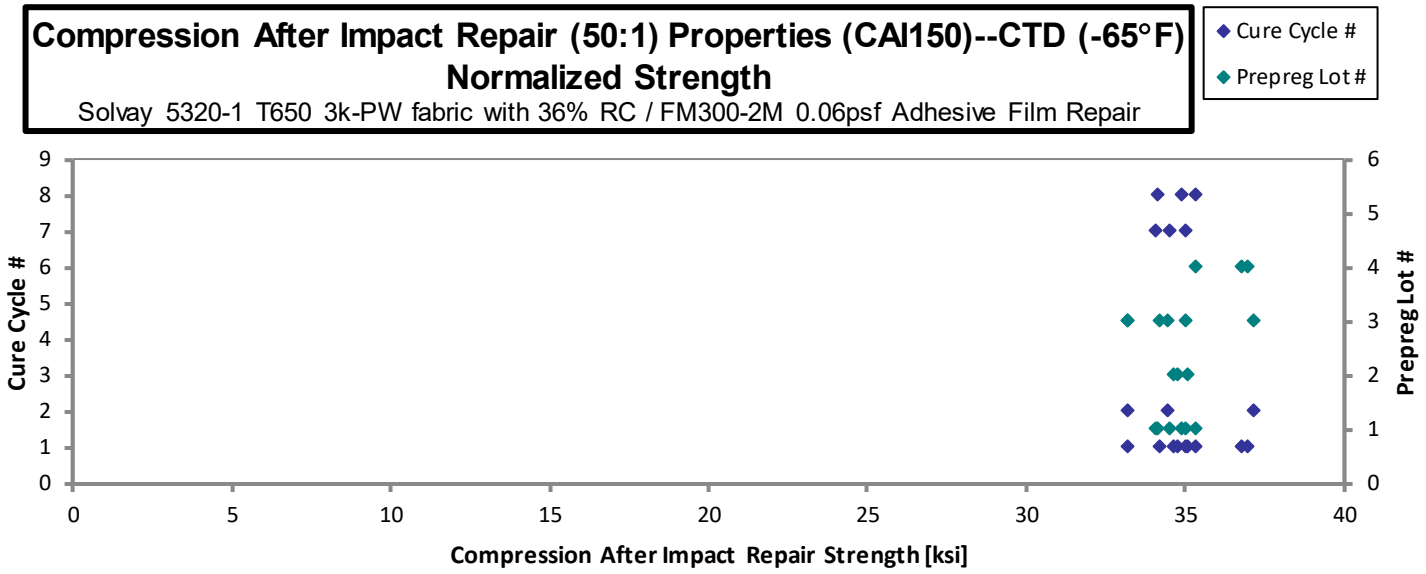
normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Measured Impact Energy [in-lbf]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-1-1-CTD-1*	A	C7	1	7	269.4	33.51	242.0	0.1608	20	LDM	0.008040	34.99
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-1-2-CTD-1*	A	C7	1	7	262.1	32.02	245.7	0.1637	20	LDM	0.008185	34.03
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-2-1-CTD-1*	A	C7	1	7	265.8	32.52	246.5	0.1635	20	LDM	0.008173	34.52
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-1-1-CTD-1*	A	C8	1	8	268.5	32.16	248.2	0.1670	20	LDM	0.008349	34.87
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-1-2-CTD-1*	A	C8	1	8	272.0	33.75	241.6	0.1612	20	LDM	0.008059	35.32
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-2-1-CTD-1*	A	C8	1	8	262.9	32.36	240.5	0.1625	20	LDM	0.008124	34.14
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-1-CTD-1	B	C1	2	1	266.4	33.15	238.6	0.1608	20	LDM	0.008038	34.60
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-1-CTD-2	B	C1	2	1	267.8	33.07	244.5	0.1619	20	LDM	0.008097	34.77
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-2-CTD-1	B	C1	2	1	270.1	33.28	243.6	0.1624	20	LDM	0.008118	35.08
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-1-CTD-1	C	C1	3	1	269.5	33.47	243.7	0.1610	20	LDM	0.008052	34.99
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-1-CTD-2	C	C1	3	1	255.3	30.99	252.1	0.1648	20	LDM	0.008241	33.16
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-2-CTD-1	C	C1	3	1	255.5	32.00	247.4	0.1644	20	LDM	0.008220	34.16
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-1-CTD-1	C	C2	3	2	286.3	34.59	251.5	0.1655	20	LDM	0.008277	37.18
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-1-CTD-2	C	C2	3	2	265.2	31.48	255.5	0.1685	20	LDM	0.008425	34.45
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-2-CTD-1	C	C2	3	2	263.0	31.28	249.5	0.1634	20	LDM	0.008168	33.19
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-1-CTD-1	D	C1	4	1	284.5	36.15	236.7	0.1574	20	LDM	0.007872	36.95
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-1-CTD-2	D	C1	4	1	283.0	34.94	244.3	0.1620	20	LDM	0.008102	36.76
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-2-CTD-1	D	C1	4	1	272.1	33.54	245.1	0.1623	20	LDM	0.008114	35.34

* Specimen was machined and tested as CAI150 test method, but the specimens are identified as UNCFS instead of CAI150.

Average	**268.9**	**33.01**
Standard Dev.	**8.672**	**1.333**
Coeff. of Var. [%]	**3.225**	**4.039**
Min.	**255.3**	**30.99**
Max.	**286.3**	**36.15**
Number of Spec.	**18**	**18**

$Average_{norm}$	**0.008147**	**34.92**
Standard $Dev._{norm}$		**1.126**
Coeff. of $Var.[\%]_{norm}$		**3.225**
Min.	**0.007872**	**33.16**
Max.	**0.008425**	**37.18**
Number of Spec.	**18**	**18**


Compression After Impact Repair (50:1) Properties (CAI150)--CTD (-65°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Compression After Impact Repair Strength [ksi]
0
5
10
15
20
25
30
35
40
0
1
2
3
4
5
6
7
8
9

Compression After Impact Repair (50:1) Properties (CAI150)--RTD (70°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

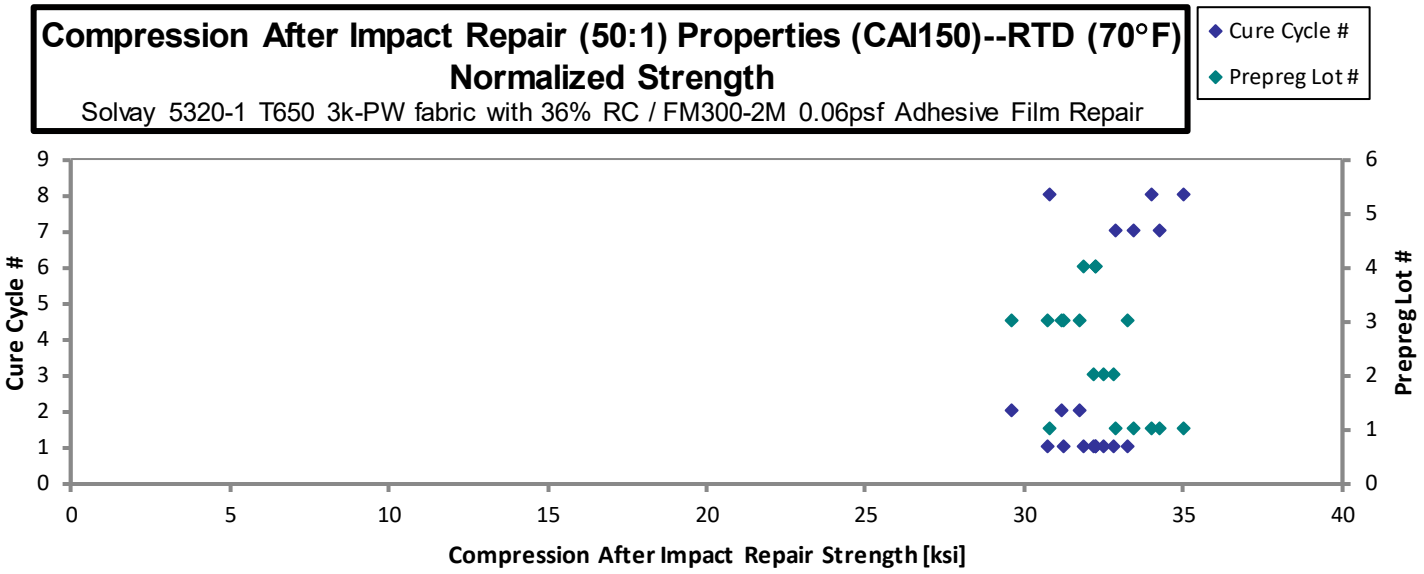
normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Measured Impact Energy [in-lbf]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-2-2-RTD-1*	A	C7	1	7	257.2	31.23	245.9	0.1647	20	LDM	0.008236	33.41
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-3-1-RTD-1*	A	C7	1	7	252.8	30.78	245.5	0.1643	20	LDM	0.008213	32.84
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-3-2-RTD-1*	A	C7	1	7	263.6	31.71	249.9	0.1663	20	LDM	0.008315	34.24
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-2-2-RTD-1*	A	C8	1	8	237.3	28.61	249.1	0.1659	20	LDM	0.008294	30.81
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-3-1-RTD-1*	A	C8	1	8	269.4	32.66	249.1	0.1650	20	LDM	0.008251	34.99
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-3-2-RTD-1*	A	C8	1	8	261.8	33.36	236.0	0.1570	20	LDM	0.007848	34.00
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-2-RTD-1	B	C1	2	1	250.0	30.13	250.9	0.1660	20	LDM	0.008298	32.47
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-3-RTD-1	B	C1	2	1	252.7	31.95	239.7	0.1582	20	LDM	0.007909	32.82
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-3-RTD-2	B	C1	2	1	247.9	30.68	241.5	0.1616	20	LDM	0.008081	32.20
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-2-RTD-1	C	C1	3	1	236.4	28.74	246.0	0.1645	20	LDM	0.008225	30.70
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-3-RTD-1	C	C1	3	1	240.5	28.55	245.6	0.1685	20	LDM	0.008423	31.23
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-3-RTD-2	C	C1	3	1	255.8	29.92	246.5	0.1710	20	LDM	0.008550	33.22
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-2-RTD-1	C	C2	3	2	227.8	27.40	250.3	0.1663	20	LDM	0.008314	29.58
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-3-RTD-1	C	C2	3	2	244.2	29.81	249.5	0.1639	20	LDM	0.008193	31.72
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-3-RTD-2	C	C2	3	2	240.2	28.99	249.0	0.1657	20	LDM	0.008286	31.19
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-2-RTD-1	D	C1	4	1	248.4	30.14	247.9	0.1648	20	LDM	0.008242	32.27
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-3-RTD-1	D	C1	4	1	248.0	30.90	240.7	0.1605	20	LDM	0.008027	32.21
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-3-RTD-2	D	C1	4	1	245.2	29.97	244.2	0.1637	20	LDM	0.008183	31.85

* Specimen was machined and tested as CAI150 test method, but the specimens are identified as UNCFS instead of CAI150.

Average	**248.9**	**30.31**
Standard Dev.	**10.50**	**1.539**
Coeff. of Var. [%]	**4.221**	**5.079**
Min.	**227.8**	**27.40**
Max.	**269.4**	**33.36**
Number of Spec.	**18**	**18**

$Average_{norm}$	**0.008216**	**32.32**
Standard $Dev._{norm}$		**1.364**
Coeff. of Var. $[\%]_{norm}$		**4.221**
Min.	**0.007848**	**29.58**
Max.	**0.008550**	**34.99**
Number of Spec.	**18**	**18**


Compression After Impact Repair (50:1) Properties (CAI150)--RTD (70°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Compression After Impact Repair Strength [ksi]
0
5
10
15
20
25
30
35
40
0
1
2
3
4
5
6
7
8
9

Compression After Impact Repair (50:1) Properties (CAI150)--ETW2 (180°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

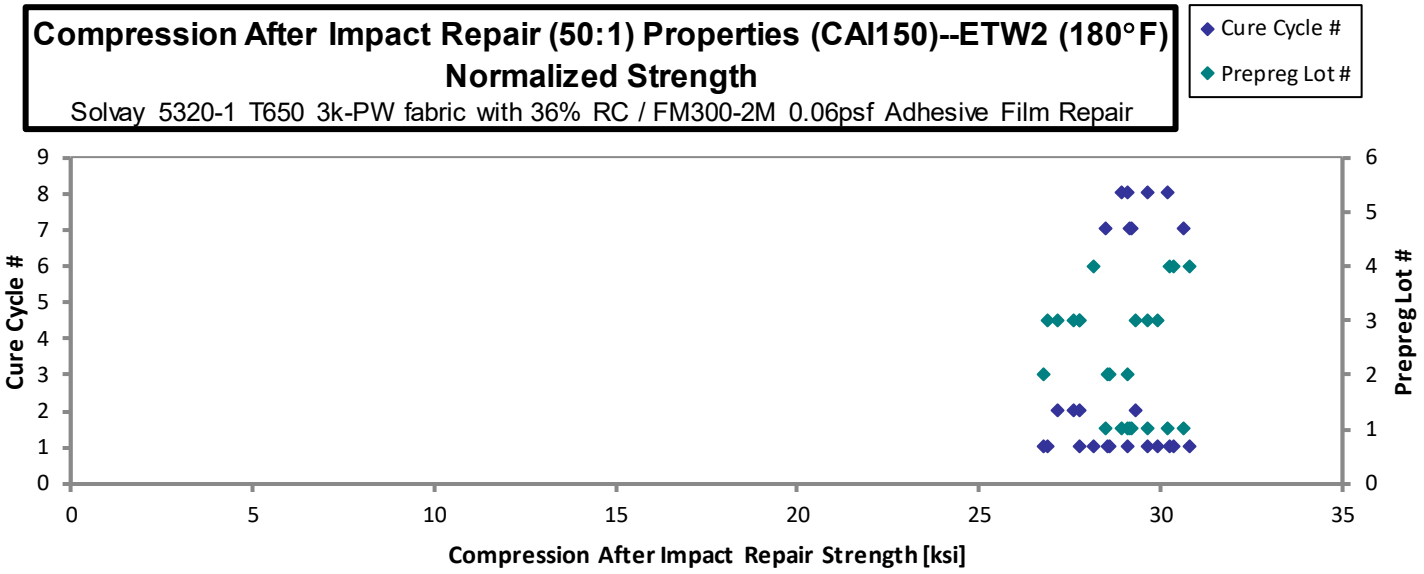
Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Measured Impact Energy [in-lbf]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-1-ETW-1*	A	C7	1	7	219.3	27.11	244.4	0.1618	20	LDM	0.008092	28.49
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-2-ETW-1*	A	C7	1	7	235.7	28.03	252.8	0.1682	20	LDM	0.008408	30.61
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-1-ETW-1*	A	C7	1	7	224.7	27.79	244.8	0.1617	20	LDM	0.008086	29.18
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-2-ETW-1-EXTRA*	A	C7	1	7	224.2	27.99	239.5	0.1603	20	LDM	0.008013	29.12
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-1-ETW-1*	A	C8	1	8	224.0	27.89	243.5	0.1606	20	LDM	0.008031	29.09
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-2-ETW-1*	A	C8	1	8	222.6	29.00	231.0	0.1536	20	LDM	0.007678	28.91
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-1-ETW-1*	A	C8	1	8	228.2	27.48	249.3	0.1661	20	LDM	0.008304	29.63
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-2-ETW-1-EXTRA*	A	C8	1	8	232.3	28.65	242.3	0.1622	20	LDM	0.008109	30.17
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-ETW-1	B	C1	2	1	206.1	25.55	241.9	0.1613	20	LDM	0.008063	26.76
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-ETW-2	B	C1	2	1	223.9	27.53	243.2	0.1627	20	LDM	0.008133	29.08
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-ETW-1	B	C1	2	1	219.9	27.82	240.5	0.1581	20	LDM	0.007904	28.56
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-ETW-2	B	C1	2	1	220.2	27.47	241.2	0.1603	20	LDM	0.008016	28.59
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-ETW-1	C	C1	3	1	207.0	26.29	237.6	0.1575	20	LDM	0.007874	26.88
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-ETW-2	C	C1	3	1	213.7	26.43	241.2	0.1617	20	LDM	0.008083	27.75
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-ETW-1	C	C1	3	1	230.5	27.29	252.3	0.1689	20	LDM	0.008445	29.93
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-ETW-2	C	C1	3	1	228.4	26.53	256.3	0.1722	20	LDM	0.008609	29.66
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-ETW-1	C	C2	3	2	209.3	25.97	242.7	0.1612	20	LDM	0.008058	27.18
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-ETW-2	C	C2	3	2	225.6	27.46	246.6	0.1643	20	LDM	0.008215	29.30
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-ETW-1	C	C2	3	2	213.9	27.44	232.4	0.1559	20	LDM	0.007794	27.77
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-ETW-2	C	C2	3	2	212.5	26.69	239.1	0.1593	20	LDM	0.007963	27.60
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-ETW-1	D	C1	4	1	237.2	30.01	237.9	0.1581	20	LDM	0.007904	30.81
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-ETW-2	D	C1	4	1	233.0	28.83	242.8	0.1617	20	LDM	0.008083	30.26
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-ETW-1	D	C1	4	1	233.6	28.72	246.0	0.1627	20	LDM	0.008133	30.34
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-ETW-2	D	C1	4	1	216.6	25.99	252.2	0.1667	20	LDM	0.008336	28.13

Note: All specimens are identified as ETW instead of ETW2 per test plan.

* Specimen was machined and tested as CAI150 test method, but the specimens are identified as UNCFS instead of CAI150.

Average	**222.6**	**27.50**
Standard Dev.	**9.006**	**1.080**
Coeff. of Var. [%]	**4.046**	**3.927**
Min.	**206.1**	**25.55**
Max.	**237.2**	**30.01**
Number of Spec.	**24**	**24**

$Average_{norm}$	**0.008097**	**28.91**
Standard $Dev._{norm}$		**1.170**
Coeff. of Var. $[\%]_{norm}$		**4.046**
Min.	**0.007678**	**26.76**
Max.	**0.008609**	**30.81**
Number of Spec.	**24**	**24**


Compression After Impact Repair (50:1) Properties (CAI150)--ETW2 (180°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Compression After Impact Repair Strength [ksi]
0
5
10
15
20
25
30
35
0
1
2
3
4
5
6
7
8
9

4.3 Laminate Level Repair (Scarf Ratio of 30:1) - Equivalency

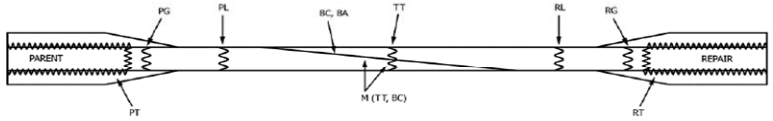
4.3.1 Tensile Repair Tests with Scarf Ratio of 30:1 (TR30)

Tension Repair (30:1) Properties (TR30)--CTD (-65°F)
Strength & Modulus
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

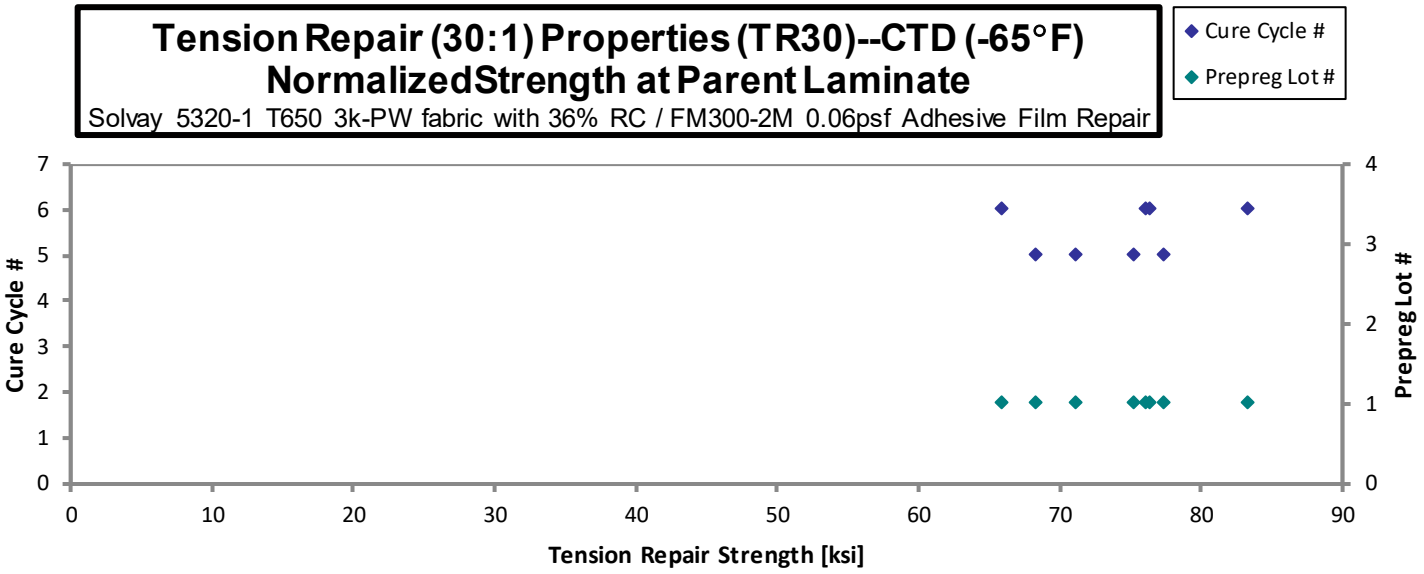
normalizing t_{ply} [in]: 0.007700

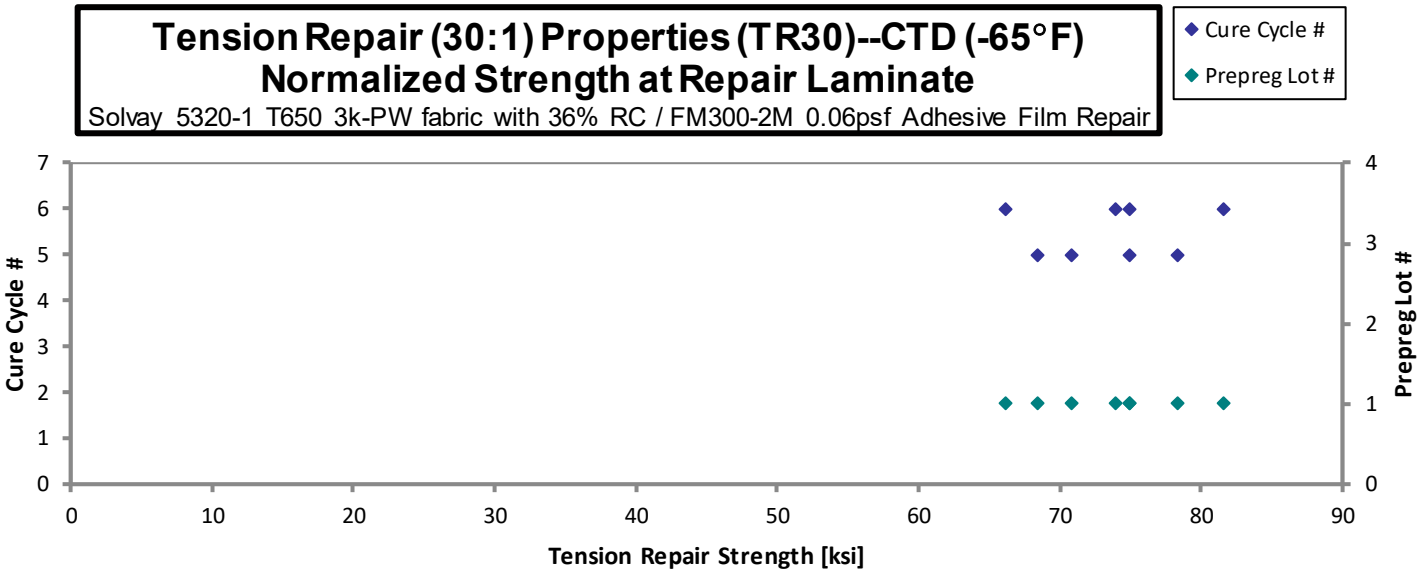
Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength at Parent Laminate [ksi]	Strength at Repair Laminate [ksi]	Modulus I [Msi]	Modulus II [Msi]	Avg. Specimen Thickness: Scarf Section [in]	Avg. Specimen Thickness: Parent Section [in]	Avg. Specimen Thickness: Repair Section [in]	# Plies in Laminate	Failure Mode (a)	Avg. t_{ply} (Scarf Section) [in]	$Strength_{norm}$ at Parent Laminate [ksi]	$Strength_{norm}$ at Repair Laminate [ksi]	$Modulus_{norm}$ I [Msi]	$Modulus_{norm}$ II [Msi]
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-CTD-1	D	C1	1	5	585.3	75.24	76.16	6.826	6.970	0.1584	0.1556	0.1537	20	TT	0.007918	77.38	78.32	7.019	7.168
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-CTD-2	D	C1	1	5	515.4	65.74	65.84	6.777	6.935	0.1600	0.1568	0.1566	20	PT	0.007999	68.29	68.40	7.040	7.204
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-CTD-3	D	C1	1	5	561.7	71.67	71.33	6.798	6.748	0.1618	0.1568	0.1575	20	PT	0.008090	75.30	74.94	7.143	7.089
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-CTD-4	D	C1	1	5	530.9	67.64	67.39	6.810	6.840	0.1620	0.1570	0.1576	20	PT	0.008101	71.16	70.90	7.164	7.196
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-CTD-1	D	C2	1	6	487.2	62.52	62.73	7.080	6.871	0.1623	0.1559	0.1553	20	RT	0.008115	65.89	66.11	7.462	7.241
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-CTD-2	D	C2	1	6	550.8	70.72	69.38	6.642	6.889	0.1662	0.1558	0.1588	20	RT	0.008310	76.32	74.88	7.169	7.434
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-CTD-3	D	C2	1	6	544.8	70.11	68.19	6.739	6.874	0.1670	0.1554	0.1598	20	PT	0.008348	76.01	73.93	7.306	7.452
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-CTD-4	D	C2	1	6	598.2	76.62	75.04	6.884	6.804	0.1675	0.1561	0.1594	20	PT	0.008374	83.33	81.62	7.487	7.399
Average					**546.8**	**70.03**	**69.51**	**6.820**	**6.866**						**0.008157**	**74.21**	**73.64**	**7.224**	**7.273**
Standard Dev.					**36.18**	**4.697**	**4.532**	**0.1267**	**0.07051**							**5.552**	**5.077**	**0.1778**	**0.1365**
Coeff. of Var. [%]					**6.617**	**6.707**	**6.520**	**1.857**	**1.027**							**7.482**	**6.895**	**2.461**	**1.876**
Min.					**487.2**	**62.52**	**62.73**	**6.642**	**6.748**						**0.007918**	**65.89**	**66.11**	**7.019**	**7.089**
Max.					**598.2**	**76.62**	**76.16**	**7.080**	**6.970**						**0.008374**	**83.33**	**81.62**	**7.487**	**7.452**
Number of Spec.					**8**	**8**	**8**	**8**	**8**						**8**	**8**	**8**	**8**	**8**

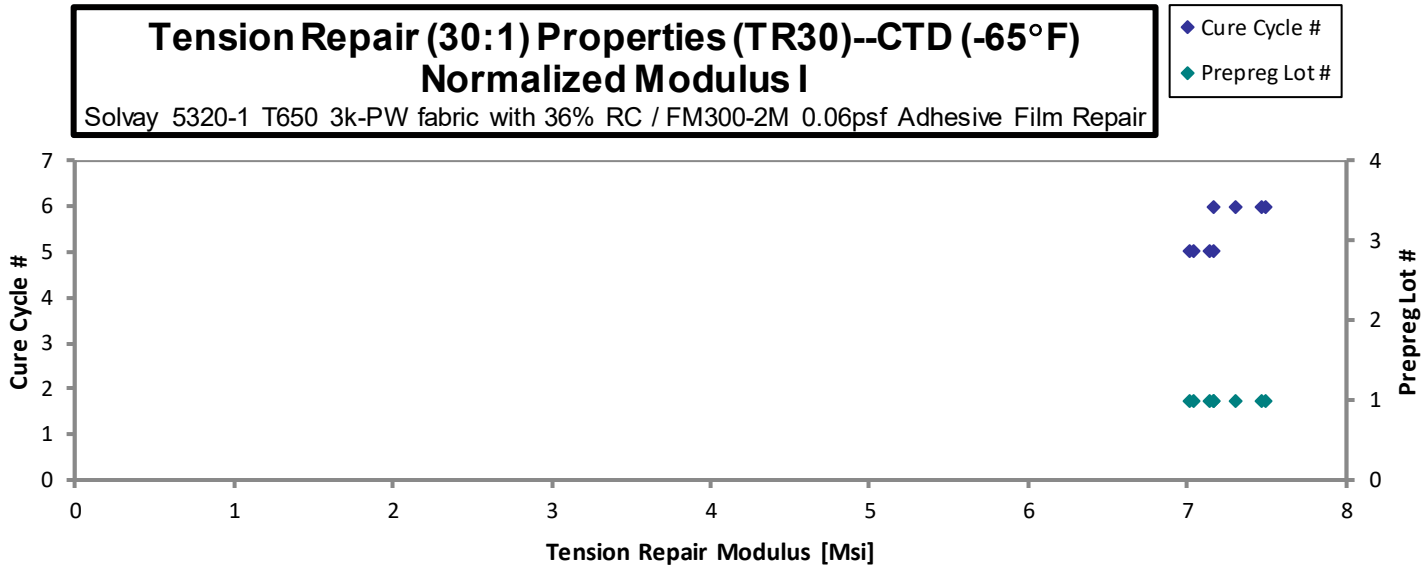
Modulus I (bag side) and Modulus II (tool side).
Note: Specimen thickness taken from scarf section are used for data reduction.

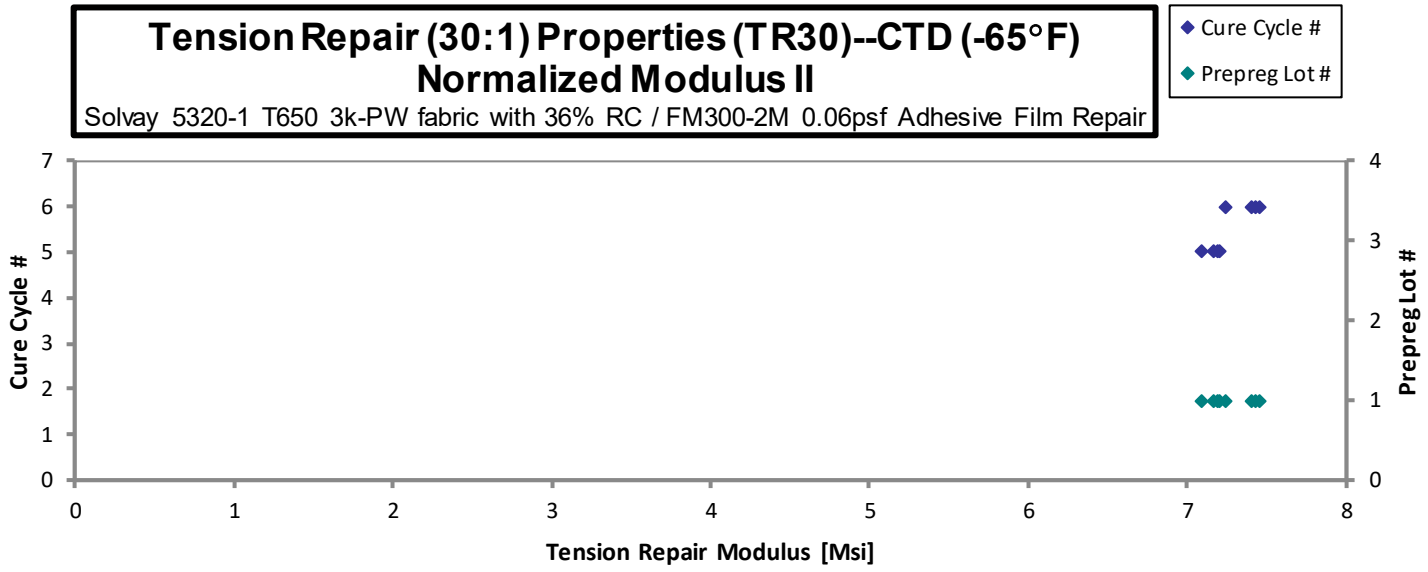


(a) Failure Modes - defined by the test standard
BA = Bondline/Shear Failure - Adhesive
BC = Bondline/Shear Failure - Cohesive
PL = Parent Laminate through Thickness Failure (Gage Area)
PG = Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT = Parent Laminate Tab Area Failure (Tabbed Specimen)
RL = Repair Laminate through Thickness Failure (Gage Area)
RG = Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT = Repair Laminate Tab Area Failure (Tabbed Specimen)
TT = Through Thickness Failure in Repair Joint Area
M = Multiple Failure Locations, list each code in parentheses, for example, M (TT,BC)


Tension Repair (30:1) Properties (TR30)--CTD (-65°F)
Normalized Strength at Parent Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90
0 1 2 3 4 5 6 7
0 1 2 3 4


Tension Repair (30:1) Properties (TR30)--CTD (-65°F)
Normalized Strength at Repair Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90
0 1 2 3 4 5 6 7
0 1 2 3 4


Tension Repair (30:1) Properties (TR30)--CTD (-65°F)
Normalized Modulus I
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

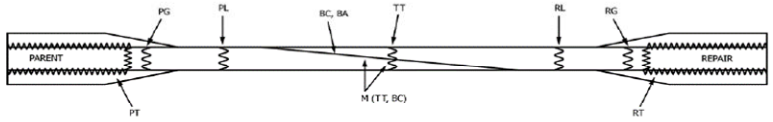

Tension Repair (30:1) Properties (TR30)--CTD (-65°F)
Normalized Modulus II
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

Tension Repair (30:1) Properties (TR30)--RTD (70°F)
Strength & Modulus
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.00770

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength at Parent Laminate [ksi]	Strength at Repair Laminate [ksi]	Modulus I [Msi]	Modulus II [Msi]	Avg. Specimen Thickness: Scarf Section [in]	Avg. Specimen Thickness: Parent Section [in]	Avg. Specimen Thickness: Repair Section [in]	# Plies in Laminate	Failure Mode (a)	Avg. t_{ply} (Scarf Section) [in]	$Strength_{norm}$ at Parent Laminate [ksi]	$Strength_{norm}$ at Repair Laminate [ksi]	$Modulus_{norm}$ I [Msi]	$Modulus_{norm}$ II [Msi]
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-RTD-1	D	C1	1	5	653.3	83.41	83.03	6.778	6.472	0.1630	0.1567	0.1574	20	TT	0.008148	88.26	87.87	7.172	6.849
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-RTD-2	D	C1	1	5	640.3	82.22	81.10	6.716	6.532	0.1634	0.1558	0.1579	20	RL	0.008168	87.22	86.03	7.124	6.930
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-RTD-3	D	C1	1	5	665.0	85.56	83.94	6.641	6.717	0.1633	0.1555	0.1585	20	PL, RL	0.008163	90.71	88.99	7.041	7.121
NTP5325QR1-SOL-S36-NIAR-TR30-D-C5-1-RTD-4	D	C1	1	5	631.9	81.19	79.50	6.790	6.469	0.1641	0.1557	0.1590	20	PL, RL	0.008203	86.48	84.69	7.233	6.891
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-RTD-1	D	C2	1	6	679.7	87.16	85.27	6.962	6.583	0.1674	0.1560	0.1594	20	PL, RL	0.008368	94.72	92.66	7.565	7.153
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-RTD-2	D	C2	1	6	655.0	83.77	82.52	6.651	6.660	0.1675	0.1564	0.1588	20	TT	0.008373	91.10	89.74	7.232	7.243
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-RTD-3	D	C2	1	6	657.3	83.87	82.37	6.643	6.891	0.1689	0.1568	0.1596	20	RT	0.008444	91.97	90.33	7.285	7.557
NTP5325QR1-SOL-S36-NIAR-TR30-D-C6-1-RTD-4	D	C2	1	6	672.7	85.89	84.23	6.714	6.519	0.1693	0.1567	0.1597	20	RT	0.008463	94.40	92.58	7.379	7.166
Average					**656.9**	**84.13**	**82.74**	**6.737**	**6.605**						**Average$_{norm}$**	**0.008291**	**90.61**	**89.11**	**7.254**	**7.114**
Standard Dev.					**15.82**	**1.978**	**1.833**	**0.1080**	**0.1448**						**Standard Dev.$_{norm}$**		**3.104**	**2.857**	**0.1619**	**0.2303**
Coeff. of Var. [%]					**2.409**	**2.351**	**2.215**	**1.603**	**2.192**						**Coeff. of Var. [%]$_{norm}$**		**3.425**	**3.206**	**2.232**	**3.237**
Min.					**631.9**	**81.19**	**79.50**	**6.641**	**6.469**						**Min.**	**0.008148**	**86.48**	**84.69**	**7.041**	**6.849**
Max.					**679.7**	**87.16**	**85.27**	**6.962**	**6.891**						**Max.**	**0.008463**	**94.72**	**92.66**	**7.565**	**7.557**
Number of Spec.					**8**	**8**	**8**	**8**	**8**						**Number of Spec.**	**8**	**8**	**8**	**8**	**8**

Modulus I (bag side) and Modulus II (tool side).
Note: Specimen thickness taken from scarf section are used for data reduction.



(a) Failure Modes - defined by the test standard
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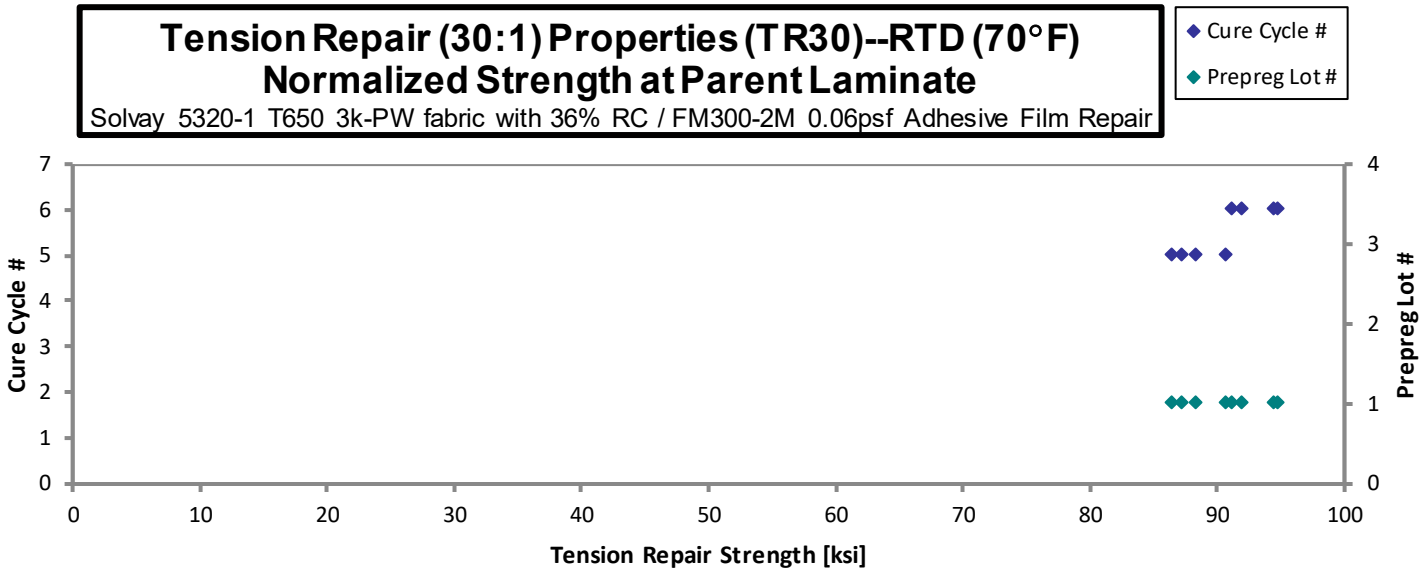
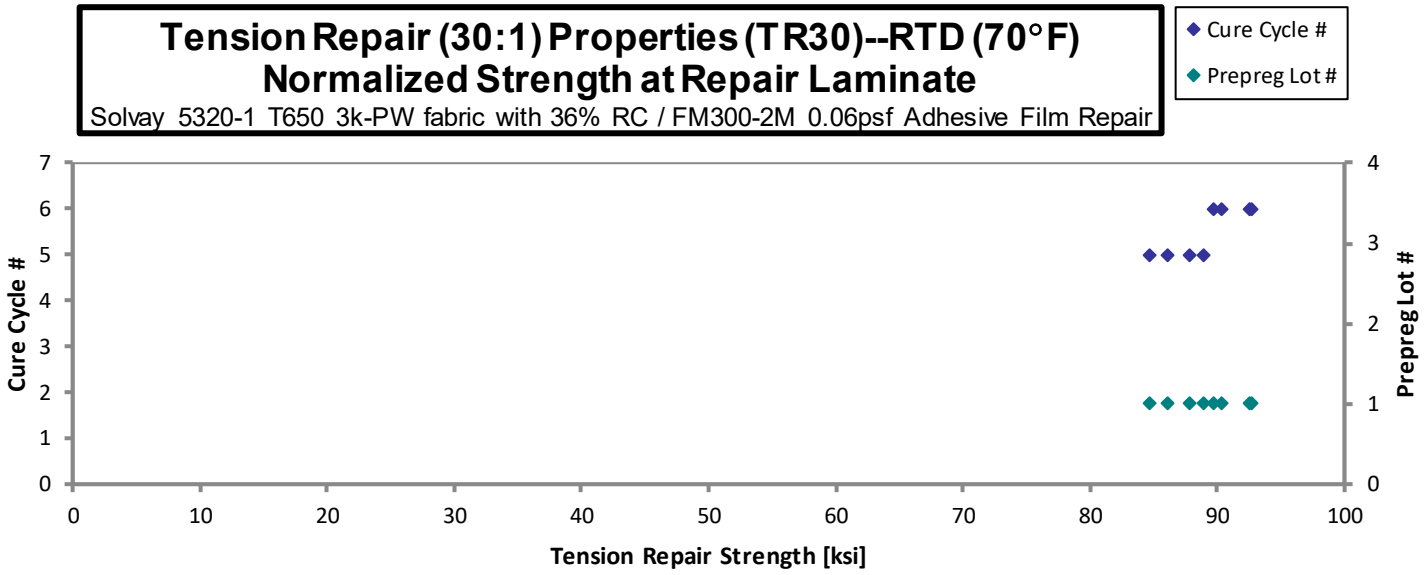
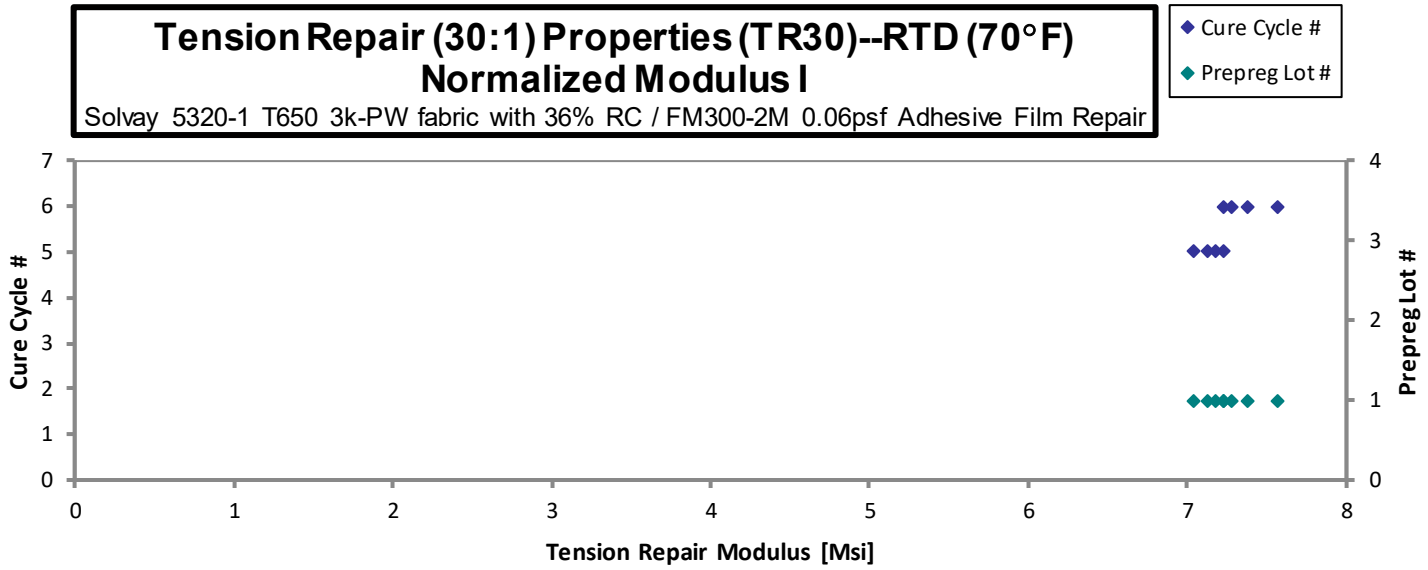
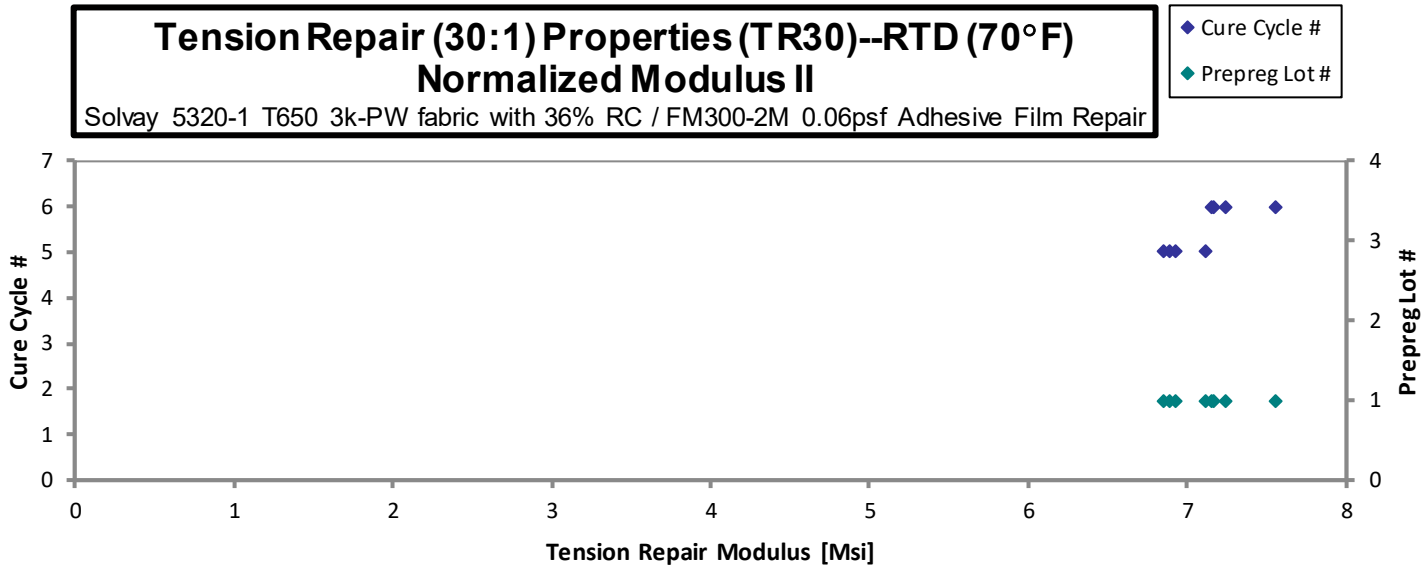
BC = Bondline/Shear Failure - Cohesive
PL = Parent Laminate through Thickness Failure (Gage Area)
PG = Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT = Parent Laminate Tab Area Failure (Tabbed Specimen)
RL = Repair Laminate through Thickness Failure (Gage Area)
RG = Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT = Repair Laminate Tab Area Failure (Tabbed Specimen)
TT = Through Thickness Failure in Repair Joint Area
M = Multiple Failure Locations, list each code in parentheses, for example, M (TT,BC)


Tension Repair (30:1) Properties (TR30)--RTD (70°F)
Normalized Strength at Parent Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90 100
0 1 2 3 4 5 6 7
0 1 2 3 4


Tension Repair (30:1) Properties (TR30)--RTD (70°F)
Normalized Strength at Repair Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0 10 20 30 40 50 60 70 80 90 100
0 1 2 3 4 5 6 7
0 1 2 3 4


Tension Repair (30:1) Properties (TR30)--RTD (70°F)
Normalized Modulus I
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]

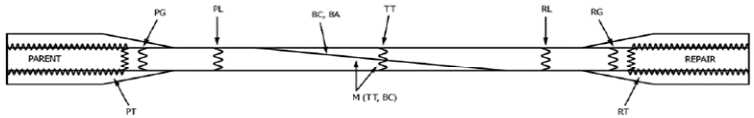

Tension Repair (30:1) Properties (TR30)--RTD (70°F)
Normalized Modulus II
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]

Tension Repair (30:1) Properties (TR30)--ETW2 (180°F)
Strength & Modulus
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]: 0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength at Parent Laminate [ksi]	Strength at Repair Laminate [ksi]	Modulus I [Msi]	Modulus II [Msi]	Avg. Specimen Thickness: Scarf Section [in]	Avg. Specimen Thickness: Parent Section [in]	Avg. Specimen Thickness: Repair Section [in]	# Plies in Laminate	Failure Mode (a)	Avg. t_{ply} (Scarf Section) [in]	$Strength_{norm}$ at Parent Laminate [ksi]	$Strength_{norm}$ at Repair Laminate [ksi]	$Modulus_{norm}$ I [Msi]	$Modulus_{norm}$ II [Msi]
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C1-1-ETW2-1	A	C1	1	1	482.7	61.88	63.39	6.484	6.684	0.1658	0.1560	0.1523	20	M(TT, BA, BC)	0.008288	66.60	68.24	6.979	7.194
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C1-1-ETW2-2	A	C1	1	1	454.1	57.36	59.40	6.501	6.536	0.1679	0.1583	0.1529	20	M(TT, BA, BC)	0.008393	62.53	64.75	7.087	7.125
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C1-1-ETW2-3	A	C1	1	1	441.3	56.06	57.54	6.491	6.694	0.1674	0.1574	0.1534	20	M(TT, BA, BC)	0.008372	60.95	62.56	7.057	7.278
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C1-1-ETW2-4	A	C1	1	1	427.7	54.19	55.00	6.540	6.617	0.1681	0.1579	0.1555	20	M(TT, BA, BC)	0.008405	59.15	60.04	7.139	7.223
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C2-1-ETW2-1	A	C2	1	2	509.5	65.97	66.85	6.806	6.760	0.1644	0.1545	0.1524	20	M(TT, BA, BC)	0.008222	70.44	71.38	7.267	7.218
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C2-1-ETW2-2	A	C2	1	2	406.4	52.62	51.45	6.652	6.655	0.1683	0.1544	0.1580	20	M(TT, BA, BC)	0.008413	57.50	56.21	7.268	7.271
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C2-1-ETW2-3	A	C2	1	2	384.2	49.68	48.57	6.573	6.656	0.1686	0.1547	0.1582	20	M(TT, BA, BC)	0.008432	54.40	53.19	7.197	7.289
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C2-1-ETW2-4	A	C2	1	2	391.6	50.02	49.83	6.524	6.652	0.1688	0.1566	0.1572	20	M(TT, BA, BC)	0.008438	54.81	54.60	7.149	7.290
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C2-1-ETW2-5	A	C2	1	2	362.2	47.16	46.00	6.616	6.728	0.1690	0.1536	0.1575	20	M(TT, BA, BC)	0.008450	51.75	50.48	7.260	7.383
NTP5325QR1-SOL-S36-NIAR-TR30r-A-C2-1-ETW2-6	A	C2	1	2	360.7	46.74	46.06	6.670	6.741	0.1682	0.1543	0.1566	20	M(TT, BA, BC)	0.008412	51.06	50.32	7.286	7.364
Average					**422.0**	**54.17**	**54.41**	**6.586**	**6.672**						**0.008383**	**58.92**	**59.18**	**7.169**	**7.264**
Standard Dev.					**50.25**	**6.295**	**7.263**	**0.1019**	**0.06550**							**6.337**	**7.408**	**0.1049**	**0.07734**
Coeff. of Var. [%]					**11.91**	**11.62**	**13.35**	**1.547**	**0.9816**							**10.76**	**12.52**	**1.463**	**1.065**
Min.					**360.7**	**46.74**	**46.00**	**6.484**	**6.536**						**0.008222**	**51.06**	**50.32**	**6.979**	**7.125**
Max.					**509.5**	**65.97**	**66.85**	**6.806**	**6.760**						**0.008450**	**70.44**	**71.38**	**7.286**	**7.383**
Number of Spec.					**10**	**10**	**10**	**10**	**10**						**10**	**10**	**10**	**10**	**10**

Modulus I (bag side) and Modulus II (tool side).
Note: Specimen thickness taken from scarf section are used for data reduction.



(a) Failure Modes - defined by the test standard
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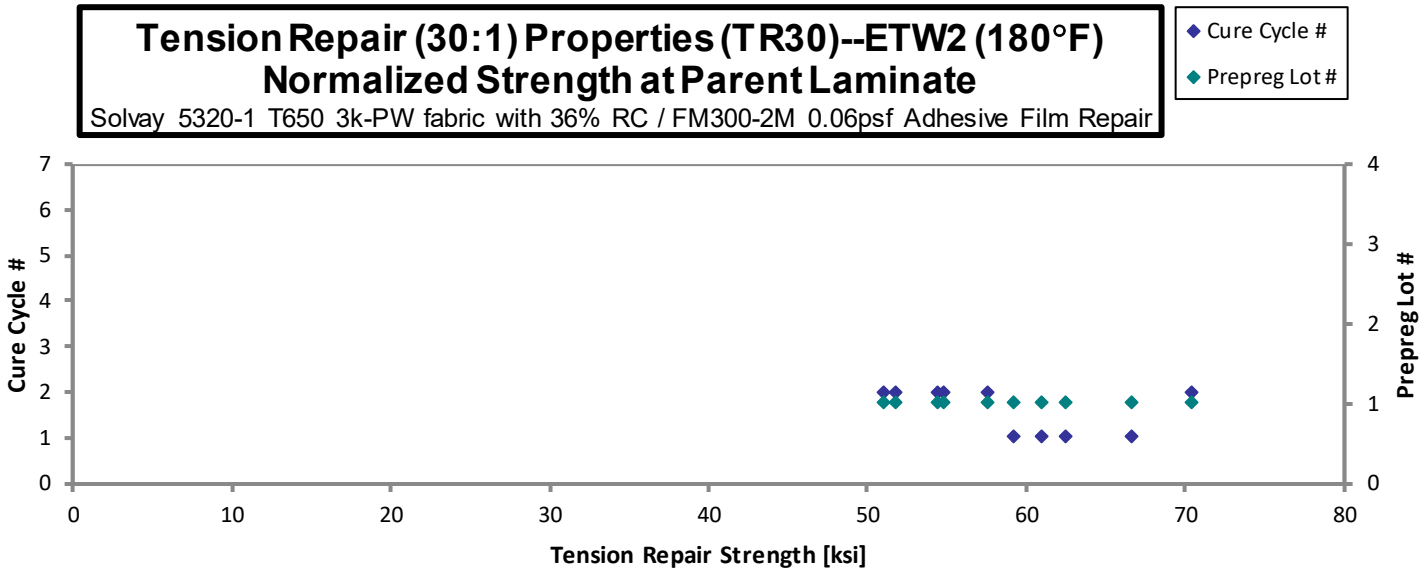
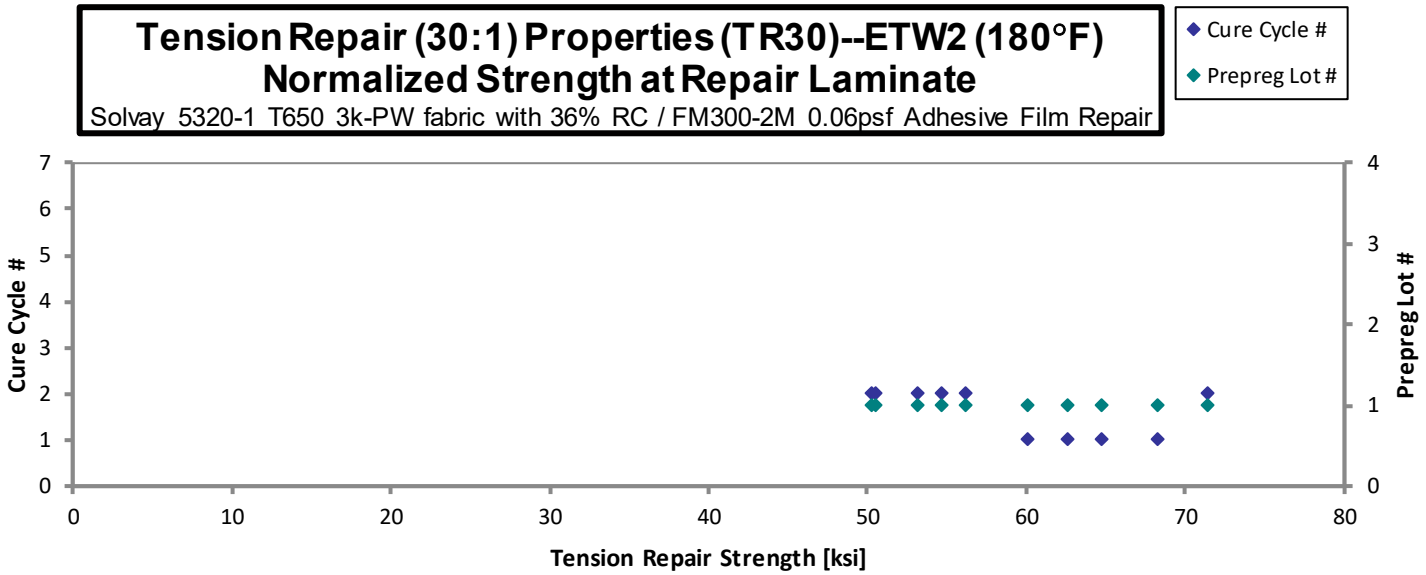
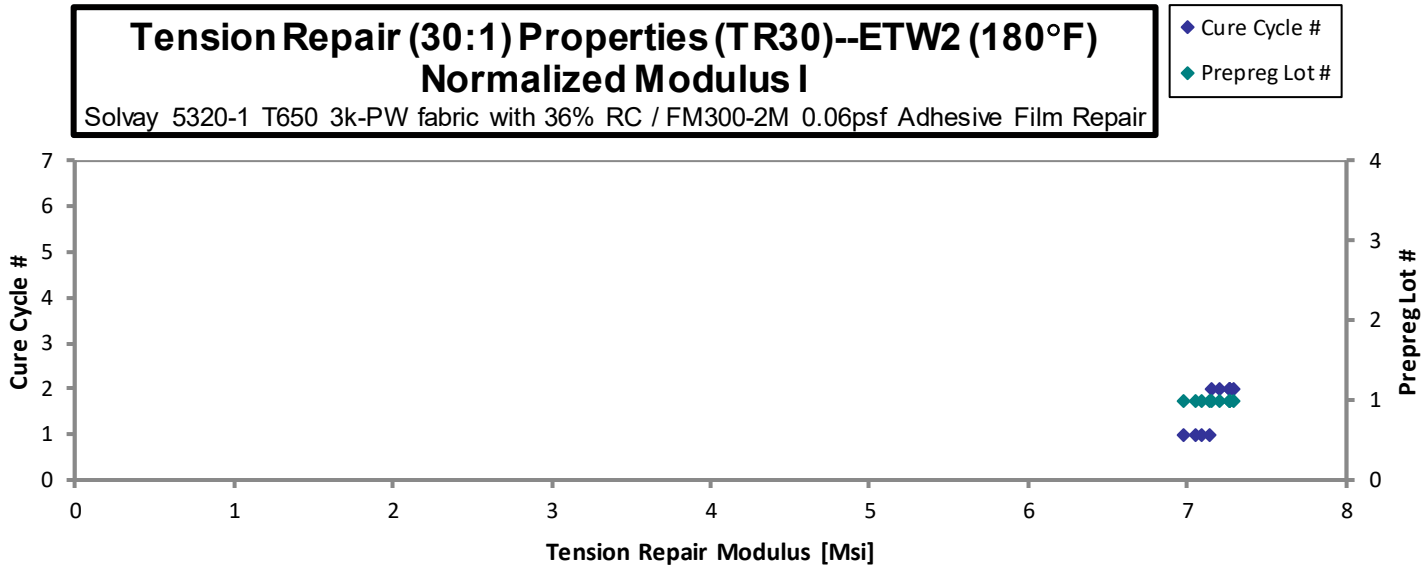
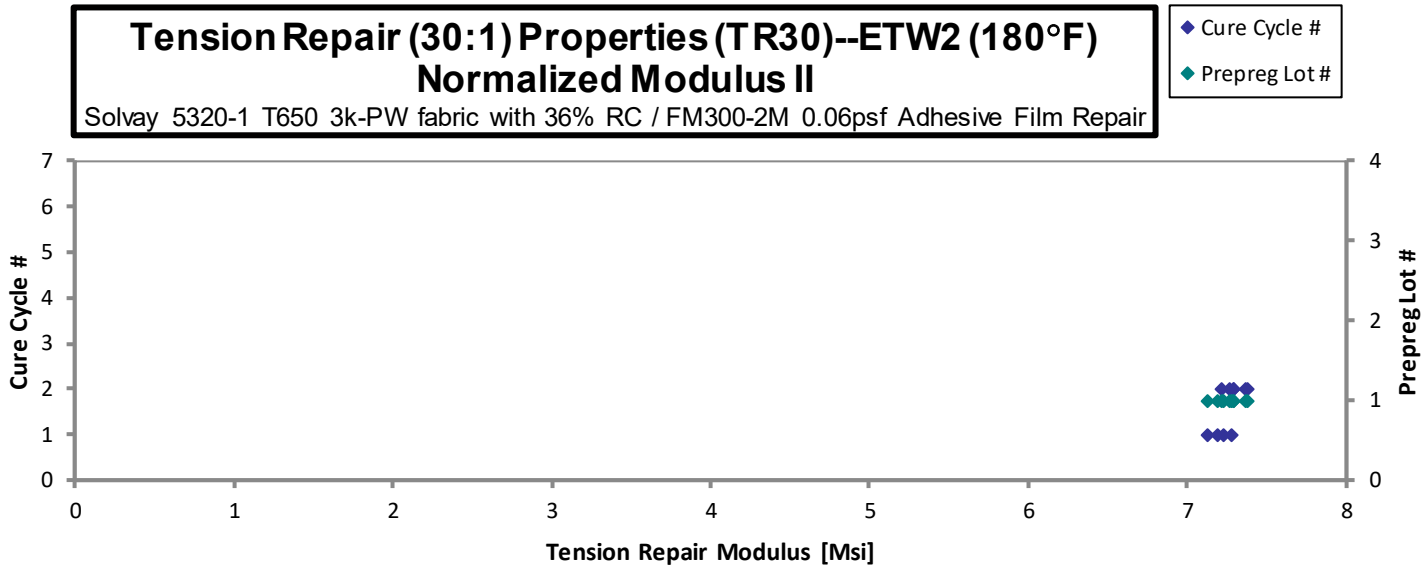
BC = Bondline/Shear Failure - Cohesive
PL = Parent Laminate through Thickness Failure (Gage Area)
PG = Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT = Parent Laminate Tab Area Failure (Tabbed Specimen)
RL = Repair Laminate through Thickness Failure (Gage Area)
RG = Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT = Repair Laminate Tab Area Failure (Tabbed Specimen)
TT = Through Thickness Failure in Repair Joint Area
M = Multiple Failure Locations, list each code in parentheses, for example, M (TT,BC)


Tension Repair (30:1) Properties (TR30)--ETW2 (180°F)
Normalized Strength at Parent Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7


Tension Repair (30:1) Properties (TR30)--ETW2 (180°F)
Normalized Strength at Repair Laminate
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7


Tension Repair (30:1) Properties (TR30)--ETW2 (180°F)
Normalized Modulus I
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8


Tension Repair (30:1) Properties (TR30)--ETW2 (180°F)
Normalized Modulus II
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Tension Repair Modulus [Msi]
0
1
2
3
4
5
6
7
8

4.3.2 Un-Notched Compression Repair Test with Scarf Ratio 30:1 (UNCR30)

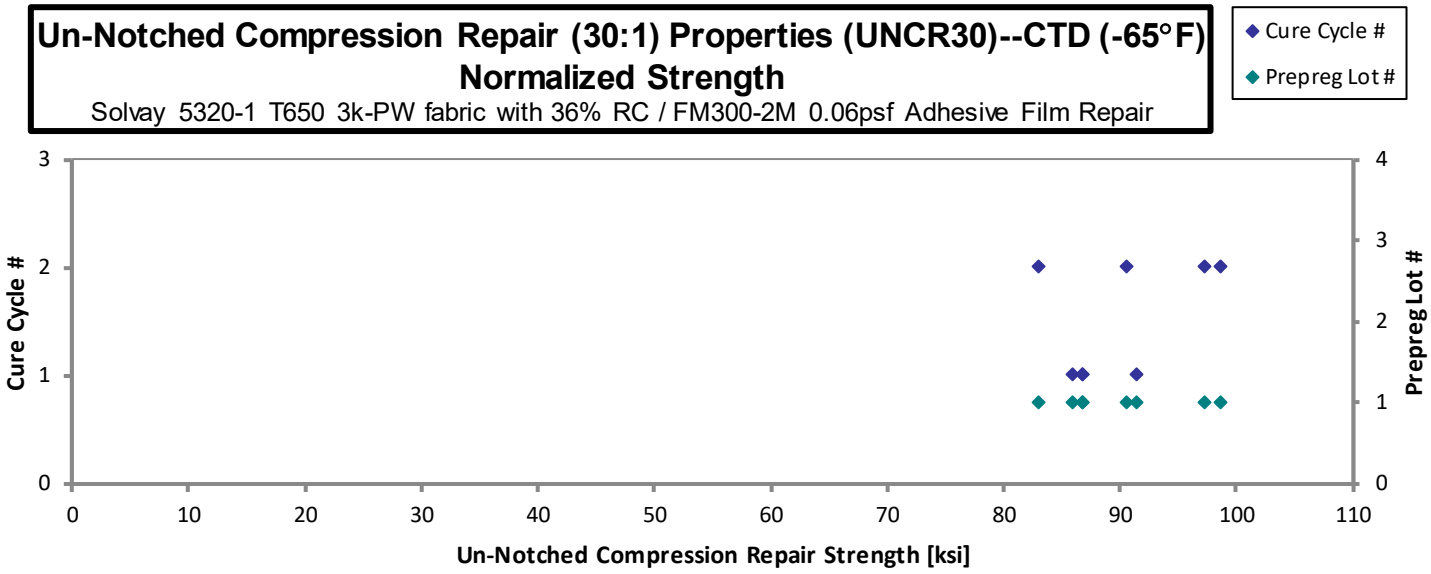
Un-Notched Compression Repair (30:1) Properties (UNCR30)--CTD (-65°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-CTD-1	D	C1	1	1	667.9	85.40	0.1564	20	M(A,L)GM	0.007822	86.74
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-CTD-2	D	C1	1	1	662.1	82.39	0.1607	20	LGM	0.008036	85.98
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-CTD-3	D	C1	1	1	704.4	88.30	0.1595	20	AWT	0.007977	91.47
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-CTD-4	D	C1	1	1	667.6	83.18	0.1605	20	M(A,L)WT	0.008027	86.70
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-CTD-1	D	C2	1	2	638.7	79.84	0.1600	20	M(A,L)WB	0.008000	82.95
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-CTD-2	D	C2	1	2	696.8	85.17	0.1636	20	M(A,L)GM	0.008182	90.50
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-CTD-3	D	C2	1	2	759.9	90.32	0.1683	20	M(A,D,L)WT	0.008413	98.69
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-CTD-4	D	C2	1	2	749.2	90.59	0.1654	20	M(A,L)WT	0.008271	97.30

Average	**693.3**	**85.65**
Standard Dev.	**43.03**	**3.857**
Coeff. of Var. [%]	**6.207**	**4.503**
Min.	**638.7**	**79.84**
Max.	**759.9**	**90.59**
Number of Spec.	**8**	**8**

$Average_{norm}$	**0.008091**	**90.04**
Standard $Dev._{norm}$		**5.589**
Coeff. of Var. $[\%]_{norm}$		**6.207**
Min.	**0.007822**	**82.95**
Max.	**0.008413**	**98.69**
Number of Spec.	**8**	**8**


Un-Notched Compression Repair (30:1) Properties (UNCR30)--CTD (-65°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Repair Strength [ksi]
0
1
2
3
4
10
20
30
40
50
60
70
80
90
100
110

Un-Notched Compression Repair (30:1) Properties (UNCR30)--RTD (70°F)
Strength

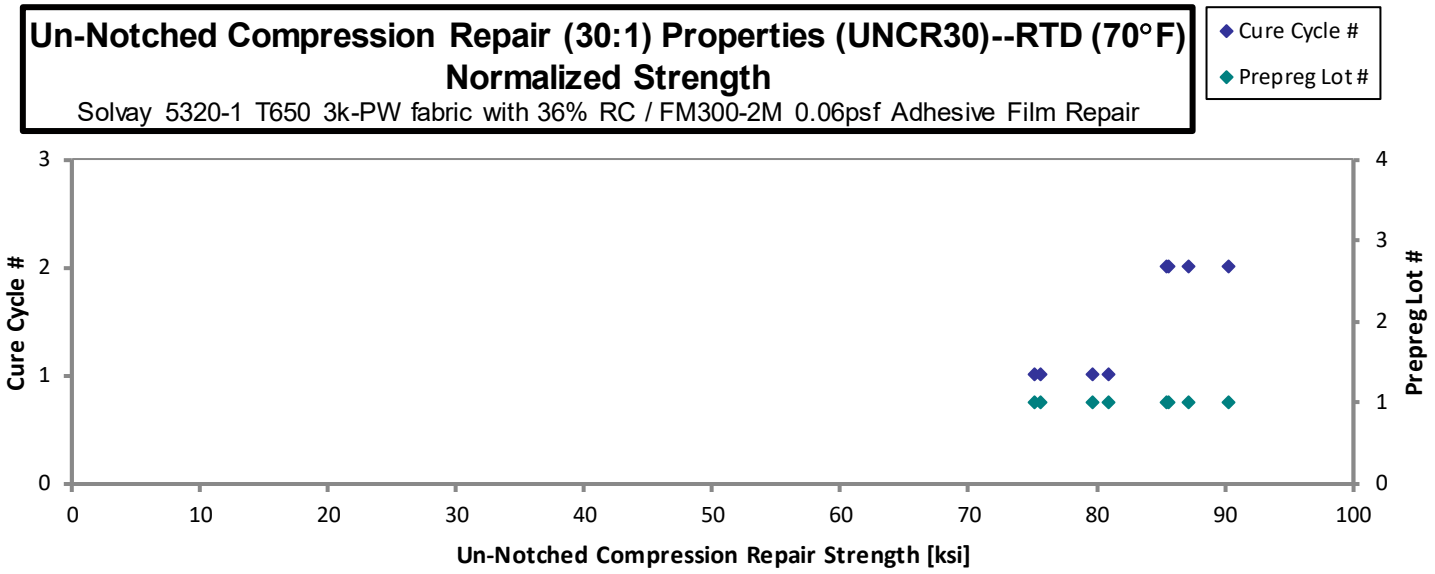
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-RTD-1	D	C1	1	1	582.0	72.20	0.1612	20	M(D,L)GM, LWT	0.008061	75.58
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-RTD-2	D	C1	1	1	623.5	76.82	0.1623	20	M(A,L)GM	0.008116	80.97
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-RTD-3	D	C1	1	1	613.1	75.28	0.1629	20	LWB	0.008144	79.62
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C5-1-RTD-4	D	C1	1	1	579.1	71.23	0.1626	20	M(A,L)GM	0.008130	75.21
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-RTD-1	D	C2	1	2	694.9	84.14	0.1652	20	M(A,L)GM	0.008259	90.25
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-RTD-2	D	C2	1	2	658.8	79.16	0.1665	20	M(A,L)WT	0.008323	85.56
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-RTD-3	D	C2	1	2	658.4	78.95	0.1668	20	M(A,L)WB	0.008340	85.51
NTP5325QR1-SOL-S36-NIAR-UNCR30-D-C6-1-RTD-4	D	C2	1	2	671.8	80.99	0.1659	20	M(A,L)WB	0.008295	87.25

Average	**635.2**	**77.35**
Standard Dev.	**42.44**	**4.371**
Coeff. of Var. [%]	**6.681**	**5.651**
Min.	**579.1**	**71.23**
Max.	**694.9**	**84.14**
Number of Spec.	**8**	**8**

$Average_{norm}$	**0.008208**	**82.49**
Standard $Dev._{norm}$		**5.512**
Coeff. of Var. $[\%]_{norm}$		**6.681**
Min.	**0.008061**	**75.21**
Max.	**0.008340**	**90.25**
Number of Spec.	**8**	**8**

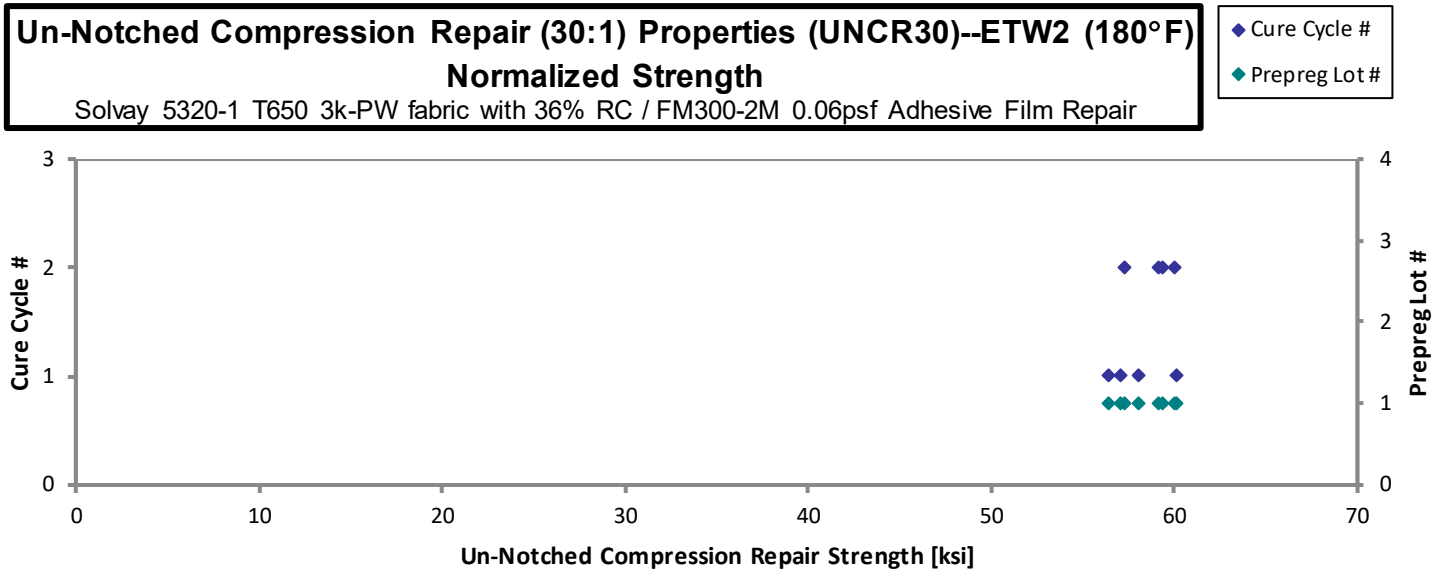

Un-Notched Compression Repair (30:1) Properties (UNCR30)--RTD (70°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
Un-Notched Compression Repair Strength [ksi]
0
10
20
30
40
50
60
70
80
90
100
0
1
2
3
4

Un-Notched Compression Repair (30:1) Properties (UNCR30)--ETW2 (180°F)
Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

normalizing t_{ply} [in]
0.007700

Specimen Number	NIAR Batch #	NIAR Cure Cycle	Prepreg Lot #	Cure Cycle #	Ultimate Joint Running Force per Repair Ply [lb/in/ply]	Strength [ksi]	Avg. Specimen Scarf Thickness [in]	# Plies in Laminate	Failure Mode	Avg. t_{ply} [in]	$Strength_{norm}$ [ksi]
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C1-1-ETW2-1	A	C1	1	1	447.1	55.98	0.1597	20	SCARF JOINT FAILURE	0.007986	58.06
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C1-1-ETW2-2	A	C1	1	1	463.3	56.42	0.1642	20	SCARF JOINT FAILURE	0.008212	60.17
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C1-1-ETW2-3	A	C1	1	1	434.4	52.43	0.1657	20	SCARF JOINT FAILURE	0.008284	56.41
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C1-1-ETW2-4	A	C1	1	1	439.9	53.24	0.1653	20	SCARF JOINT FAILURE	0.008263	57.13
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C2-1-ETW2-1	A	C2	1	2	462.6	56.15	0.1648	20	SCARF JOINT FAILURE, LWB, LWT	0.008239	60.08
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C2-1-ETW2-2	A	C2	1	2	457.5	53.85	0.1699	20	SCARF JOINT FAILURE, M(A,L)WB, M(A,L)WT	0.008496	59.41
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C2-1-ETW2-3	A	C2	1	2	455.7	53.65	0.1699	20	SCARF JOINT FAILURE, M(A,L)WB, M(A,L)WT	0.008493	59.18
NTP5325QR1-SOL-S36-NIAR-UNCR30r-A-C2-1-ETW2-4	A	C2	1	2	441.3	52.26	0.1689	20	SCARF JOINT FAILURE, M(A,L)WB, LWT	0.008444	57.31

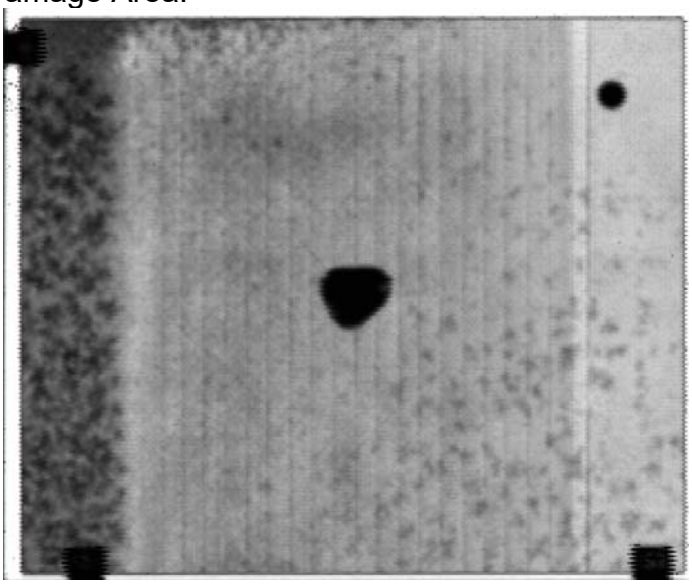
Average	**450.2**	**54.25**	**$Average_{norm}$**	**0.008302**	**58.47**
Standard Dev.	**11.06**	**1.696**	**$Standard\ Dev._{norm}$**		**1.436**
Coeff. of Var. [%]	**2.456**	**3.127**	**$Coeff.\ of\ Var.\ [\%]_{norm}$**		**2.456**
Min.	**434.4**	**52.26**	**Min.**	**0.007986**	**56.41**
Max.	**463.3**	**56.42**	**Max.**	**0.008496**	**60.17**
Number of Spec.	**8**	**8**	**Number of Spec.**	**8**	**8**


Un-Notched Compression Repair (30:1) Properties (UNCR30)--ETW2 (180°F)
Normalized Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair
Cure Cycle #
Prepreg Lot #
Cure Cycle #
Prepreg Lot #
0
1
2
3
4
0
10
20
30
40
50
60
70
Un-Notched Compression Repair Strength [ksi]

5. Additional Compression After Impact Data – Laminate Repair (Scarf Ratio of 50:1)

Impactor Diameter: 0.625”

Representative of Damage Area:



Damage Area and Dent Depth Summary:

Specimen ID	Damage Area ($inch^2$)	Dent Depth (inch)
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-1-1-CTD-1	1.110	0.0485
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-1-2-CTD-1	1.034	0.0565
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-2-1-CTD-1	0.942	0.0500
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-1-1-CTD-1	1.328	0.0585
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-1-2-CTD-1	1.272	0.0330
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-2-1-CTD-1	0.970	0.0500
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-1-CTD-1	0.941	0.0485
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-1-CTD-2	0.931	0.0525
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-2-CTD-1	1.282	0.0600
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-1-CTD-1	1.162	0.0495
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-1-CTD-2	1.082	0.0515
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-2-CTD-1	1.082	0.0515
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-1-CTD-1	0.898	0.0595
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-1-CTD-2	1.118	0.0525
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-2-CTD-1	1.261	0.0555
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-1-CTD-1	0.846	0.0430
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-1-CTD-2	0.992	0.0460
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-2-CTD-1	1.058	0.0485
NTP-5325QR1-SOL-S36-NIAR-UNCFS-A-C7-2-2-RTD-1	1.133	0.0505

Specimen ID	Damage Area ($inch^2$)	Dent Depth (inch)
NTP-5325QR1-SOL-S36-NIAR-UNCFS-A-C7-3-1-RTD-1	1.118	0.0455
NTP-5325QR1-SOL-S36-NIAR-UNCFS-A-C7-3-2-RTD-1	1.155	0.0475
NTP-5325QR1-SOL-S36-NIAR-UNCFS-A-C8-2-2-RTD-1	1.038	0.0515
NTP-5325QR1-SOL-S36-NIAR-UNCFS-A-C8-3-1-RTD-1	0.962	0.0490
NTP-5325QR1-SOL-S36-NIAR-UNCFS-A-C8-3-2-RTD-1	1.075	0.0380
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-2-RTD-1	1.270	0.0545
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-3-RTD-1	1.149	0.0515
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-3-RTD-2	1.131	0.0585
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-2-RTD-1	1.037	0.0515
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-3-RTD-1	1.398	0.0505
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-3-RTD-2	1.342	0.0515
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-2-RTD-1	1.194	0.0520
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-2-RTD-2	1.398	0.0505
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-3-RTD-1	1.214	0.0490
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-3-RTD-2	0.960	0.0515
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-2-RTD-1	1.083	0.0540
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-3-RTD-1	1.341	0.0480
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-3-RTD-2	1.013	0.0430
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-1-ETW-1	0.973	0.0515
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-2-ETW-1	1.142	0.0440
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-1-ETW-1	0.990	0.0495
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-2-ETW-1-EXTRA	1.072	0.0465
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-1-ETW-1	1.112	0.0375
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-2-ETW-1	0.914	0.0425
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-1-ETW-1	1.165	0.0580
NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-2-ETW-1-EXTRA	1.293	0.0415
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-ETW-1	1.162	0.0545
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-ETW-2	1.134	0.0605
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-ETW-1	1.274	0.0415
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-ETW-2	1.128	0.0435
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-ETW-1	0.926	0.0455
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-ETW-2	0.989	0.0510
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-ETW-1	1.251	0.0470
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-ETW-2	1.106	0.0440
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-ETW-1	0.970	0.0455
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-ETW-2	0.888	0.0500
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-ETW-1	1.176	0.0420
NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-ETW-2	1.018	0.0470
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-ETW-1	0.925	0.0455
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-ETW-2	0.958	0.0470
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-ETW-1	0.854	0.0465
NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-ETW-2	1.002	0.0635

6. Comparison Test Results

6.1 Tension Repair Test

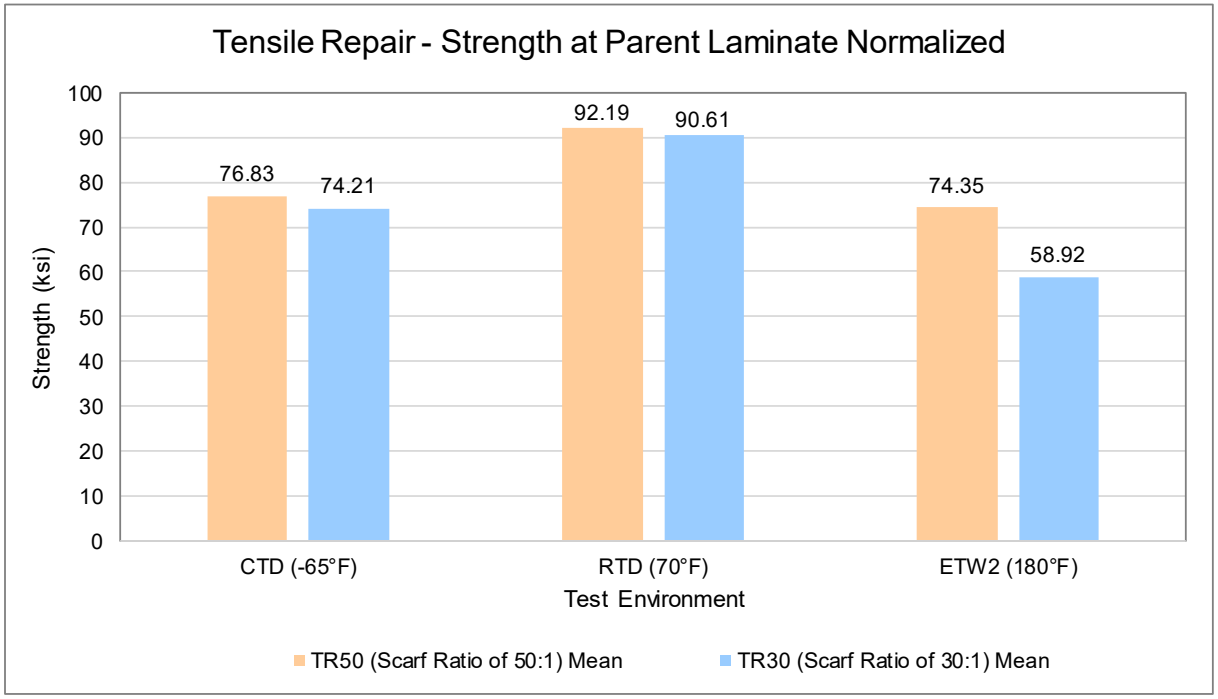


Figure 6-1: Comparison of Tension Repair Strength at Parent Laminate Results (Scarf Ratios of 50:1 and 30:1)

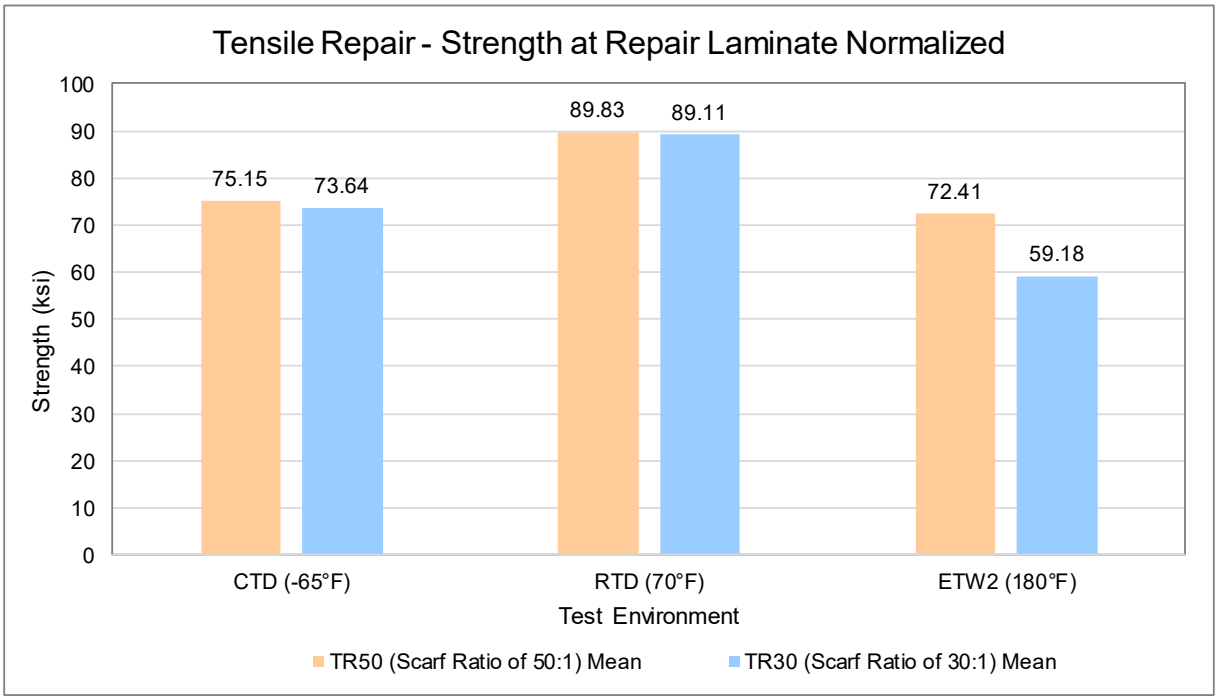


Figure 6-2: Comparison of Tension Repair Strength at Repair Laminate Results (Scarf Ratios of 50:1 and 30:1)

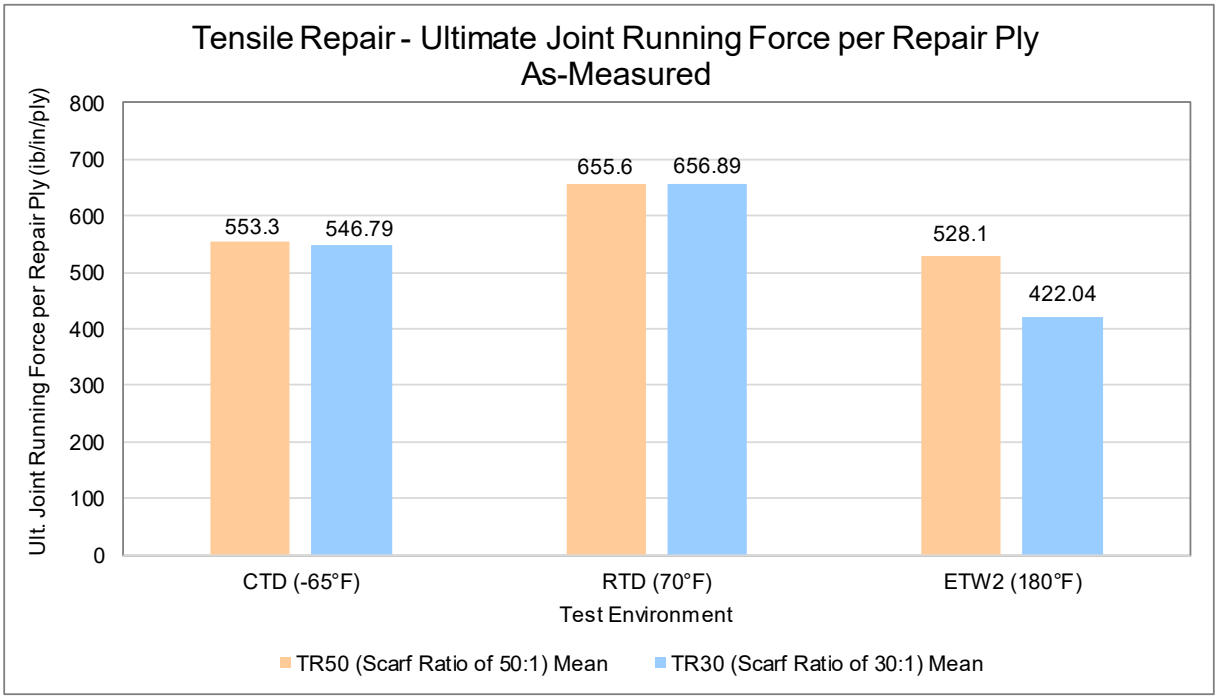
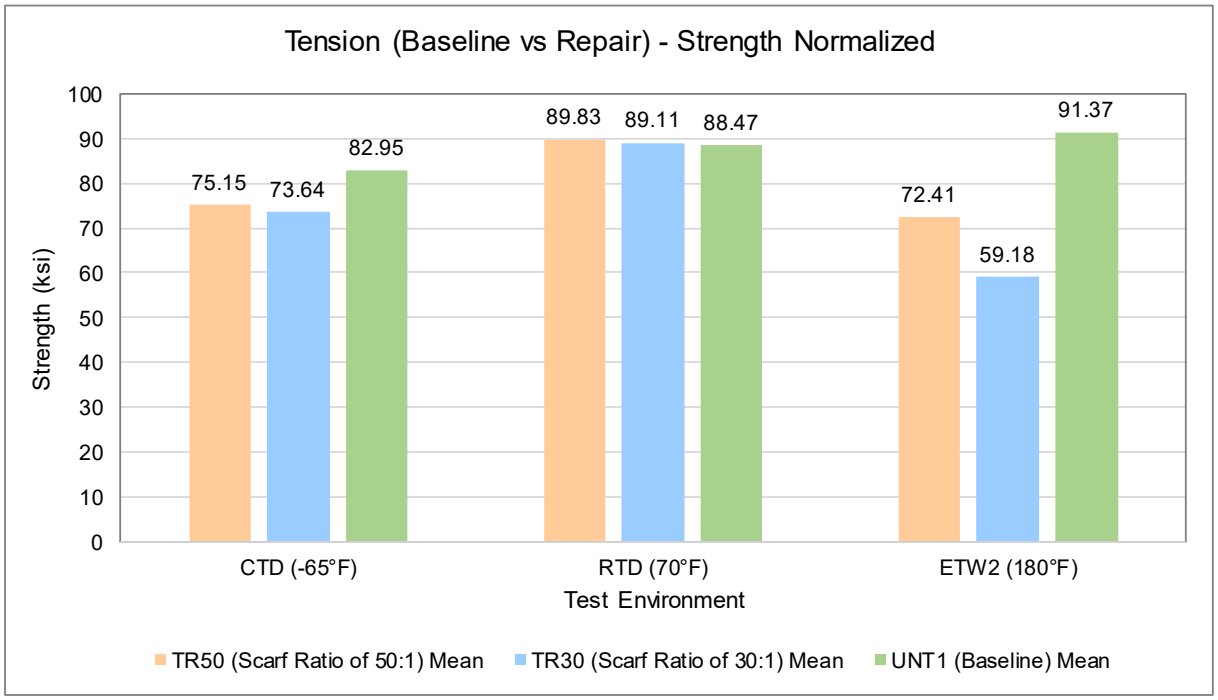


Figure 6-3: Comparison of Tension Repair Joint Running Force per Repair Ply Results (Scarf Ratios of 50:1 and 30:1)



Note: UNT1 (Baseline) unrepaired tension data was obtained from Solvay 5320-1 T650 3k-PW Qualification, quasi layup - [45/0/-45/90]2S with D3039 test method. TR50 and TR30 were obtained with D8131 test method.

Figure 6-4: Comparison of Tension Strength Results (Baseline, TR50 and TR30)

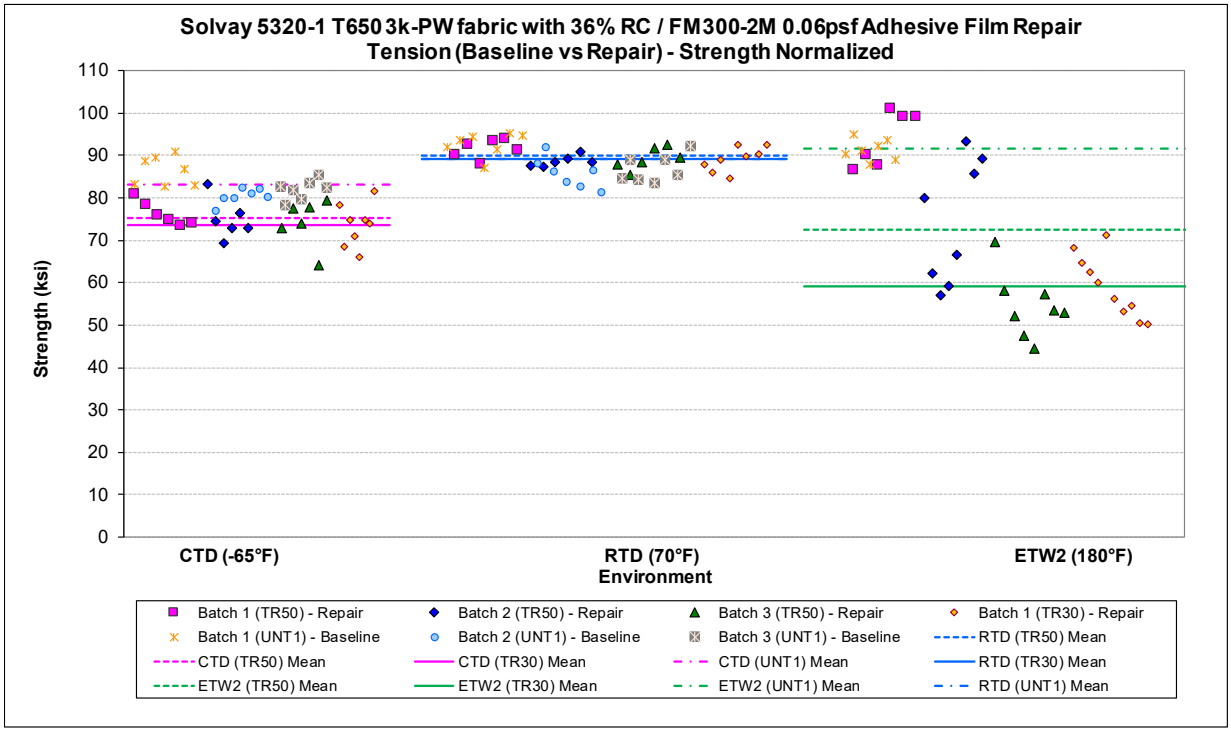


Figure 6-5: Data plot for Tension Strength Results (Baseline, TR50 and TR30)

6.2 Un-Notched Compression Test

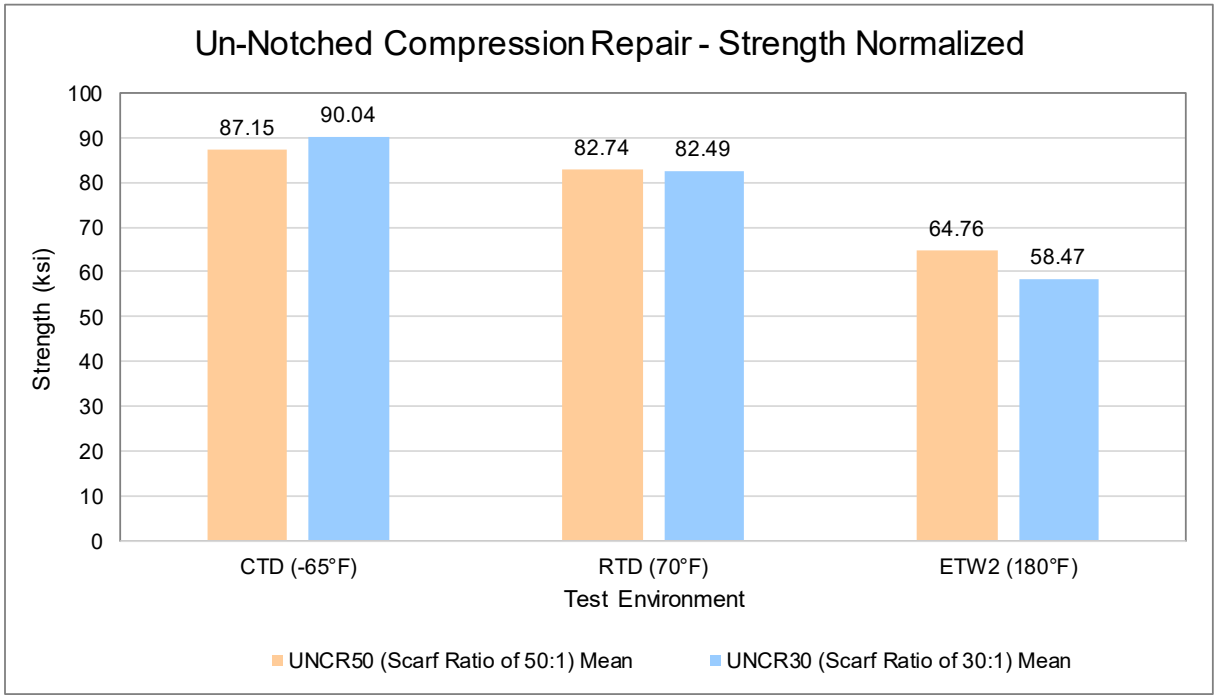


Figure 6-6: Comparison of Un-Notched Compression Repair Strength Results (Scarf Ratios of 50:1 and 30:1)

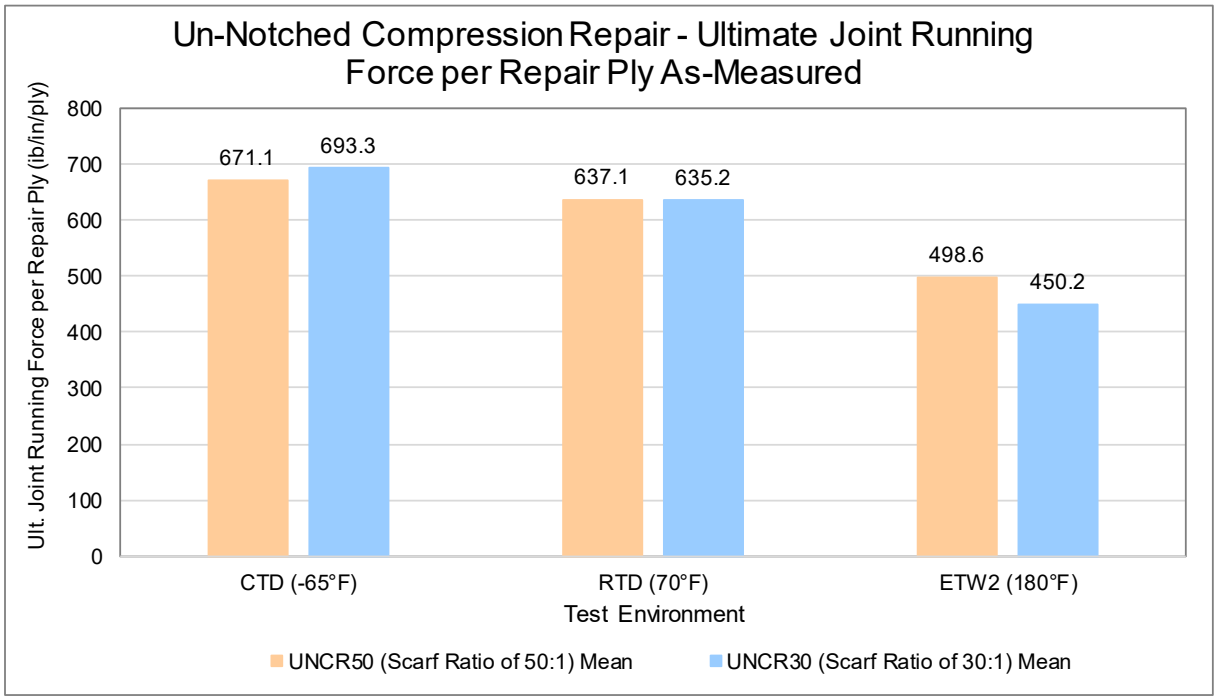


Figure 6-7: Comparison of Un-Notched Compression Repair Joint Running Force per Repair Ply Results (Scarf Ratios of 50:1 and 30:1)

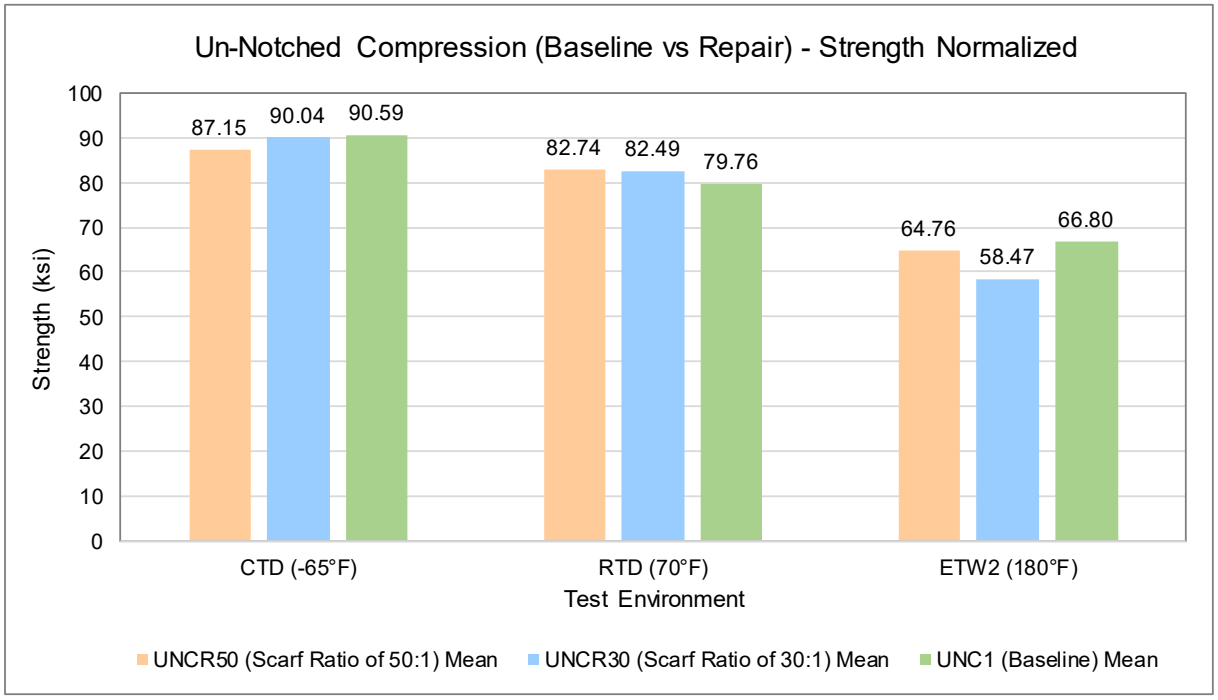


Figure 6-8: Comparison of Un-Notched Compression Strength Results (Baseline, UNCR50 and UNCR30)

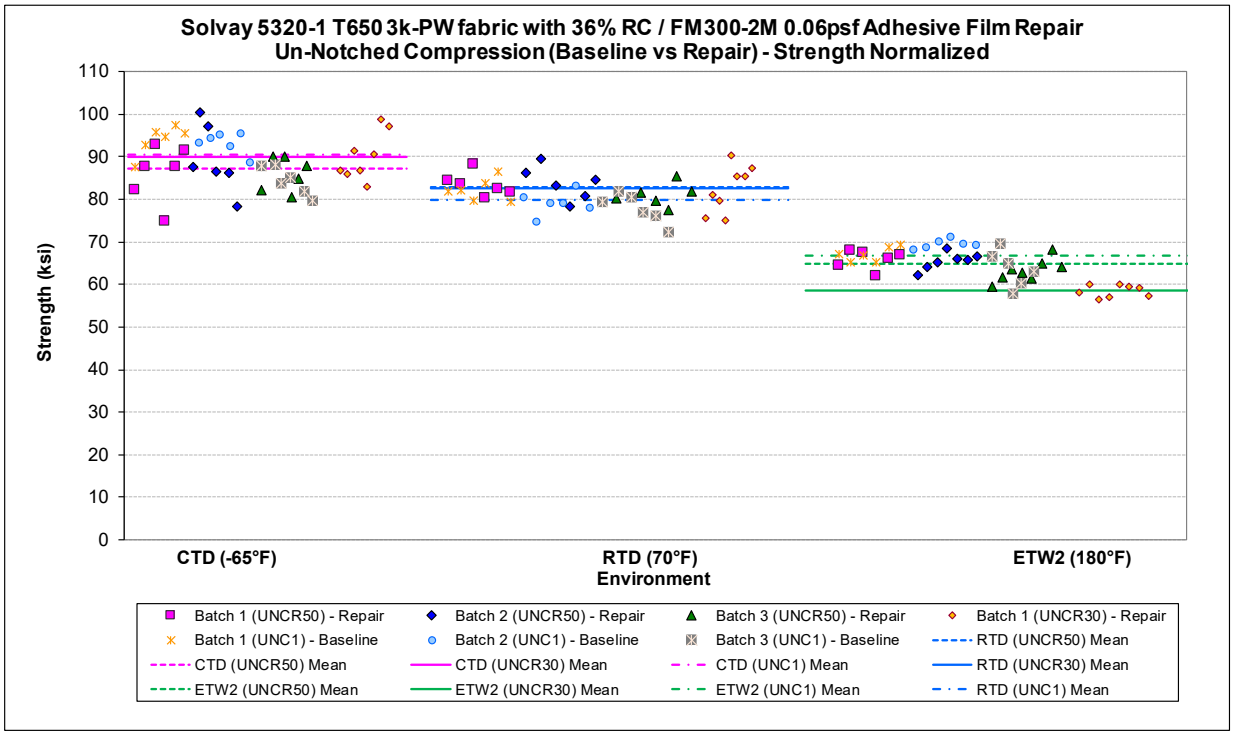
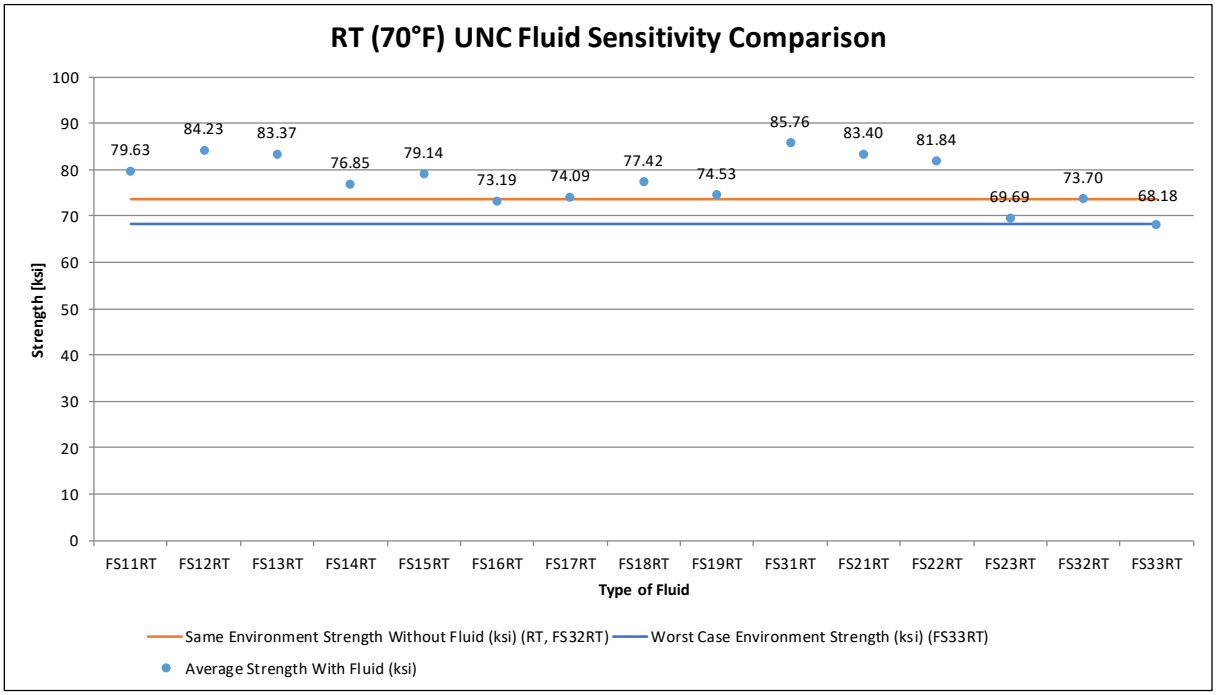


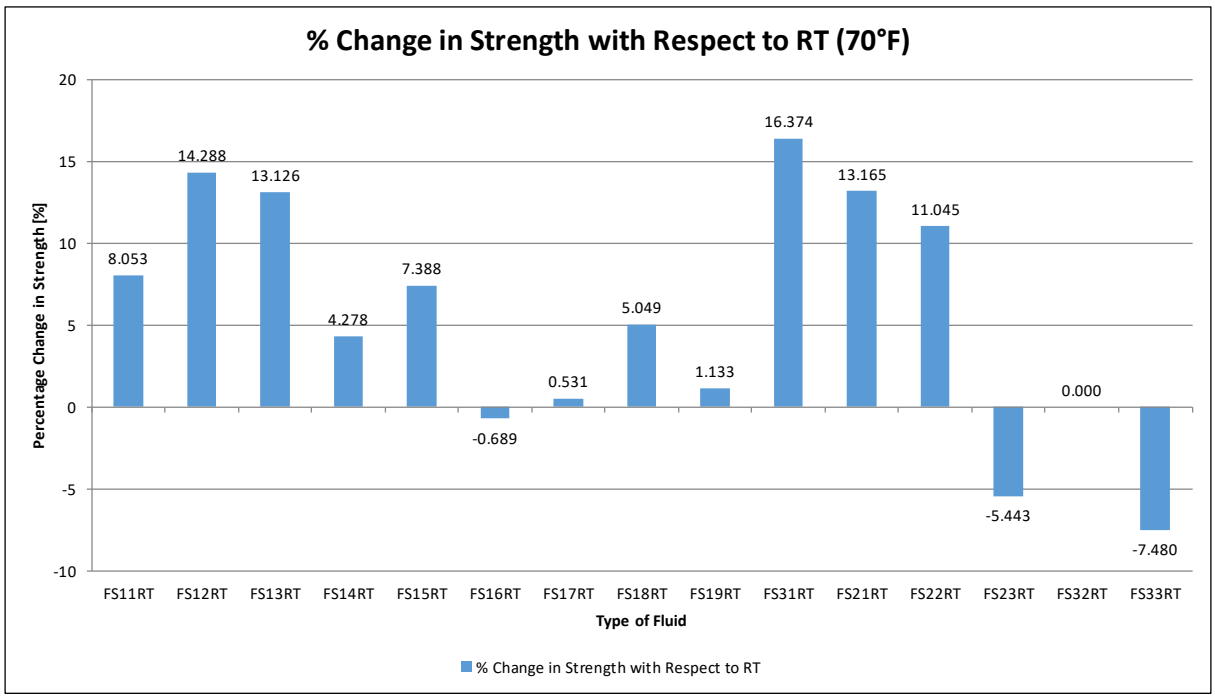
Figure 6-9: Data plot for Un-Notched Compression Strength Results (Baseline, UNCR50 and UNCR30)

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	
FS23RT	Isopropyl Alcohol Deicing	48±4 hrs @ 70°F ± 10F
FS32RT	Dry	Per section 6.1 Test Plan
FS33RT	85% Relative Humidity	


RT (70°F) UNC Fluid Sensitivity Comparison
Strength [ksi]
100
90
80
70
60
50
40
30
20
10
0
79.63
84.23
83.37
76.85
79.14
73.19
74.09
77.42
74.53
85.76
83.40
81.84
69.69
73.70
68.18
FS11RT
FS12RT
FS13RT
FS14RT
FS15RT
FS16RT
FS17RT
FS18RT
FS19RT
FS31RT
FS21RT
FS22RT
FS23RT
FS32RT
FS33RT
Type of Fluid
Same Environment Strength Without Fluid (ksi) (RT, FS32RT)
Worst Case Environment Strength (ksi) (FS33RT)
Average Strength With Fluid (ksi)

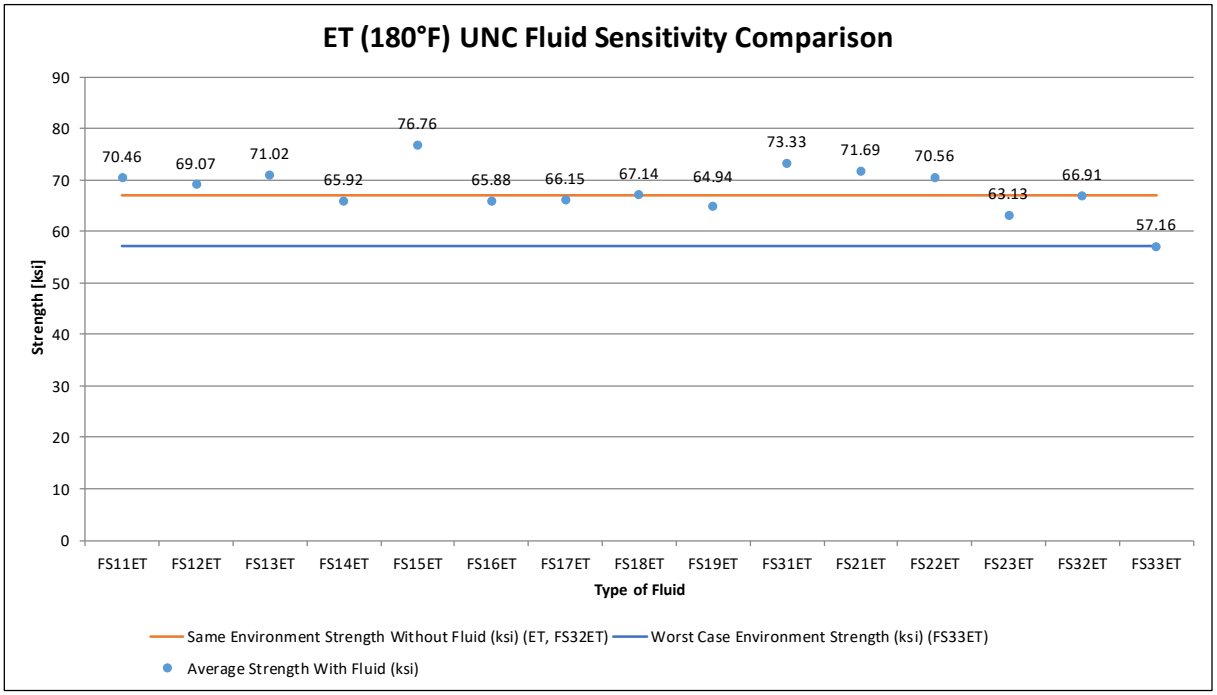

% Change in Strength with Respect to RT (70°F)
Percentage Change in Strength [%]
20
15
10
5
0
-5
-10
8.053
14.288
13.126
4.278
7.388
-0.689
0.531
5.049
1.133
16.374
13.165
11.045
-5.443
0.000
-7.480
FS11RT
FS12RT
FS13RT
FS14RT
FS15RT
FS16RT
FS17RT
FS18RT
FS19RT
FS31RT
FS21RT
FS22RT
FS23RT
FS32RT
FS33RT
Type of Fluid
% Change in Strength with Respect to RT

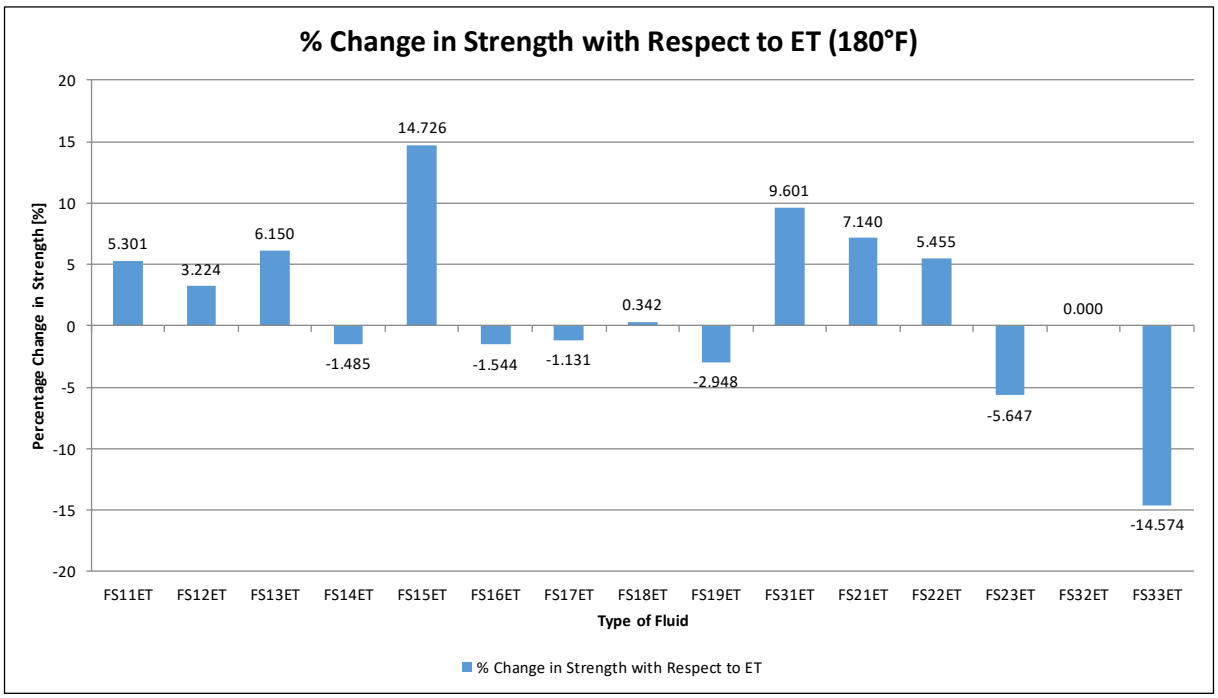
Fluid Sensitivity Screening
Un-Notched Compression Properties (UNCFS)--RT (70°F) Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

Fluid Code	Specimen Number	NAIR Batch #	NAIR Panel #	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Average
FS11RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11RT-1	A	6	1	7	74.03	0.1614	20	M(L,A)WT	79.63
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11RT-2	A	6	1	7	79.61	0.1656	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11RT-3	A	6	1	7	80.40	0.1655	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11RT-4	A	6	1	7	81.33	0.1659	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11RT-5	A	6	1	7	82.79	0.1653	20	M(L,A)GM	
FS12RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS12RT-1	A	7	1	7	80.75	0.1633	20	M(L,A)GM	84.23
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS12RT-1	A	8	1	7	84.79	0.1499	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS12RT-2	A	8	1	7	83.30	0.1554	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS12RT-3	A	8	1	7	84.10	0.1564	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS12RT-4	A	8	1	7	88.20	0.1545	20	M(L,A)WT	
FS13RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS13RT-1	A	7	1	7	77.80	0.1726	20	M(L,A)GM	83.37
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13RT-1	A	7	1	7	82.79	0.1514	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13RT-2	A	7	1	7	84.41	0.1566	20	LGM, AWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13RT-3	A	7	1	7	84.13	0.1572	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13RT-4	A	7	1	7	87.72	0.1564	20	M(L,A)WB	
FS14RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14RT-1	A	1	1	9	75.32	0.1620	20	M(A,L)WB	76.85
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14RT-2	A	1	1	9	79.73	0.1708	20	M(A,L)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14RT-3	A	1	1	9	78.21	0.1717	20	M(A,L)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14RT-4	A	1	1	9	75.72	0.1696	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14RT-5	A	1	1	9	75.27	0.1708	20	M(A,L)GM	
FS15RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15RT-1	A	1	1	9	80.21	0.1522	20	M(L,A)WB	79.14
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15RT-2	A	1	1	9	78.82	0.1571	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15RT-3	A	1	1	9	81.75	0.1574	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15RT-4	A	1	1	9	78.69	0.1557	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15RT-5	A	1	1	9	76.25	0.1568	20	M(L,A)WB	
FS16RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16RT-1	A	1	1	10	75.22	0.1653	20	M(L,A)WT	73.19
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16RT-2	A	1	1	10	70.85	0.1692	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16RT-3	A	1	1	10	72.46	0.1704	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16RT-4	A	1	1	10	72.55	0.1709	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16RT-5	A	1	1	10	74.86	0.1713	20	M(L,A)GM, AWB	
FS17RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17RT-1	A	1	1	10	71.01	0.1524	20	LWT	74.09
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17RT-2	A	1	1	10	74.01	0.1604	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17RT-3	A	1	1	10	73.60	0.1606	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17RT-4	A	1	1	10	77.45	0.1591	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17RT-5	A	1	1	10	74.37	0.1598	20	LWT	
FS18RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18RT-1	B	1	2	9	77.52	0.1638	20	M(L,A)WB	77.42
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18RT-2	B	1	2	9	79.10	0.1656	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18RT-3	B	1	2	9	79.10	0.1667	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18RT-4	B	1	2	9	76.33	0.1672	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18RT-5	B	1	2	9	75.04	0.1666	20	M(L,A)WT	
FS19RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19RT-1	B	1	2	9	79.08	0.1615	20	M(L,A)WT	74.53
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19RT-2	B	1	2	9	74.32	0.1656	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19RT-3	B	1	2	9	69.81	0.1656	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19RT-4	B	1	2	9	74.53	0.1671	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19RT-5	B	1	2	9	74.93	0.1672	20	LWB	
FS21RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21RT-1	A	8	1	7	80.46	0.1510	20	LWT	85.76
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21RT-2	A	8	1	7	86.64	0.1549	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21RT-3	A	8	1	7	84.33	0.1558	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21RT-4	A	8	1	7	83.65	0.1548	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21RT-5	A	8	1	7	93.74	0.1548	20	M(L,A)WT	
FS22RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS22RT-1	A	6	1	8	85.84	0.1563	20	M(L,A)WB	83.40
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS22RT-2	A	6	1	8	87.10	0.1564	20	AWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS22RT-3	A	6	1	8	86.17	0.1569	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS22RT-4	A	6	1	8	81.10	0.1566	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6B-FS22RT-1	A	6	1	8	76.78	0.1581	20	M(L,A)GM	
FS23RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7A-FS23RT-1	A	7	1	8	82.15	0.1510	20	M(L,A)WT	81.84
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7A-FS23RT-2	A	7	1	8	77.58	0.1580	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7A-FS23RT-3	A	7	1	8	78.91	0.1580	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7A-FS23RT-4	A	7	1	8	85.96	0.1581	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7A-FS23RT-5	A	7	1	8	84.58	0.1584	20	M(L,A)WT	
FS31RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31RT-1	C	10	3	10	64.02	0.1614	20	M(L,A)WB	69.69
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31RT-2	C	10	3	10	66.99	0.1669	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31RT-3	C	10	3	10	68.30	0.1680	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31RT-4	C	10	3	10	73.05	0.1677	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31RT-5	C	10	3	10	76.07	0.1683	20	M(L,A)GM	
FS32RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32RT-1	B	10	2	10	70.37	0.1642	20	LWB	73.70
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32RT-2	B	10	2	10	74.52	0.1672	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32RT-3	B	10	2	10	74.44	0.1678	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32RT-4	B	10	2	10	71.55	0.1688	20	AGM, AWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32RT-5	B	10	2	10	77.61	0.1683	20	M(L,A)WB	
FS33RT	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33RT-1	B	10	2	10	69.31	0.1578	20	M(L,A)WB	68.18
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33RT-2	B	10	2	10	63.30	0.1633	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33RT-3	B	10	2	10	68.91	0.1648	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33RT-4	B	10	2	10	70.35	0.1654	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33RT-5	B	10	2	10	69.05	0.1661	20	M(L,A)WB	

7.2 Elevated Temperature (180°F) 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	Sea 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
FS32ET	Dry	Per section 6.1 Test Plan
FS33ET	85% Relative Humidity	

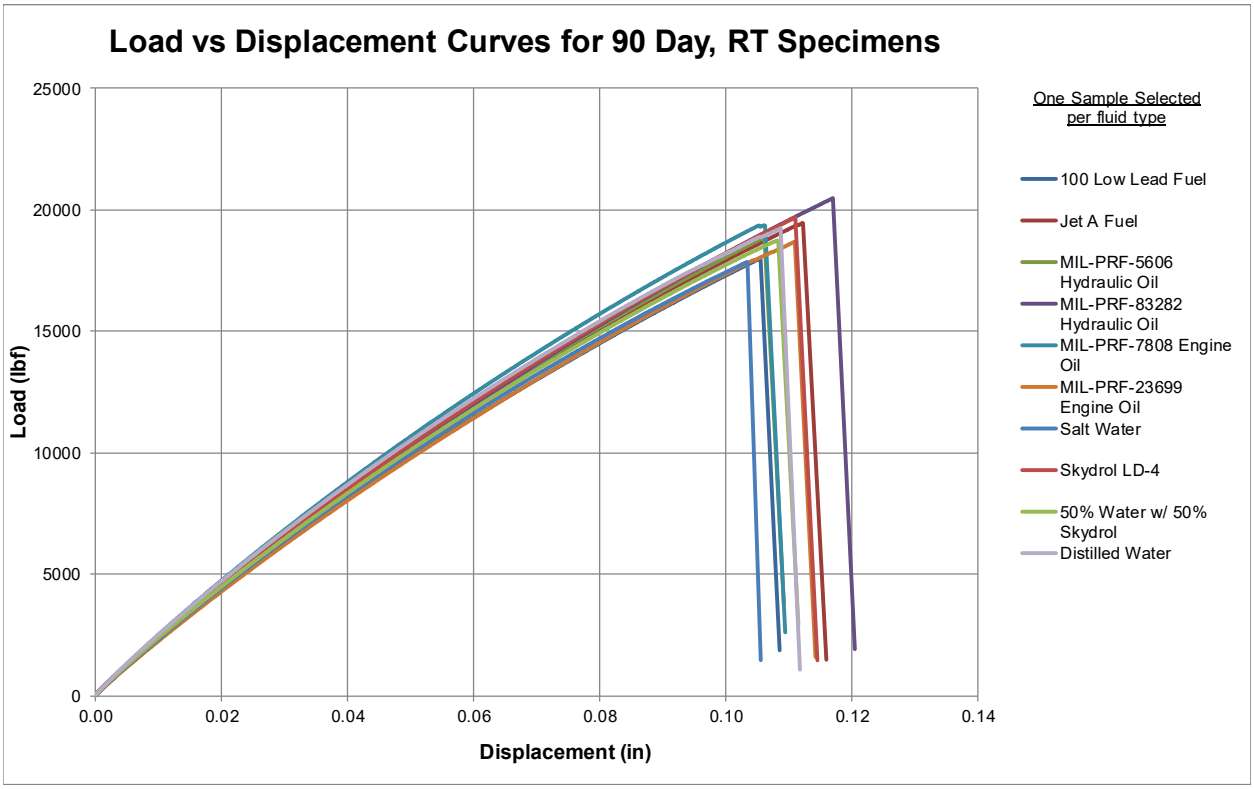

ET (180°F) UNC Fluid Sensitivity Comparison
Strength [ksi]
90
80
70
60
50
40
30
20
10
0
70.46
69.07
71.02
65.92
76.76
65.88
66.15
67.14
64.94
73.33
71.69
70.56
63.13
66.91
57.16
FS11ET
FS12ET
FS13ET
FS14ET
FS15ET
FS16ET
FS17ET
FS18ET
FS19ET
FS31ET
FS21ET
FS22ET
FS23ET
FS32ET
FS33ET
Type of Fluid
Same Environment Strength Without Fluid (ksi) (ET, FS32ET)
Worst Case Environment Strength (ksi) (FS33ET)
Average Strength With Fluid (ksi)

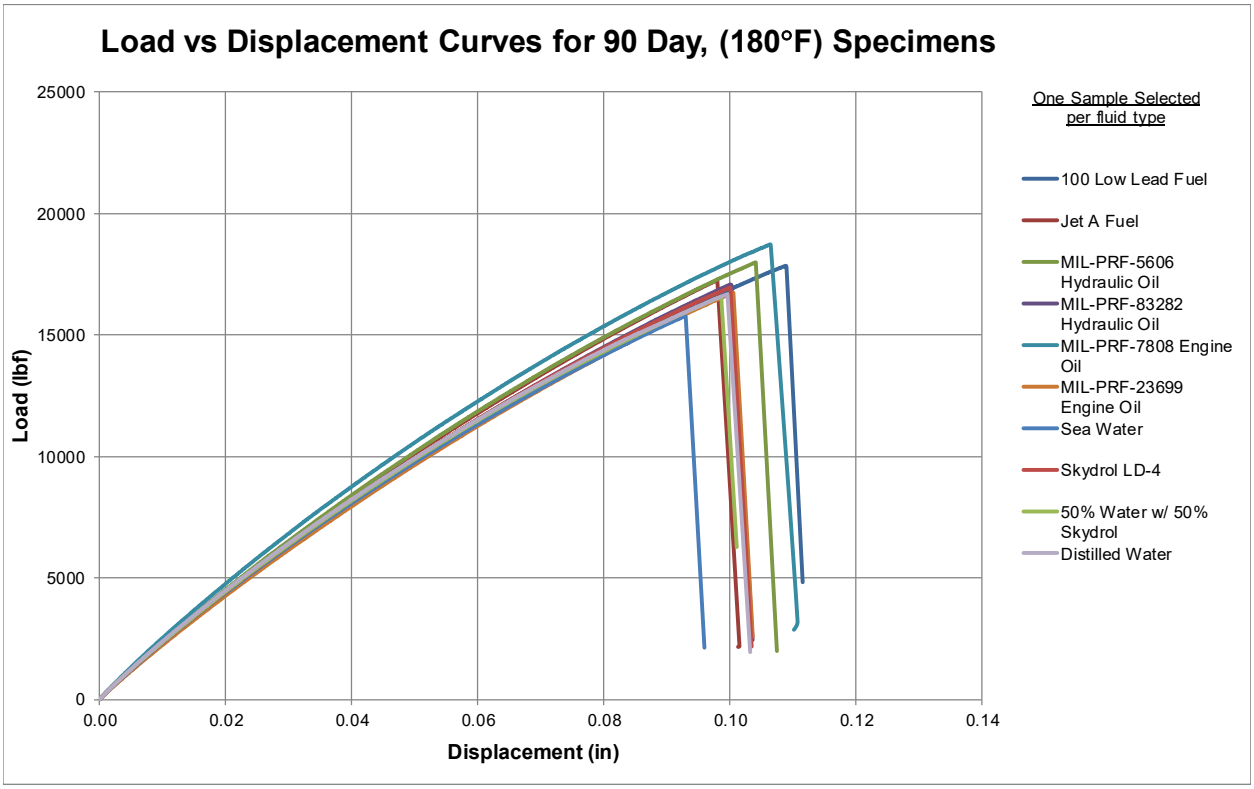

% Change in Strength with Respect to ET (180°F)
Percentage Change in Strength [%]
20
15
10
5
0
-5
-10
-15
-20
5.301
3.224
6.150
-1.485
14.726
-1.544
-1.131
0.342
-2.948
9.601
7.140
5.455
-5.647
0.000
-14.574
FS11ET
FS12ET
FS13ET
FS14ET
FS15ET
FS16ET
FS17ET
FS18ET
FS19ET
FS31ET
FS21ET
FS22ET
FS23ET
FS32ET
FS33ET
Type of Fluid
% Change in Strength with Respect to ET

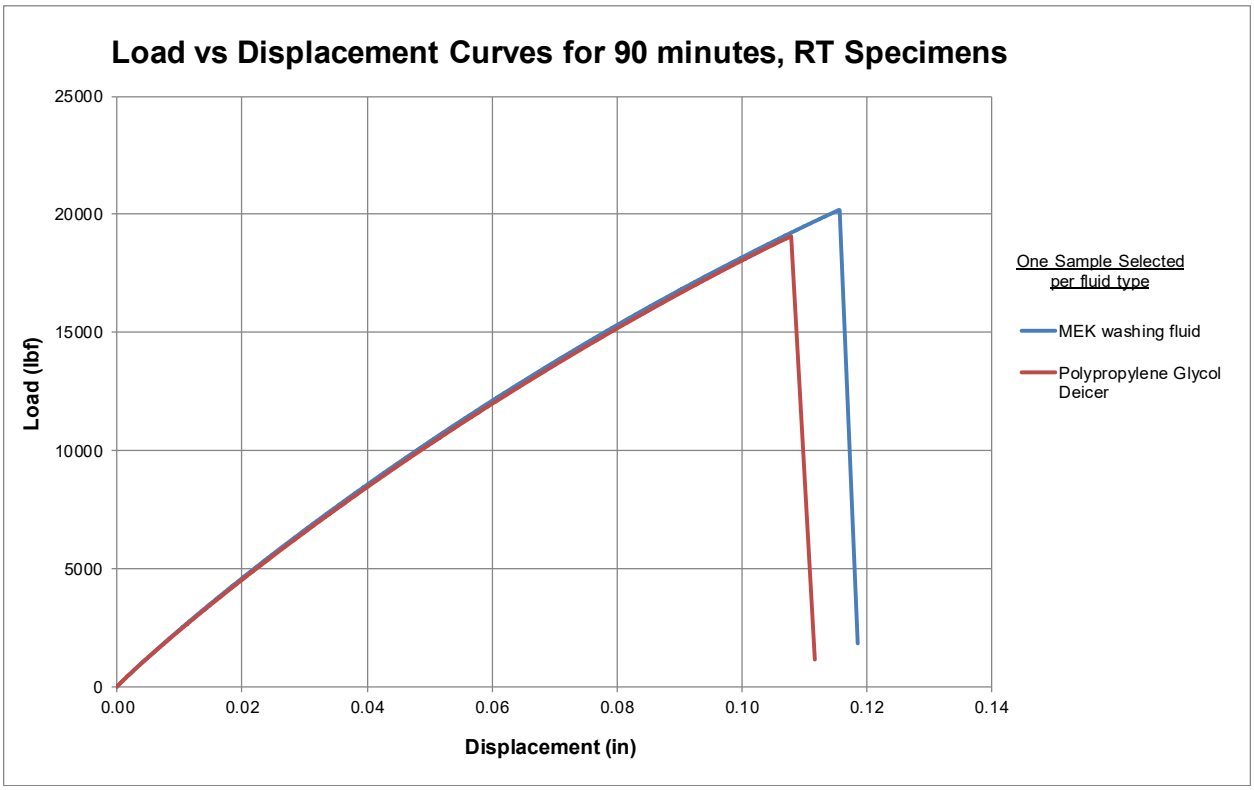
Fluid Sensitivity Screening
Un-Notched Compression Properties (UNCFS)--ET (180°F) Strength
Solvay 5320-1 T650 3k-PW fabric with 36% RC / FM300-2M 0.06psf Adhesive Film Repair

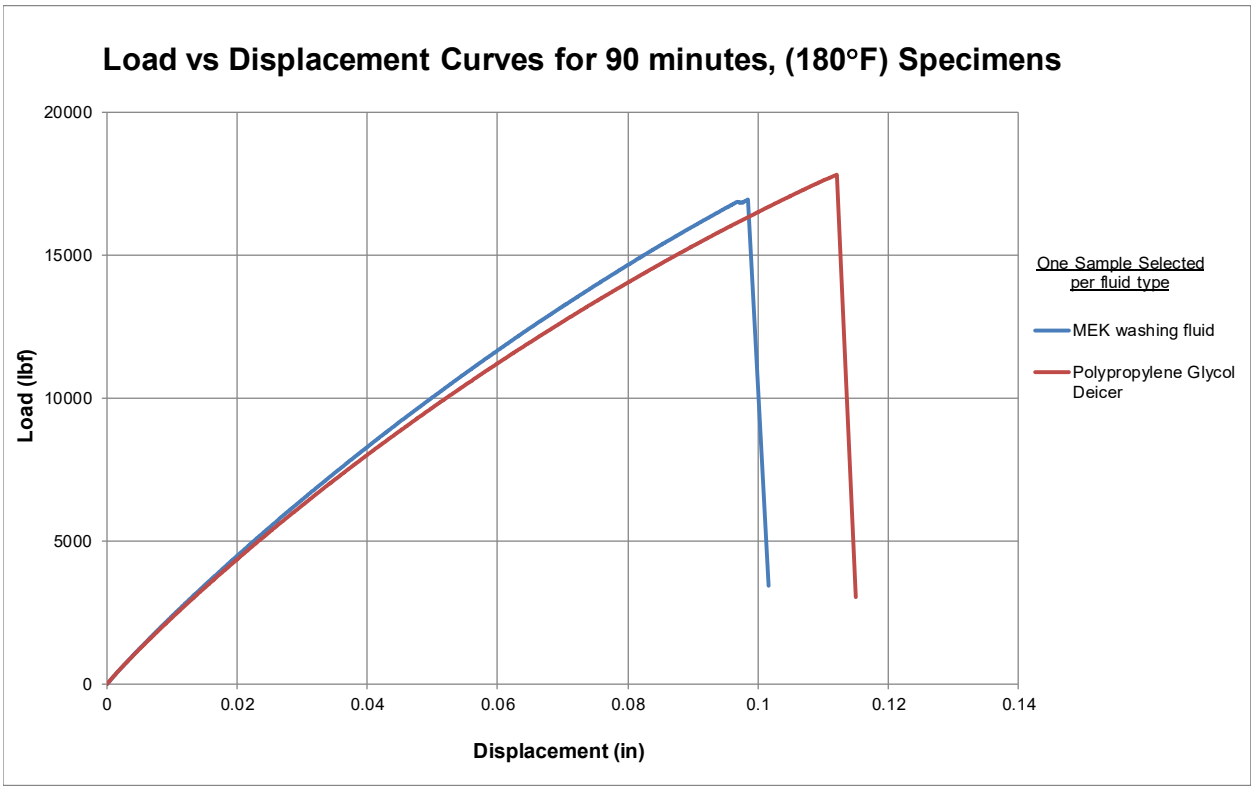
Fluid Code	Specimen Number	NAIR Batch #	NAIR Panel #	Prepreg Lot #	Cure Cycle #	Strength [ksi]	Avg. Specimen Thickness [in]	# Plies in Laminate	Failure Mode	Average
FS11ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11ET-1	A	6	1	7	72.01	0.1648	20	LWB	70.46
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-6a-FS11ET-2	A	6	1	7	69.68	0.1641	20	M(A,L)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS11ET-1	A	8	1	7	71.16	0.1547	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS11ET-2	A	8	1	7	71.02	0.1563	20	M(A,L)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8a-FS11ET-3	A	8	1	7	68.42	0.1560	20	M(A,L)WT	
FS12ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS12ET-1	A	7	1	7	67.19	0.1708	20	LGM, M(L,A)WT	69.07
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS12ET-2	A	7	1	7	71.89	0.1722	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS12ET-3	A	7	1	7	70.61	0.1728	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS12ET-4	A	7	1	7	67.16	0.1724	20	M(A,L)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7a-FS12ET-5	A	7	1	7	68.48	0.1722	20	M(L,A)WB	
FS13ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13ET-1	A	7	1	7	76.20	0.1569	20	M(L,A)WT	71.02
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13ET-2	A	7	1	7	75.54	0.1574	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-7b-FS13ET-3	A	7	1	7	75.27	0.1574	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2A-FS13ET-1	C	2	3	10	61.88	0.1606	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2A-FS13ET-2	C	2	3	10	66.24	0.1684	20	LWB	
FS14ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14ET-1	A	1	1	9	65.85	0.1725	20	M(L,A)GM	65.92
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14ET-2	A	1	1	9	67.94	0.1724	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14ET-3	A	1	1	9	65.37	0.1705	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14ET-4	A	1	1	9	68.16	0.1698	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1a-FS14ET-5	A	1	1	9	62.25	0.1684	20	LWB	
FS15ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15ET-1	A	1	1	9	79.22	0.1572	20	M(L,A)GM	76.76
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15ET-2	A	1	1	9	78.04	0.1565	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15ET-3	A	1	1	9	79.73	0.1561	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15ET-4	A	1	1	9	73.02	0.1571	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C9-1b-FS15ET-5	A	1	1	9	73.80	0.1550	20	M(L,A)WB	
FS16ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16ET-1	A	1	1	10	66.11	0.1704	20	M(L,A)GM	65.88
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16ET-2	A	1	1	10	64.57	0.1694	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16ET-3	A	1	1	10	65.33	0.1705	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16ET-4	A	1	1	10	67.20	0.1689	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1A-FS16ET-5	A	1	1	10	66.16	0.1660	20	M(L,A)GM	
FS17ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17ET-1	A	1	1	10	65.81	0.1592	20	M(L,A)WT	66.15
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17ET-2	A	1	1	10	67.58	0.1582	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17ET-3	A	1	1	10	66.38	0.1580	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17ET-4	A	1	1	10	65.90	0.1579	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C10-1B-FS17ET-5	A	1	1	10	65.09	0.1552	20	M(L,A)WB	
FS18ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18ET-1	B	1	2	9	68.52	0.1673	20	M(L,A)WB	67.14
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18ET-2	B	1	2	9	68.65	0.1677	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18ET-3	B	1	2	9	67.87	0.1662	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18ET-4	B	1	2	9	66.42	0.1652	20	M(A,L)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1A-FS18ET-5	B	1	2	9	64.22	0.1632	20	LGM	
FS19ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19ET-1	B	1	2	9	62.30	0.1675	20	M(A,L)WT	64.94
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19ET-2	B	1	2	9	65.50	0.1678	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19ET-3	B	1	2	9	64.54	0.1666	20	M(A,L)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19ET-4	B	1	2	9	66.06	0.1665	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C9-1B-FS19ET-5	B	1	2	9	66.28	0.1647	20	M(A,L)WT, M(A,L)GM	
FS21ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21ET-1	A	8	1	7	72.58	0.1552	20	LWT	73.33
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-8b-FS21ET-2	A	8	1	7	75.26	0.1559	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS21ET-1	A	6	1	8	70.74	0.1511	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS21ET-2	A	6	1	8	72.13	0.1568	20	M(L,A)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6A-FS21ET-3	A	6	1	8	75.96	0.1562	20	M(L,A)GM	
FS22ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6B-FS22ET-1	A	6	1	8	70.31	0.1635	20	M(L,A)GM	71.69
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6B-FS22ET-2	A	6	1	8	70.12	0.1628	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6B-FS22ET-3	A	6	1	8	72.62	0.1630	20	M(L,A)WB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6B-FS22ET-4	A	6	1	8	72.19	0.1626	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-6B-FS22ET-5	A	6	1	8	73.19	0.1629	20	M(L,A)GM	
FS23ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7B-FS23ET-1	A	7	1	8	69.52	0.1636	20	M(L,A)WB	70.56
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7B-FS23ET-2	A	7	1	8	67.72	0.1713	20	LWB	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7B-FS23ET-3	A	7	1	8	70.90	0.1733	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7B-FS23ET-4	A	7	1	8	72.59	0.1733	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-7B-FS23ET-5	A	7	1	8	72.06	0.1725	20	M(L,A)GM	
FS31ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31ET-1	C	10	3	10	63.22	0.1686	20	LWT	63.13
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31ET-2	C	10	3	10	63.18	0.1685	20	M(A,L)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31ET-3	C	10	3	10	65.81	0.1686	20	LGM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31ET-4	C	10	3	10	62.20	0.1682	20	M(A,L)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-C-C10-2B-FS31ET-5	C	10	3	10	61.25	0.1671	20	LWB	
FS32ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32ET-1	B	10	2	10	67.83	0.1691	20	M(L,A)GM	66.91
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32ET-2	B	10	2	10	69.16	0.1680	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32ET-3	B	10	2	10	67.67	0.1679	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32ET-4	B	10	2	10	66.05	0.1669	20	M(L,A)GM	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2A-FS32ET-5	B	10	2	10	63.84	0.1641	20	M(L,A)WB	
FS33ET	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33ET-1	B	10	2	10	53.46	0.1663	20	M(A,L)WT	57.16
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33ET-2	B	10	2	10	57.08	0.1664	20	M(A,L)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33ET-3	B	10	2	10	59.46	0.1661	20	LWT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33ET-4	B	10	2	10	57.05	0.1646	20	M(A,L)GM, M(A,L)WT	
	NTP5325QR1-SOL-S36-NIAR-UNCFS-B-C10-2B-FS33ET-5	B	10	2	10	58.74	0.1634	20	LGM	

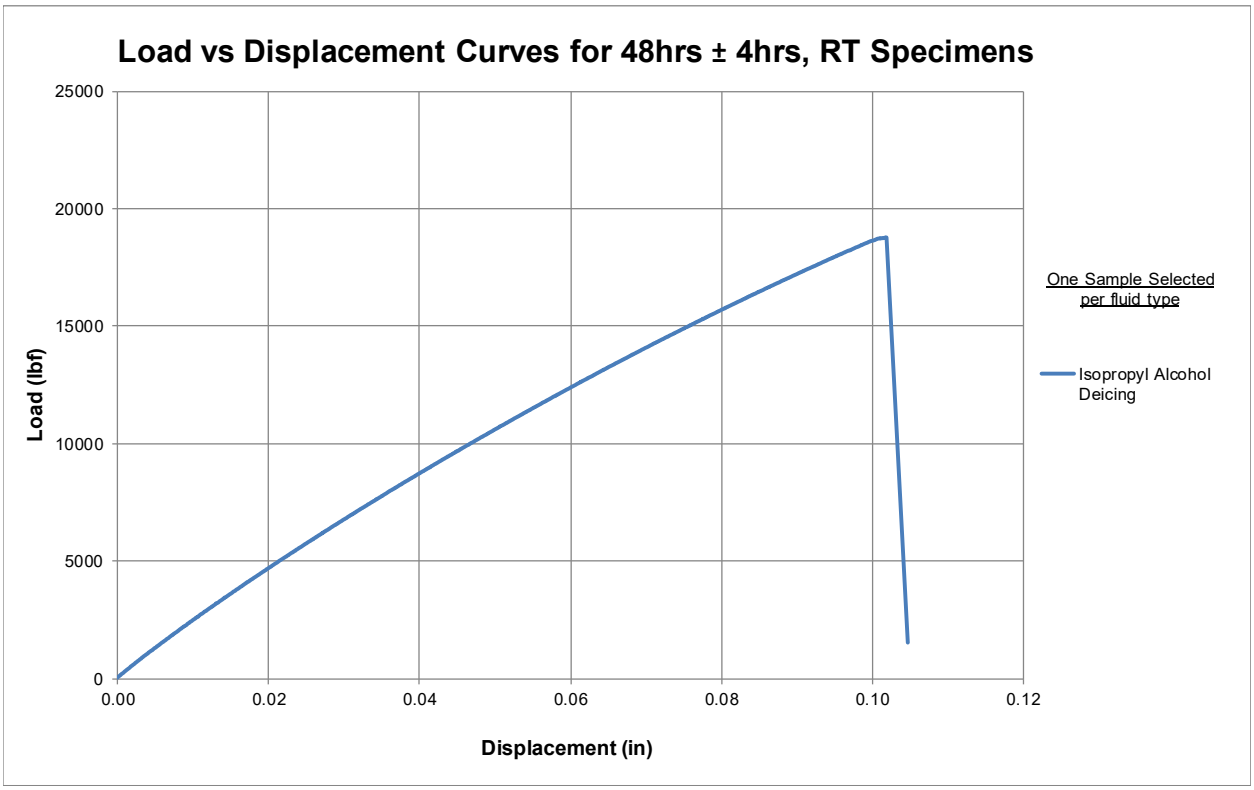
7.3 Load Displacement Curves

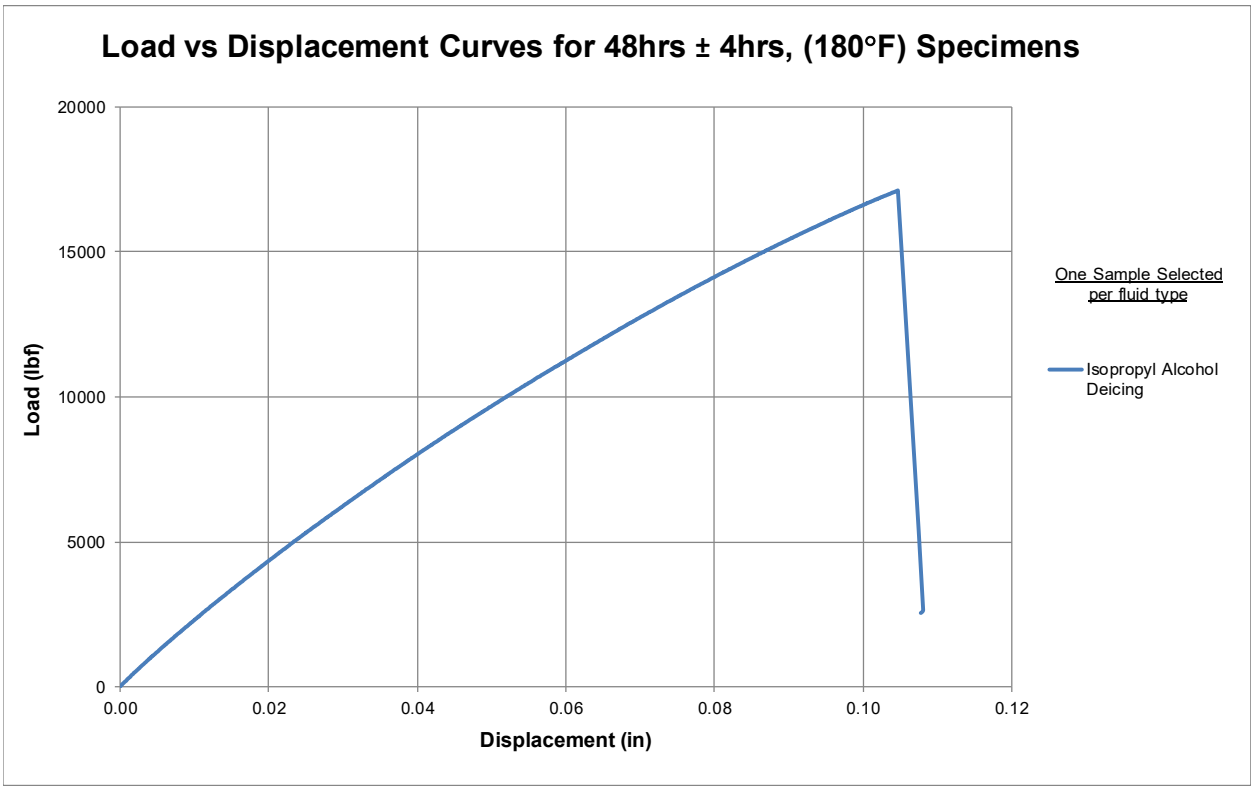


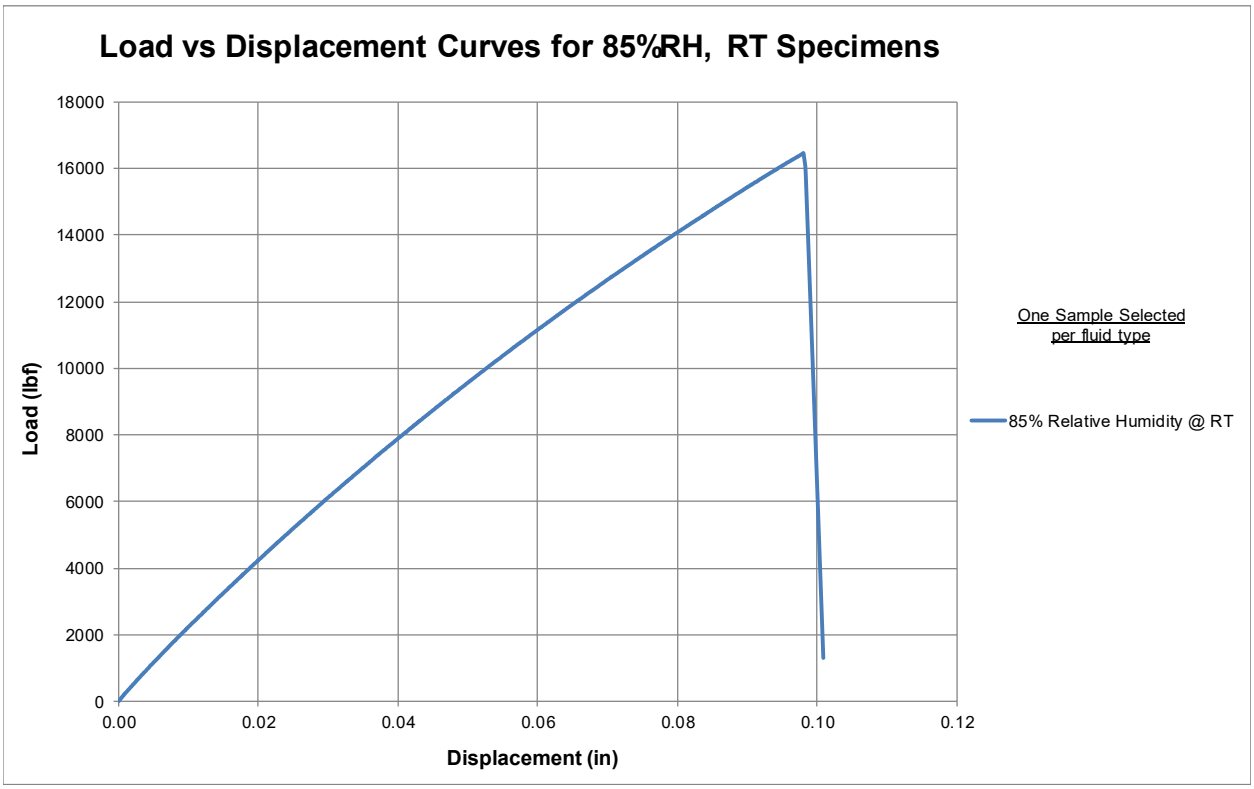


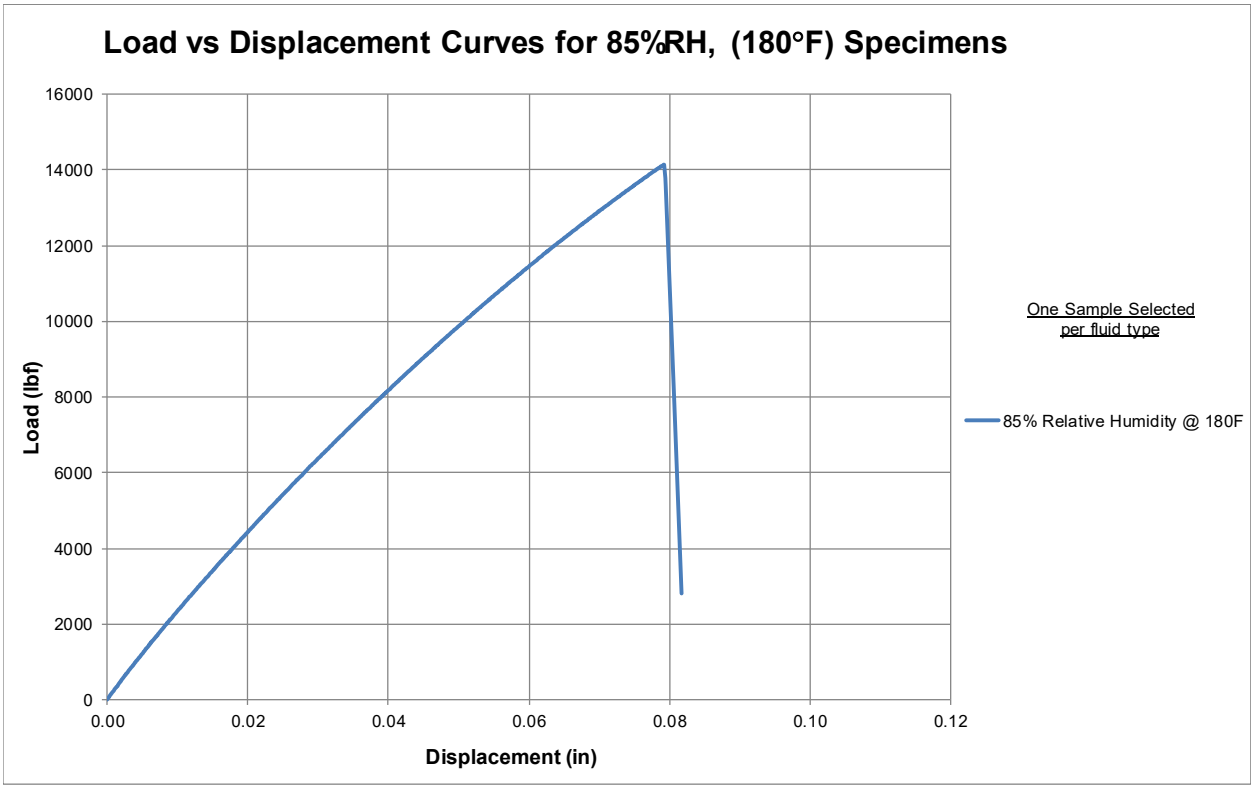

Load vs Displacement Curves for 90 minutes, RT Specimens
25000
20000
15000
10000
5000
0
Load (lbf)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
Displacement (in)
One Sample Selected per fluid type
MEK washing fluid
Polypropylene Glycol Deicer


Load vs Displacement Curves for 90 minutes, (180°F) Specimens
20000
15000
10000
5000
0
Load (lbf)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
Displacement (in)
One Sample Selected per fluid type
MEK washing fluid
Polypropylene Glycol Deicer


Load vs Displacement Curves for 48hrs ± 4hrs, RT Specimens
25000
20000
15000
10000
5000
0
Load (lbf)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Displacement (in)
One Sample Selected per fluid type
Isopropyl Alcohol Deicing

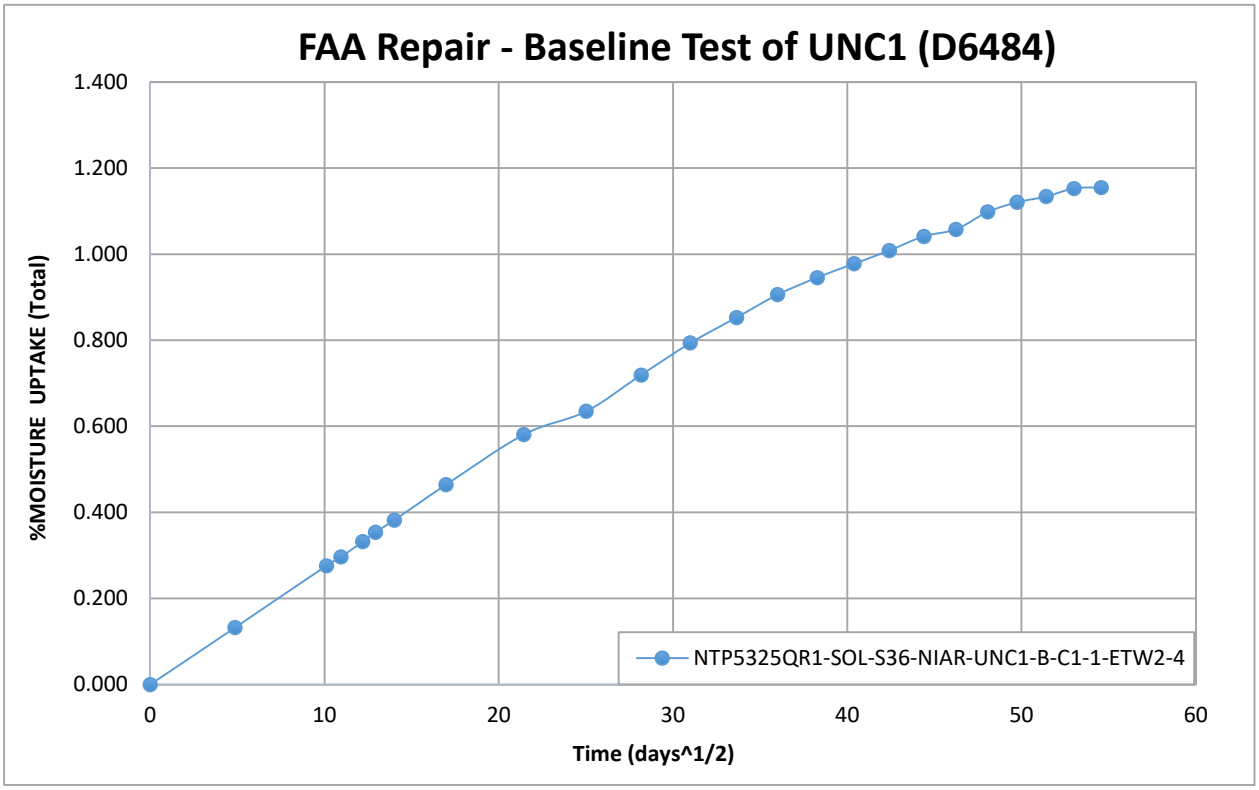

Load vs Displacement Curves for 48hrs ± 4hrs, (180°F) Specimens
20000
15000
10000
5000
0
Load (lbf)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Displacement (in)
One Sample Selected per fluid type
Isopropyl Alcohol Deicing


Load vs Displacement Curves for 85%RH, RT Specimens
Load (lbf)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Displacement (in)
One Sample Selected per fluid type
85% Relative Humidity @ RT


Load vs Displacement Curves for 85%RH, (180°F) Specimens
Load (lbf)
16000
14000
12000
10000
8000
6000
4000
2000
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Displacement (in)
One Sample Selected per fluid type
85% Relative Humidity @ 180F

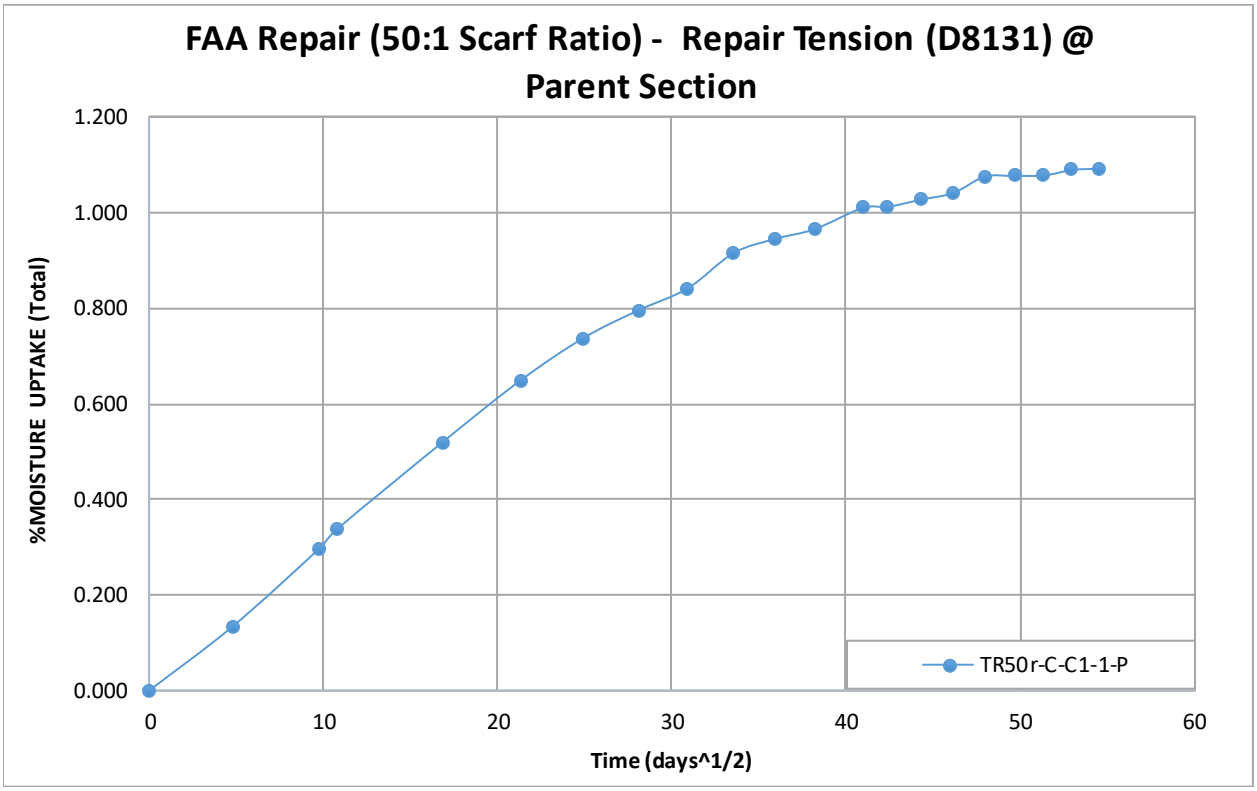
8. Moisture Conditioning Charts

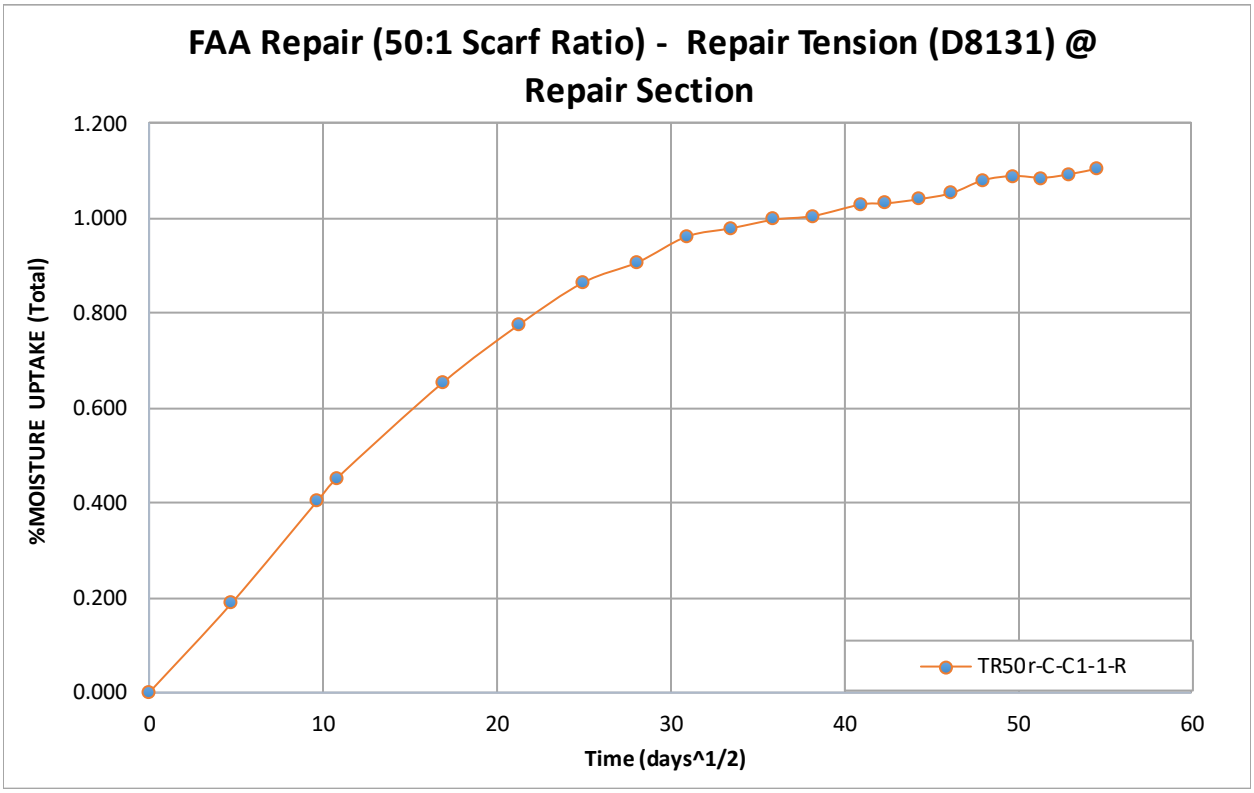
8.1 Baseline Test of UNC1

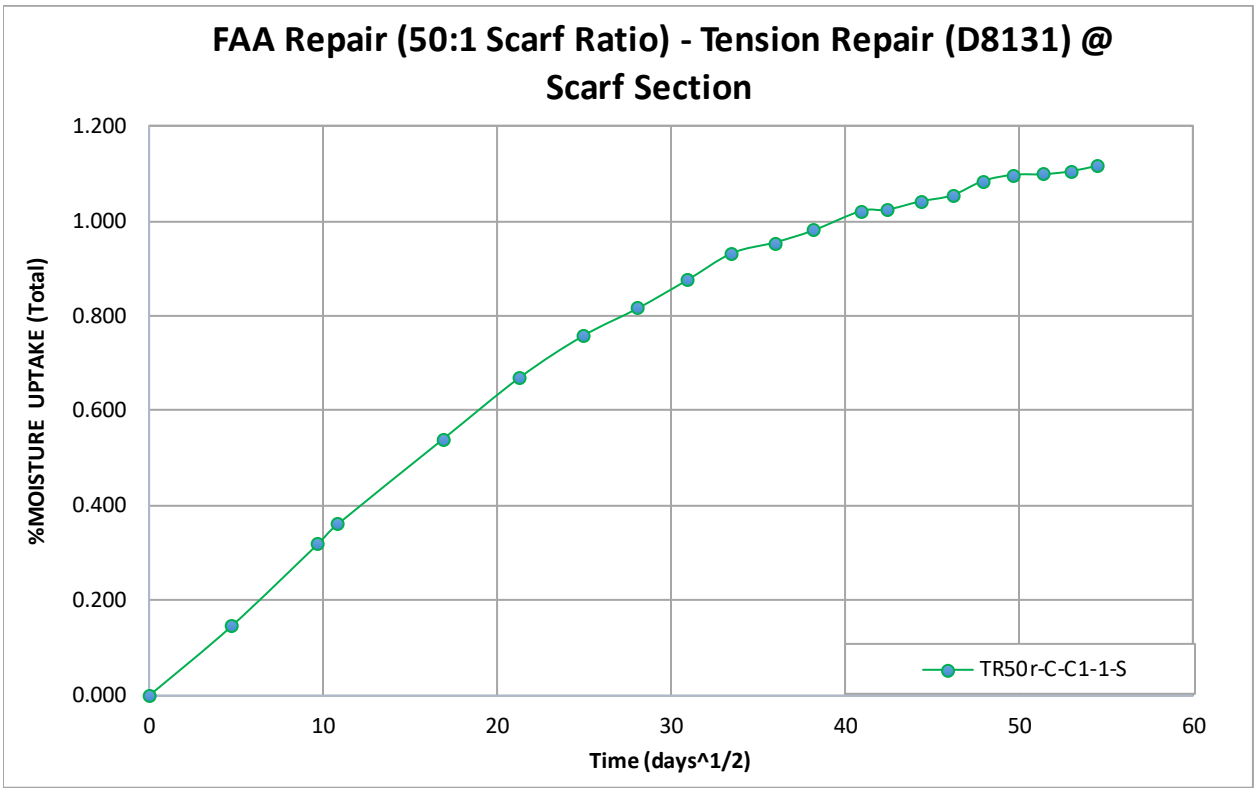


8.2 Laminate Level Repair (Scarf Ratio of 50:1) - Qualification

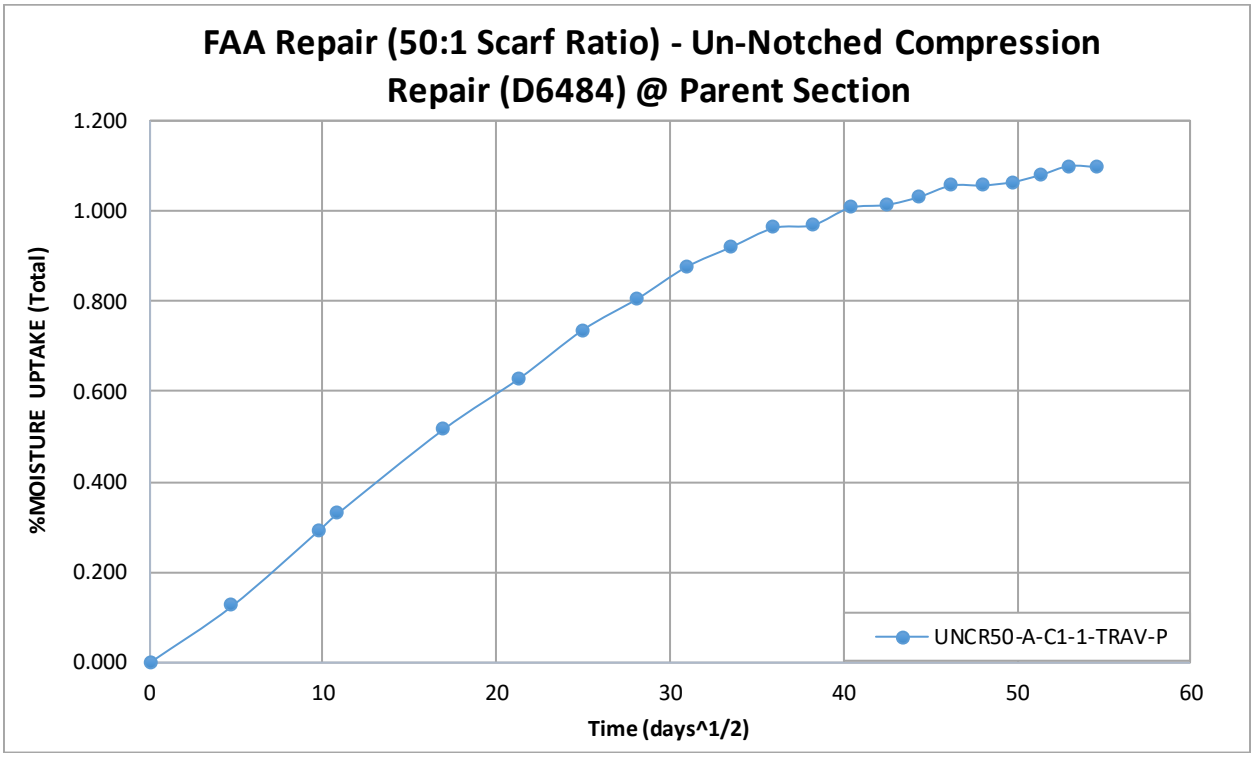
8.2.1 Tension Repair with Scarf Ratio of 50:1 (TR50)

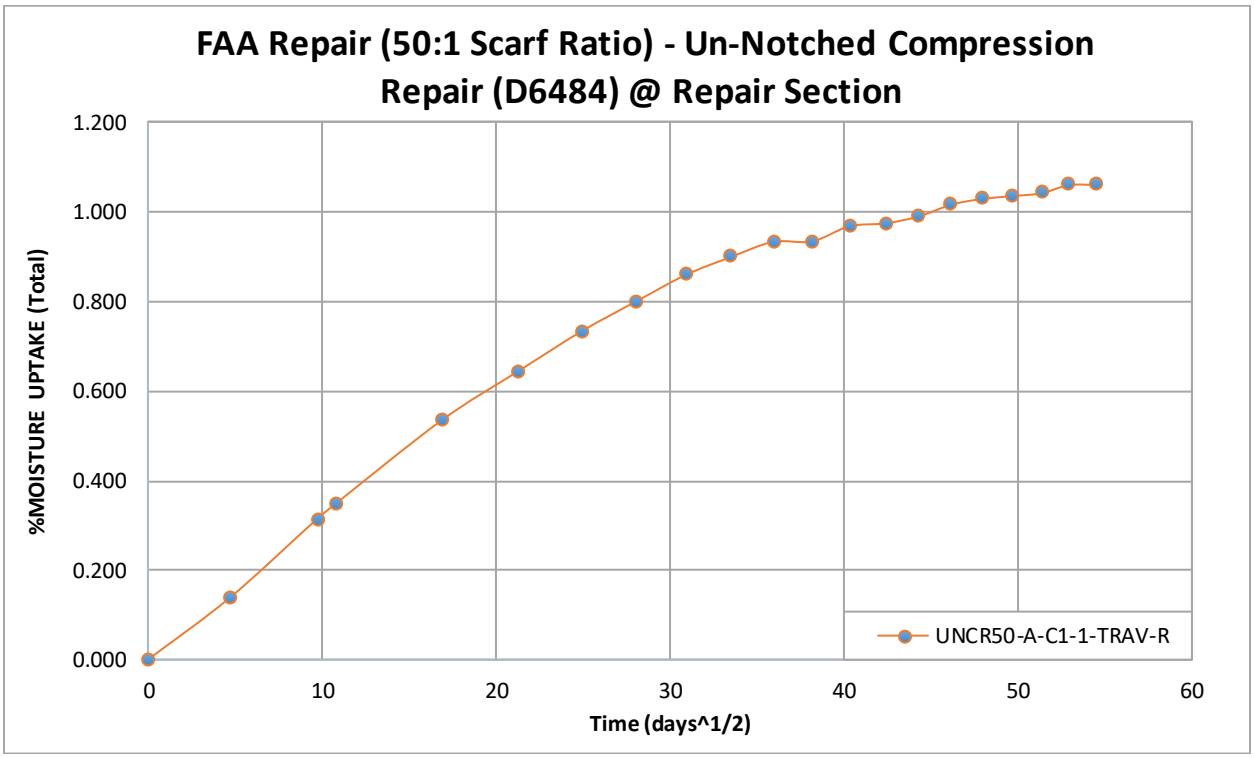


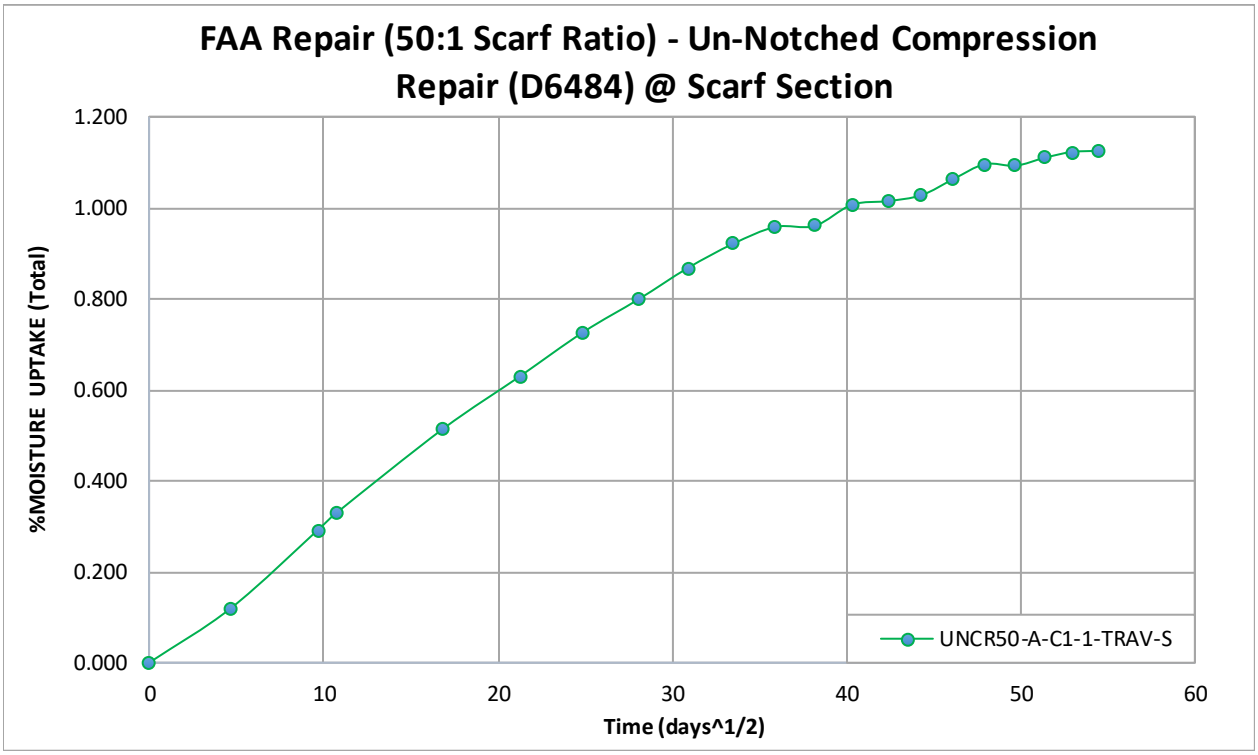



FAA Repair (50:1 Scarf Ratio) - Tension Repair (D8131) @ Scarf Section
%MOISTURE UPTAKE (Total)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
0
10
20
30
40
50
60
Time (days^1/2)
TR50r-C-C1-1-S

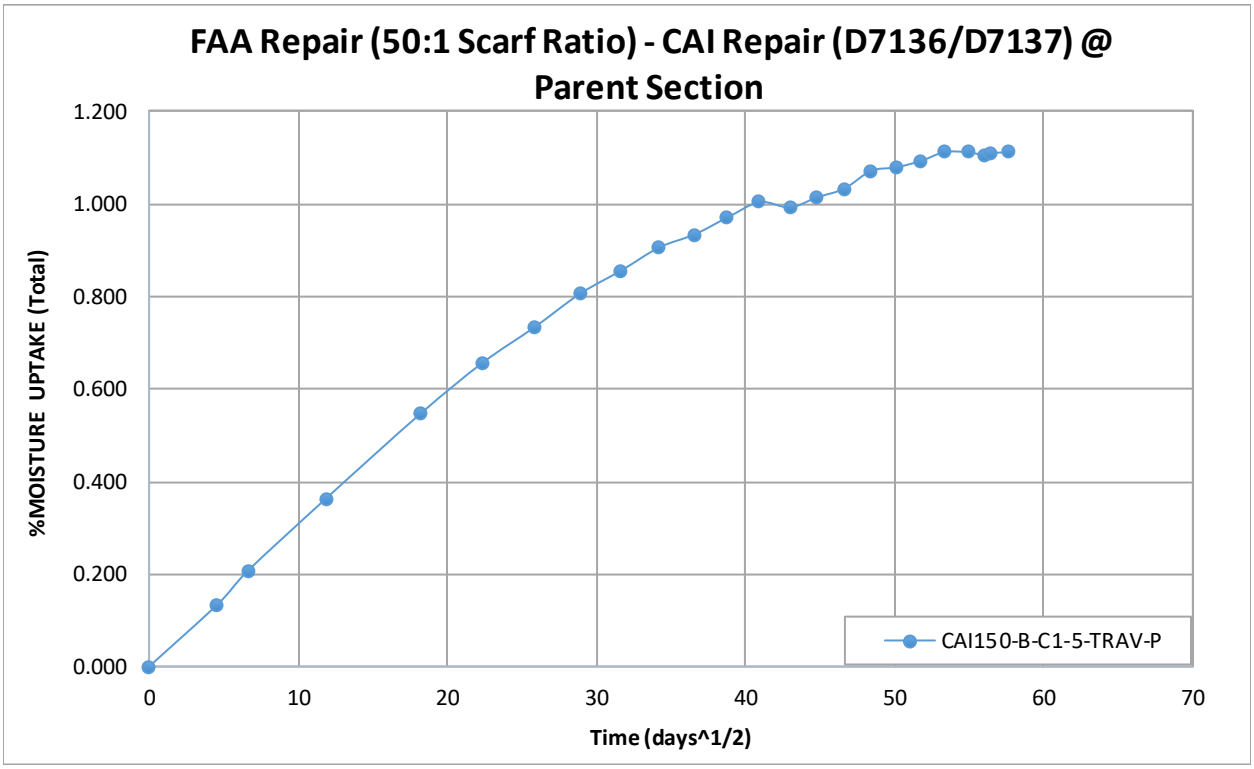
8.2.2 Un-Notched Compression Repair with Scarf Ratio of 50:1 (UNCR50)

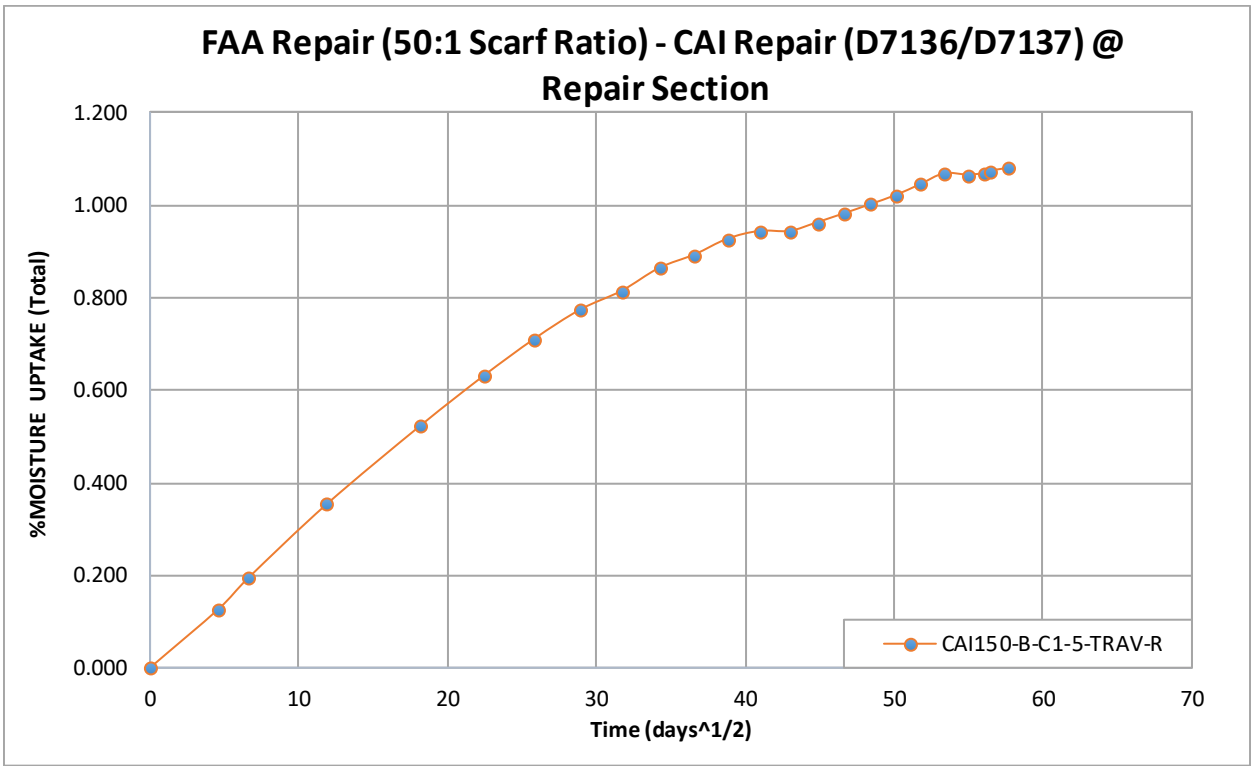


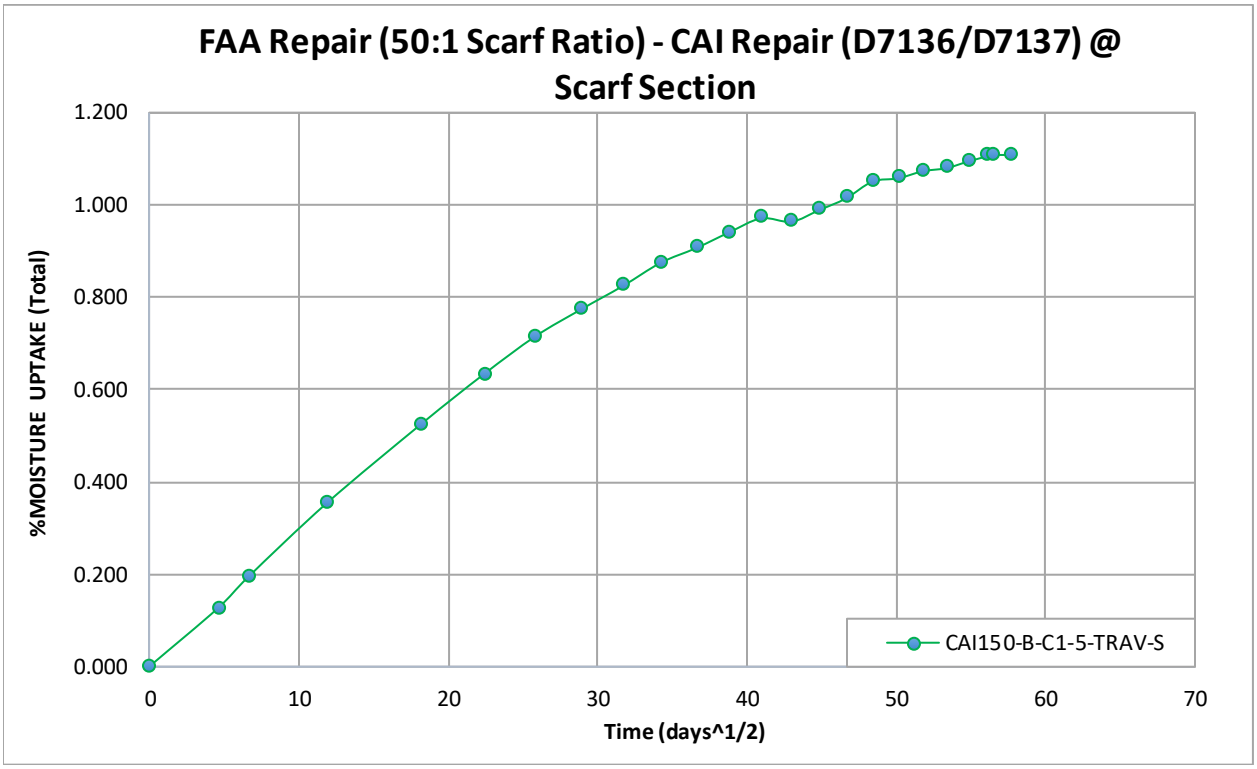




8.2.3 Compression After Impact Repair with Scarf Ratio of 50:1 (CAI150)

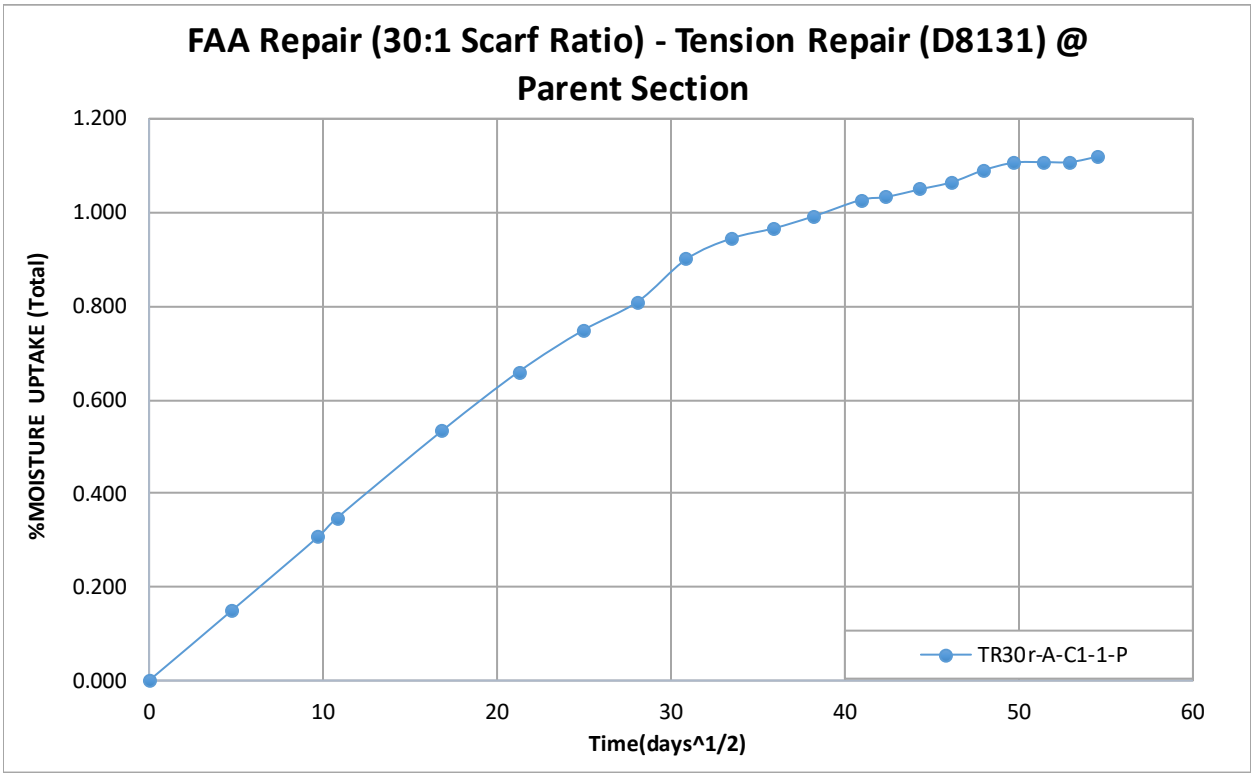


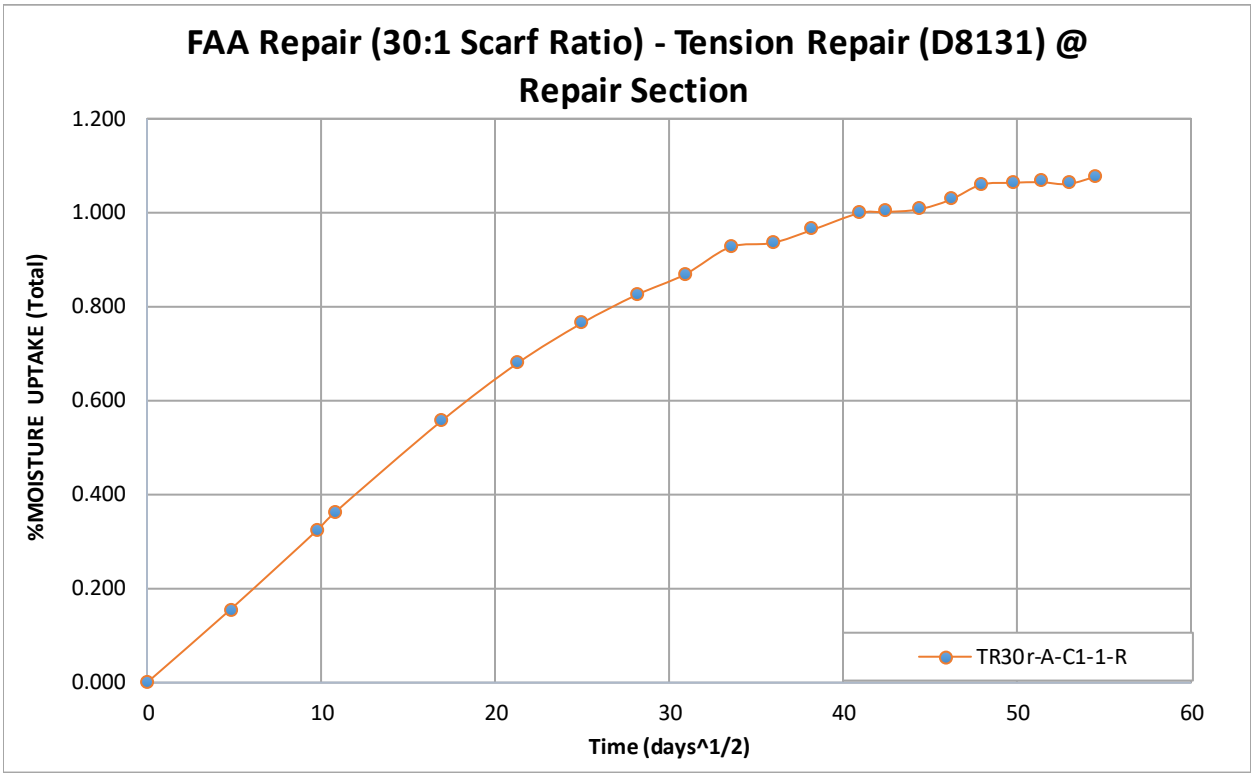

FAA Repair (50:1 Scarf Ratio) - CAI Repair (D7136/D7137) @ Repair Section
%MOISTURE UPTAKE (Total)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
0
10
20
30
40
50
60
70
Time (days^1/2)
CAI150-B-C1-5-TRAV-R

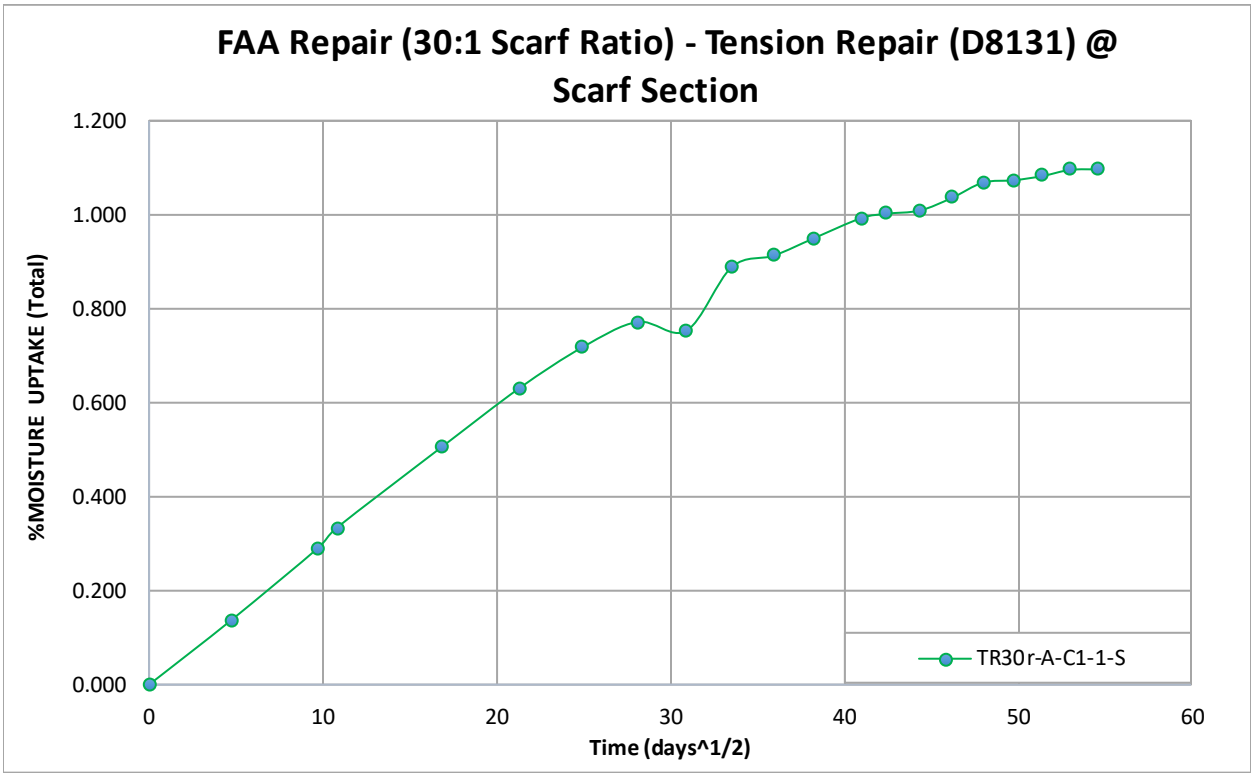

FAA Repair (50:1 Scarf Ratio) - CAI Repair (D7136/D7137) @ Scarf Section
%MOISTURE UPTAKE (Total)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
0
10
20
30
40
50
60
70
Time (days^1/2)
CAI150-B-C1-5-TRAV-S

8.3 Laminate Level Repair (Scarf Ratio of 30:1) – Equivalency

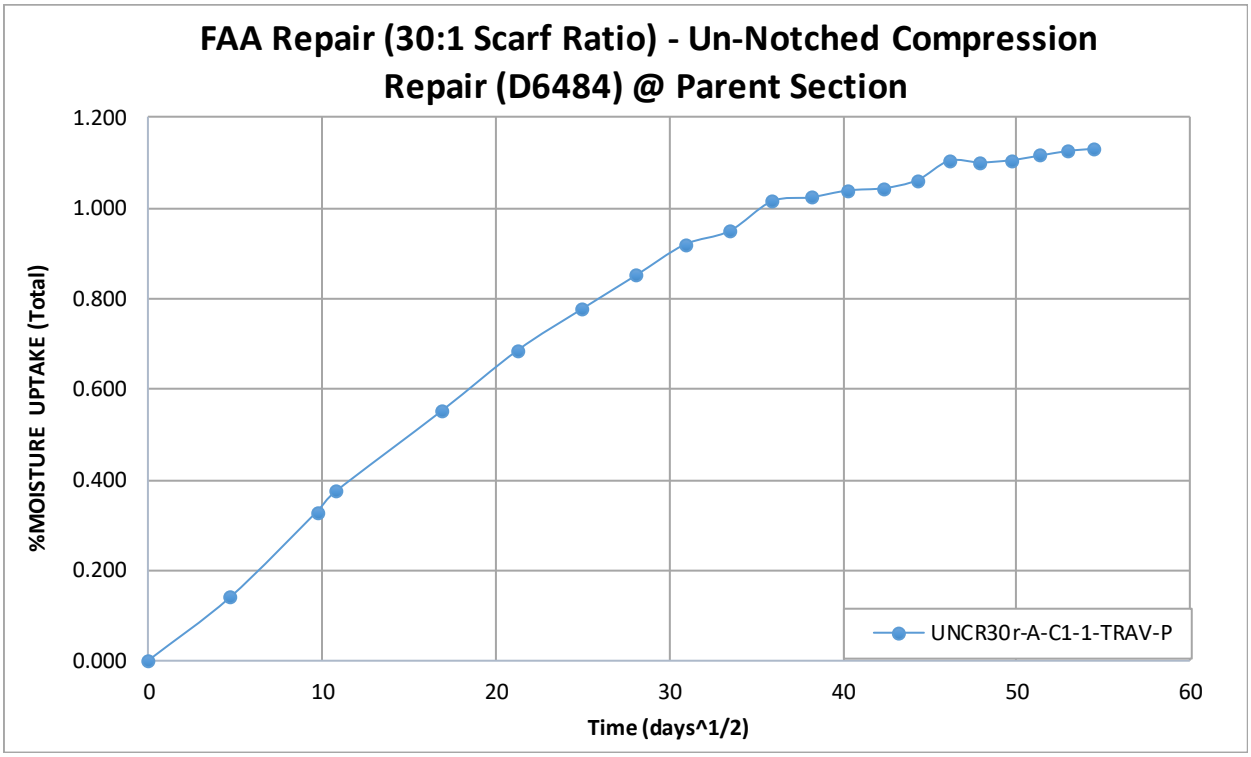
8.3.1 Tension Repair with Scarf Ratio of 30:1 (TR30)

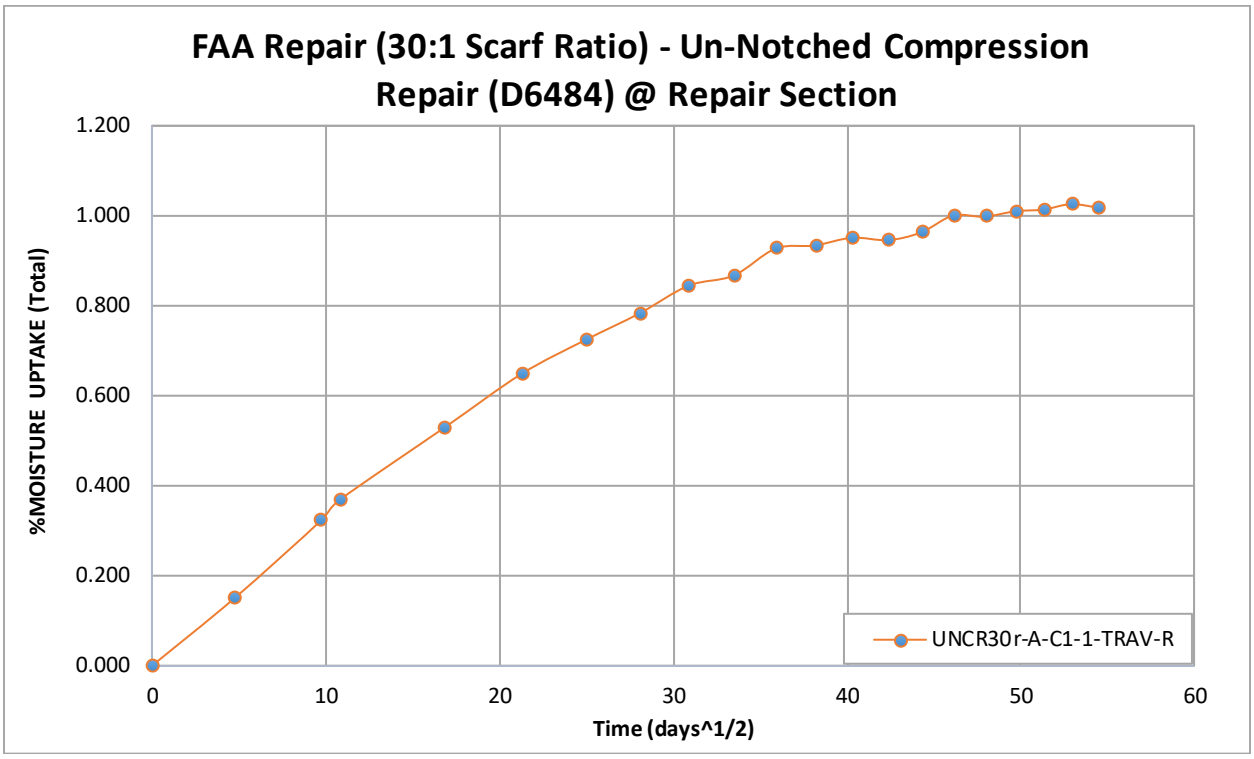


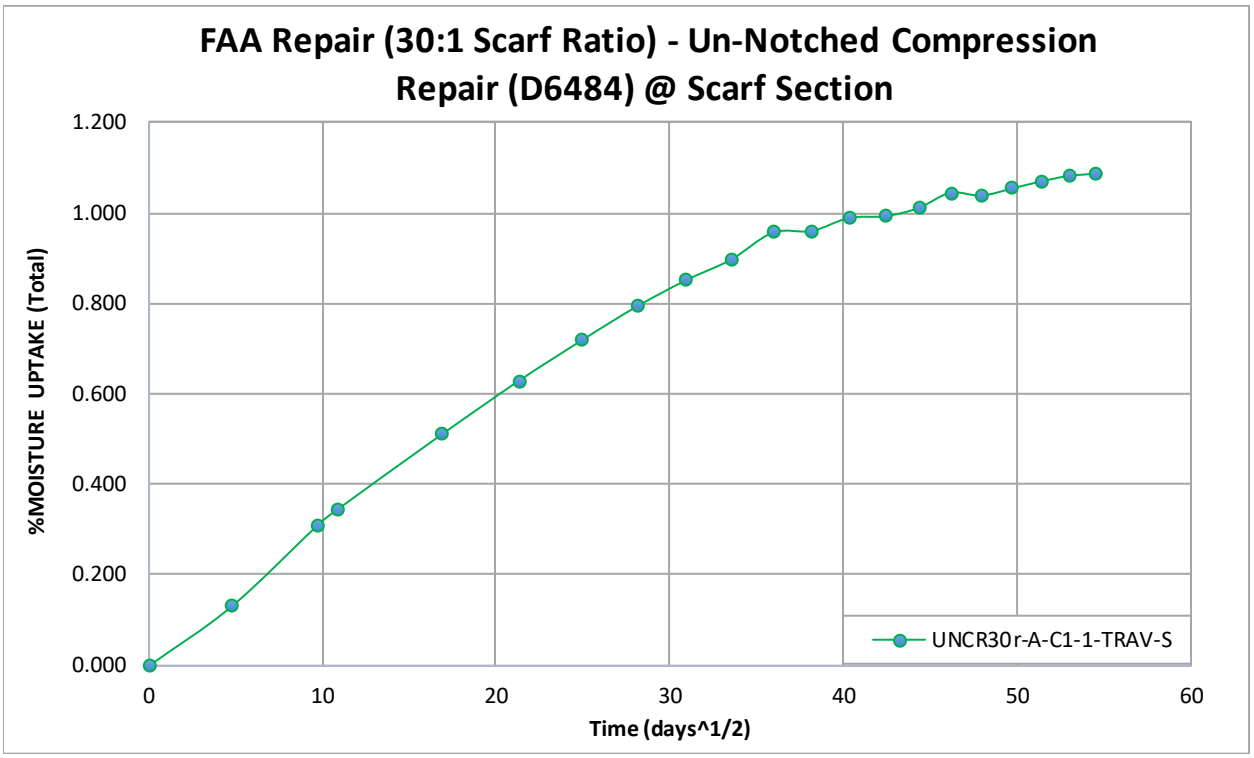




8.3.2 Un-Notched Compression Repair with Scarf Ratio of 30:1 (UNCR30)




FAA Repair (30:1 Scarf Ratio) - Un-Notched Compression
Repair (D6484) @ Repair Section
%MOISTURE UPTAKE (Total)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
0
10
20
30
40
50
60
Time (days^1/2)
UNCR30r-A-C1-1-TRAV-R


FAA Repair (30:1 Scarf Ratio) - Un-Notched Compression
Repair (D6484) @ Scarf Section
%MOISTURE UPTAKE (Total)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
0
10
20
30
40
50
60
Time (days^1/2)
UNCR30r-A-C1-1-TRAV-S

9. DMA Results

9.1 Baseline Test of Un-Notched Compression

9.1.1 DMA Dry Data (Baseline Test of UNC1)

DMA Results Summary

FAA Repair Qualification DMA Dry - UNC1 Baseline

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
UNC1-A-C1-1-DMA-D	198.14	388.65	216.80	422.24
UNC1-A-C2-1-DMA-D	198.82	389.88	217.31	423.16
UNC1-B-C1-1-DMA-D	199.88	391.78	217.65	423.77
UNC1-B-C2-1-DMA-D	199.24	390.63	218.25	424.85
UNC1-C-C1-1-DMA-D	199.55	391.19	217.25	423.05
UNC1-C-C2-1-DMA-D	199.13	390.43	217.61	423.70
Average	199.13	390.43	217.48	423.46
Standard Deviation	0.60	1.09	0.49	0.88

9.1.2 DMA Wet Data (Baseline Test of UNC1)

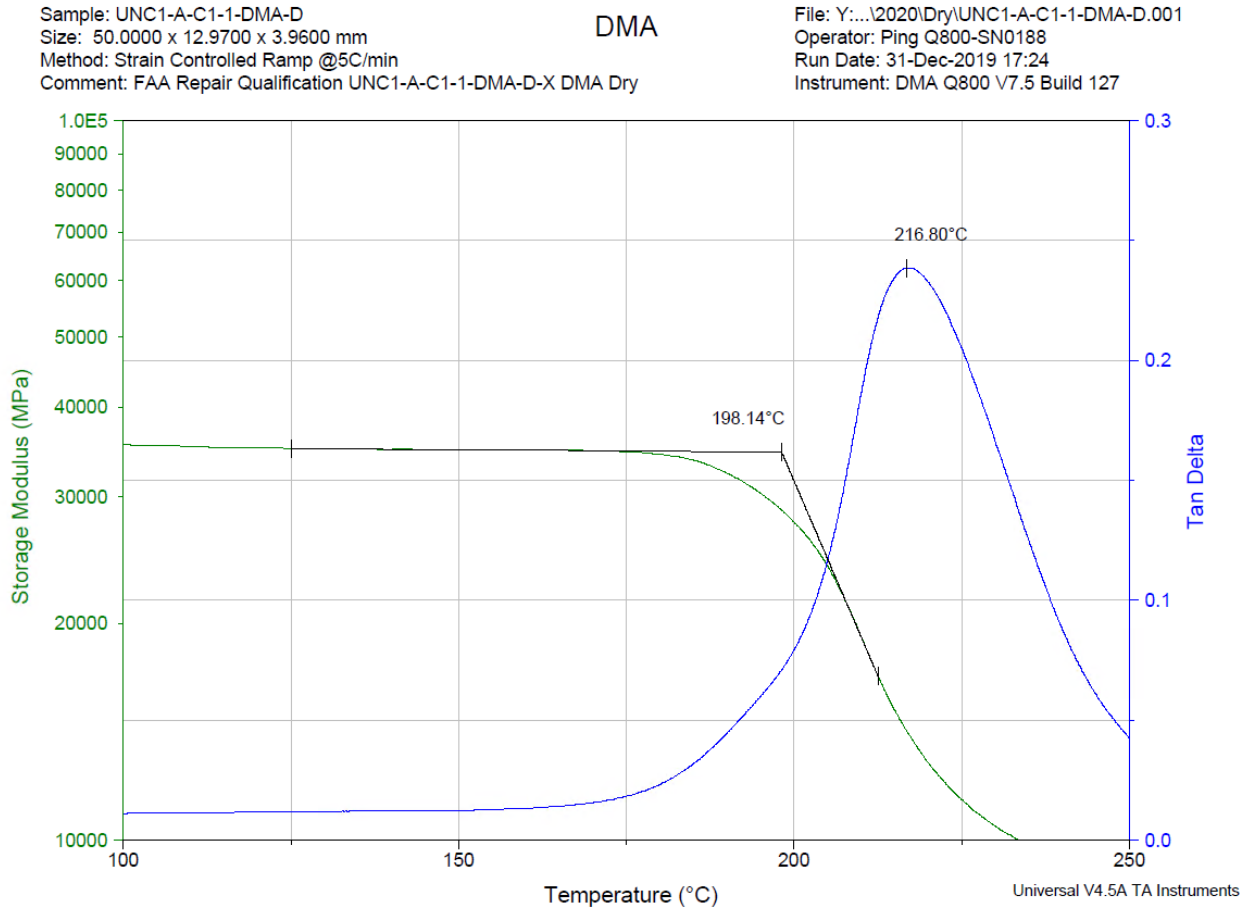
DMA Results Summary

FAA Repair Qualification DMA Wet - UNC1 Baseline

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
UNC1-A-C1-1-DMA-W	161.07	321.93	175.23	347.41
UNC1-A-C2-1-DMA-W	159.51	319.12	174.56	346.21
UNC1-B-C1-1-DMA-W	161.94	323.49	174.99	346.98
UNC1-B-C2-1-DMA-W	161.22	322.20	175.74	348.33
UNC1-C-C1-1-DMA-W	160.25	320.45	174.85	346.73
UNC1-C-C2-1-DMA-W	159.17	318.51	173.09	343.56
Average	160.53	320.95	174.74	346.54
Standard Deviation	1.07	1.93	0.90	1.62

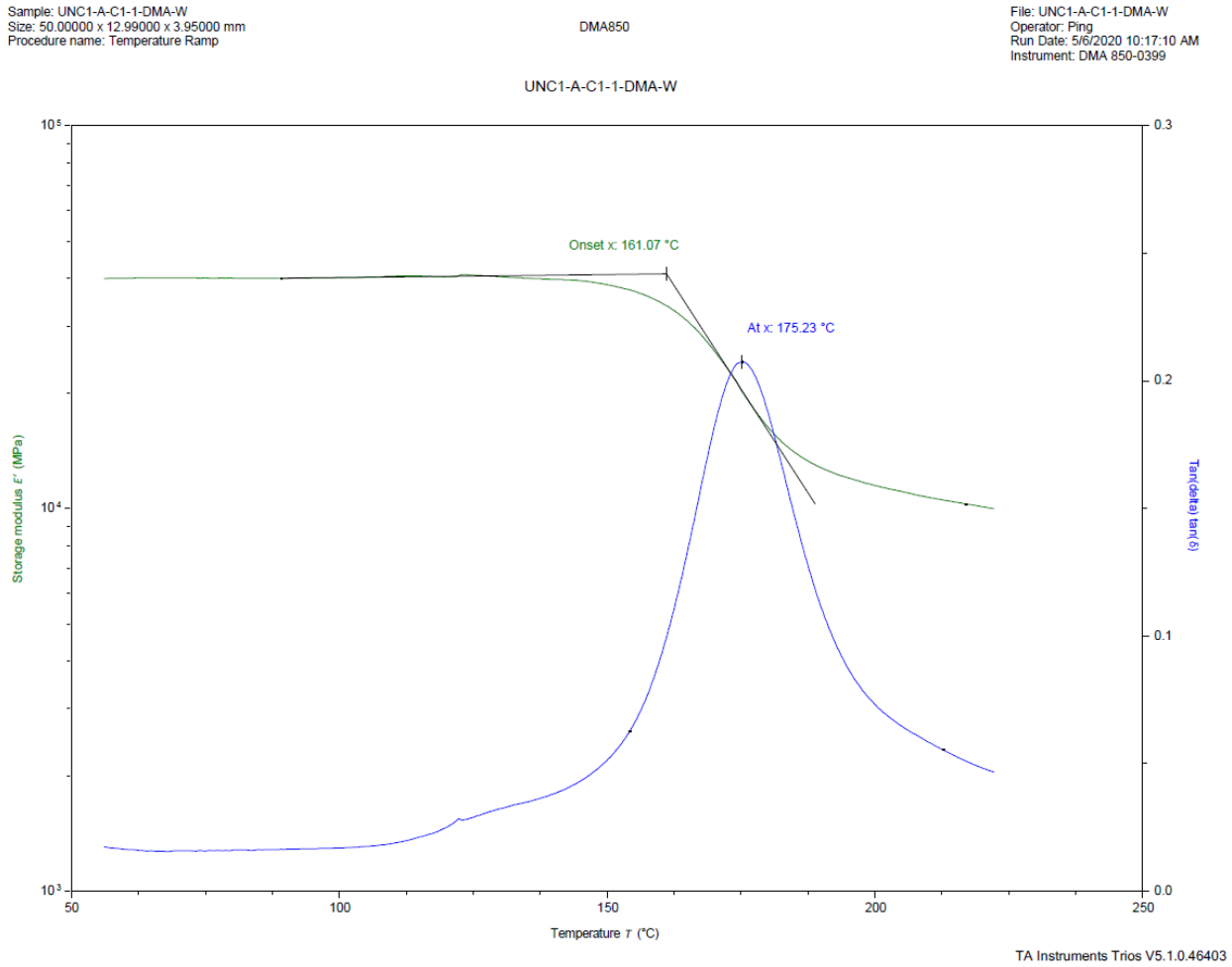
9.1.3 DMA Dry Batch A (Baseline Test of UNC1)

A representative of UNC1 DMA Dry profile from Batch A is provided below.



9.1.4 DMA Wet Batch A (Baseline Test of UNC1)

A representative of UNC1 DMA Wet profile from Batch A is provided below.



9.2 Laminate Level Repair (Scarf Ratio of 50:1) – Qualification

9.2.1 DMA Dry Data – Parent Section (Scarf Ratio of 50:1)

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Dry (Parent Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-D-P	206.51	403.72	221.70	431.06
CAI150-B-C1-2-DMA-D-P	205.50	401.90	221.67	431.01
CAI150-B-C1-3-DMA-D-P	204.36	399.85	219.33	426.79
CAI150-B-C1-4-DMA-D-P	204.06	399.31	219.45	427.01
CAI150-B-C1-5-DMA-D-P	205.18	401.32	220.62	429.12
CAI150-C-C1-1-DMA-D-P	204.41	399.94	219.40	426.92
CAI150-C-C1-2-DMA-D-P	205.10	401.18	219.88	427.78
CAI150-C-C1-3-DMA-D-P	200.68	393.22	216.23	421.21
CAI150-C-C1-4-DMA-D-P	200.23	392.41	215.65	420.17
CAI150-C-C1-5-DMA-D-P	200.65	393.17	215.99	420.78
CAI150-C-C2-1-DMA-D-P	201.47	394.65	217.31	423.16
CAI150-C-C2-2-DMA-D-P	201.04	393.87	216.22	421.20
CAI150-C-C2-3-DMA-D-P	200.87	393.57	215.75	420.35
CAI150-C-C2-4-DMA-D-P	199.97	391.95	216.04	420.87
CAI150-C-C2-5-DMA-D-P	199.50	391.10	215.50	419.90
CAI150-D-C1-1-DMA-D-P	200.26	392.47	216.68	422.02
CAI150-D-C1-2-DMA-D-P	201.51	394.72	217.31	423.16
CAI150-D-C1-3-DMA-D-P	202.35	396.23	218.32	424.98
CAI150-D-C1-4-DMA-D-P	201.56	394.81	216.54	421.77
CAI150-D-C1-5-DMA-D-P	202.88	397.18	218.04	424.47
TR50-A-C3-1-DMA-D-P	200.77	393.39	217.42	423.36
TR50-A-C4-1-DMA-D-P	199.15	390.47	216.30	421.34
TR50-B-C3-1-DMA-D-P	200.02	392.04	216.72	422.10
TR50-B-C4-1-DMA-D-P	202.45	396.41	218.85	425.93
TR50-C-C3-1-DMA-D-P	199.40	390.92	216.17	421.11
TR50-C-C4-1-DMA-D-P	199.59	391.26	217.24	423.03
UNCFS-A-C7-1-1-DMA-D-P	201.12	394.02	217.40	423.32
UNCFS-A-C7-1-2-DMA-D-P	201.87	395.37	217.98	424.36
UNCFS-A-C7-2-1-DMA-D-P	201.47	394.65	218.25	424.85
UNCFS-A-C7-2-2-DMA-D-P	201.87	395.37	218.84	425.91
UNCFS-A-C7-3-1-DMA-D-P	201.22	394.20	217.01	422.62
UNCFS-A-C7-3-2-DMA-D-P	201.23	394.21	217.56	423.61
UNCFS-A-C7-4-1-DMA-D-P	202.28	396.10	218.53	425.35
UNCFS-A-C7-4-2-DMA-D-P	201.62	394.92	218.05	424.49
UNCFS-A-C7-5-1-DMA-D-P	202.48	396.46	218.93	426.07
UNCFS-A-C7-5-2-DMA-D-P	202.42	396.36	218.25	424.85
UNCFS-A-C7-6a-DMA-D-P	198.79	389.82	215.49	419.88
UNCFS-A-C7-7a-DMA-D-P	199.40	390.92	215.96	420.73
UNCFS-A-C7-7b-DMA-D-P	199.40	390.92	216.26	421.27
UNCFS-A-C7-8a-DMA-D-P	200.46	392.83	217.12	422.82
UNCFS-A-C7-8b-DMA-D-P	200.26	392.47	216.16	421.09
UNCFS-A-C8-1-1-DMA-D-P	202.22	396.00	218.05	424.49
UNCFS-A-C8-1-2-DMA-D-P	202.42	396.36	218.50	425.30
UNCFS-A-C8-2-1-DMA-D-P	201.01	393.82	217.52	423.54
UNCFS-A-C8-2-2-DMA-D-P	201.59	394.86	217.37	423.27
UNCFS-A-C8-3-1-DMA-D-P	200.00	392.00	216.48	421.66
UNCFS-A-C8-3-2-DMA-D-P	200.81	393.46	216.25	421.25
UNCFS-A-C8-4-1-DMA-D-P	199.19	390.54	216.26	421.27
UNCFS-A-C8-4-2-DMA-D-P	199.60	391.28	216.51	421.72
UNCFS-A-C8-5-1-DMA-D-P	200.00	392.00	216.51	421.72
UNCFS-A-C8-5-2-DMA-D-P	199.19	390.54	215.66	420.19
UNCFS-A-C8-6a-DMA-D-P	199.26	390.67	216.69	422.04
UNCFS-A-C8-6b-DMA-D-P	200.06	392.11	216.15	421.07
UNCFS-A-C8-7a-DMA-D-P	199.05	390.29	215.72	420.30
UNCFS-A-C8-7b-DMA-D-P	199.05	390.29	215.54	419.97
UNCFS-A-C9-1a-DMA-D-P	203.80	398.84	219.50	427.10
UNCFS-A-C9-1b-DMA-D-P	203.23	397.81	218.61	425.50
UNCFS-A-C10-1a-DMA-D-P	204.03	399.25	219.26	426.67
UNCFS-A-C10-1b-DMA-D-P	204.64	400.35	219.58	427.24
UNCFS-B-C9-1a-DMA-D-P	203.23	397.81	218.77	425.79
UNCFS-B-C9-1b-DMA-D-P	204.90	400.82	219.49	427.08
UNCFS-B-C10-2a-DMA-D-P	204.49	400.08	219.45	427.01
UNCFS-B-C10-2b-DMA-D-P	204.29	399.72	219.32	426.78
UNCFS-C-C10-2a-DMA-D-P	199.05	390.29	215.56	420.01
UNCFS-C-C10-2b-DMA-D-P	201.27	394.29	216.43	421.57
UNCR50-A-C3-1-DMA-D-P	197.23	387.01	214.18	417.52
UNCR50-A-C4-1-DMA-D-P	200.47	392.85	217.01	422.62
UNCR50-B-C3-1-DMA-D-P	199.99	391.98	216.32	421.38
UNCR50-B-C4-1-DMA-D-P	199.32	390.78	216.22	421.20
UNCR50-C-C3-1-DMA-D-P	198.00	388.40	214.38	417.88
UNCR50-C-C4-1-DMA-D-P	200.20	392.36	216.76	422.17
Average	201.37	394.46	217.41	423.34
Standard Deviation	2.02	3.63	1.60	2.88

9.2.2 DMA Dry Data – Repair Section (Scarf Ratio of 50:1)

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Dry (Repair Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-D-R	204.87	400.77	221.90	431.42
CAI150-B-C1-2-DMA-D-R	200.56	393.01	219.35	426.83
CAI150-B-C1-3-DMA-D-R	199.18	390.52	217.86	424.15
CAI150-B-C1-4-DMA-D-R	201.21	394.18	218.92	426.06
CAI150-B-C1-5-DMA-D-R	199.90	391.82	218.01	424.42
CAI150-C-C1-1-DMA-D-R	202.48	396.46	220.35	428.63
CAI150-C-C1-2-DMA-D-R	202.45	396.41	220.43	428.77
CAI150-C-C1-3-DMA-D-R	195.08	383.14	214.00	417.20
CAI150-C-C1-4-DMA-D-R	194.82	382.68	214.86	418.75
CAI150-C-C1-5-DMA-D-R	195.74	384.33	214.89	418.80
CAI150-C-C2-1-DMA-D-R	195.69	384.24	214.08	417.34
CAI150-C-C2-2-DMA-D-R	194.75	382.55	214.69	418.44
CAI150-C-C2-3-DMA-D-R	195.63	384.13	213.75	416.75
CAI150-C-C2-4-DMA-D-R	197.68	387.82	215.70	420.26
CAI150-C-C2-5-DMA-D-R	195.77	384.39	213.66	416.59
CAI150-D-C1-1-DMA-D-R	196.24	385.23	213.85	416.93
CAI150-D-C1-2-DMA-D-R	195.84	384.51	214.76	418.57
CAI150-D-C1-3-DMA-D-R	197.12	386.82	215.08	419.14
CAI150-D-C1-4-DMA-D-R	198.46	389.23	215.92	420.66
CAI150-D-C1-5-DMA-D-R	201.28	394.30	218.49	425.28
TR50-A-C3-1-DMA-D-R	199.70	391.46	217.59	423.66
TR50-A-C4-1-DMA-D-R	192.06	377.71	211.03	411.85
TR50-B-C3-1-DMA-D-R	192.46	378.43	211.57	412.83
TR50-B-C4-1-DMA-D-R	201.52	394.74	218.97	426.15
TR50-C-C3-1-DMA-D-R	194.08	381.34	212.73	414.91
TR50-C-C4-1-DMA-D-R	195.43	383.77	214.20	417.56
UNCFS-A-C7-1-1-DMA-D-R	194.02	381.24	212.17	413.91
UNCFS-A-C7-1-2-DMA-D-R	194.26	381.67	213.52	416.34
UNCFS-A-C7-2-1-DMA-D-R	196.64	385.95	214.20	417.56
UNCFS-A-C7-2-2-DMA-D-R	193.51	380.32	211.49	412.68
UNCFS-A-C7-3-1-DMA-D-R	194.30	381.74	213.32	415.98
UNCFS-A-C7-3-2-DMA-D-R	195.14	383.25	212.94	415.29
UNCFS-A-C7-4-1-DMA-D-R	195.07	383.13	213.82	416.88
UNCFS-A-C7-4-2-DMA-D-R	195.57	384.03	214.63	418.33
UNCFS-A-C7-5-1-DMA-D-R	193.84	380.91	213.02	415.44
UNCFS-A-C7-5-2-DMA-D-R	195.30	383.54	214.21	417.58
UNCFS-A-C7-6a-DMA-D-R	195.27	383.49	214.05	417.29
UNCFS-A-C7-7a-DMA-D-R	196.81	386.26	214.28	417.70
UNCFS-A-C7-7b-DMA-D-R	195.36	383.65	213.96	417.13
UNCFS-A-C7-8a-DMA-D-R	195.38	383.68	214.06	417.31
UNCFS-A-C7-8b-DMA-D-R	193.41	380.14	211.13	412.03
UNCFS-A-C8-1-1-DMA-D-R	198.99	390.18	215.76	420.37
UNCFS-A-C8-1-2-DMA-D-R	194.65	382.37	212.81	415.06
UNCFS-A-C8-2-1-DMA-D-R	194.90	382.82	213.50	416.30
UNCFS-A-C8-2-2-DMA-D-R	190.75	375.35	209.97	409.95
UNCFS-A-C8-3-1-DMA-D-R	192.26	378.07	211.07	411.93
UNCFS-A-C8-3-2-DMA-D-R	192.94	379.29	211.00	411.80
UNCFS-A-C8-4-1-DMA-D-R	194.14	381.45	211.84	413.31
UNCFS-A-C8-4-2-DMA-D-R	195.80	384.44	214.47	418.05
UNCFS-A-C8-5-1-DMA-D-R	194.64	382.35	213.81	416.86
UNCFS-A-C8-5-2-DMA-D-R	192.40	378.32	211.34	412.41
UNCFS-A-C8-6a-DMA-D-R	195.65	384.17	214.00	417.20
UNCFS-A-C8-6b-DMA-D-R	194.92	382.86	213.14	415.65
UNCFS-A-C8-7a-DMA-D-R	195.52	383.94	214.47	418.05
UNCFS-A-C8-7b-DMA-D-R	195.23	383.41	213.19	415.74
UNCFS-A-C9-1a-DMA-D-R	198.24	388.83	217.29	423.12
UNCFS-A-C9-1b-DMA-D-R	197.03	386.65	215.35	419.63
UNCFS-A-C10-1a-DMA-D-R	200.84	393.51	219.63	427.33
UNCFS-A-C10-1b-DMA-D-R	199.94	391.89	217.98	424.36
UNCFS-B-C9-1a-DMA-D-R	199.48	391.06	218.04	424.47
UNCFS-B-C9-1b-DMA-D-R	198.30	388.94	216.50	421.70
UNCFS-B-C10-2a-DMA-D-R	195.63	384.13	214.63	418.33
UNCFS-B-C10-2b-DMA-D-R	197.33	387.19	216.05	420.89
UNCFS-C-C10-2a-DMA-D-R	194.50	382.10	213.32	415.98
UNCFS-C-C10-2b-DMA-D-R	197.18	386.92	216.35	421.43
UNCR50-A-C3-1-DMA-D-R	184.58	364.24	203.74	398.73
UNCR50-A-C4-1-DMA-D-R	190.95	375.71	210.74	411.33
UNCR50-B-C3-1-DMA-D-R	196.76	386.17	215.76	420.37
UNCR50-B-C4-1-DMA-D-R	200.71	393.28	218.22	424.80
UNCR50-C-C3-1-DMA-D-R	188.48	371.26	208.79	407.82
UNCR50-C-C4-1-DMA-D-R	195.85	384.53	214.47	418.05
Average	196.09	384.96	214.57	418.23
Standard Deviation	3.32	5.98	2.98	5.36

9.2.3 DMA Dry Data – Scarf Section (Scarf Ratio of 50:1)

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Dry (Scarf Section, Adhesive)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-D-S	141.81	287.26	153.04	307.47
CAI150-B-C1-2-DMA-D-S	143.05	289.49	152.78	307.00
CAI150-B-C1-3-DMA-D-S	145.26	293.47	154.39	309.90
CAI150-B-C1-4-DMA-D-S	146.05	294.89	154.28	309.70
CAI150-B-C1-5-DMA-D-S	143.26	289.87	151.67	305.01
CAI150-C-C1-1-DMA-D-S	142.24	288.03	152.42	306.36
CAI150-C-C1-2-DMA-D-S	143.65	290.57	154.21	309.58
CAI150-C-C1-3-DMA-D-S	141.84	287.31	149.84	301.71
CAI150-C-C1-4-DMA-D-S	140.44	284.79	151.08	303.94
CAI150-C-C1-5-DMA-D-S	140.46	284.83	148.94	300.09
CAI150-C-C2-1-DMA-D-S	138.96	282.13	149.24	300.63
CAI150-C-C2-2-DMA-D-S	141.48	286.66	150.20	302.36
CAI150-C-C2-3-DMA-D-S	139.49	283.08	149.23	300.61
CAI150-C-C2-4-DMA-D-S	143.73	290.71	151.63	304.93
CAI150-C-C2-5-DMA-D-S	141.54	286.77	150.02	302.04
CAI150-D-C1-1-DMA-D-S	141.20	286.16	150.15	302.27
CAI150-D-C1-2-DMA-D-S	139.05	282.29	147.86	298.15
CAI150-D-C1-3-DMA-D-S	142.45	288.41	150.04	302.07
CAI150-D-C1-4-DMA-D-S	139.22	282.60	148.58	299.44
CAI150-D-C1-5-DMA-D-S	140.43	284.77	149.81	301.66
TR50-A-C3-1-DMA-D-S	141.84	287.31	151.22	304.20
TR50-A-C4-1-DMA-D-S	141.30	286.34	150.46	302.83
TR50-B-C3-1-DMA-D-S	140.64	285.15	150.95	303.71
TR50-B-C4-1-DMA-D-S	141.95	287.51	149.64	301.35
TR50-C-C3-1-DMA-D-S	141.88	287.38	151.34	304.41
TR50-C-C4-1-DMA-D-S	142.38	288.28	152.32	306.18
UNCFS-A-C7-1-1-DMA-D-S	144.82	292.68	152.81	307.06
UNCFS-A-C7-1-2-DMA-D-S	144.90	292.82	154.26	309.67
UNCFS-A-C7-2-1-DMA-D-S	144.89	292.80	154.24	309.63
UNCFS-A-C7-2-2-DMA-D-S	144.67	292.41	152.67	306.81
UNCFS-A-C7-3-1-DMA-D-S	146.16	295.09	154.96	310.93
UNCFS-A-C7-3-2-DMA-D-S	144.62	292.32	152.84	307.11
UNCFS-A-C7-4-1-DMA-D-S	143.46	290.23	153.14	307.65
UNCFS-A-C7-4-2-DMA-D-S	148.02	298.44	155.17	311.31
UNCFS-A-C7-5-1-DMA-D-S	148.15	298.67	156.74	314.13
UNCFS-A-C7-5-2-DMA-D-S	145.58	294.04	153.80	308.84
UNCFS-A-C7-6a-DMA-D-S	144.35	291.83	153.18	307.72
UNCFS-A-C7-7a-DMA-D-S	144.56	292.21	153.56	308.41
UNCFS-A-C7-7b-DMA-D-S	144.12	291.42	153.52	308.34
UNCFS-A-C7-8a-DMA-D-S	144.86	292.75	153.71	308.68
UNCFS-A-C7-8b-DMA-D-S	146.00	294.80	154.73	310.51
UNCFS-A-C8-1-1-DMA-D-S	146.39	295.50	155.13	311.23
UNCFS-A-C8-1-2-DMA-D-S	146.87	296.37	154.89	310.80
UNCFS-A-C8-2-1-DMA-D-S	144.43	291.97	153.12	307.62
UNCFS-A-C8-2-2-DMA-D-S	147.56	297.61	155.47	311.85
UNCFS-A-C8-3-1-DMA-D-S	143.91	291.04	151.54	304.77
UNCFS-A-C8-3-2-DMA-D-S	142.85	289.13	150.58	303.04
UNCFS-A-C8-4-1-DMA-D-S	145.40	293.72	152.61	306.70
UNCFS-A-C8-4-2-DMA-D-S	142.72	288.90	151.00	303.80
UNCFS-A-C8-5-1-DMA-D-S	146.59	295.86	153.82	308.88
UNCFS-A-C8-5-2-DMA-D-S	143.17	289.71	152.11	305.80
UNCFS-A-C8-6a-DMA-D-S	146.27	295.29	155.48	311.86
UNCFS-A-C8-6b-DMA-D-S	146.07	294.93	155.05	311.09
UNCFS-A-C8-7a-DMA-D-S	145.72	294.30	154.90	310.82
UNCFS-A-C8-7b-DMA-D-S	144.99	292.98	153.55	308.39
UNCFS-A-C9-1a-DMA-D-S	144.79	292.62	153.63	308.53
UNCFS-A-C9-1b-DMA-D-S	143.22	289.80	151.55	304.79
UNCFS-A-C10-1a-DMA-D-S	140.09	284.16	150.68	303.22
UNCFS-A-C10-1b-DMA-D-S	146.06	294.91	155.94	312.69
UNCFS-B-C9-1a-DMA-D-S	140.44	284.79	150.67	303.21
UNCFS-B-C9-1b-DMA-D-S	143.34	290.01	153.19	307.74
UNCFS-B-C10-2a-DMA-D-S	143.83	290.89	152.57	306.63
UNCFS-B-C10-2b-DMA-D-S	142.59	288.66	152.10	305.78
UNCFS-C-C10-2a-DMA-D-S	144.56	292.21	153.88	308.98
UNCFS-C-C10-2b-DMA-D-S	145.03	293.05	153.29	307.92
UNCR50-A-C3-1-DMA-D-S	140.13	284.23	149.89	301.80
UNCR50-A-C4-1-DMA-D-S	138.32	280.98	148.14	298.65
UNCR50-B-C3-1-DMA-D-S	140.05	284.09	149.71	301.48
UNCR50-B-C4-1-DMA-D-S	140.93	285.67	150.24	302.43
UNCR50-C-C3-1-DMA-D-S	139.21	282.58	148.58	299.44
UNCR50-C-C4-1-DMA-D-S	140.05	284.09	149.74	301.53
Average	143.24	289.84	152.22	306.00
Standard Deviation	2.44	4.40	2.14	3.85

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Dry (Scarf Section, Laminate)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-D-S	202.97	397.35	219.87	427.77
CAI150-B-C1-2-DMA-D-S	201.66	394.99	219.12	426.42
CAI150-B-C1-3-DMA-D-S	202.69	396.84	218.98	426.16
CAI150-B-C1-4-DMA-D-S	202.44	396.39	218.87	425.97
CAI150-B-C1-5-DMA-D-S	203.81	398.86	219.75	427.55
CAI150-C-C1-1-DMA-D-S	202.37	396.27	218.76	425.77
CAI150-C-C1-2-DMA-D-S	201.50	394.70	219.54	427.17
CAI150-C-C1-3-DMA-D-S	201.74	395.13	217.42	423.36
CAI150-C-C1-4-DMA-D-S	199.31	390.76	215.66	420.19
CAI150-C-C1-5-DMA-D-S	198.41	389.14	215.03	419.05
CAI150-C-C2-1-DMA-D-S	198.95	390.11	216.56	421.81
CAI150-C-C2-2-DMA-D-S	198.66	389.59	215.78	420.40
CAI150-C-C2-3-DMA-D-S	199.01	390.22	216.07	420.93
CAI150-C-C2-4-DMA-D-S	200.78	393.40	215.72	420.30
CAI150-C-C2-5-DMA-D-S	199.61	391.30	216.13	421.03
CAI150-D-C1-1-DMA-D-S	199.65	391.37	216.02	420.84
CAI150-D-C1-2-DMA-D-S	199.67	391.41	215.97	420.75
CAI150-D-C1-3-DMA-D-S	199.54	391.17	216.15	421.07
CAI150-D-C1-4-DMA-D-S	202.24	396.03	216.66	421.99
CAI150-D-C1-5-DMA-D-S	200.00	392.00	217.16	422.89
TR50-A-C3-1-DMA-D-S	199.91	391.84	217.56	423.61
TR50-A-C4-1-DMA-D-S	197.49	387.48	215.55	419.99
TR50-B-C3-1-DMA-D-S	198.80	389.84	216.30	421.34
TR50-B-C4-1-DMA-D-S	197.63	387.73	215.54	419.97
TR50-C-C3-1-DMA-D-S	202.45	396.41	218.45	425.21
TR50-C-C4-1-DMA-D-S	198.95	390.11	217.40	423.32
UNCFS-A-C7-1-1-DMA-D-S	201.23	394.21	217.98	424.36
UNCFS-A-C7-1-2-DMA-D-S	202.61	396.70	218.64	425.55
UNCFS-A-C7-2-1-DMA-D-S	202.05	395.69	218.85	425.93
UNCFS-A-C7-2-2-DMA-D-S	202.42	396.36	219.29	426.72
UNCFS-A-C7-3-1-DMA-D-S	201.49	394.68	218.31	424.96
UNCFS-A-C7-3-2-DMA-D-S	201.23	394.21	217.97	424.35
UNCFS-A-C7-4-1-DMA-D-S	202.37	396.27	218.99	426.18
UNCFS-A-C7-4-2-DMA-D-S	201.74	395.13	219.28	426.70
UNCFS-A-C7-5-1-DMA-D-S	202.37	396.27	219.35	426.83
UNCFS-A-C7-5-2-DMA-D-S	200.93	393.67	218.68	425.62
UNCFS-A-C7-6a-DMA-D-S	199.97	391.95	217.31	423.16
UNCFS-A-C7-7a-DMA-D-S	200.92	393.66	217.67	423.81
UNCFS-A-C7-7b-DMA-D-S	200.88	393.58	217.64	423.75
UNCFS-A-C7-8a-DMA-D-S	200.78	393.40	218.07	424.53
UNCFS-A-C7-8b-DMA-D-S	200.71	393.28	218.09	424.56
UNCFS-A-C8-1-1-DMA-D-S	202.11	395.80	219.01	426.22
UNCFS-A-C8-1-2-DMA-D-S	201.06	393.91	218.99	426.18
UNCFS-A-C8-2-1-DMA-D-S	200.77	393.39	218.50	425.30
UNCFS-A-C8-2-2-DMA-D-S	201.84	395.31	218.33	424.99
UNCFS-A-C8-3-1-DMA-D-S	200.00	392.00	217.39	423.30
UNCFS-A-C8-3-2-DMA-D-S	199.16	390.49	217.72	423.90
UNCFS-A-C8-4-1-DMA-D-S	200.15	392.27	216.97	422.55
UNCFS-A-C8-4-2-DMA-D-S	200.03	392.05	217.14	422.85
UNCFS-A-C8-5-1-DMA-D-S	199.36	390.85	216.94	422.49
UNCFS-A-C8-5-2-DMA-D-S	198.78	389.80	215.52	419.94
UNCFS-A-C8-6a-DMA-D-S	199.77	391.59	217.08	422.74
UNCFS-A-C8-6b-DMA-D-S	199.86	391.75	217.92	424.26
UNCFS-A-C8-7a-DMA-D-S	200.53	392.95	216.78	422.20
UNCFS-A-C8-7b-DMA-D-S	200.08	392.14	217.16	422.89
UNCFS-A-C9-1a-DMA-D-S	195.48	383.86	213.72	416.70
UNCFS-A-C9-1b-DMA-D-S	195.53	383.95	215.91	420.64
UNCFS-A-C10-1a-DMA-D-S	195.30	383.54	214.01	417.22
UNCFS-A-C10-1b-DMA-D-S	196.46	385.63	215.01	419.02
UNCFS-B-C9-1a-DMA-D-S	198.76	389.77	218.50	425.30
UNCFS-B-C9-1b-DMA-D-S	195.43	383.77	214.76	418.57
UNCFS-B-C10-2a-DMA-D-S	190.95	375.71	210.91	411.64
UNCFS-B-C10-2b-DMA-D-S	193.91	381.04	213.18	415.72
UNCFS-C-C10-2a-DMA-D-S	193.88	380.98	212.72	414.90
UNCFS-C-C10-2b-DMA-D-S	195.15	383.27	213.87	416.97
UNCR50-A-C3-1-DMA-D-S	197.25	387.05	215.23	419.41
UNCR50-A-C4-1-DMA-D-S	201.82	395.28	218.00	424.40
UNCR50-B-C3-1-DMA-D-S	197.81	388.06	215.80	420.44
UNCR50-B-C4-1-DMA-D-S	197.98	388.36	215.33	419.59
UNCR50-C-C3-1-DMA-D-S	196.93	386.47	214.93	418.87
UNCR50-C-C4-1-DMA-D-S	198.90	390.02	217.07	422.73
Average	199.68	391.42	216.99	422.59
Standard Deviation	2.50	4.50	1.83	3.29

9.2.4 DMA Wet Data – Parent Section (Scarf Ratio of 50:1)

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Wet (Parent Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-W-P	159.57	319.23	172.93	343.27
CAI150-B-C1-2-DMA-W-P	158.02	316.44	171.26	340.27
CAI150-B-C1-3-DMA-W-P	158.06	316.51	171.50	340.70
CAI150-B-C1-4-DMA-W-P	158.31	316.96	170.99	339.78
CAI150-B-C1-5-DMA-W-P	158.75	317.75	172.00	341.60
CAI150-C-C1-1-DMA-W-P	156.68	314.02	170.67	339.21
CAI150-C-C1-2-DMA-W-P	157.54	315.57	170.55	338.99
CAI150-C-C1-3-DMA-W-P	157.74	315.93	170.45	338.81
CAI150-C-C1-4-DMA-W-P	157.86	316.15	170.07	338.13
CAI150-C-C1-5-DMA-W-P	157.07	314.73	170.04	338.07
CAI150-C-C2-1-DMA-W-P	157.82	316.08	170.46	338.83
CAI150-C-C2-2-DMA-W-P	156.88	314.38	169.98	337.96
CAI150-C-C2-3-DMA-W-P	157.48	315.46	170.26	338.47
CAI150-C-C2-4-DMA-W-P	156.46	313.63	169.70	337.46
CAI150-C-C2-5-DMA-W-P	157.34	315.21	169.76	337.57
CAI150-D-C1-1-DMA-W-P	158.76	317.77	171.19	340.14
CAI150-D-C1-2-DMA-W-P	158.07	316.53	170.52	338.94
CAI150-D-C1-3-DMA-W-P	157.96	316.33	170.40	338.72
CAI150-D-C1-4-DMA-W-P	157.73	315.91	170.36	338.65
CAI150-D-C1-5-DMA-W-P	158.16	316.69	170.01	338.02
TR50-A-C3-1-DMA-W-P	160.34	320.61	173.77	344.79
TR50-A-C4-1-DMA-W-P	159.75	319.55	172.75	342.95
TR50-B-C3-1-DMA-W-P	159.61	319.30	172.88	343.18
TR50-B-C4-1-DMA-W-P	159.84	319.71	173.37	344.07
TR50-C-C3-1-DMA-W-P	160.12	320.22	172.38	342.28
TR50-C-C4-1-DMA-W-P	159.68	319.42	173.08	343.54
TR50r-B-C1-1-DMA-W-P	163.50	326.30	177.04	350.67
TR50r-C-C1-1-DMA-W-P	162.27	324.09	176.63	349.93
UNCFS-A-C7-1-1-DMA-W-P	158.97	318.15	172.65	342.77
UNCFS-A-C7-1-2-DMA-W-P	158.55	317.39	172.35	342.23
UNCFS-A-C7-2-1-DMA-W-P	158.97	318.15	173.04	343.47
UNCFS-A-C7-2-2-DMA-W-P	159.16	318.49	172.40	342.32
UNCFS-A-C7-3-1-DMA-W-P	157.79	316.02	171.42	340.56
UNCFS-A-C7-3-2-DMA-W-P	157.96	316.33	171.49	340.68
UNCFS-A-C7-4-1-DMA-W-P	159.60	319.28	173.63	344.53
UNCFS-A-C7-4-2-DMA-W-P	159.71	319.48	173.04	343.47
UNCFS-A-C7-5-1-DMA-W-P	160.45	320.81	171.53	340.75
UNCFS-A-C7-5-2-DMA-W-P	159.24	318.63	172.47	342.45
UNCFS-A-C7-6a-DMA-W-P	158.27	316.89	172.46	342.43
UNCFS-A-C7-7a-DMA-W-P	159.94	319.89	174.24	345.63
UNCFS-A-C7-7b-DMA-W-P	160.20	320.36	173.76	344.77
UNCFS-A-C7-8a-DMA-W-P	159.50	319.10	174.12	345.42
UNCFS-A-C7-8b-DMA-W-P	160.20	320.36	174.31	345.76
UNCFS-A-C8-1-1-DMA-W-P	157.82	316.08	170.97	339.75
UNCFS-A-C8-1-2-DMA-W-P	158.54	317.37	172.07	341.73
UNCFS-A-C8-2-1-DMA-W-P	158.10	316.58	171.74	341.13
UNCFS-A-C8-2-2-DMA-W-P	158.57	317.43	172.01	341.62
UNCFS-A-C8-3-1-DMA-W-P	158.08	316.54	172.03	341.65
UNCFS-A-C8-3-2-DMA-W-P	160.84	321.51	173.59	344.46
UNCFS-A-C8-4-1-DMA-W-P	158.90	318.02	174.19	345.54
UNCFS-A-C8-4-2-DMA-W-P	159.84	319.71	173.44	344.19
UNCFS-A-C8-5-1-DMA-W-P	161.65	322.97	173.69	344.64
UNCFS-A-C8-5-2-DMA-W-P	159.28	318.70	173.02	343.44
UNCFS-A-C8-6a-DMA-W-P	158.76	317.77	174.32	345.78
UNCFS-A-C8-6b-DMA-W-P	159.38	318.88	173.80	344.84
UNCFS-A-C8-7a-DMA-W-P	158.95	318.11	172.85	343.13
UNCFS-A-C8-7b-DMA-W-P	158.91	318.04	172.70	342.86
UNCFS-A-C9-1a-DMA-W-P	160.06	320.11	173.87	344.97
UNCFS-A-C9-1b-DMA-W-P	161.18	322.12	173.73	344.71
UNCFS-A-C10-1a-DMA-W-P	160.92	321.66	173.73	344.71
UNCFS-A-C10-1b-DMA-W-P	161.05	321.89	173.41	344.14
UNCFS-B-C9-1a-DMA-W-P	160.47	320.85	172.93	343.27
UNCFS-B-C9-1b-DMA-W-P	160.10	320.18	173.08	343.54
UNCFS-B-C10-2a-DMA-W-P	159.54	319.17	173.20	343.76
UNCFS-B-C10-2b-DMA-W-P	160.60	321.08	173.37	344.07
UNCFS-C-C10-2a-DMA-W-P	158.75	317.75	171.78	341.20
UNCFS-C-C10-2b-DMA-W-P	159.10	318.38	172.63	342.73
UNCR50-A-C1-1-DMA-W-P	159.06	318.31	173.86	344.95
UNCR50-A-C2-1-DMA-W-P	164.80	328.64	176.92	350.46
UNCR50-A-C3-1-DMA-W-P	159.28	318.70	172.67	342.81
UNCR50-A-C4-1-DMA-W-P	158.86	317.95	172.31	342.16
UNCR50-B-C1-1-DMA-W-P	163.93	327.07	177.55	351.59
UNCR50-B-C3-1-DMA-W-P	160.11	320.20	173.28	343.90
UNCR50-B-C4-1-DMA-W-P	159.54	319.17	172.89	343.20
UNCR50-C-C1-1-DMA-W-P	164.63	328.33	177.09	350.76
UNCR50-C-C3-1-DMA-W-P	157.72	315.90	172.49	342.48
UNCR50-C-C4-1-DMA-W-P	159.00	318.20	173.89	345.00
Average	159.30	318.74	172.64	342.75
Standard Deviation	1.65	2.96	1.74	3.13

9.2.5 DMA Wet Data – Repair Section (Scarf Ratio of 50:1)

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Wet (Repair Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-W-R	159.46	319.03	174.30	345.74
CAI150-B-C1-2-DMA-W-R	153.47	308.25	169.59	337.26
CAI150-B-C1-3-DMA-W-R	155.86	312.55	171.23	340.21
CAI150-B-C1-4-DMA-W-R	154.65	310.37	170.63	339.13
CAI150-B-C1-5-DMA-W-R	155.75	312.35	170.53	338.95
CAI150-C-C1-1-DMA-W-R	156.37	313.47	170.65	339.17
CAI150-C-C1-2-DMA-W-R	156.05	312.89	169.83	337.69
CAI150-C-C1-3-DMA-W-R	153.59	308.46	169.12	336.42
CAI150-C-C1-4-DMA-W-R	151.31	304.36	168.63	335.53
CAI150-C-C1-5-DMA-W-R	154.73	310.51	168.86	335.95
CAI150-C-C2-1-DMA-W-R	153.13	307.63	168.43	335.17
CAI150-C-C2-2-DMA-W-R	153.17	307.71	168.02	334.44
CAI150-C-C2-3-DMA-W-R	153.79	308.82	168.22	334.80
CAI150-C-C2-4-DMA-W-R	153.59	308.46	168.29	334.92
CAI150-C-C2-5-DMA-W-R	153.89	309.00	167.87	334.17
CAI150-D-C1-1-DMA-W-R	154.61	310.30	170.10	338.18
CAI150-D-C1-2-DMA-W-R	155.17	311.31	168.61	335.50
CAI150-D-C1-3-DMA-W-R	153.71	308.68	168.16	334.69
CAI150-D-C1-4-DMA-W-R	154.76	310.57	169.11	336.40
CAI150-D-C1-5-DMA-W-R	154.03	309.25	168.81	335.86
TR50-A-C3-1-DMA-W-R	160.15	320.27	173.05	343.49
TR50-A-C4-1-DMA-W-R	156.76	314.17	170.52	338.94
TR50-B-C3-1-DMA-W-R	156.20	313.16	169.89	337.80
TR50-B-C4-1-DMA-W-R	159.37	318.87	172.68	342.82
TR50-C-C3-1-DMA-W-R	155.37	311.67	170.49	338.88
TR50-C-C4-1-DMA-W-R	153.01	307.42	168.29	334.92
TR50r-B-C1-1-DMA-W-R	159.28	318.70	174.78	346.60
TR50r-C-C1-1-DMA-W-R	159.14	318.45	173.64	344.55
UNCFS-A-C7-1-1-DMA-W-R	153.77	308.79	168.13	334.63
UNCFS-A-C7-1-2-DMA-W-R	154.47	310.05	169.65	337.37
UNCFS-A-C7-2-1-DMA-W-R	154.62	310.32	169.64	337.35
UNCFS-A-C7-2-2-DMA-W-R	153.74	308.73	168.25	334.85
UNCFS-A-C7-3-1-DMA-W-R	153.63	308.53	168.87	335.97
UNCFS-A-C7-3-2-DMA-W-R	153.23	307.81	168.51	335.32
UNCFS-A-C7-4-1-DMA-W-R	155.81	312.46	169.68	337.42
UNCFS-A-C7-4-2-DMA-W-R	156.40	313.52	170.80	339.44
UNCFS-A-C7-5-1-DMA-W-R	155.27	311.49	170.00	338.00
UNCFS-A-C7-5-2-DMA-W-R	155.98	312.76	170.42	338.76
UNCFS-A-C7-6a-DMA-W-R	155.04	311.07	170.28	338.50
UNCFS-A-C7-7a-DMA-W-R	155.24	311.43	170.93	339.67
UNCFS-A-C7-7b-DMA-W-R	156.21	313.18	170.48	338.86
UNCFS-A-C7-8a-DMA-W-R	154.21	309.58	169.55	337.19
UNCFS-A-C7-8b-DMA-W-R	153.73	308.71	169.89	337.80
UNCFS-A-C8-1-1-DMA-W-R	155.51	311.92	170.10	338.18
UNCFS-A-C8-1-2-DMA-W-R	154.68	310.42	169.16	336.49
UNCFS-A-C8-2-1-DMA-W-R	153.95	309.11	168.89	336.00
UNCFS-A-C8-2-2-DMA-W-R	151.95	305.51	167.47	333.45
UNCFS-A-C8-3-1-DMA-W-R	154.08	309.34	168.66	335.59
UNCFS-A-C8-3-2-DMA-W-R	157.28	315.10	169.79	337.62
UNCFS-A-C8-4-1-DMA-W-R	157.39	315.30	170.07	338.13
UNCFS-A-C8-4-2-DMA-W-R	157.68	315.82	172.02	341.64
UNCFS-A-C8-5-1-DMA-W-R	158.90	318.02	172.00	341.60
UNCFS-A-C8-5-2-DMA-W-R	155.61	312.10	170.88	339.58
UNCFS-A-C8-6a-DMA-W-R	154.63	310.33	169.60	337.28
UNCFS-A-C8-6b-DMA-W-R	155.82	312.48	169.93	337.87
UNCFS-A-C8-7a-DMA-W-R	155.60	312.08	169.86	337.75
UNCFS-A-C8-7b-DMA-W-R	154.56	310.21	169.83	337.69
UNCFS-A-C9-1a-DMA-W-R	151.29	304.32	168.67	335.61
UNCFS-A-C9-1b-DMA-W-R	153.50	308.30	169.71	337.48
UNCFS-A-C10-1a-DMA-W-R	153.03	307.45	170.74	339.33
UNCFS-A-C10-1b-DMA-W-R	155.24	311.43	171.59	340.86
UNCFS-B-C9-1a-DMA-W-R	156.45	313.61	171.71	341.08
UNCFS-B-C9-1b-DMA-W-R	153.36	308.05	169.39	336.90
UNCFS-B-C10-2a-DMA-W-R	151.50	304.70	167.94	334.29
UNCFS-B-C10-2b-DMA-W-R	152.88	307.18	168.79	335.82
UNCFS-C-C10-2a-DMA-W-R	152.67	306.81	168.42	335.16
UNCFS-C-C10-2b-DMA-W-R	152.35	306.23	168.25	334.85
UNCR50-A-C1-1-DMA-W-R	164.17	327.51	177.48	351.46
UNCR50-A-C2-1-DMA-W-R	160.36	320.65	175.53	347.95
UNCR50-A-C3-1-DMA-W-R	152.39	306.30	167.11	332.80
UNCR50-A-C4-1-DMA-W-R	154.00	309.20	168.69	335.64
UNCR50-B-C1-1-DMA-W-R	159.77	319.59	174.69	346.44
UNCR50-B-C3-1-DMA-W-R	156.05	312.89	171.38	340.48
UNCR50-B-C4-1-DMA-W-R	159.16	318.49	173.35	344.03
UNCR50-C-C1-1-DMA-W-R	157.81	316.06	174.51	346.12
UNCR50-C-C3-1-DMA-W-R	154.81	310.66	168.54	335.37
UNCR50-C-C4-1-DMA-W-R	154.73	310.51	169.31	336.76
Average	155.26	311.46	170.15	338.27
Standard Deviation	2.37	4.27	2.02	3.64

9.2.6 DMA Wet Data – Scarf Section (Scarf Ratio of 50:1)

DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Wet (Scarf Section, Adhesive)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-W-S	106.20	223.16	115.90	240.62
CAI150-B-C1-2-DMA-W-S	107.76	225.97	116.60	241.88
CAI150-B-C1-3-DMA-W-S	104.22	219.60	114.86	238.75
CAI150-B-C1-4-DMA-W-S	108.11	226.60	115.87	240.57
CAI150-B-C1-5-DMA-W-S	104.83	220.69	114.05	237.29
CAI150-C-C1-1-DMA-W-S	105.08	221.14	114.55	238.19
CAI150-C-C1-2-DMA-W-S	104.87	220.77	115.91	240.64
CAI150-C-C1-3-DMA-W-S	104.58	220.24	115.05	239.09
CAI150-C-C1-4-DMA-W-S	106.68	224.02	116.50	241.70
CAI150-C-C1-5-DMA-W-S	105.23	221.41	114.48	238.06
CAI150-C-C2-1-DMA-W-S	108.24	226.83	114.30	237.74
CAI150-C-C2-2-DMA-W-S	104.61	220.30	114.92	238.86
CAI150-C-C2-3-DMA-W-S	105.34	221.61	114.72	238.50
CAI150-C-C2-4-DMA-W-S	105.55	221.99	115.99	240.78
CAI150-C-C2-5-DMA-W-S	104.98	220.96	115.40	239.72
CAI150-D-C1-1-DMA-W-S	105.60	222.08	116.27	241.29
CAI150-D-C1-2-DMA-W-S	105.14	221.25	113.33	235.99
CAI150-D-C1-3-DMA-W-S	104.82	220.68	114.64	238.35
CAI150-D-C1-4-DMA-W-S	104.05	219.29	113.69	236.64
CAI150-D-C1-5-DMA-W-S	103.39	218.10	113.75	236.75
TR50-A-C3-1-DMA-W-S	107.75	225.95	117.58	243.64
TR50-A-C4-1-DMA-W-S	107.12	224.82	117.44	243.39
TR50-B-C3-1-DMA-W-S	105.51	221.92	115.96	240.73
TR50-B-C4-1-DMA-W-S	107.34	225.21	117.11	242.80
TR50-C-C3-1-DMA-W-S	105.04	221.07	116.01	240.82
TR50-C-C4-1-DMA-W-S	106.75	224.15	117.60	243.68
TR50r-B-C1-1-DMA-W-S	113.11	235.60	122.17	251.91
TR50r-C-C1-1-DMA-W-S	112.79	235.02	121.98	251.56
UNCFS-A-C7-1-1-DMA-W-S	109.19	228.54	118.96	246.13
UNCFS-A-C7-1-2-DMA-W-S	109.65	229.37	118.07	244.53
UNCFS-A-C7-2-1-DMA-W-S	110.59	231.06	117.59	243.66
UNCFS-A-C7-2-2-DMA-W-S	105.35	221.63	116.20	241.16
UNCFS-A-C7-3-1-DMA-W-S	108.11	226.60	118.25	244.85
UNCFS-A-C7-3-2-DMA-W-S	108.02	226.44	117.70	243.86
UNCFS-A-C7-4-1-DMA-W-S	108.33	226.99	118.07	244.53
UNCFS-A-C7-4-2-DMA-W-S	110.43	230.77	119.32	246.78
UNCFS-A-C7-5-1-DMA-W-S	112.08	233.74	121.47	250.65
UNCFS-A-C7-5-2-DMA-W-S	108.70	227.66	118.38	245.08
UNCFS-A-C7-6a-DMA-W-S	109.65	229.37	117.23	243.01
UNCFS-A-C7-7a-DMA-W-S	107.90	226.22	117.50	243.50
UNCFS-A-C7-7b-DMA-W-S	111.64	232.95	118.85	245.93
UNCFS-A-C7-8a-DMA-W-S	108.69	227.64	118.70	245.66
UNCFS-A-C7-8b-DMA-W-S	110.62	231.12	119.58	247.24
UNCFS-A-C8-1-1-DMA-W-S	108.73	227.71	118.95	246.11
UNCFS-A-C8-1-2-DMA-W-S	109.72	229.50	117.93	244.27
UNCFS-A-C8-2-1-DMA-W-S	106.19	223.14	115.95	240.71
UNCFS-A-C8-2-2-DMA-W-S	110.82	231.48	119.23	246.61
UNCFS-A-C8-3-1-DMA-W-S	107.21	224.98	116.12	241.02
UNCFS-A-C8-3-2-DMA-W-S	107.63	225.73	118.17	244.71
UNCFS-A-C8-4-1-DMA-W-S	109.41	228.94	119.67	247.41
UNCFS-A-C8-4-2-DMA-W-S	108.04	226.47	118.11	244.60
UNCFS-A-C8-5-1-DMA-W-S	110.54	230.97	120.92	249.66
UNCFS-A-C8-5-2-DMA-W-S	109.89	229.80	119.36	246.85
UNCFS-A-C8-6a-DMA-W-S	111.10	231.98	121.18	250.12
UNCFS-A-C8-6b-DMA-W-S	108.57	227.43	118.88	245.98
UNCFS-A-C8-7a-DMA-W-S	110.71	231.28	118.65	245.57
UNCFS-A-C8-7b-DMA-W-S	108.00	226.40	117.15	242.87
UNCFS-A-C9-1a-DMA-W-S	108.07	226.53	117.14	242.85
UNCFS-A-C9-1b-DMA-W-S	107.50	225.50	116.40	241.52
UNCFS-A-C10-1a-DMA-W-S	106.13	223.03	115.43	239.77
UNCFS-A-C10-1b-DMA-W-S	108.55	227.39	117.41	243.34
UNCFS-B-C9-1a-DMA-W-S	103.65	218.57	113.17	235.71
UNCFS-B-C9-1b-DMA-W-S	107.82	226.08	116.78	242.20
UNCFS-B-C10-2a-DMA-W-S	105.08	221.14	114.68	238.42
UNCFS-B-C10-2b-DMA-W-S	104.61	220.30	114.16	237.49
UNCFS-C-C10-2a-DMA-W-S	106.00	222.80	115.63	240.13
UNCFS-C-C10-2b-DMA-W-S	107.81	226.06	116.93	242.47
UNCR50-A-C1-1-DMA-W-S	115.75	240.35	125.52	257.94
UNCR50-A-C2-1-DMA-W-S	114.52	238.14	123.59	254.46
UNCR50-A-C3-1-DMA-W-S	108.32	226.98	117.40	243.32
UNCR50-A-C4-1-DMA-W-S	103.25	217.85	112.72	234.90
UNCR50-B-C1-1-DMA-W-S	113.14	235.65	122.74	252.93
UNCR50-B-C3-1-DMA-W-S	108.26	226.87	117.10	242.78
UNCR50-B-C4-1-DMA-W-S	108.71	227.68	118.37	245.07
UNCR50-C-C1-1-DMA-W-S	112.10	233.78	122.89	253.20
UNCR50-C-C3-1-DMA-W-S	107.18	224.92	116.84	242.31
UNCR50-C-C4-1-DMA-W-S	103.77	218.79	113.98	237.16
Average	107.80	226.04	117.29	243.13
Standard Deviation	2.74	4.93	2.58	4.64

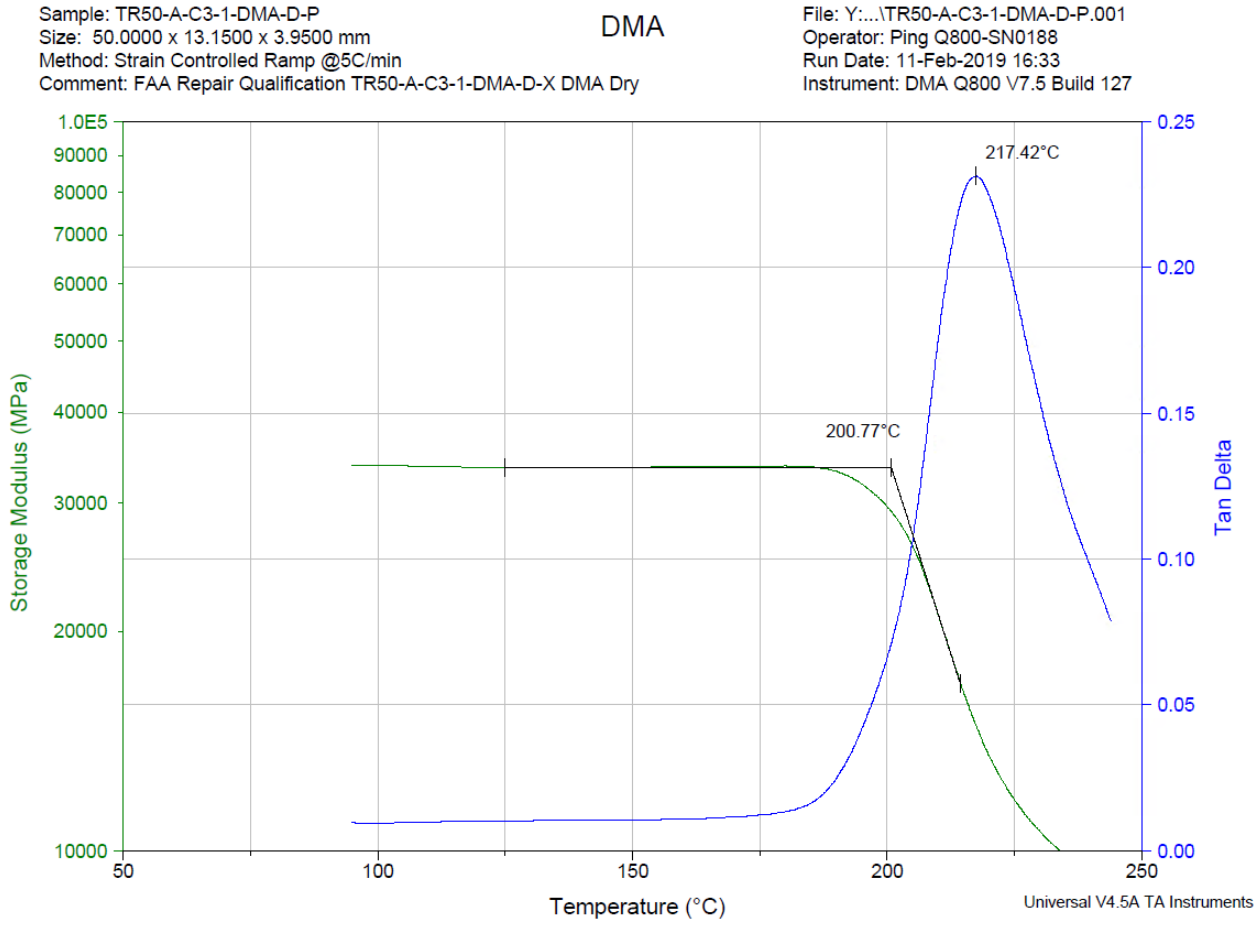
DMA Results Summary
FAA Repair (50:1 Scarf Ratio) DMA Wet (Scarf Section, Laminate)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
CAI150-B-C1-1-DMA-W-S	161.58	322.84	173.15	343.67
CAI150-B-C1-2-DMA-W-S	160.51	320.92	172.38	342.28
CAI150-B-C1-3-DMA-W-S	159.74	319.53	171.88	341.38
CAI150-B-C1-4-DMA-W-S	159.75	319.55	171.64	340.95
CAI150-B-C1-5-DMA-W-S	160.71	321.28	172.07	341.73
CAI150-C-C1-1-DMA-W-S	159.73	319.51	171.07	339.93
CAI150-C-C1-2-DMA-W-S	159.16	318.49	170.92	339.66
CAI150-C-C1-3-DMA-W-S	159.96	319.93	172.07	341.73
CAI150-C-C1-4-DMA-W-S	159.23	318.61	171.27	340.29
CAI150-C-C1-5-DMA-W-S	159.60	319.28	170.74	339.33
CAI150-C-C2-1-DMA-W-S	159.07	318.33	170.56	339.01
CAI150-C-C2-2-DMA-W-S	159.54	319.17	171.18	340.12
CAI150-C-C2-3-DMA-W-S	160.55	320.99	171.50	340.70
CAI150-C-C2-4-DMA-W-S	159.85	319.73	171.01	339.82
CAI150-C-C2-5-DMA-W-S	158.96	318.13	171.17	340.11
CAI150-D-C1-1-DMA-W-S	160.54	320.97	172.05	341.69
CAI150-D-C1-2-DMA-W-S	159.95	319.91	170.84	339.51
CAI150-D-C1-3-DMA-W-S	158.94	318.09	170.66	339.19
CAI150-D-C1-4-DMA-W-S	159.47	319.05	170.71	339.28
CAI150-D-C1-5-DMA-W-S	158.67	317.61	170.53	338.95
TR50-A-C3-1-DMA-W-S	161.82	323.28	174.65	346.37
TR50-A-C4-1-DMA-W-S	161.13	322.03	173.35	344.03
TR50-B-C3-1-DMA-W-S	160.92	321.66	173.45	344.21
TR50-B-C4-1-DMA-W-S	161.23	322.21	172.75	342.95
TR50-C-C3-1-DMA-W-S	161.86	323.35	173.50	344.30
TR50-C-C4-1-DMA-W-S	161.08	321.94	173.62	344.52
TR50r-B-C1-1-DMA-W-S	165.80	330.44	176.99	350.58
TR50r-C-C1-1-DMA-W-S	163.43	326.17	176.13	349.03
UNCFS-A-C7-1-1-DMA-W-S	162.06	323.71	173.49	344.28
UNCFS-A-C7-1-2-DMA-W-S	161.46	322.63	173.07	343.53
UNCFS-A-C7-2-1-DMA-W-S	161.49	322.68	173.36	344.05
UNCFS-A-C7-2-2-DMA-W-S	161.03	321.85	172.95	343.31
UNCFS-A-C7-3-1-DMA-W-S	160.58	321.04	172.01	341.62
UNCFS-A-C7-3-2-DMA-W-S	161.17	322.11	172.71	342.88
UNCFS-A-C7-4-1-DMA-W-S	161.16	322.09	173.56	344.41
UNCFS-A-C7-4-2-DMA-W-S	160.83	321.49	173.32	343.98
UNCFS-A-C7-5-1-DMA-W-S	160.82	321.48	173.12	343.62
UNCFS-A-C7-5-2-DMA-W-S	160.90	321.62	173.20	343.76
UNCFS-A-C7-6a-DMA-W-S	161.05	321.89	171.79	341.22
UNCFS-A-C7-7a-DMA-W-S	161.66	322.99	173.28	343.90
UNCFS-A-C7-7b-DMA-W-S	162.84	325.11	174.12	345.42
UNCFS-A-C7-8a-DMA-W-S	160.06	320.11	173.46	344.23
UNCFS-A-C7-8b-DMA-W-S	162.54	324.57	174.07	345.33
UNCFS-A-C8-1-1-DMA-W-S	160.83	321.49	172.97	343.35
UNCFS-A-C8-1-2-DMA-W-S	160.16	320.29	172.28	342.10
UNCFS-A-C8-2-1-DMA-W-S	160.43	320.77	171.72	341.10
UNCFS-A-C8-2-2-DMA-W-S	160.65	321.17	172.55	342.59
UNCFS-A-C8-3-1-DMA-W-S	159.76	319.57	171.87	341.37
UNCFS-A-C8-3-2-DMA-W-S	162.31	324.16	174.23	345.61
UNCFS-A-C8-4-1-DMA-W-S	161.69	323.04	173.50	344.30
UNCFS-A-C8-4-2-DMA-W-S	161.79	323.22	173.43	344.17
UNCFS-A-C8-5-1-DMA-W-S	161.77	323.19	173.67	344.61
UNCFS-A-C8-5-2-DMA-W-S	162.48	324.46	173.87	344.97
UNCFS-A-C8-6a-DMA-W-S	159.92	319.86	173.20	343.76
UNCFS-A-C8-6b-DMA-W-S	158.70	317.66	171.37	340.47
UNCFS-A-C8-7a-DMA-W-S	160.61	321.10	172.49	342.48
UNCFS-A-C8-7b-DMA-W-S	159.74	319.53	171.90	341.42
UNCFS-A-C9-1a-DMA-W-S	157.59	315.66	171.65	340.97
UNCFS-A-C9-1b-DMA-W-S	158.94	318.09	171.90	341.42
UNCFS-A-C10-1a-DMA-W-S	158.92	318.06	171.69	341.04
UNCFS-A-C10-1b-DMA-W-S	158.32	316.98	170.66	339.19
UNCFS-B-C9-1a-DMA-W-S	158.48	317.26	171.18	340.12
UNCFS-B-C9-1b-DMA-W-S	157.41	315.34	170.78	339.40
UNCFS-B-C10-2a-DMA-W-S	156.18	313.12	171.19	340.14
UNCFS-B-C10-2b-DMA-W-S	156.54	313.77	170.68	339.22
UNCFS-C-C10-2a-DMA-W-S	155.25	311.45	169.13	336.43
UNCFS-C-C10-2b-DMA-W-S	156.05	312.89	169.94	337.89
UNCR50-A-C1-1-DMA-W-S	164.30	327.74	177.18	350.92
UNCR50-A-C2-1-DMA-W-S	166.48	331.66	177.94	352.29
UNCR50-A-C3-1-DMA-W-S	160.28	320.50	173.89	345.00
UNCR50-A-C4-1-DMA-W-S	163.46	326.23	172.98	343.36
UNCR50-B-C1-1-DMA-W-S	162.47	324.45	176.50	349.70
UNCR50-B-C3-1-DMA-W-S	158.63	317.53	173.08	343.54
UNCR50-B-C4-1-DMA-W-S	158.68	317.62	172.95	343.31
UNCR50-C-C1-1-DMA-W-S	164.36	327.85	176.19	349.14
UNCR50-C-C3-1-DMA-W-S	159.52	319.14	172.58	342.64
UNCR50-C-C4-1-DMA-W-S	161.79	323.22	172.25	342.05
Average	160.48	320.86	172.63	342.74
Standard Deviation	1.98	3.56	1.69	3.03

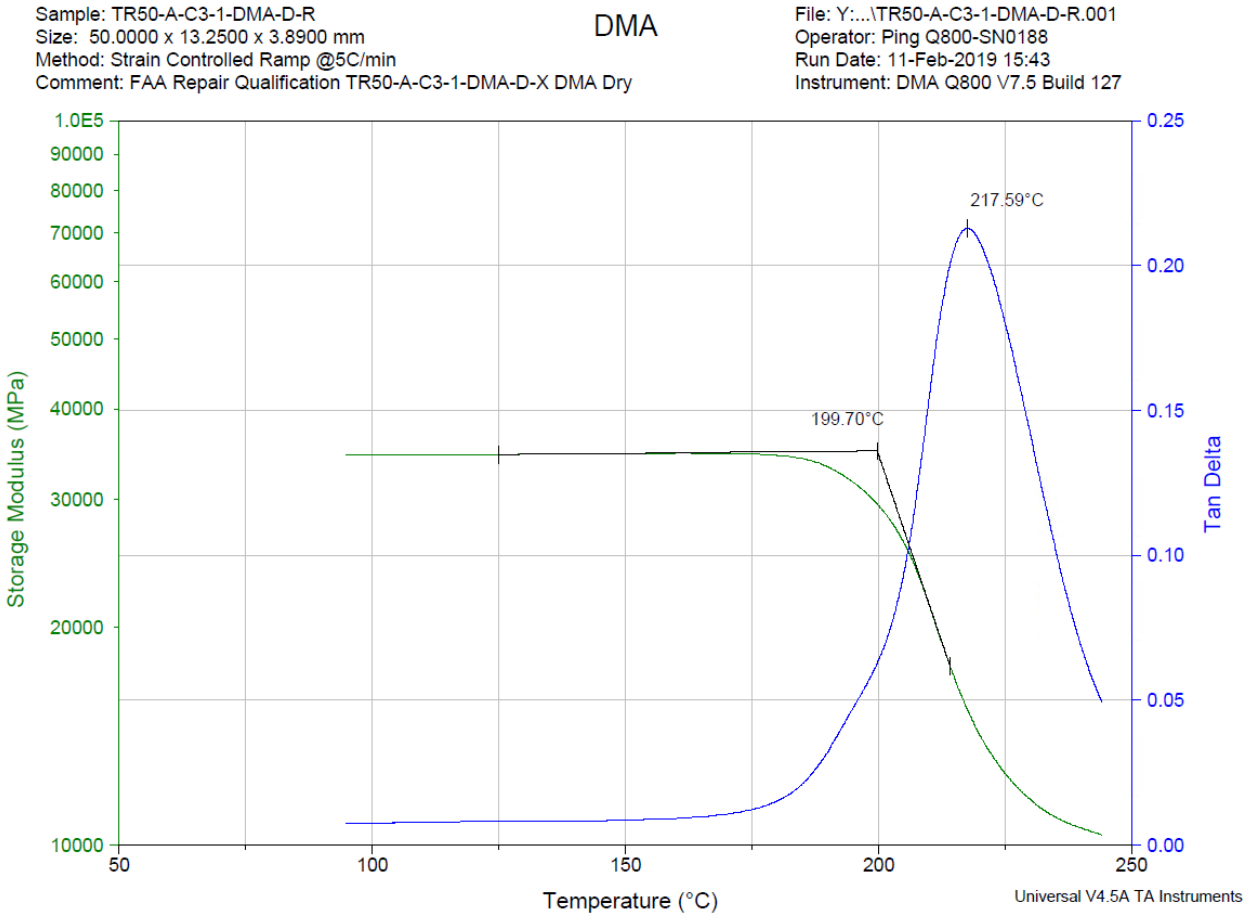
9.2.7 DMA Dry Batch A (Scarf Ratio of 50:1) – Qualification

A representative of TR50 DMA Dry profile from Batch A is provided below.

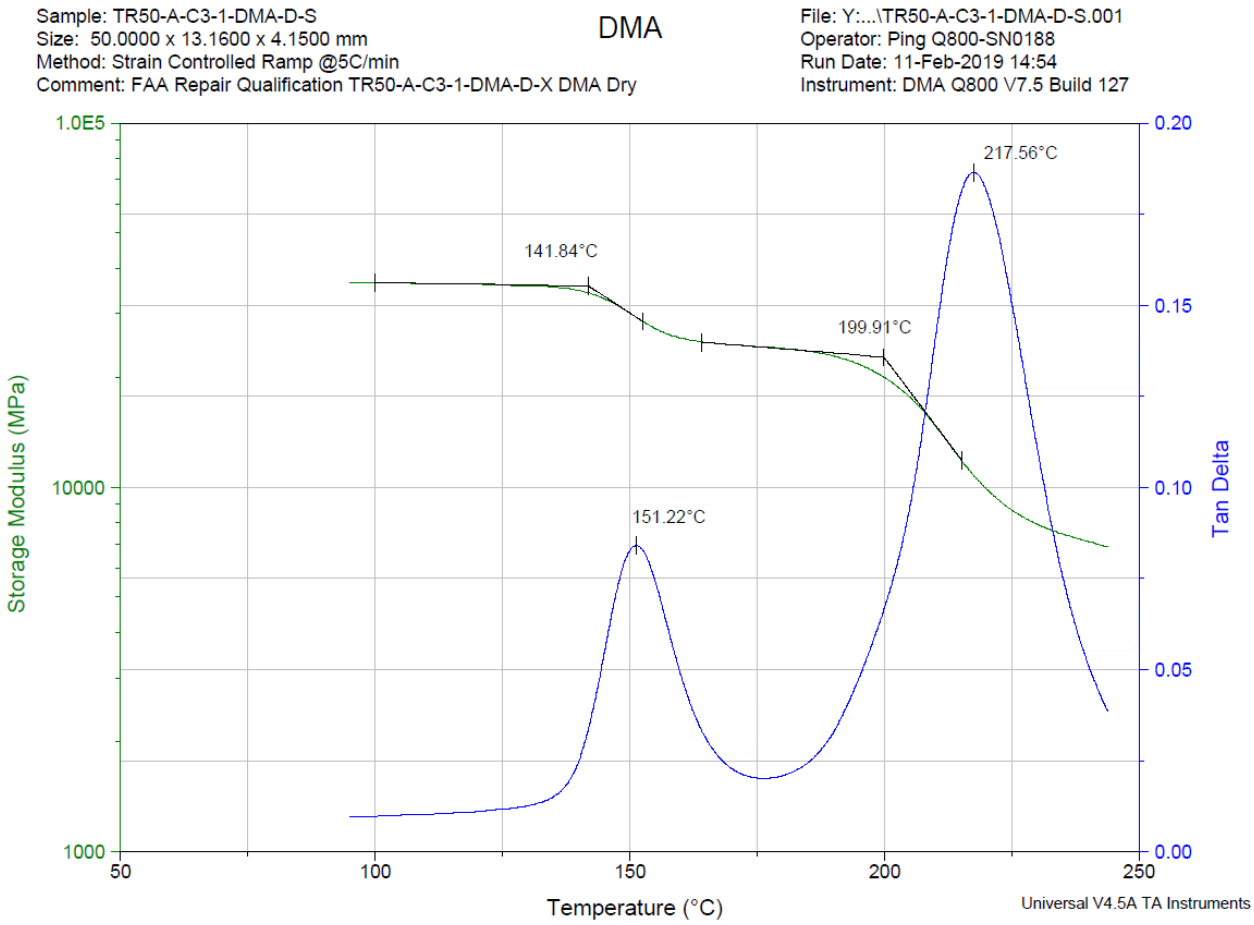
9.2.7.1 Parent Section (Scarf Ratio of 50:1)



9.2.7.2 Repair Section (Scarf Ratio of 50:1)



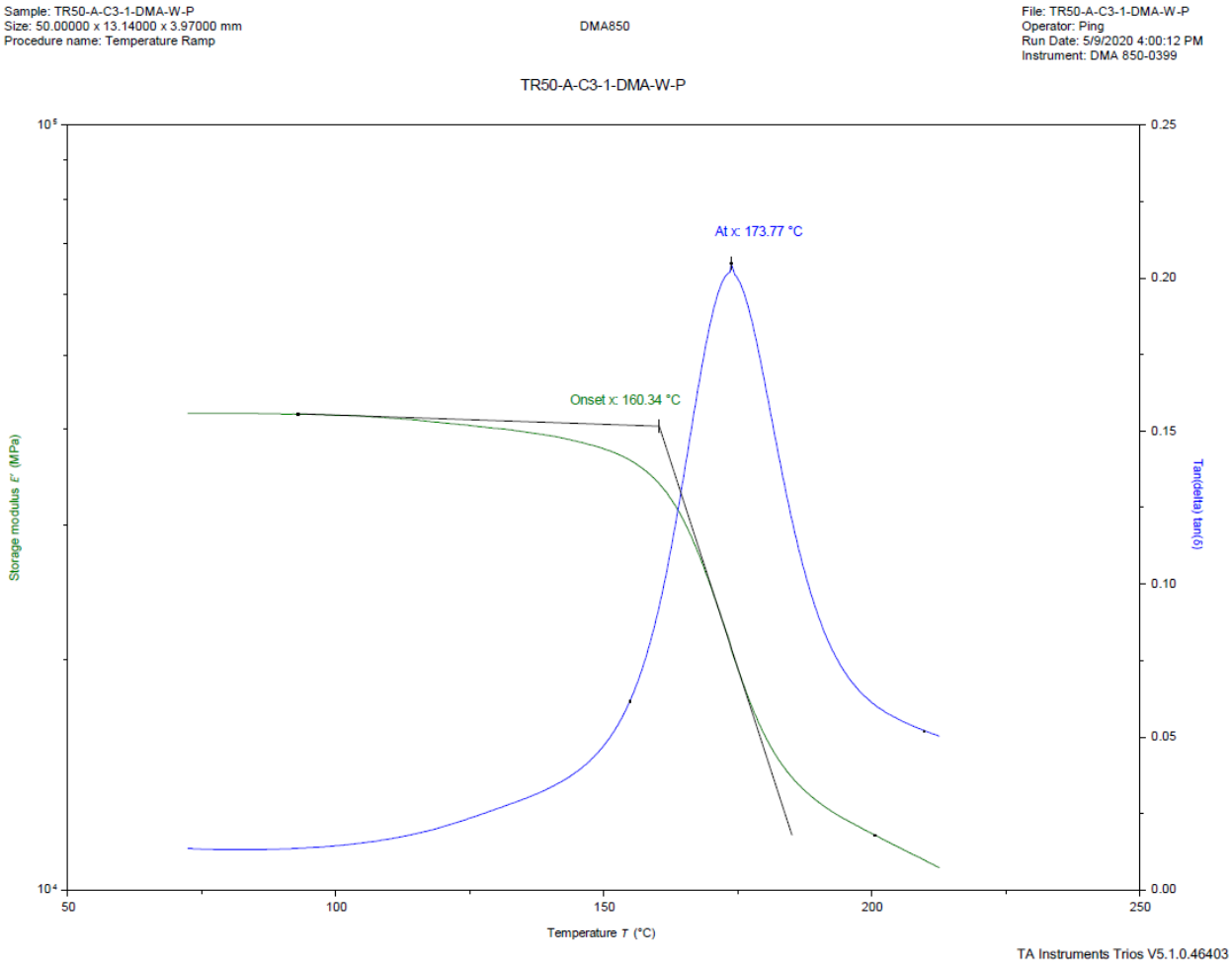
9.2.7.3 Scarf Section (Scarf Ratio of 50:1)



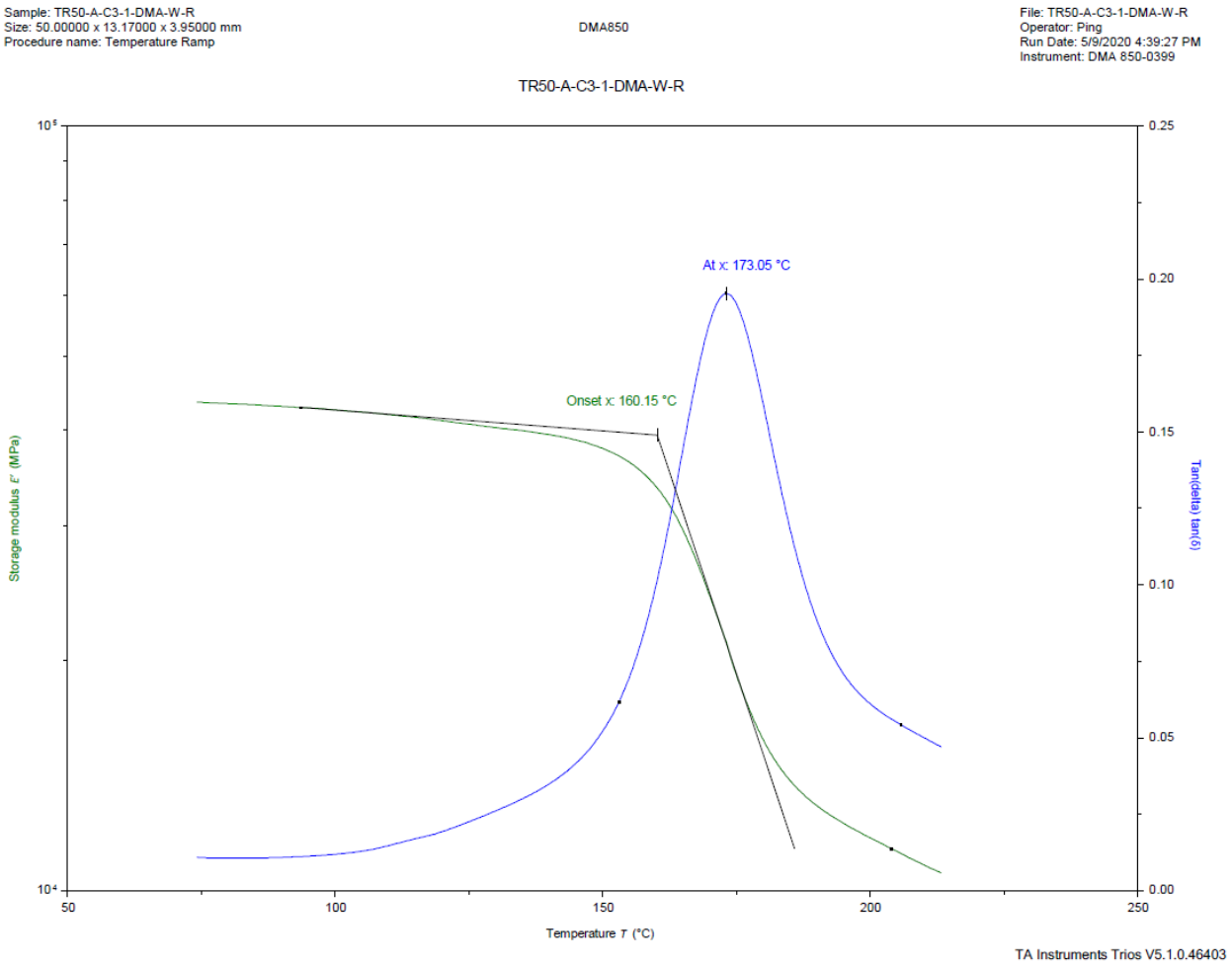
9.2.8 DMA Wet Batch A (Scarf Ratio of 50:1) – Qualification

A representative of TR50 DMA Wet profile from Batch A is provided below.

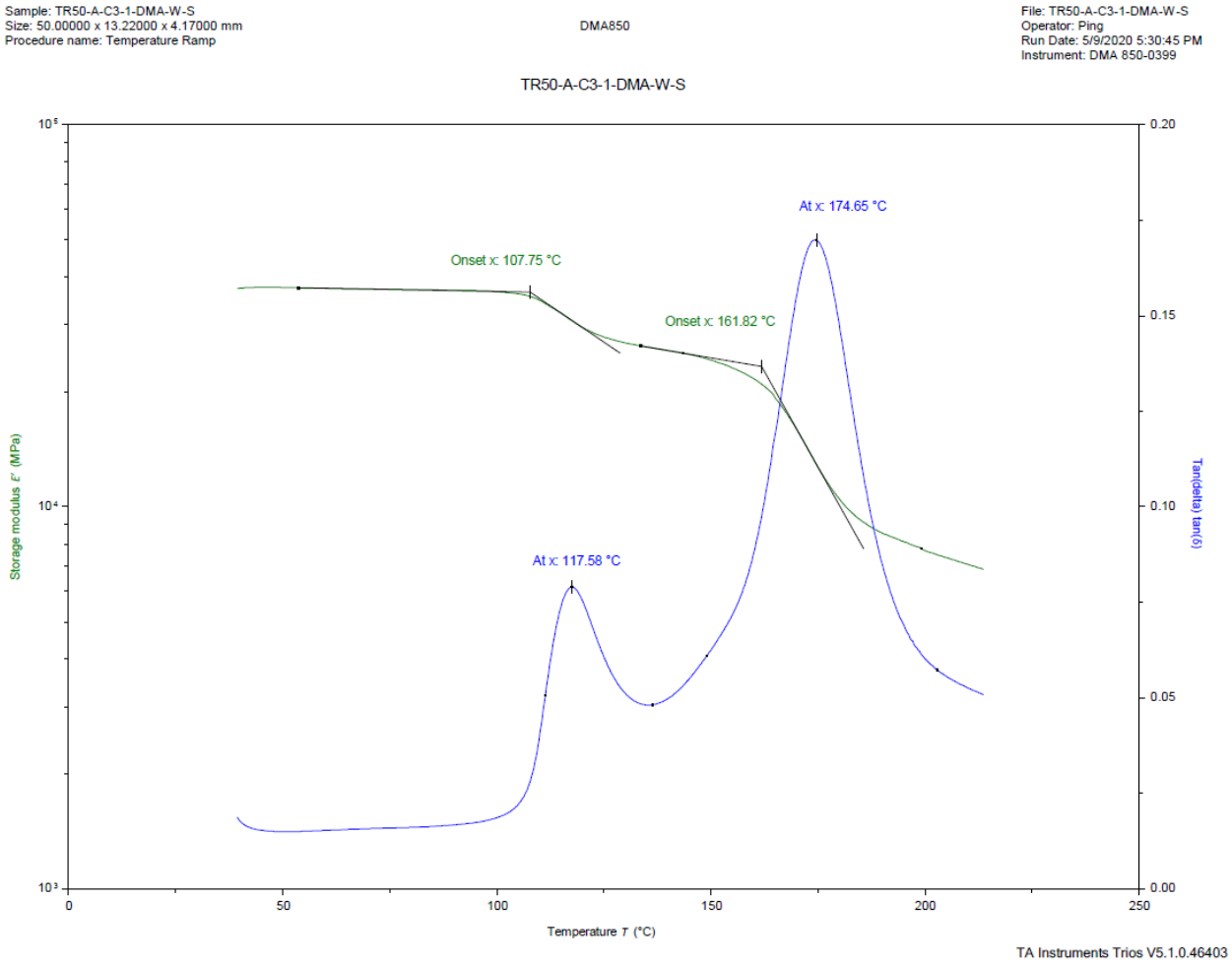
9.2.8.1 Parent Section (Scarf Ratio of 50:1)



9.2.8.2 Repair Section (Scarf Ratio of 50:1)



9.2.8.3 Scarf Section (Scarf Ratio of 50:1)



9.3 Laminate Level Repair (Scarf Ratio of 30:1) – Equivalency

9.3.1 DMA Dry Data – Parent Section (Scarf Ratio of 30:1)

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Dry (Parent Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-D-P	201.35	394.43	217.98	424.36
TR30-D-C6-1-DMA-D-P	201.47	394.65	217.54	423.57
UNCR30-D-C5-1-DMA-D-P	200.08	392.14	217.14	422.85
UNCR30-D-C6-1-DMA-D-P	200.20	392.36	216.79	422.22
Average	200.78	393.40	217.36	423.25
Standard Deviation	0.74	1.33	0.51	0.92

9.3.2 DMA Dry Data – Repair Section (Scarf Ratio of 30:1)

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Dry (Repair Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-D-R	194.00	381.20	212.49	414.48
TR30-D-C6-1-DMA-D-R	196.23	385.21	214.41	417.94
UNCR30-D-C5-1-DMA-D-R	192.05	377.69	211.30	412.34
UNCR30-D-C6-1-DMA-D-R	194.94	382.89	213.91	417.04
Average	194.31	381.75	213.03	415.45
Standard Deviation	1.76	3.17	1.41	2.54

9.3.3 DMA Dry Data – Scarf Section (Scarf Ratio of 30:1)

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Dry (Scarf Section, Adhesive)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-D-S	141.16	286.09	150.27	302.49
TR30-D-C6-1-DMA-D-S	140.71	285.28	153.47	308.25
UNCR30-D-C5-1-DMA-D-S	142.80	289.04	153.34	308.01
UNCR30-D-C6-1-DMA-D-S	143.41	290.14	154.13	309.43
Average	142.02	287.64	152.80	307.04
Standard Deviation	1.29	2.32	1.72	3.10

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Dry (Scarf Section, Laminate)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-D-S	198.66	389.59	217.36	423.25
TR30-D-C6-1-DMA-D-S	199.22	390.60	217.37	423.27
UNCR30-D-C5-1-DMA-D-S	200.58	393.04	217.92	424.26
UNCR30-D-C6-1-DMA-D-S	198.65	389.57	216.51	421.72
Average	199.28	390.70	217.29	423.12
Standard Deviation	0.91	1.63	0.58	1.05

9.3.4 DMA Wet Data – Parent Section (Scarf Ratio of 30:1)

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Wet (Parent Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-W-P	159.04	318.27	172.56	342.61
TR30-D-C6-1-DMA-W-P	160.00	320.00	172.89	343.20
TR30r-A-C1-1-DMA-W-P	163.38	326.08	176.60	349.88
TR30r-A-C2-1-DMA-W-P	163.14	325.65	176.94	350.49
UNCR30-D-C5-1-DMA-W-P	159.35	318.83	171.97	341.55
UNCR30-D-C6-1-DMA-W-P	158.70	317.66	173.57	344.43
UNCR30r-A-C1-1-DMA-W-P	164.30	327.74	177.70	351.86
UNCR30r-A-C2-1-DMA-W-P	164.13	327.43	176.40	349.52
Average	161.51	322.71	174.83	346.69
Standard Deviation	2.44	4.40	2.30	4.14

9.3.5 DMA Wet Data – Repair Section (Scarf Ratio of 30:1)

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Wet (Repair Section)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-W-R	157.98	316.36	170.16	338.29
TR30-D-C6-1-DMA-W-R	156.91	314.44	170.92	339.66
TR30r-A-C1-1-DMA-W-R	160.08	320.14	173.17	343.71
TR30r-A-C2-1-DMA-W-R	156.44	313.59	173.77	344.79
UNCR30-D-C5-1-DMA-W-R	155.09	311.16	168.97	336.15
UNCR30-D-C6-1-DMA-W-R	156.30	313.34	169.31	336.76
UNCR30r-A-C1-1-DMA-W-R	158.44	317.19	174.62	346.32
UNCR30r-A-C2-1-DMA-W-R	161.47	322.65	175.06	347.11
Average	157.84	316.11	172.00	341.60
Standard Deviation	2.12	3.81	2.44	4.39

9.3.6 DMA Wet Data – Scarf Section (Scarf Ratio of 30:1)

DMA Results Summary
FAA Repair (30:1 Scarf Ratio) DMA Wet (Scarf Section, Adhesive)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-W-S	107.40	225.32	117.50	243.50
TR30-D-C6-1-DMA-W-S	105.22	221.40	115.92	240.66
TR30r-A-C1-1-DMA-W-S	112.14	233.85	121.62	250.92
TR30r-A-C2-1-DMA-W-S	114.92	238.86	124.49	256.08
UNCR30-D-C5-1-DMA-W-S	104.58	220.24	115.85	240.53
UNCR30-D-C6-1-DMA-W-S	105.88	222.58	116.72	242.10
UNCR30r-A-C1-1-DMA-W-S	111.24	232.23	121.17	250.11
UNCR30r-A-C2-1-DMA-W-S	113.88	236.98	124.09	255.36
Average	109.41	228.93	119.67	247.41
Standard Deviation	4.11	7.41	3.60	6.49

DMA Results Summary

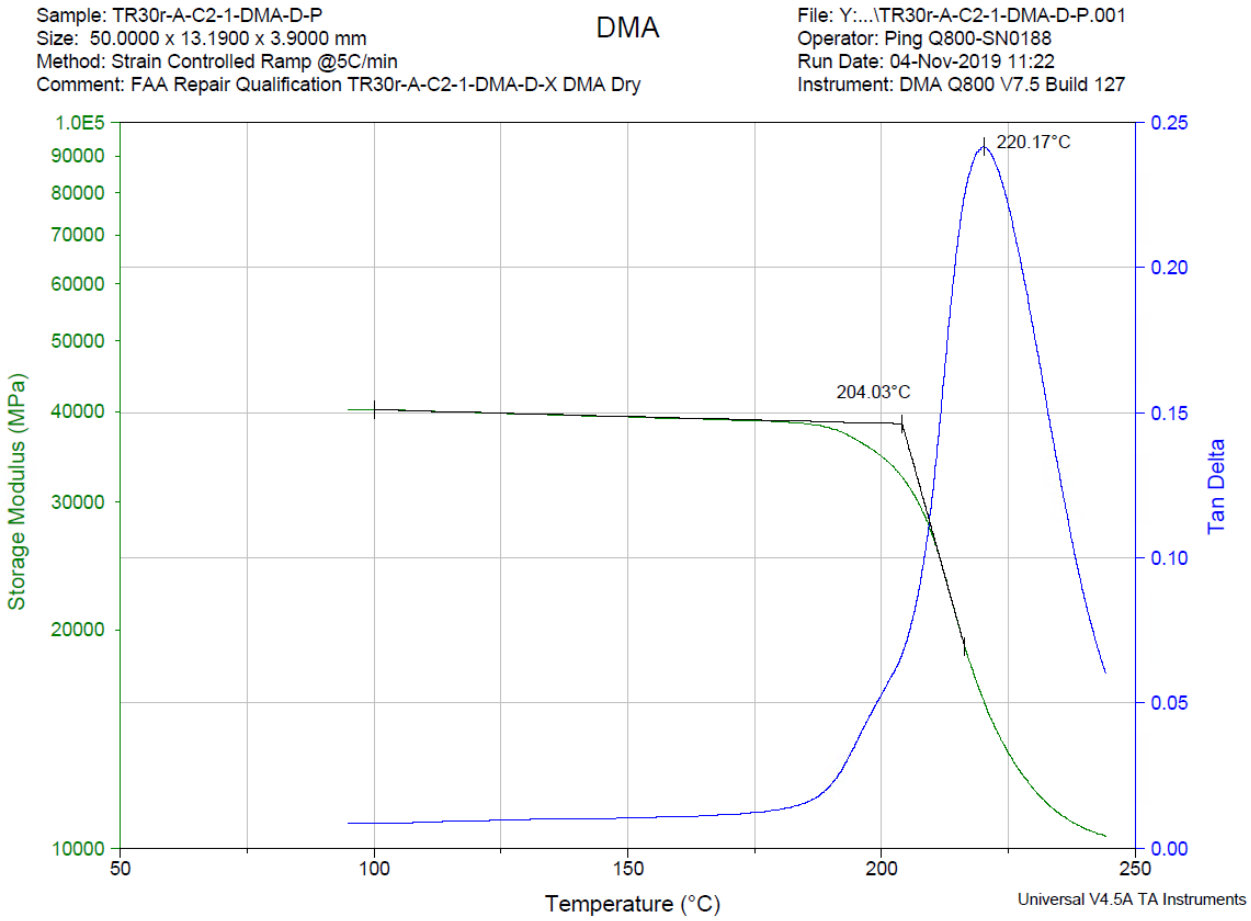
FAA Repair (30:1 Scarf Ratio) DMA Wet (Scarf Section, Laminate)

Sample #	Onset Storage Modulus		Peak of Tangent Delta	
	T_g [°C]	T_g [°F]	T_g [°C]	T_g [°F]
TR30-D-C5-1-DMA-W-S	160.93	321.67	173.08	343.54
TR30-D-C6-1-DMA-W-S	156.66	313.99	169.94	337.89
TR30r-A-C1-1-DMA-W-S	165.02	329.04	176.76	350.17
TR30r-A-C2-1-DMA-W-S	165.48	329.86	177.06	350.71
UNCR30-D-C5-1-DMA-W-S	156.15	313.07	170.26	338.47
UNCR30-D-C6-1-DMA-W-S	155.13	311.23	169.21	336.58
UNCR30r-A-C1-1-DMA-W-S	164.43	327.97	177.15	350.87
UNCR30r-A-C2-1-DMA-W-S	164.70	328.46	176.63	349.93
Average	161.06	321.91	173.76	344.77
Standard Deviation	4.45	8.01	3.54	6.37

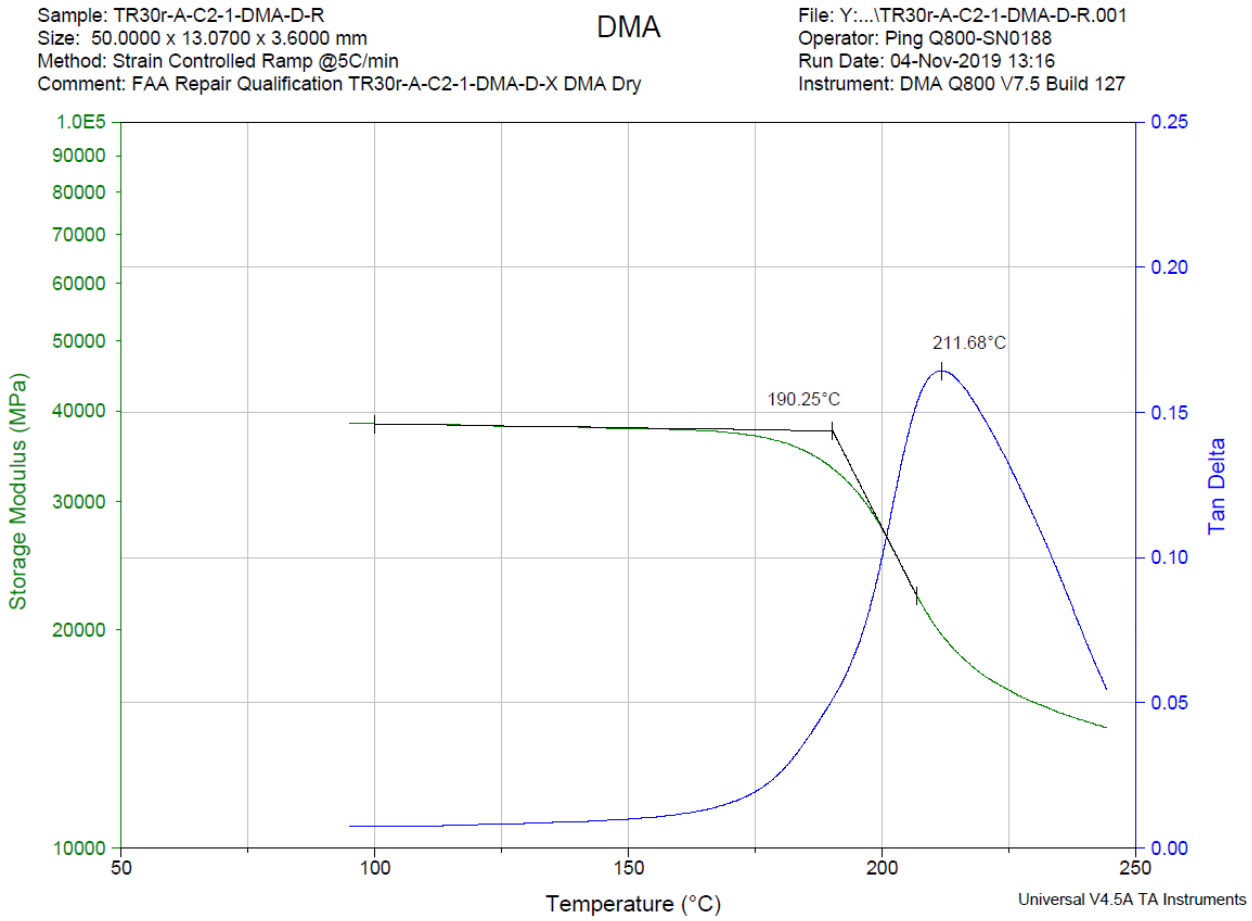
9.3.7 DMA Dry Batch A (Scarf Ratio of 30:1) – Equivalency

A representative of TR30 DMA Dry profile from Batch A is provided below.

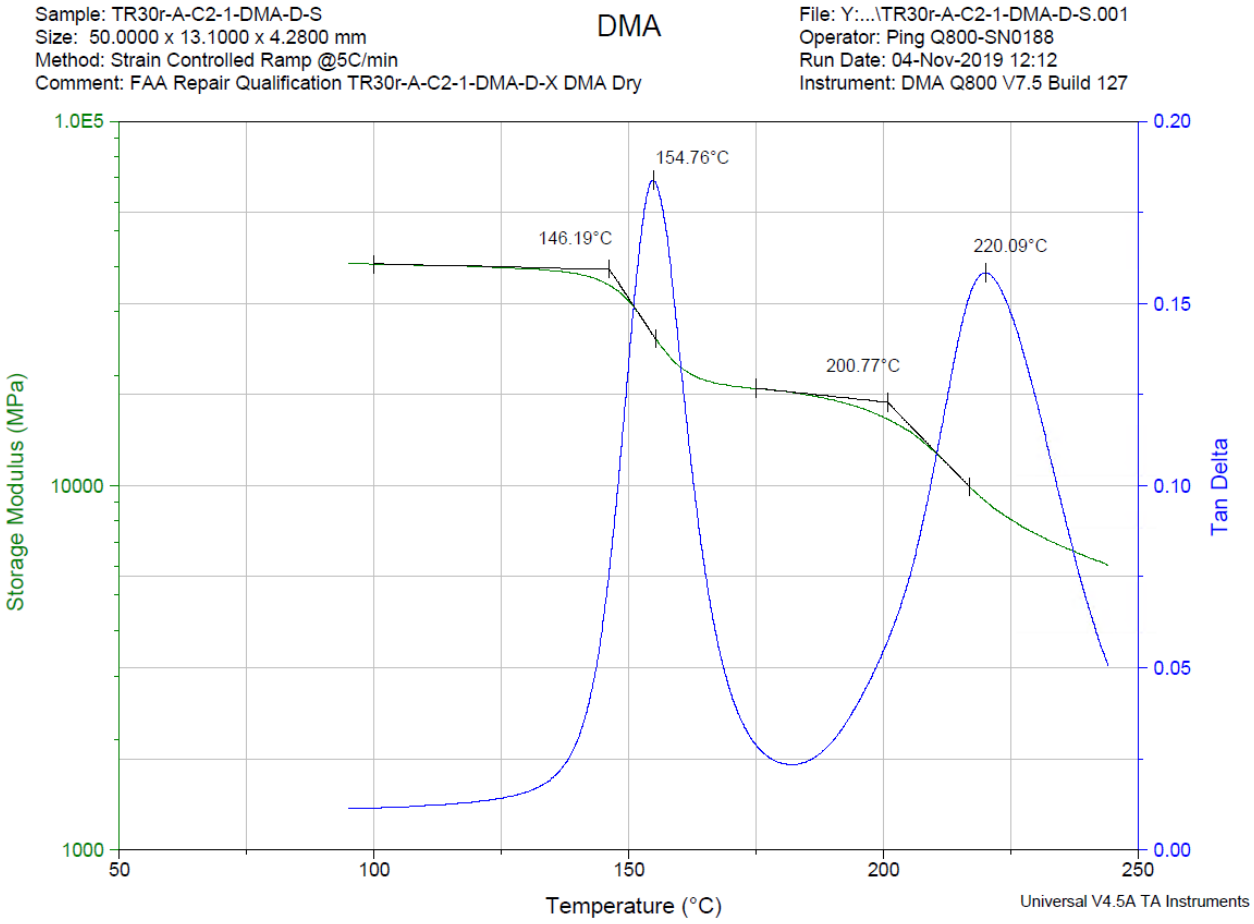
9.3.7.1 Parent Section (Scarf Ratio of 30:1)



9.3.7.2 Repair Section (Scarf Ratio of 30:1)



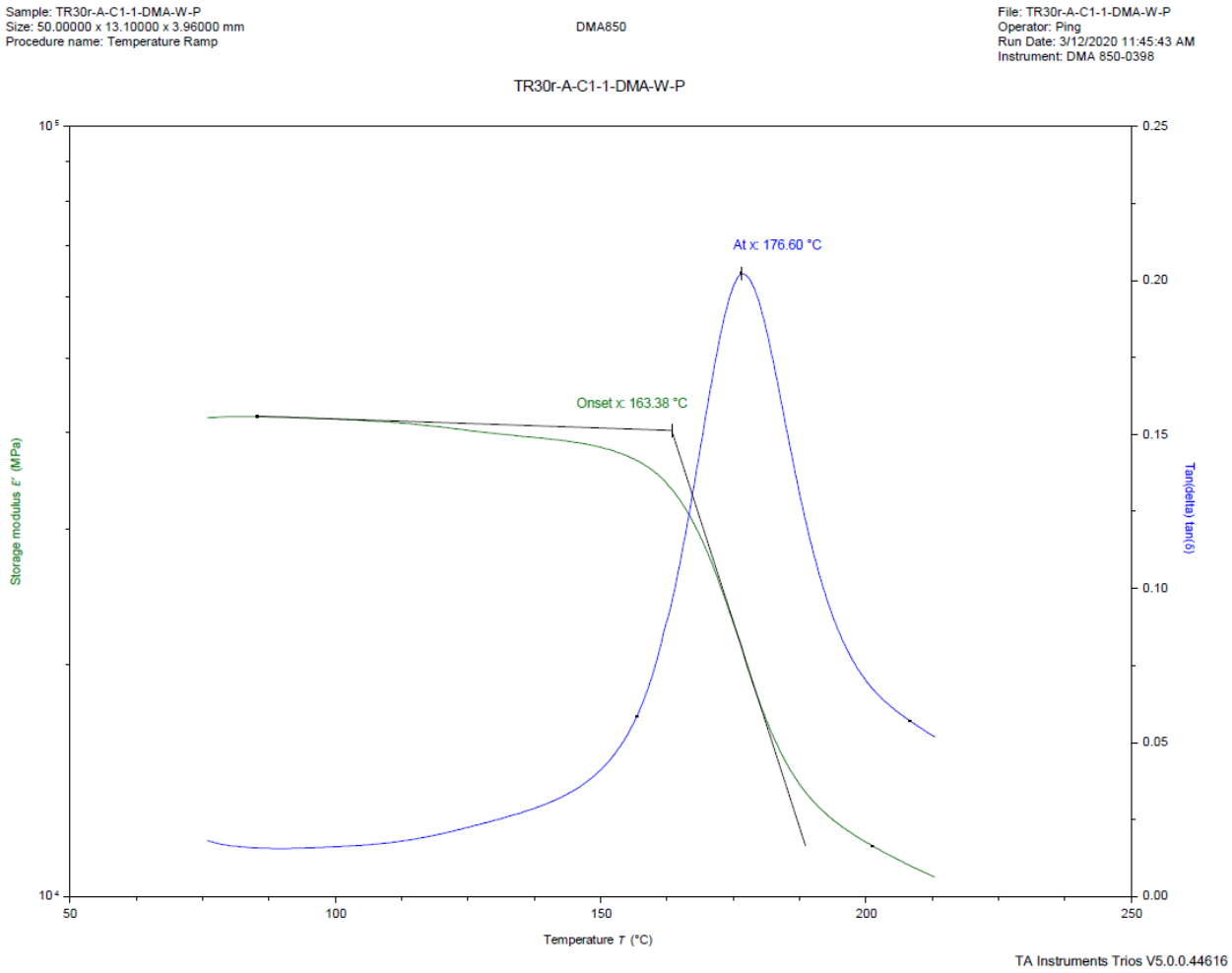
9.3.7.3 Scarf Section (Scarf Ratio of 30:1)



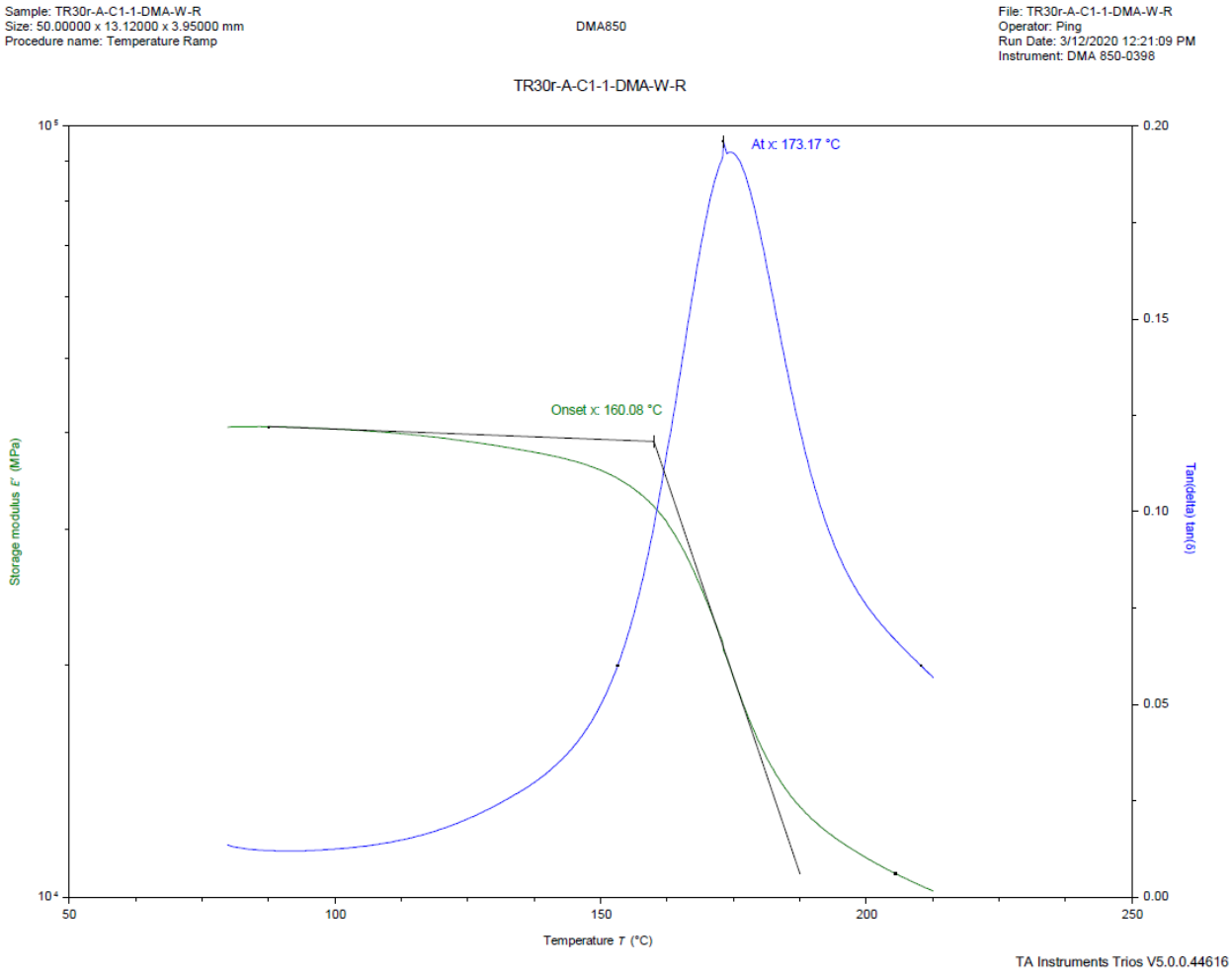
9.3.8 DMA Wet Batch A (Scarf Ratio of 30:1) – Equivalency

A representative of TR30 DMA Wet profile from Batch A is provided below.

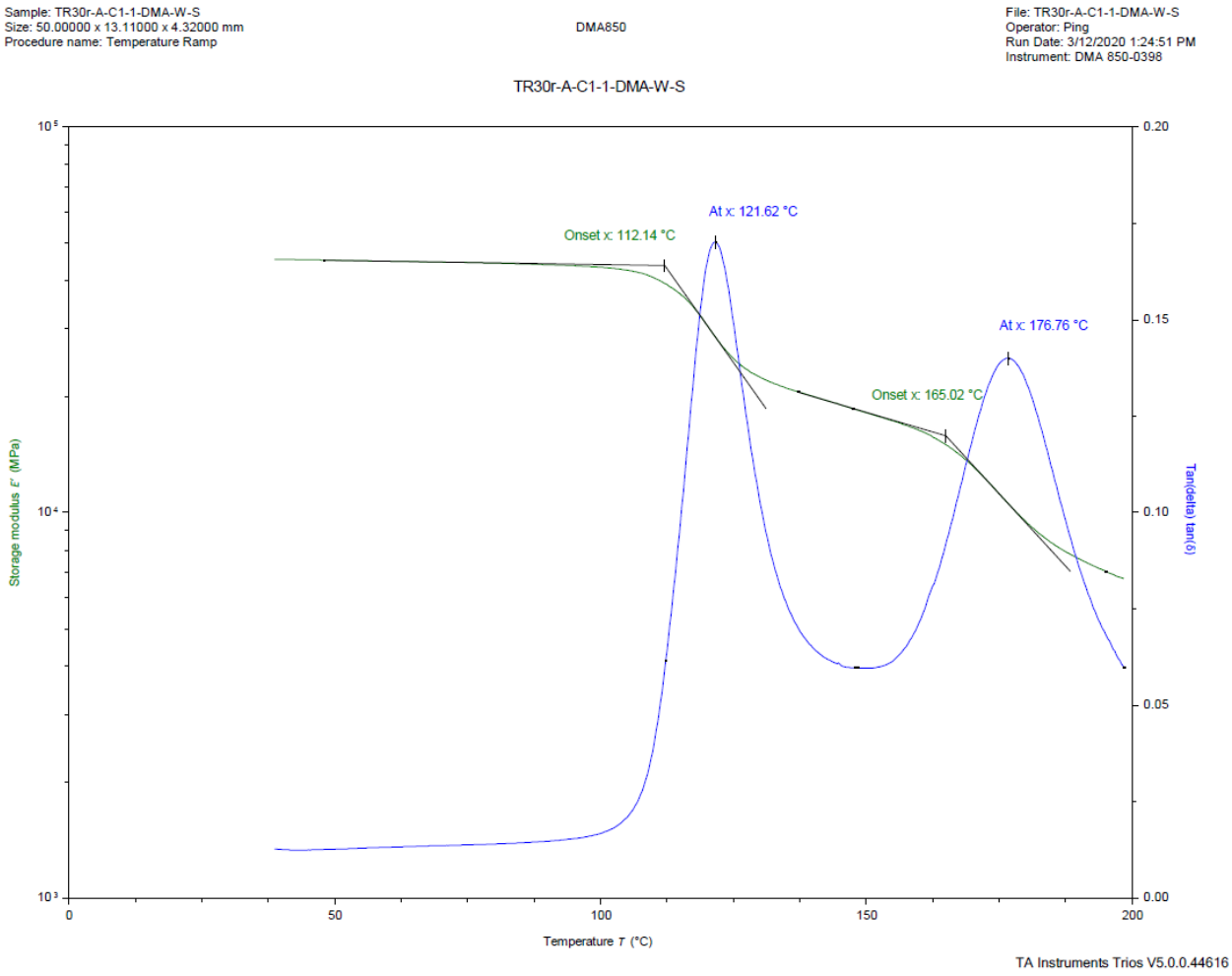
9.3.8.1 Parent Section (Scarf Ratio of 30:1)



9.3.8.2 Repair Section (Scarf Ratio of 30:1)



9.3.8.3 Scarf Section (Scarf Ratio of 30:1)



10. Moisture Loss

A representative specimen was used to measure the moisture loss.

10.1 Baseline Test for Un-Notched Compression

Layup	Test Type	Panel ID	Specimen ID	Weight Pre-Test (g)	Weight Post-Test (g)	Moisture Loss (g)
[45/0/-45/90/45/0/-45/90/-45/90]S	Un-Notched Compression ASTM D6484	NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1	NTP5325QR1-SOL-S36-NIAR-UNC1-A-C1-1-ETW2-4	71.4697	71.4440	0.0257
		NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1	NTP5325QR1-SOL-S36-NIAR-UNC1-A-C2-1-ETW2-4	71.1269	71.1014	0.0255
		NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1	NTP5325QR1-SOL-S36-NIAR-UNC1-B-C1-1-ETW2-4	70.6667	70.6390	0.0277
		NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1	NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-4	70.6186	70.5960	0.0226
		NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1	NTP5325QR1-SOL-S36-NIAR-UNC1-C-C1-1-ETW2-4	71.3771	71.3544	0.0227
		NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1	NTP5325QR1-SOL-S36-NIAR-UNC1-C-C2-1-ETW2-4	71.3163	71.2947	0.0216

10.2 Laminate Repair

Layup	Test Type	Panel ID	Specimen ID	Weight Pre-Test (g)	Weight Post-Test (g)	Moisture Loss (g)
[45/0/-45/90/45/0/-45/90/-45/90]S	Tension Repair ASTM D8131	NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1	NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-TRAV-P	8.0369	8.0324	0.0045
			NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-TRAV-R	7.9361	7.9330	0.0031
			NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-TRAV-S	8.4096	8.4096	0.0000
		NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1	NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-TRAV-P	8.0487	8.0430	0.0057
			NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-TRAV-R	7.9581	7.9533	0.0048
			NTP5325QR1-SOL-S36-NIAR-TR50-A-C4-1-TRAV-S	8.4394	8.4358	0.0036
		NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1	NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-TRAV-P	7.9775	7.9729	0.0046
			NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-TRAV-R	7.8824	7.8781	0.0043
			NTP5325QR1-SOL-S36-NIAR-TR50-B-C4-1-TRAV-S	8.4617	8.4576	0.0041
		NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1	NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-TRAV-P	8.0940	8.0902	0.0038
			NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-TRAV-R	7.8746	7.8710	0.0036
			NTP5325QR1-SOL-S36-NIAR-TR50-C-C3-1-TRAV-S	8.3774	8.3743	0.0031
[45/0/-45/90/45/0/-45/90/-45/90]S	Un-Notched Compression Repair ASTM D6484	NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1	NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-TRAV-P	8.0046	7.9977	0.0069
			NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-TRAV-R	7.9141	7.9094	0.0047
			NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C3-1-TRAV-S	8.4753	8.4694	0.0059
		NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1	NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-TRAV-P	7.9426	7.9386	0.0040
			NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-TRAV-R	8.0220	8.0175	0.0045
			NTP5325QR1-SOL-S36-NIAR-UNCR50-B-C4-1-TRAV-S	8.3996	8.3959	0.0037
		NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1	NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-TRAV-P	8.1193	8.1167	0.0026
			NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-TRAV-R	7.9738	7.9715	0.0023
			NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C3-1-TRAV-S	8.6482	8.6457	0.0025
		NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1	NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-TRAV-P	8.1201	8.1137	0.0064
			NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-TRAV-R	7.9673	7.9616	0.0057
			NTP5325QR1-SOL-S36-NIAR-UNCR50-C-C4-1-TRAV-S	8.7549	8.7495	0.0054
[45/0/-45/90/45/0/-45/90/-45/90]S	Compression After Impact ASTM D7136/ D7137	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-1	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-1-TRAV-P	8.0501	8.0445	0.0056
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-1-TRAV-R	7.9650	7.9608	0.0042
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-1-TRAV-S	8.6047	8.6000	0.0047
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-2	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-2-TRAV-P	8.1419	8.1364	0.0055
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-2-TRAV-R	7.9689	7.9665	0.0024
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-4-2-TRAV-S	8.6395	8.6356	0.0039
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-1	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-1-TRAV-P	8.1242	8.1199	0.0043
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-1-TRAV-R	7.9764	7.9733	0.0031
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-1-TRAV-S	8.5180	8.5088	0.0092
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-2	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-2-TRAV-P	8.1754	8.1714	0.0040
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-2-TRAV-R	8.0039	8.0016	0.0023
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C7-5-2-TRAV-S	8.4538	8.4510	0.0028
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-1	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-1-TRAV-P	8.0917	8.0877	0.0040
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-1-TRAV-R	7.9703	7.9669	0.0034
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-1-TRAV-S	8.6772	8.6735	0.0037
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-2	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-2-TRAV-P	8.1123	8.1073	0.0050
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-2-TRAV-R	7.9578	7.9517	0.0061
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-4-2-TRAV-S	8.5031	8.4958	0.0073
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-1	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-1-TRAV-P	8.1297	8.1257	0.0040
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-1-TRAV-R	7.9350	7.9319	0.0031
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-1-TRAV-S	8.5671	8.5639	0.0032
		NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-2	NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-2-TRAV-P	8.0890	8.0818	0.0072
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-2-TRAV-R	7.9364	7.9323	0.0041
			NTP5325QR1-SOL-S36-NIAR-UNCFS-A-C8-5-2-TRAV-S	8.5333	8.5279	0.0054
		NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4	NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-TRAV-P	7.9590	7.9554	0.0036
			NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-TRAV-R	7.7164	7.7134	0.0030
			NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-4-TRAV-S	8.4394	8.4357	0.0037
		NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5	NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-TRAV-P	7.9493	7.9460	0.0033
			NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-TRAV-R	7.7294	7.7264	0.0030
			NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-5-TRAV-S	8.6255	8.6222	0.0033
		NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4	NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-TRAV-P	7.9473	7.9413	0.0060
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-TRAV-R	7.7457	7.7367	0.0090
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-4-TRAV-S	8.5204	8.5121	0.0083
		NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5	NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-TRAV-P	7.9987	7.9922	0.0065
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-TRAV-R	7.7131	7.7070	0.0061
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C1-5-TRAV-S	8.8306	8.8243	0.0063
		NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4	NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-TRAV-P	7.9446	7.9432	0.0014
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-TRAV-R	7.7755	7.7738	0.0017
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-4-TRAV-S	8.6784	8.6770	0.0014
		NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5	NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-TRAV-P	7.9620	7.9595	0.0025
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-TRAV-R	7.7781	7.7750	0.0031
			NTP5325QR1-SOL-S36-NIAR-CAI150-C-C2-5-TRAV-S	8.4484	8.4448	0.0036
		NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4	NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-TRAV-P	8.1860	8.1809	0.0051
			NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-TRAV-R	7.9265	7.9239	0.0026
			NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-4-TRAV-S	8.7585	8.7546	0.0039
		NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5	NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-TRAV-P	8.1046	8.1018	0.0028
			NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-TRAV-R	7.9189	7.9160	0.0029
			NTP5325QR1-SOL-S36-NIAR-CAI150-D-C1-5-TRAV-S	8.5958	8.5938	0.0020

11. Failure Modes

This section provides codes used to describe failure modes for each test method as defined by the test standard. Post-test photos have been selected to visually supplement the failure codes. The failure modes are listed for individual specimens in the "Raw Data" section (see section 4).

11.1 Un-Notched Compression

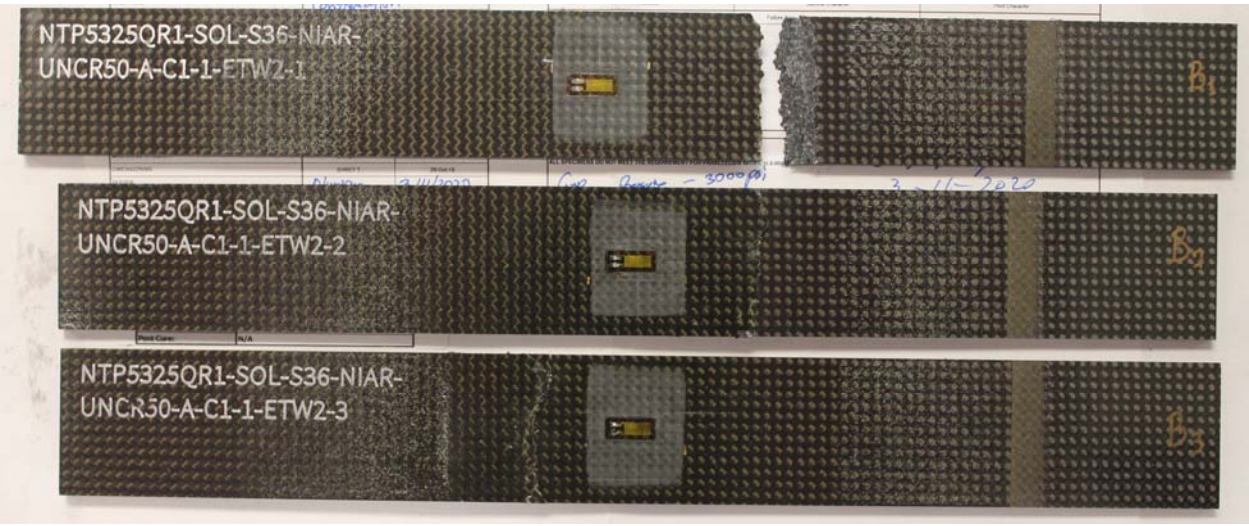
First Character		Second Character		Third Character	
Failure Type	Code	Failure Area	Code	Failure Location	Code
Angled	A	Inside Grip/tab	I	Bottom	B
edge Delamination	D	At grip/tab	A	Top	T
Grip/tab	G	< 1W from grip / tab	W	Left	L
Lateral	L	Gage	G	Right	R
Multi-mode	M(xyz)	Multiple areas	M	Middle	M
Long. Splitting	S	Various	V	Various	V
eXplosive	X	Unknown	U	Unknown	U
Other	O				

Failure modes from top to bottom:

Specimen ID	Failure Mode
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-1	LWT
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-2	M(L,A)GM
NTP5325QR1-SOL-S36-NIAR-UNC1-B-C2-1-ETW2-3	M(A,L)WT

11.2 Un-Notched Compression Repair

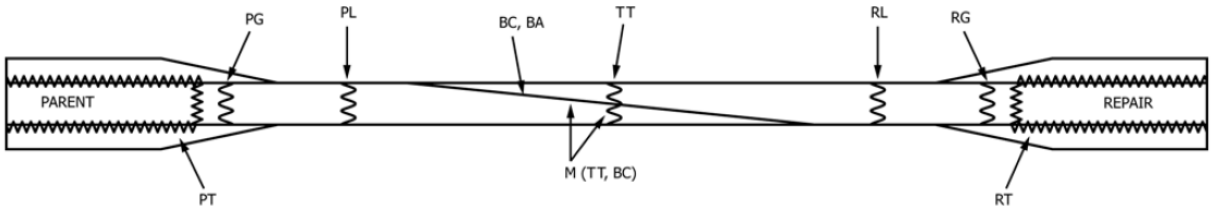
First Character		Second Character		Third Character	
Failure Type	Code	Failure Area	Code	Failure Location	Code
Angled	A	Inside Grip/tab	I	Bottom	B
edge Delamination	D	At grip/tab	A	Top	T
Grip/tab	G	< 1W from grip / tab	W	Left	L
Lateral	L	Gage	G	Right	R
Multi-mode	M(xyz)	Multiple areas	M	Middle	M
Long. Splitting	S	Various	V	Various	V
eXplosive	X	Unknown	U	Unknown	U
Other	O				



Failure modes from top to bottom:

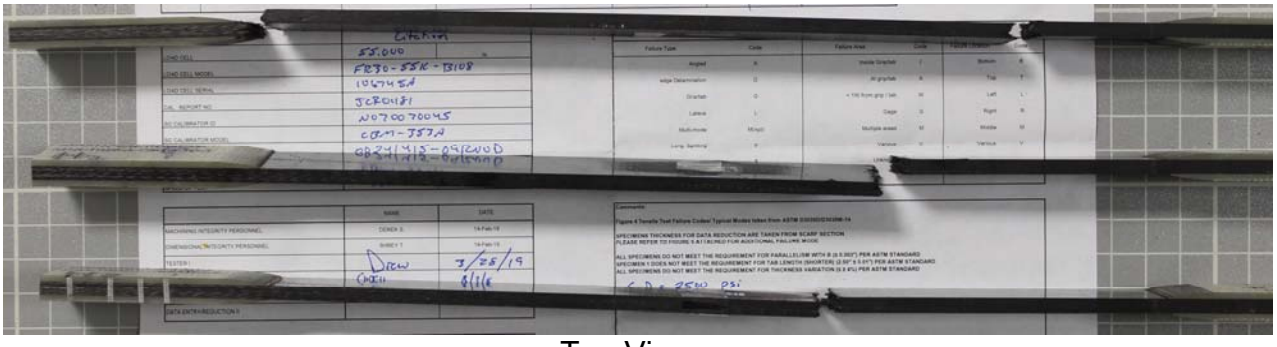
Specimen ID	Failure Mode
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C1-1-ETW2-1	LWB
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C1-1-ETW2-2	LWB, M(L,A)GM
NTP5325QR1-SOL-S36-NIAR-UNCR50-A-C1-1-ETW2-3	M(A,L)WB

11.3 Tensile Repair



BA	Bondline/Shear Failure - Adhesive
BC	Bondline/Shear Failure - Cohesive
PL	Parent Laminate through Thickness Failure (Gage Area)
PG	Parent Laminate Grip Area Failure (Un-Tabbed Specimen)
PT	Parent Laminate Tab Area Failure (Tabbed Specimen)
RL	Repair Laminate through Thickness Failure (Gage Area)
RG	Repair Laminate Grip Area Failure (Un-Tabbed Specimen)
RT	Repair Laminate Tab Area Failure (Tabbed Specimen)
TT	Through Thickness Failure in Repair Joint Area
M	Multiple Failure Locations, list each code in parentheses, for example, M (TT, BC)

Front View



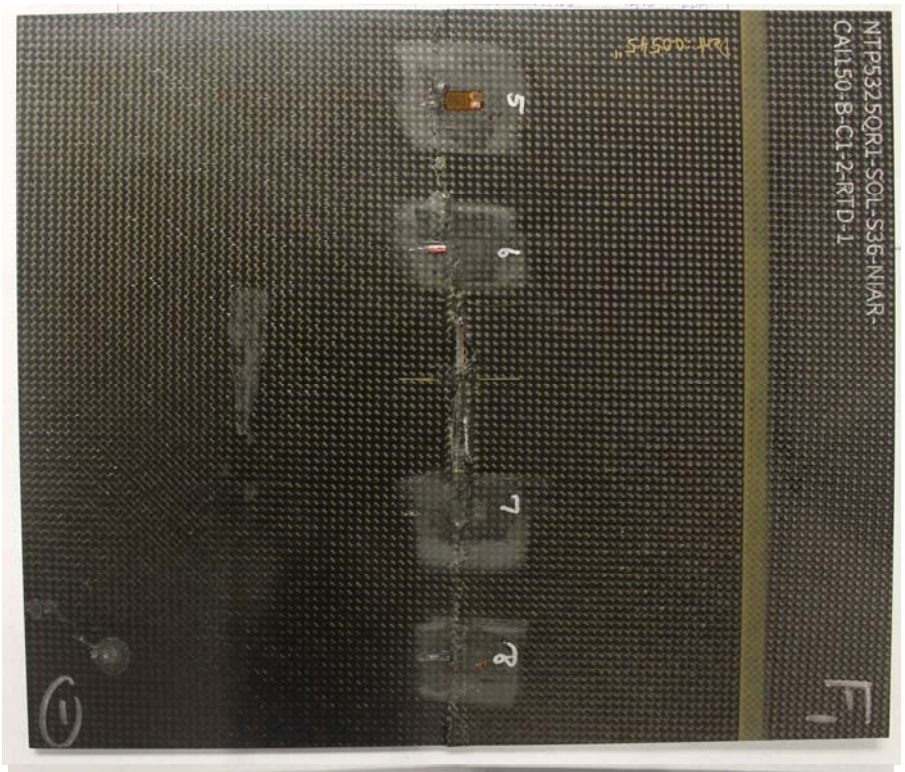
Top View

Failure modes from top to bottom:

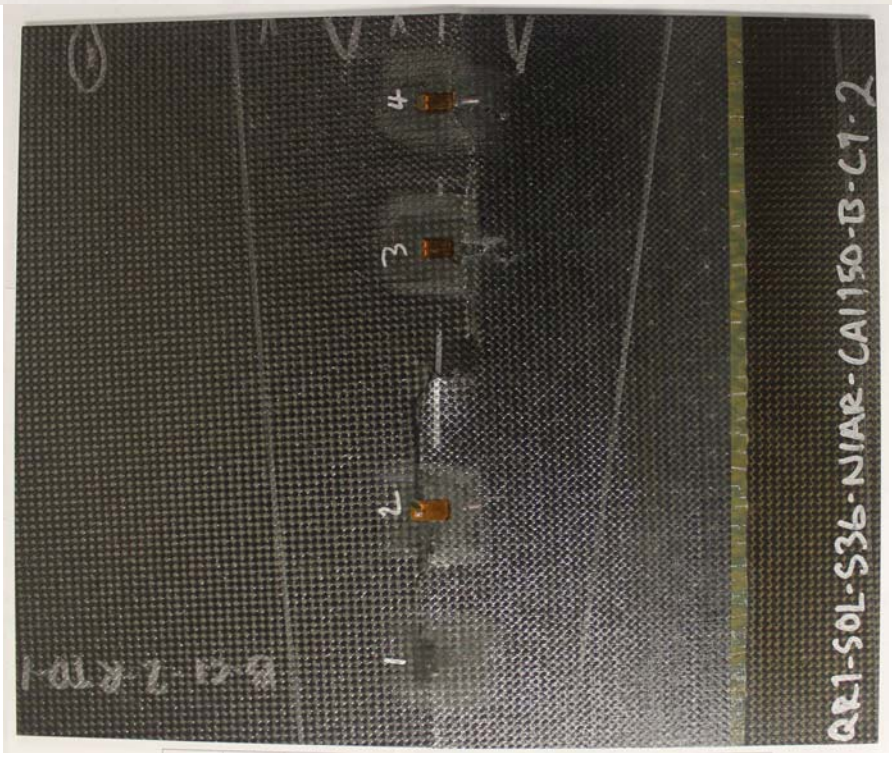
Specimen ID	Failure Mode
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-RTD-1	TT, RL
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-RTD-2	TT
NTP5325QR1-SOL-S36-NIAR-TR50-A-C3-1-RTD-3	TT

11.4 Compression After Impact Repair

First Character		Second Character		Third Character	
Failure Type	Code	Failure Area	Code	Failure Location	Code
Angled	A	At end/edge	A	Bottom	B
Brooming	B	at/through Damage	D	Left	L
end-Crushing	C	Gage, away from damage	G	Middle	M
Delamination growth to edge at final failure, lengthwise	D	Multiple areas	M	Right	R
tHrough-thickness	H	Various	V	Top	T
panel Instability	I	Unknown	U	Various	V
Kink bands	K			Unknown	U
Lateral	L				
Multimode	M(xyz)				
Delamination growth to edge prior to final failure, Restrained by edge	R				
long, Splitting	S				
delamination growth to edge at final failure,Widthwise	W				
eXplosive	X				
Other	O				



Front View



Rear View

Failure modes from top to bottom:

Specimen ID	Failure Mode
NTP5325QR1-SOL-S36-NIAR-CAI150-B-C1-2-RTD-1	LDM

12. Deviations

N/A