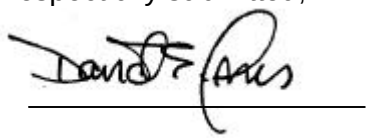
TO WHOM THIS MAY CONCERN: November 17, 2003

Subject: SIGMA TECHNOLOGY LABORATORIES, INC.
Certified Testing and Laboratory Analysis

Sigma Technology Laboratories, Inc was founded in 1988 as a division of Blackwell, Jones & Associates, Inc. Then, following a name change in 1991, became a division of D.E. Jones and Associates, Inc. **Sigma Labs** provided testing services, specializing in composite materials for builders, suppliers, engineers and designers until its sale in 1999 to Structural Composites, Inc. of Melbourne, Florida. **Sigma Labs** continues to operate under the same name, but as a division of Structural Composites, Inc. All of the original equipment is still in use with current calibration records intact.

All testing performed by **Sigma Technology Laboratories, Inc**. from 1988 until its sale in 1999 was in strict accordance with the **American Society of Materials and Testing (ASTM)** standards of calibration and testing and is considered valid for the test conditions, procedures and materials stated in the original reports. Facts of data acquisition, applicable test methods, sample preparation, equipment calibration and data reporting are standardized according to accepted **ASTM** procedures and maintain their relevance regardless of any time constraint considered. All test equipment calibration records have been preserved and are retained by D. E. Jones & Associates, Inc. **Sigma Technology Laboratories, Inc.,** as a division of Structural Composites, Inc., maintains its accreditation and the certification of all its equipment.

Respectfully submitted,



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SIGMA LABS

MECHANICAL & PHYSICAL PROPERTIES OF

FIBERGLASS/EPOXY PIPE LINERS

Report No. 97SL059

May 12, 1997

as prepared for

INFRASTRUCTURE REPAIR SYSTEMS, INC.

3201 28th Street North

St. Petersburg, Fl. 33784

Attn: Mr. David Kirby

SIGMA TECHNOLOGY LABORATORIES

A Division Of D.E. Jones & Associates, Inc.

6281 39th Street North, Suite C

Pinellas Park, FL 33781

Report Number: 97SL059
May 12, 1997
Page 1

CLIENT: INFRASTRUCTURE REPAIR SYSTEMS, INC.
P.O. Box 60457
3201 28th Street North
St. Petersburg, Fl. 33784

ATTN: Mr. David Kirby

SUBJECT: Mechanical & Physical Properties Of Fiberglass/Epoxy Pipe Liners

SUMMARY

One fiberglass/epoxy panel identified as "ST" measuring 22" x 24½"x 0.10", a two gallon and five gallon pail each of Infrastructure Repair Products, Inc. L-401 Laminating Epoxy Base, ½ and two gallon pail each of Infrastructure Repair Products, Inc. L-401 Laminating Epoxy Activator, fourteen feet of liner fabric and a 17" x 10" x 7" concrete slab were received from INFRASTRUCTURE REPAIR SYSTEMS, INC. for mechanical and physical properties analysis. Mechanical testing was performed in the 0° fiber direction to identify the tensile, compressive, and flexural properties and peel resistance. Physical property testing performed was to determine the heat deflection temperature and surface hardness of the epoxy panels.

A 12" x 24" panel identified as "IRS" approximately 0.10" thick was constructed from one ply of the submitted liner fabric, using the L-401 Laminating Epoxy Base and Activator at a 4:1 volume ratio. The panel was initially cured under vacuum at a level of 5 inches of Hg and then increased to a level of 25 inches when the epoxy began to gel. Peel resistance coupons were laminated to the submitted concrete slab and a 14"x14"x1" steel plate provided by Sigma Labs.

Testing was guided by the American Society of Testing and Materials (ASTM) test methods. Mechanical property tests employed were ASTM D 638 Tensile Properties of Plastics, ASTM D 695 Compressive Properties of Rigid Plastics, ASTM D 790 Flexural Properties of Unreinforced and Reinforced Plastics and ASTM D 1876 Peel Resistance of Adhesives (T-Peel Test). The Physical property tests employed were ASTM D 2583 Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor and ASTM D 648 Deflection Temperature of Plastics Under Flexural Load . ASTM D 648 was performed by an associate laboratory.

A brief description of the test procedures used is given in the "TEST PROCEDURE" portion of the report, observations are reported in the "OBSERVATIONS" portion and data derived from testing is reported in the "DATA" and "DATA SUMMARY" sections of this report.

TEST PROCEDURE

TEST METHOD: ASTM D 638

TITLE: Tensile Properties of Plastics

The coupons were machined to 9.0" long, with an "overall" width of .750", and "necked" to approximately .50" over the gauge length. A strain gauge extensometer (1" gauge length) was mounted flatwise on the smooth or "mold" side of the coupons for the purpose of strain measurement during the test. The instrument was removed prior to coupon failure. The crosshead speed (speed of testing) was 0.1 inches per minute.

TEST METHOD: ASTM D 695

TITLE: Compressive Properties of Rigid Plastics

Coupons were machined to 3" long with an overall width of 0.750" and "necked" to approximately 0.50" over the gage length. A strain gauge extensometer was positioned edgewise on the test coupon. Each coupon was supported in a test "jig" that prevents global buckling and allows the coupon to fail in compression. The crosshead speed was 0.05 inches per minute.

TEST METHOD: ASTM D 790

TITLE: Flexural Properties of Unreinforced and Reinforced Plastics (Method I, Procedure A)

This property was tested using a 16:1 support span : depth ratio. A three-point bending apparatus was used (D 790 Method I, Procedure A). Coupon deflection under load was measured using a deflectometer positioned under the middle of the coupon. Radii of the loading nose and end supports was ⅛". All coupons were tested with the mold side "up". The crosshead speed (speed of testing) was 0.05 inches per minute. As a result the pressure applied could be considered "normalized" to the loads seen in actual usage.

TEST PROCEDURE (Continue)

TEST METHOD: ASTM D 1876

TITLE: Peel Resistance of Adhesives (T-Peel Test)

Bonding strips 1" wide and 12" long were cut from the submitted liner fabric in the 0° direction. The bonding surface of the concrete was scrubbed clean, submerged in water for an hour, and then toweled dry prior to lamination. The bonding surface of the steel was sanded with a hand held grinder using 80 grit sandpaper and then wiped and cleaned with acetone prior to lamination. Bonding strips were laminated to the concrete slab and steel plate using the L-401 Laminating Epoxy Base and Activator at a 4:1 volume ratio. A three inch portion of each strip was bent up 90° to facilitate gripping of the specimens in the machine. The samples were tested at 10.0" per minute crosshead speed. Elongation (pulling apart) of the samples was tracked using a deflectometer positioned under the crosshead.

TEST METHOD: ASTM D 2583

TITLE: Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

Each laminate was tested for barcol hardness using a Barber Coleman GYZJ 934-1 Impressor. Sixteen readings were taken from the both surfaces of the laminate. The highest and the lowest readings were thrown out, and the remaining fourteen were averaged.

OBSERVATIONS
"ST" PANEL

ASTM D 638

COUPON 1,2	Multiple lateral tensile cracks in liner layer followed by fiber tensile failure at bottom of gage section.
COUPON 3	Multiple lateral tensile cracks in liner layer followed by fiber tensile failure near top of gage section.
COUPON 4,5	Multiple lateral tensile cracks in liner layer followed by fiber tensile failure at top of gage section.

ASTM D 790

COUPON 1-5	Tension side failure at midspan with lateral resin cracks.

OBSERVATIONS
"IRS" PANEL

ASTM D 638

COUPON 1, 4-6	Multiple lateral tension cracks in the liner layer followed by fiber tensile failure at the bottom of gage section.
COUPON 2,3	Multiple lateral tension cracks in the liner layer followed by fiber tensile failure at the top of gage section.

ASTM D 695

COUPON 1,5	Compressive buckling of liner layer followed by compression failure of fiber layer at the bottom of the gage section.
COUPON 2,3,6	Compression failure at top of gage section.

ASTM D 790

COUPON 1-5	Tension side failure at midspan with visible fiber damage. Mild wrinkling on compression side at midspan.

INFRASTRUCTURE REPAIR SYSTEMS, INC.
"ST" FIBERGLASS/EPOXY PANEL
DATA SUMMARY

TEST METHOD		TENSILE STRENGTH	TENSILE MODULUS
ASTM D 638	PANEL	(psi)	(mpsi)
	ST	12,865	1.147

TEST METHOD		FLEXURAL STRENGTH	FLEXURAL MODULUS
ASTM D 790	PANEL	(psi)	(mpsi)
	ST	17,508	0.660

TEST METHOD		HARDNESS READING AVERAGES
ASTM D 2583	PANEL	MOLD SIDE
	ST	82.5 *

* This figure represents the average of remaining readings after high/low readings have been discarded.

INFRASTRUCTURE REPAIR SYSTEMS, INC.
"IRS" FIBERGLASS/EPOXY PANEL
DATA SUMMARY

TEST METHOD		TENSILE STRENGTH	TENSILE MODULUS
ASTM D 638	PANEL	(psi)	(mpsi)
	IRS	16,577	1.119

TEST METHOD		STRESS	DEFLEC
ASTM D 648	PANEL	(psi)	TEMP (°F)
	IRS	264	139

TEST METHOD		COMPRESSIVE STRENGTH	COMPRESSIVE MODULUS
ASTM D 695	PANEL	(psi)	(mpsi)
	IRS	23,595	1.446

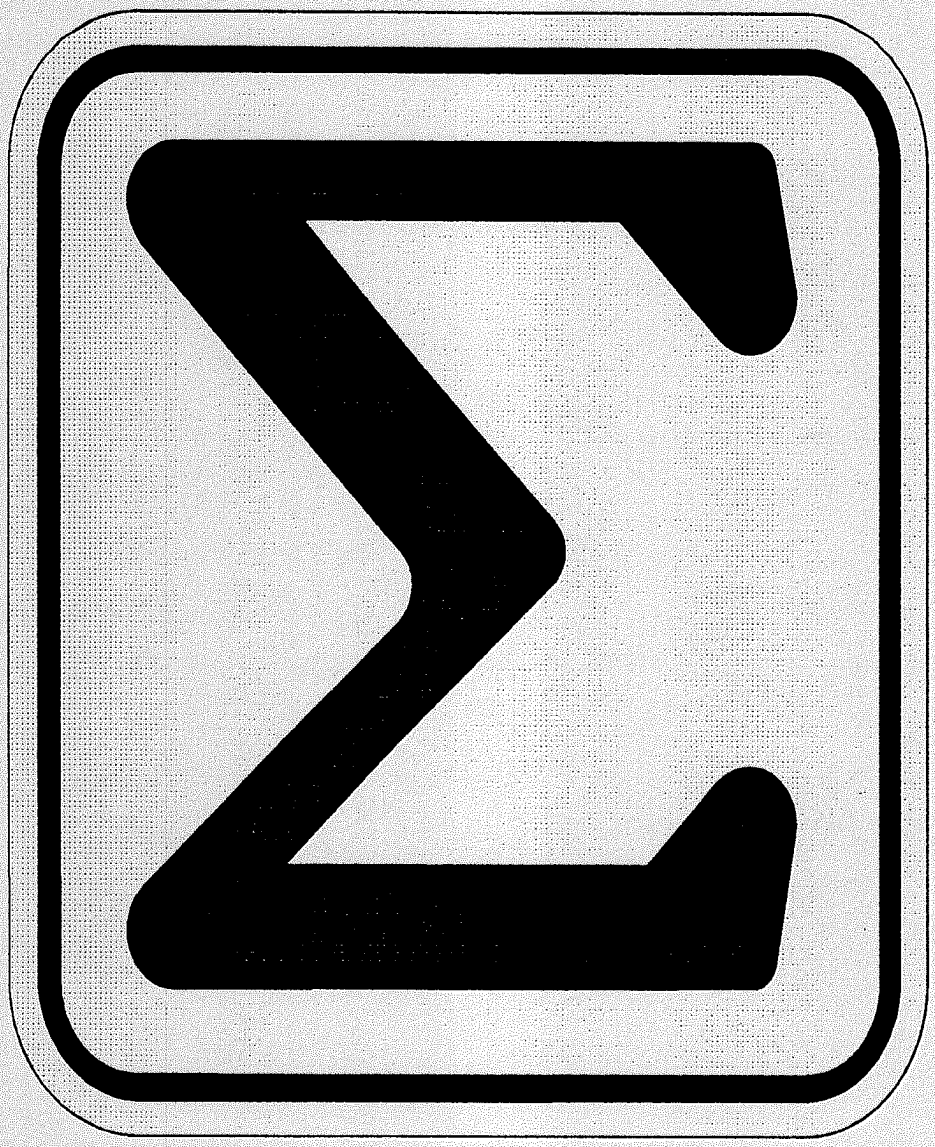
TEST METHOD		FLEXURAL STRENGTH	FLEXURAL MODULUS
ASTM D 790	PANEL	(psi)	(mpsi)
	IRS	33,266	0.822

TEST METHOD
ASTM D 1876 — DATA NOT AVAILABLE AT THIS TIME

TEST METHOD		HARDNESS READING AVERAGES
ASTM D 2583	PANEL	MOLD SIDE
	IRS	81.2 *

* This figure represents the average of remaining readings after high/low readings have been discarded.

DATA

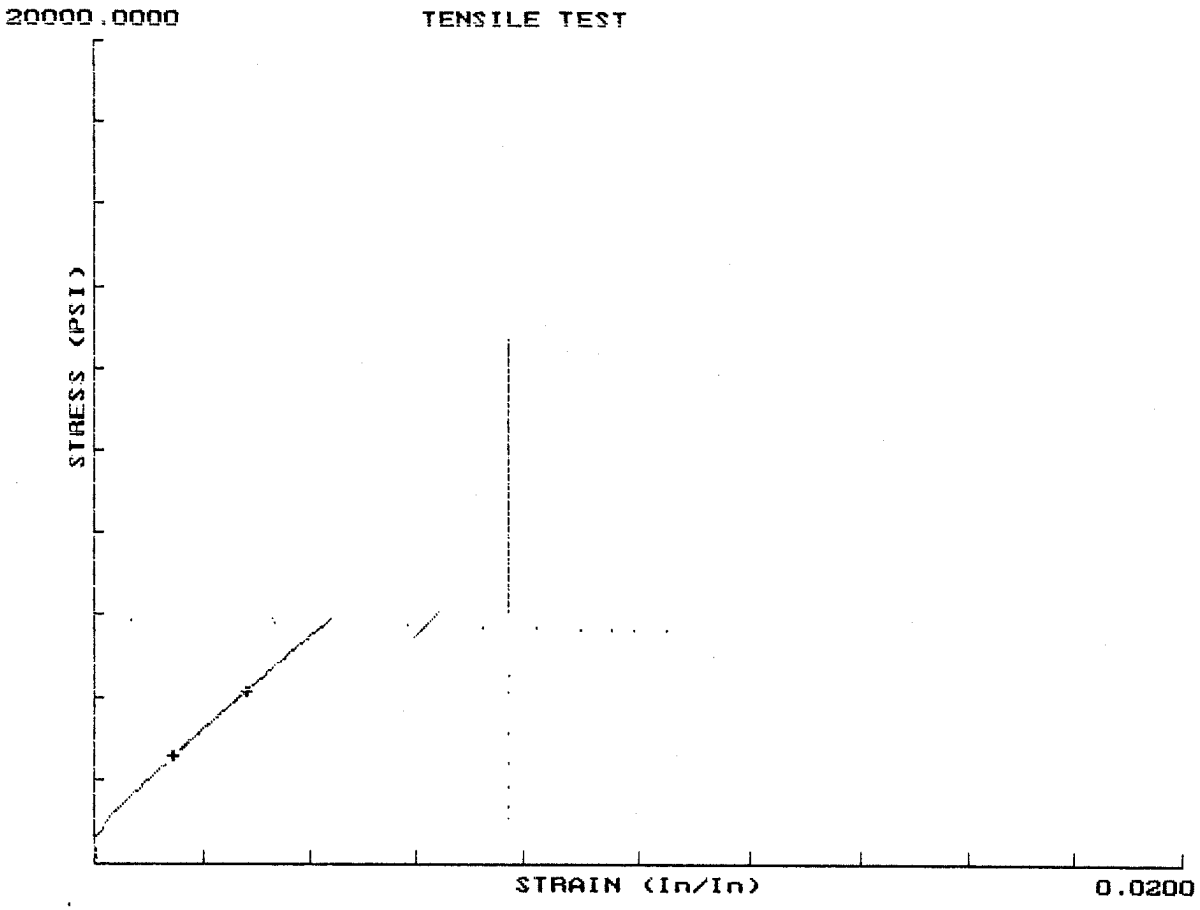


Sigma Labs

Tensile Test, Group Summary
Wed., May. 7, 1997
Group Population Count = 5

Sample type identification:	D 638, FIBERGLASS COATINGS, ST PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
ENGLISH Units	
File Set Names:	I7059001 I7059004

	Avg.	Std. Dev.	Coef. of Var. (%)
MODULUS (PSI)	1147089.80	121391.47	10.58
LOAD (Lbs)	626.7677	58.2356	9.29
STRESS (PSI)	12864.70	1055.23	8.20
STRAIN (%)	0.76169	0.08904	11.69

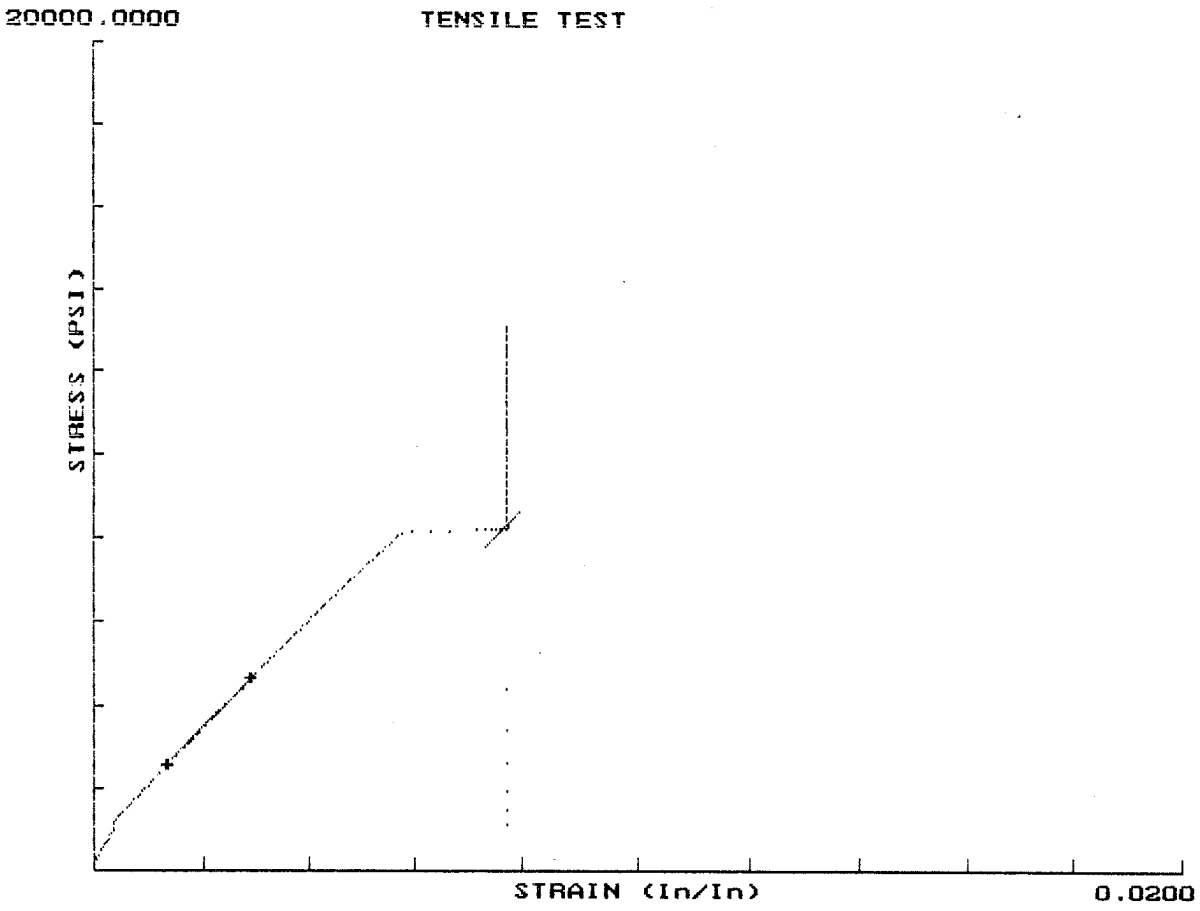


Tensile Test Results

Specimen Number => 1	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, ST PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	I7059001 I7059001

Width = 0.480 In Thickness= 0.104 In AREA = 0.050 In^2

Youngs Modulus	=	1156549 PSI			
Yield Stress	=	5755 PSI			
Yield Strain	=	0.710 %			
Values at Peak Load:	636.2 Lbs,	12745.0 PSI,	0.715 In,	0.772 %	
Values at Break Load:	122.0 Lbs,	2443.1 PSI,	0.716 In,	0.773 %	

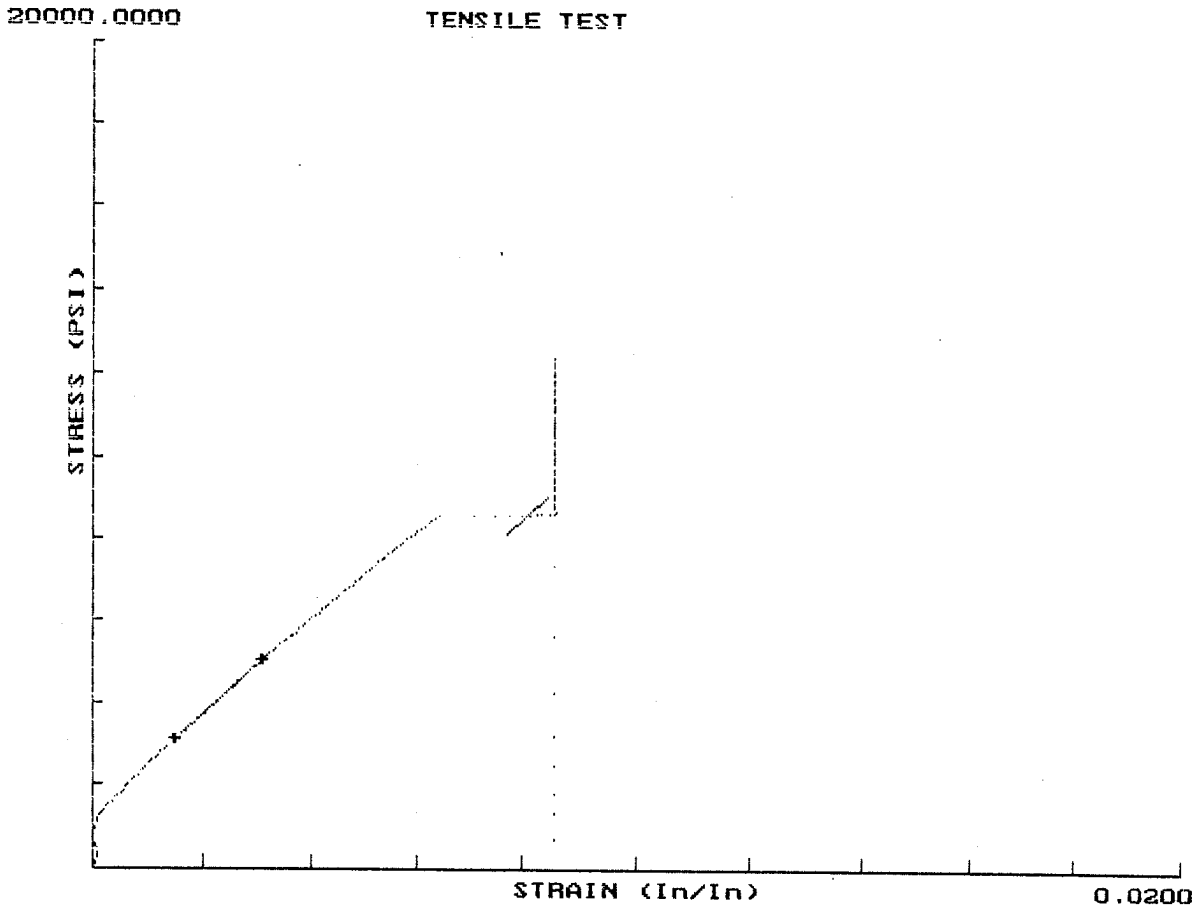


Tensile Test Results

Specimen Number => 2	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, ST PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	I7059001 I7059001

Width = 0.500 In Thickness= 0.101 In AREA = 0.051 In^2

Youngs Modulus	=	1310726 PSI			
Yield Stress	=	8213 PSI			
Yield Strain	=	0.770 %			
Values at Peak Load:		666.0 Lbs,	13187.6 PSI,	0.219 In,	0.772 %
Values at Break Load:		532.0 Lbs,	10534.5 PSI,	0.232 In,	0.772 %

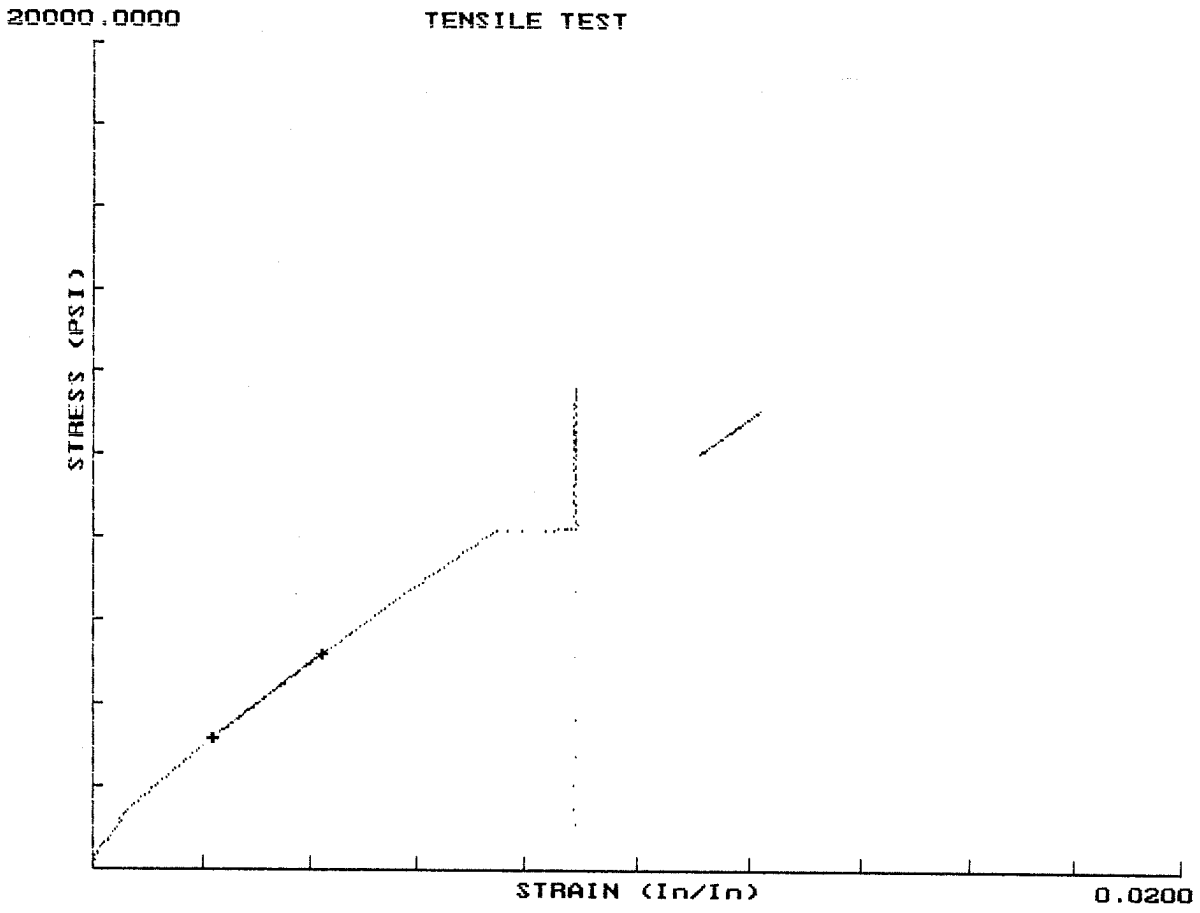


Tensile Test Results

Specimen Number => 3	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, ST PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	I7059001 I7059002

Width = 0.494 In Thickness= 0.096 In AREA = 0.047 In^2

Youngs Modulus	=	1197223 PSI			
Yield Stress	=	8593 PSI			
Yield Strain	=	0.815 %			
Values at Peak Load:	586.6 Lbs,	12370.0 PSI,	0.157 In,	0.858 %	
Values at Break Load:	406.4 Lbs,	8568.8 PSI,	0.160 In,	0.644 %	

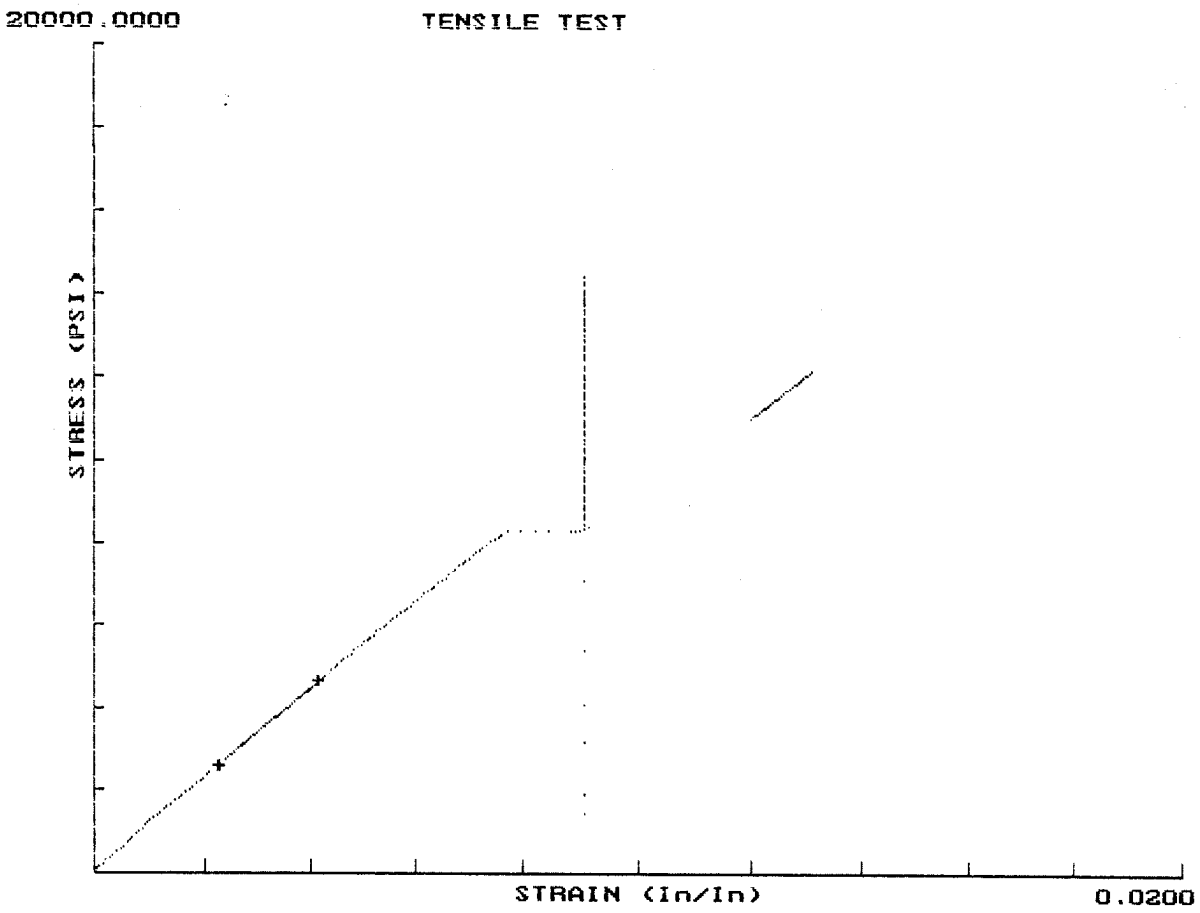


Tensile Test Results

Specimen Number => 4	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, ST PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	I7059001 I7059003

Width = 0.485 In Thickness= 0.098 In AREA = 0.048 In^2

Youngs Modulus	=	987266 PSI			
Yield Stress	=	10562 PSI			
Yield Strain	=	0.891 %			
Values at Peak Load:	550.8 Lbs,	11587.7 PSI,	0.171 In,	0.891 %	
Values at Break Load:	53.1 Lbs,	1117.8 PSI,	0.172 In,	0.891 %	



Tensile Test Results

Specimen Number =>	5	Wed., May. 7, 1997
Sample type identification:		D 638, FIBERGLASS COATINGS, ST PANEL
Gage Length		1 In
Extensometer type:		Other Type Extensometer
File Set Names:		I7059001 I7059004

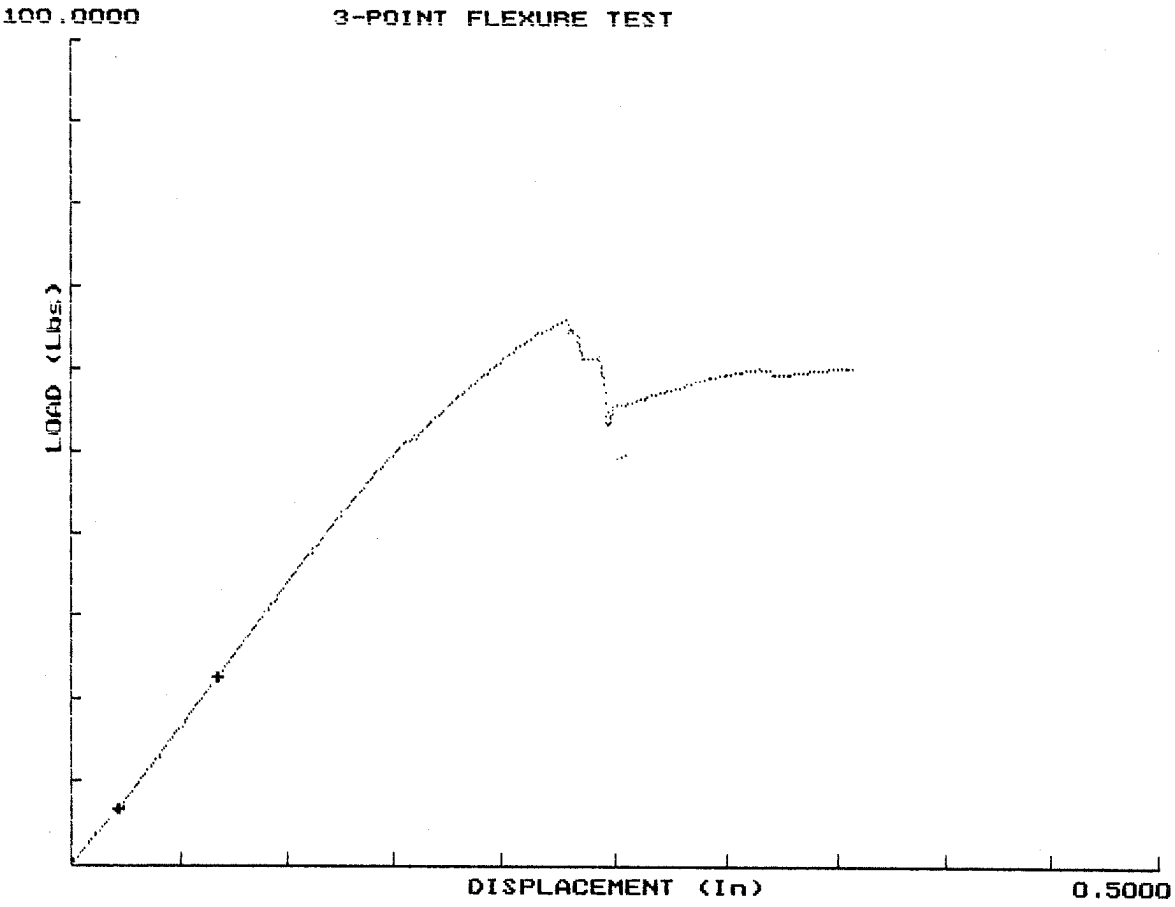
Width = 0.481 In Thickness= 0.100 In AREA = 0.048 In^2

Youngs Modulus	=	1083686 PSI			
Yield Stress	=	11577 PSI			
Yield Strain	=	0.909 %			
Values at Peak Load:		694.2 Lbs,	14433.2 PSI,	0.122 In,	0.909 %
Values at Break Load:		380.9 Lbs,	7919.6 PSI,	0.124 In,	0.729 %

3-Point Flexure Test, Group Summary
Wed., May. 7, 1997
Group Population Count = 5

Sample type identification:	D790, FIBERGLASS COATINGS,"ST" PNL, FIBER DIR
Span Length:	2
Flexure Test is	3 Point
File Set Names:	F7059001 F7059004
Initial Crosshead Velocity:	0.000 In/Min

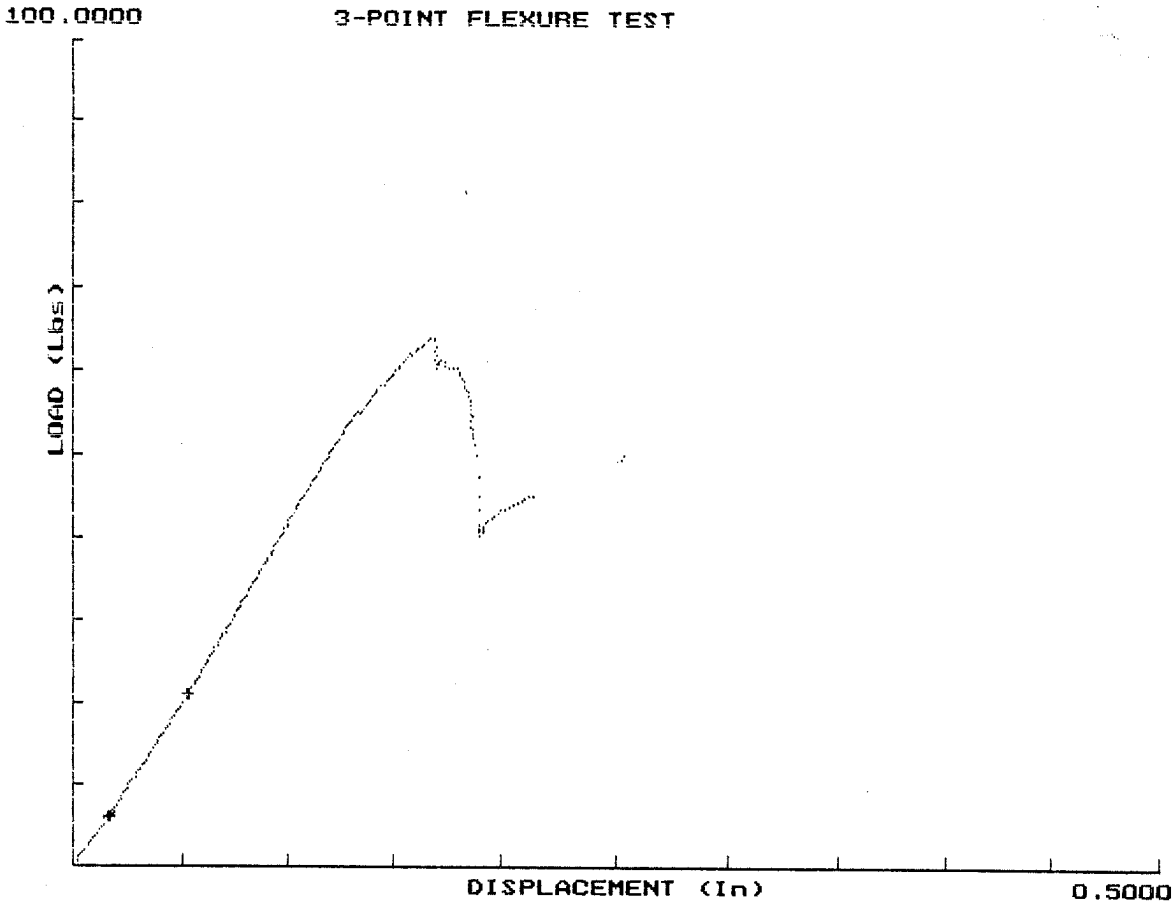
	Avg.	Std. Dev.	Coef. of Var. (%)
MODULUS (PSI)	659632.39	37520.97	5.69
LOAD (Lbs)	65.5649	8.9153	13.60
STRESS (PSI)	17507.70	1316.05	7.52
STRAIN (%)	4.13757	1.13550	27.44



3-Point Flexure Test
Specimen Number => 1
Wed., May. 7, 1997
Width = 1.011 In Thickness= 0.101 In AREA = 0.102 In^2

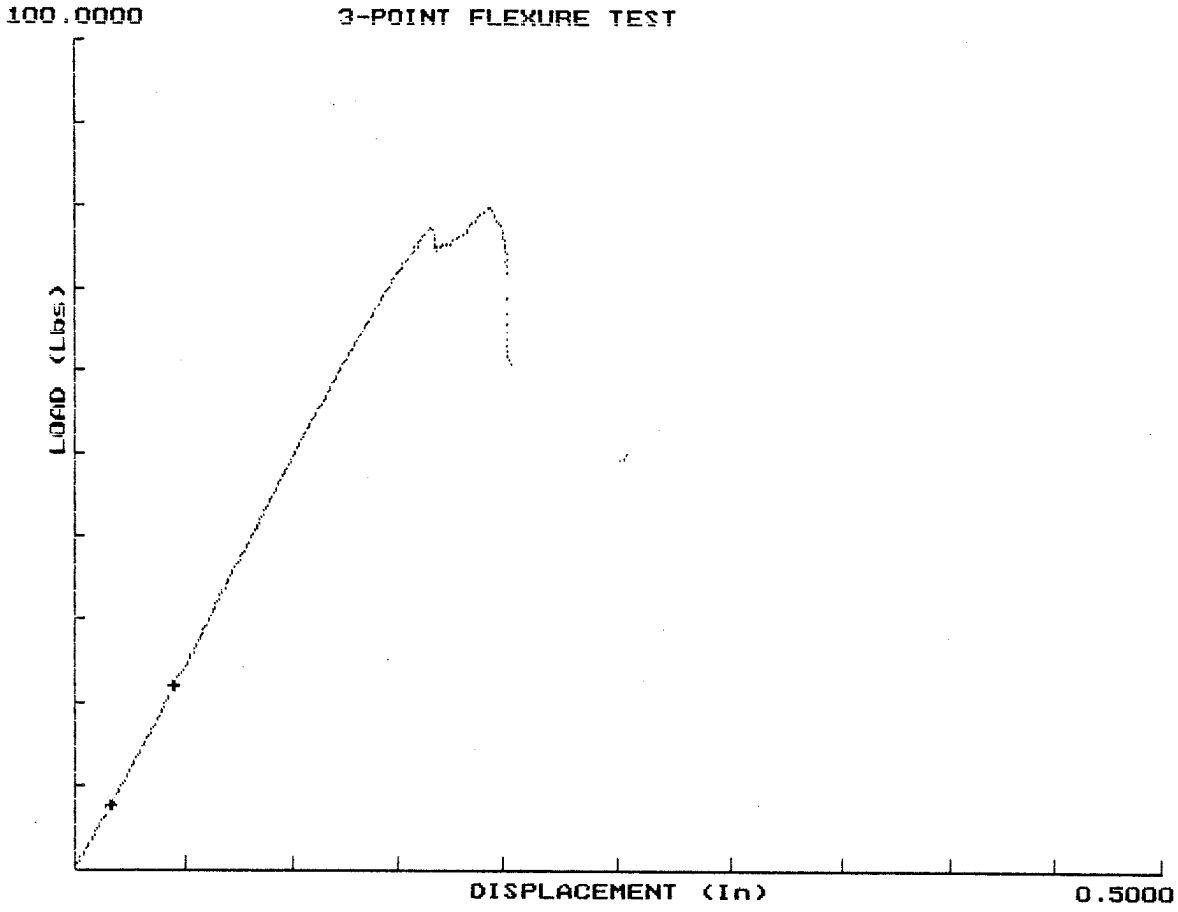
Youngs Modulus = 662623 PSI

Values at Peak Load:	66.3 Lbs,	19278.6 PSI,	0.230 In,	3.480 %
Values at Peak Disp.:	60.3 Lbs,	17528.1 PSI,	0.355 In,	5.383 %



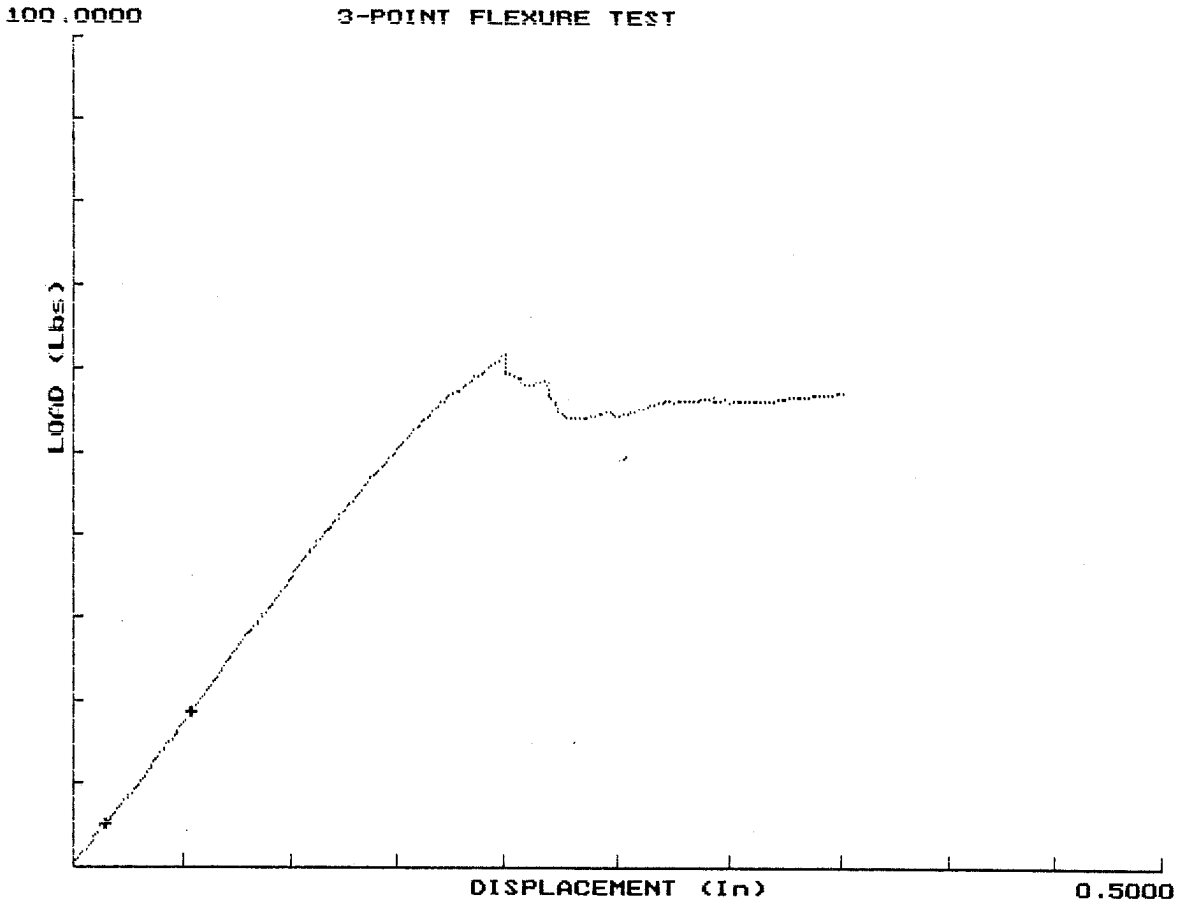
3-Point Flexure Test
Specimen Number => 2
Wed., May. 7, 1997
Width = 1.023 In Thickness= 0.109 In AREA = 0.112 In^2

Youngs Modulus = 607642 PSI
Values at Peak Load: 64.2 Lbs, 15841.0 PSI, 0.168 In, 2.751 %
Values at Peak Disp.: 44.8 Lbs, 11066.8 PSI, 0.212 In, 3.474 %



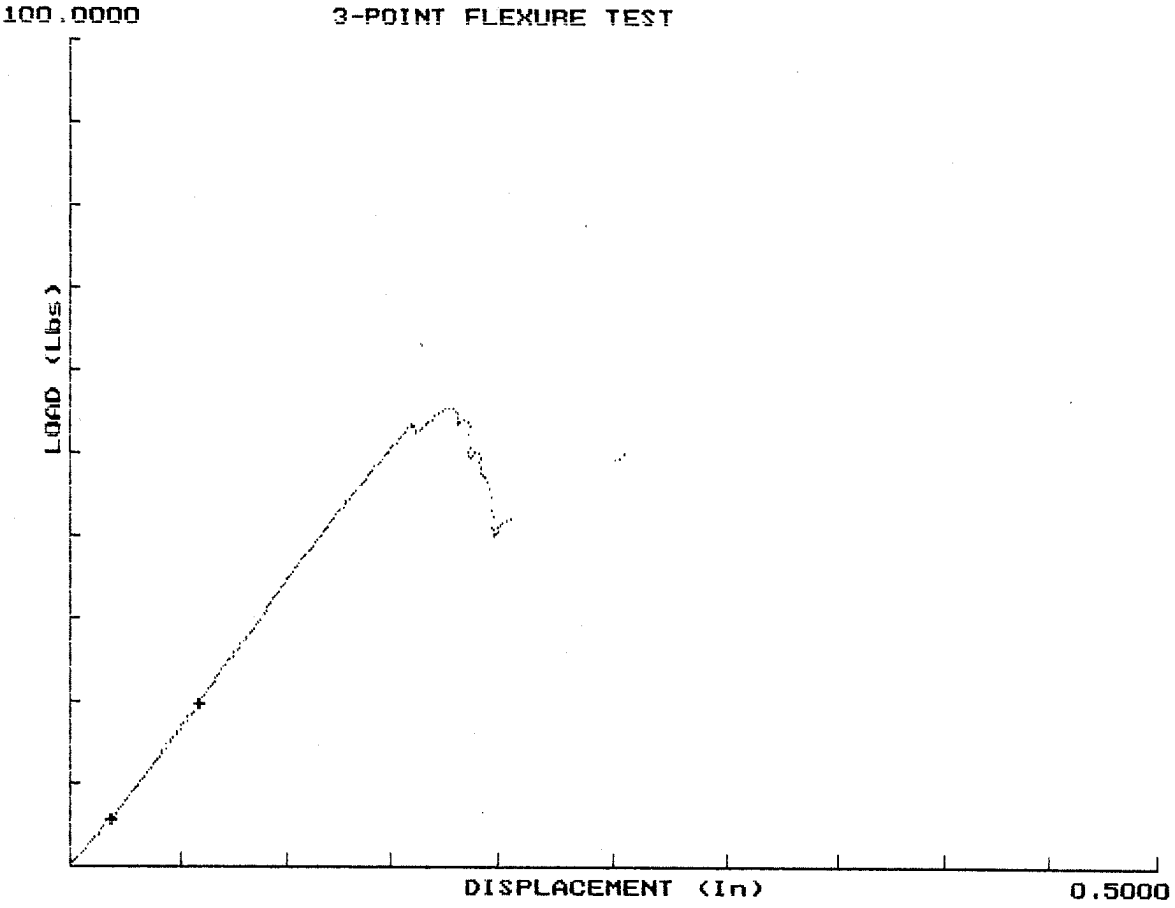
3-Point Flexure Test
Specimen Number => 3
Wed., May. 7, 1997
Width = 1.015 In Thickness= 0.114 In AREA = 0.116 In^2

Youngs Modulus = 667438 PSI
Values at Peak Load: 79.8 Lbs, 18158.8 PSI, 0.194 In, 3.316 %
Values at Peak Disp.: 61.2 Lbs, 13919.2 PSI, 0.202 In, 3.458 %



3-Point Flexure Test
Specimen Number => 4
Wed., May. 7, 1997
Width = 1.018 In Thickness= 0.102 In AREA = 0.104 In^2

Youngs Modulus	=	648528 PSI		
Values at Peak Load:	61.9 Lbs,	17520.6 PSI,	0.200 In,	3.067 %
Values at Peak Disp.:	57.3 Lbs,	16242.2 PSI,	0.350 In,	5.348 %



3-Point Flexure Test
Specimen Number => 5
Wed., May. 7, 1997
Width = 1.018 In Thickness= 0.099 In AREA = 0.101 In^2

Youngs Modulus = 711931 PSI

Values at Peak Load:	55.7 Lbs,	16739.5 PSI,	0.177 In,	2.622 %
Values at Peak Disp.:	41.7 Lbs,	12547.7 PSI,	0.204 In,	3.024 %

ASTM D 2583 INDENTATION HARDNESS OF RIGID PLASTICS
BY MEANS OF A BARCOL IMPRESSOR

Client: FIBERGLASS COATINGS
Report Number: 97SL059
Description: "ST" PANEL

READING #	MOLD SIDE	
1	83	
2	82	
3	82	
4	82	
5	84	
6	84	
7	79	
8	82	
9	84	
10	85	H
11	84	
12	83	
13	79	L
14	83	
15	81	
16	82	
Average:	82.50	

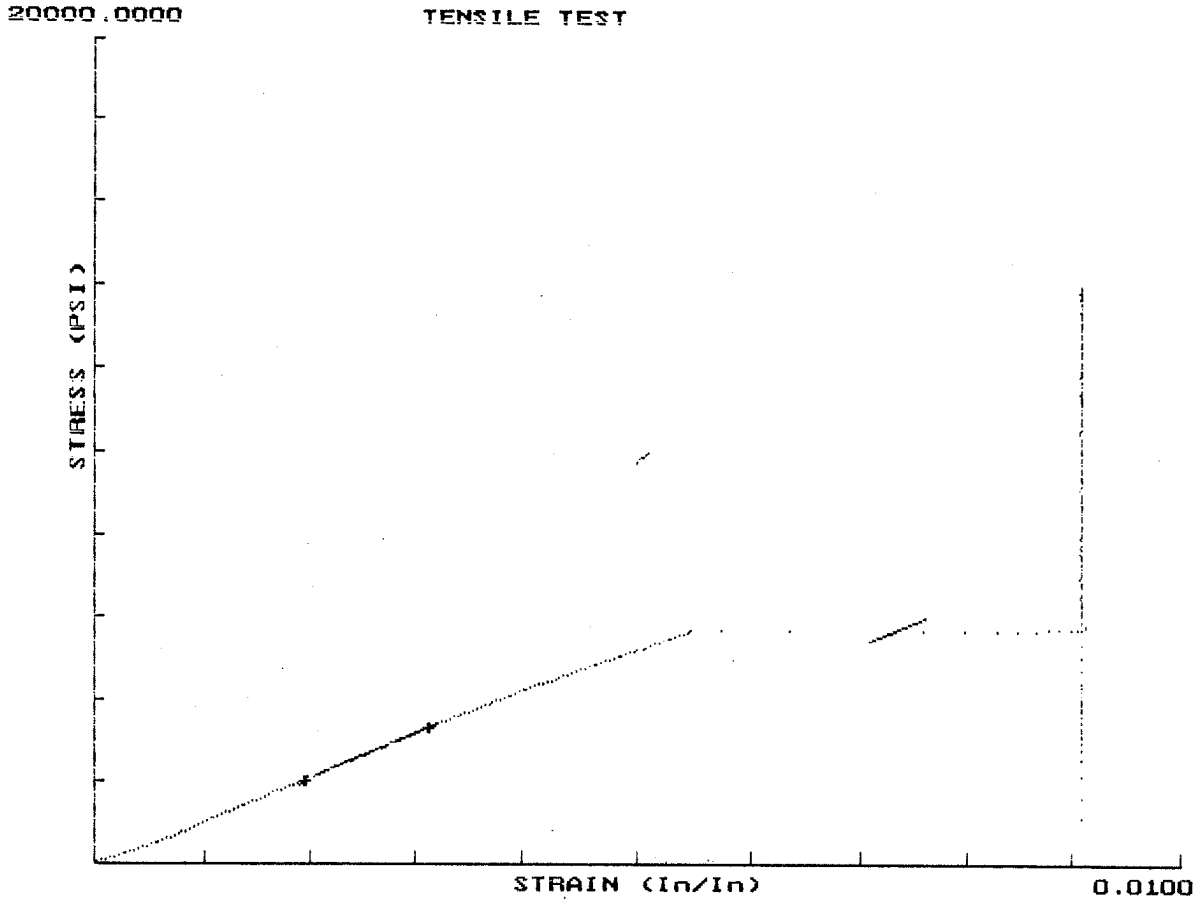
NOTES:
1) "Average" represents the average of the remaining 14 readings after the high and low readings have been eliminated.
2) H= high reading
3) L= low reading

Sigma Labs

Tensile Test, Group Summary
Weds., May 7, 1997
Group Population Count = 5

Sample type identification:	D-638, FIBERGLASS COATINGS, IRS #3 PANEL
Gage Length:	1 In
Extensometer type:	Other Type Extensometer
ENGLISH Units	
File Set Names:	J7059001 J7059006

	Avg.	Std. Dev.	Coef. of Var. (%)
MODULUS (PSI)	1118581.60	76148.08	6.81
LOAD (LBS)	810.7800	122.8897	15.16
STRESS (PSI)	16577.18	2471.43	14.91
STRAIN (%)	0.93000	0.01810	1.95

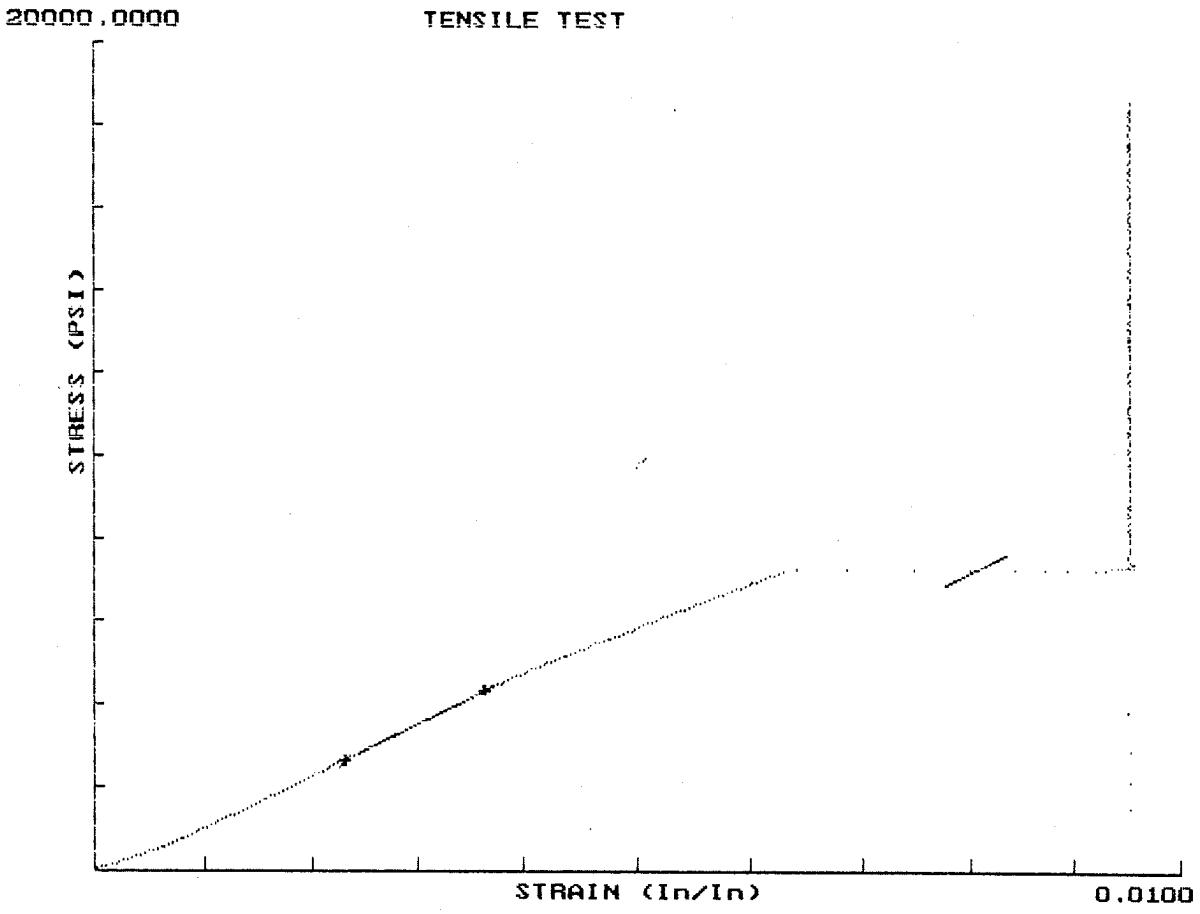


Tensile Test Results

Specimen Number => 1	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, IRS #3 PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	J7059001 J7059001

Width = 0.494 In Thickness= 0.098 In AREA = 0.049 In^2

Youngs Modulus	=	1085049 PSI			
Yield Stress	=	5705 PSI			
Yield Strain	=	0.734 %			
Values at Peak Load:	682.2 Lbs,	14048.9 PSI,	0.227 In,	0.909 %	
Values at Break Load:	147.9 Lbs,	3046.2 PSI,	0.229 In,	0.909 %	

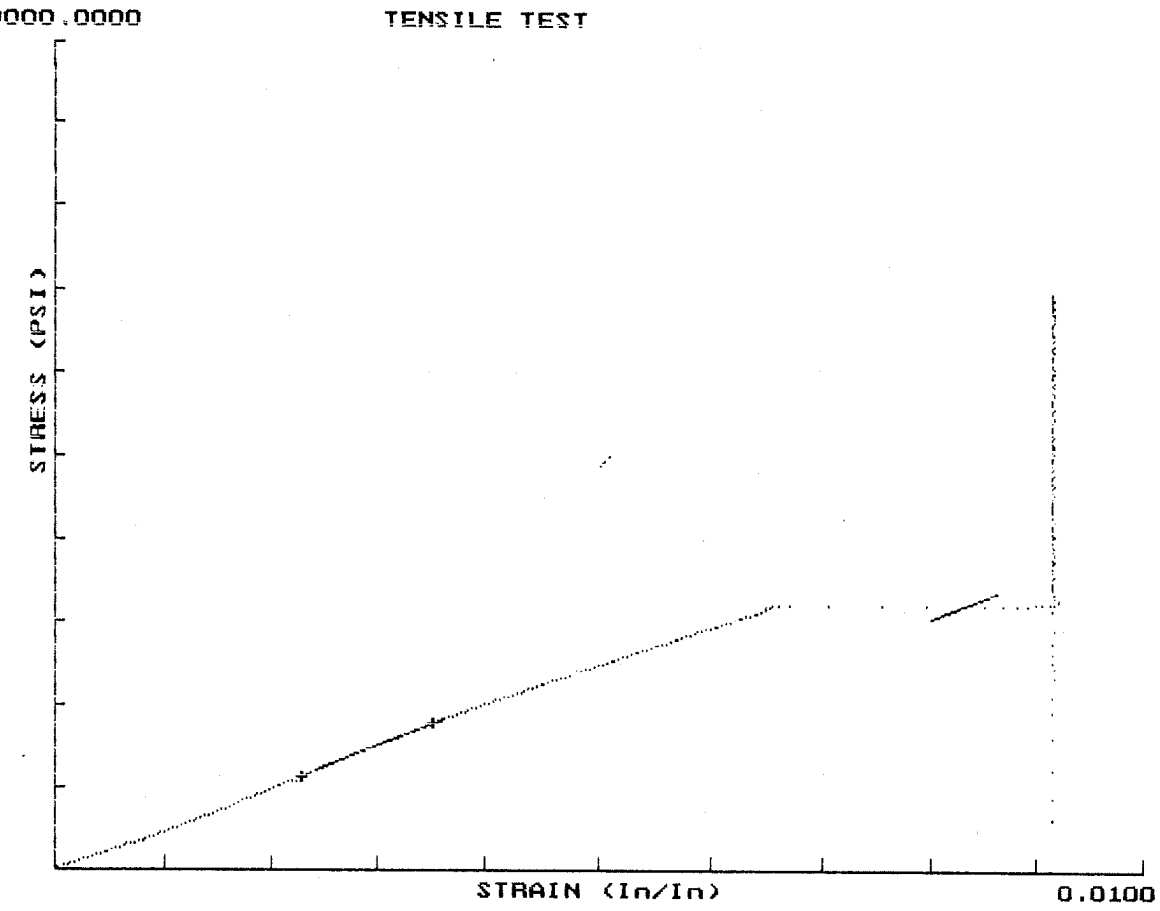


Tensile Test Results

Specimen Number => 2	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, IRS #3 PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	J7059001 J7059001

Width = 0.494 In Thickness= 0.101 In AREA = 0.050 In^2

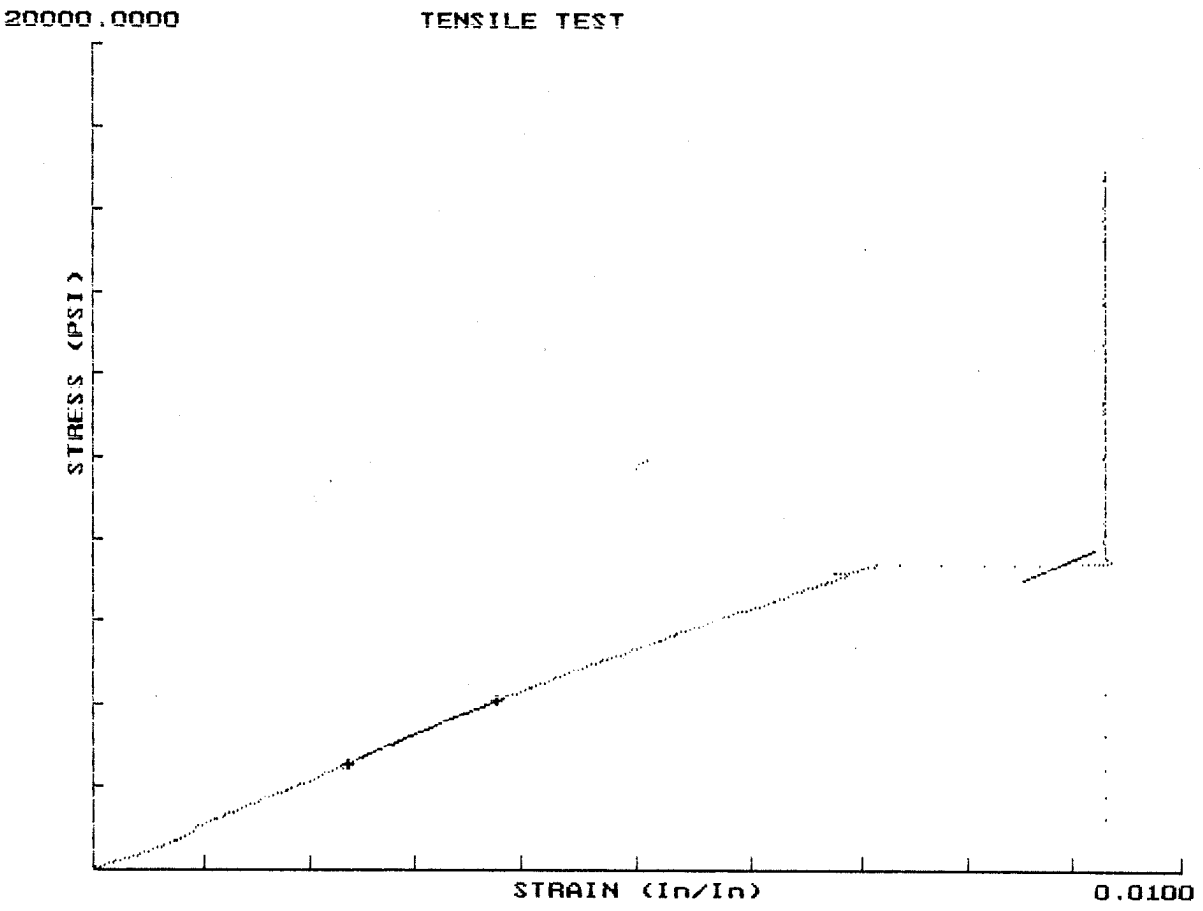
Youngs Modulus	=	1227706 PSI			
Yield Stress	=	7264 PSI			
Yield Strain	=	0.805 %			
Values at Peak Load:	931.4 Lbs,	18611.4 PSI,	0.119 In,	0.953 %	
Values at Break Load:	361.0 Lbs,	7214.3 PSI,	0.122 In,	0.629 %	



Tensile Test Results

Specimen Number => 3 Wed., May. 7, 1997
Sample type identification: D 638, FIBERGLASS COATINGS, IRS #3 PANEL
Gage Length 1 In
Extensometer type: Other Type Extensometer
File Set Names: J7059001 J7059002
Width = 0.498 In Thickness= 0.099 In AREA = 0.049 In^2

Youngs Modulus = 1031906 PSI
Yield Stress = 6440 PSI
Yield Strain = 0.829 %
Values at Peak Load: 690.5 Lbs, 13989.2 PSI, 0.114 In, 0.916 %
Values at Break Load: 88.4 Lbs, 1790.9 PSI, 0.115 In, 0.916 %

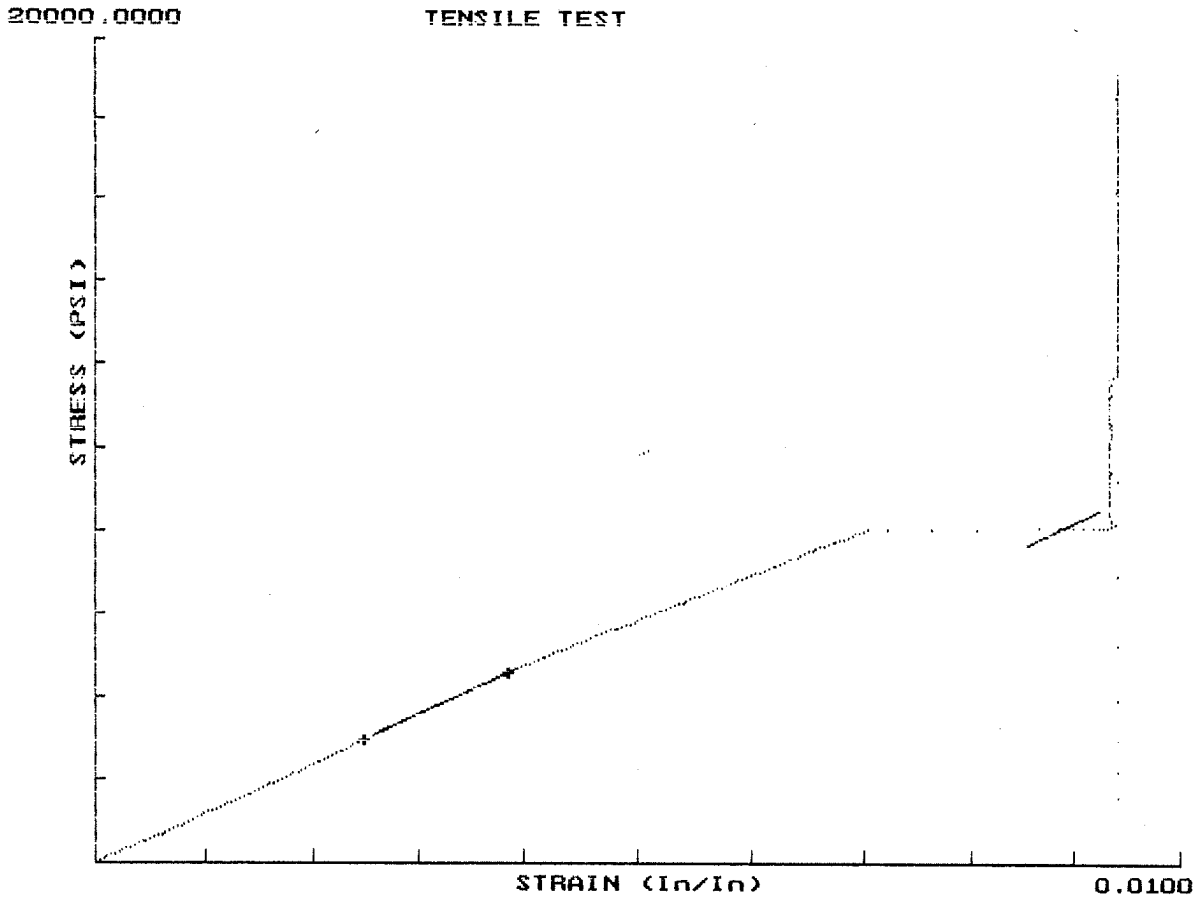


Tensile Test Results

Specimen Number => 4	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, IRS #3 PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	J7059001 J7059003

Width = 0.493 In Thickness= 0.098 In AREA = 0.048 In^2

Youngs Modulus	=	1088155 PSI			
Yield Stress	=	7440 PSI			
Yield Strain	=	0.884 %			
Values at Peak Load:	817.3 Lbs,	17010.4 PSI,	0.107 In,	0.930 %	
Values at Break Load:	59.3 Lbs,	1233.4 PSI,	0.109 In,	0.931 %	



Tensile Test Results

Specimen Number => 6	Wed., May. 7, 1997
Sample type identification:	D 638, FIBERGLASS COATINGS, IRS #3 PANEL
Gage Length	1 In
Extensometer type:	Other Type Extensometer
File Set Names:	J7059001 J7059001

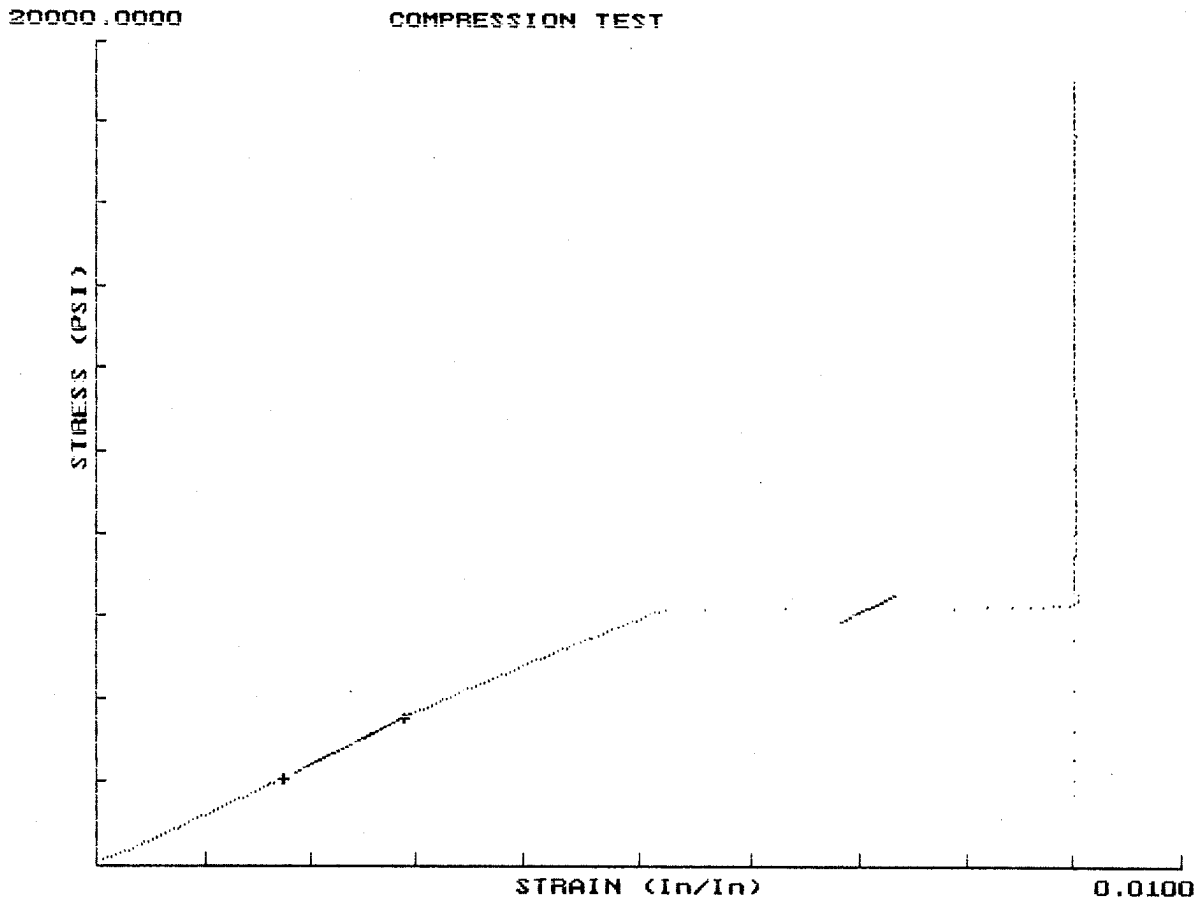
Width = 0.491 In Thickness= 0.099 In AREA = 0.049 In^2

Youngs Modulus	=	1160092 PSI			
Yield Stress	=	8087 PSI			
Yield Strain	=	0.897 %			
Values at Peak Load:	932.5 Lbs,	19226.3 PSI,	0.215 In,	0.942 %	
Values at Break Load:	106.6 Lbs,	2196.9 PSI,	0.216 In,	0.942 %	

Compression Test, Group Summary
Thurs., May 8, 1997
Group Population Count = 5

Sample type identification:	D695, FIBERGLASS COATINGS, IRS PANEL #3, 0 DEGREE
Gage Length:	0.5 In
Extensometer type:	Other Type Extensometer
ENGLISH Units	
File Set Names:	K7059001 K7059006

	Avg.	Std. Dev.	Coef. of Var. (%)
MODULUS (PSI)	1445881.00	152137.63	10.52
LOAD (Lbs)	1206.2800	290.9982	24.12
STRESS (PSI)	23595.34	4624.43	19.60
STRAIN (%)	0.89360	0.01126	1.26

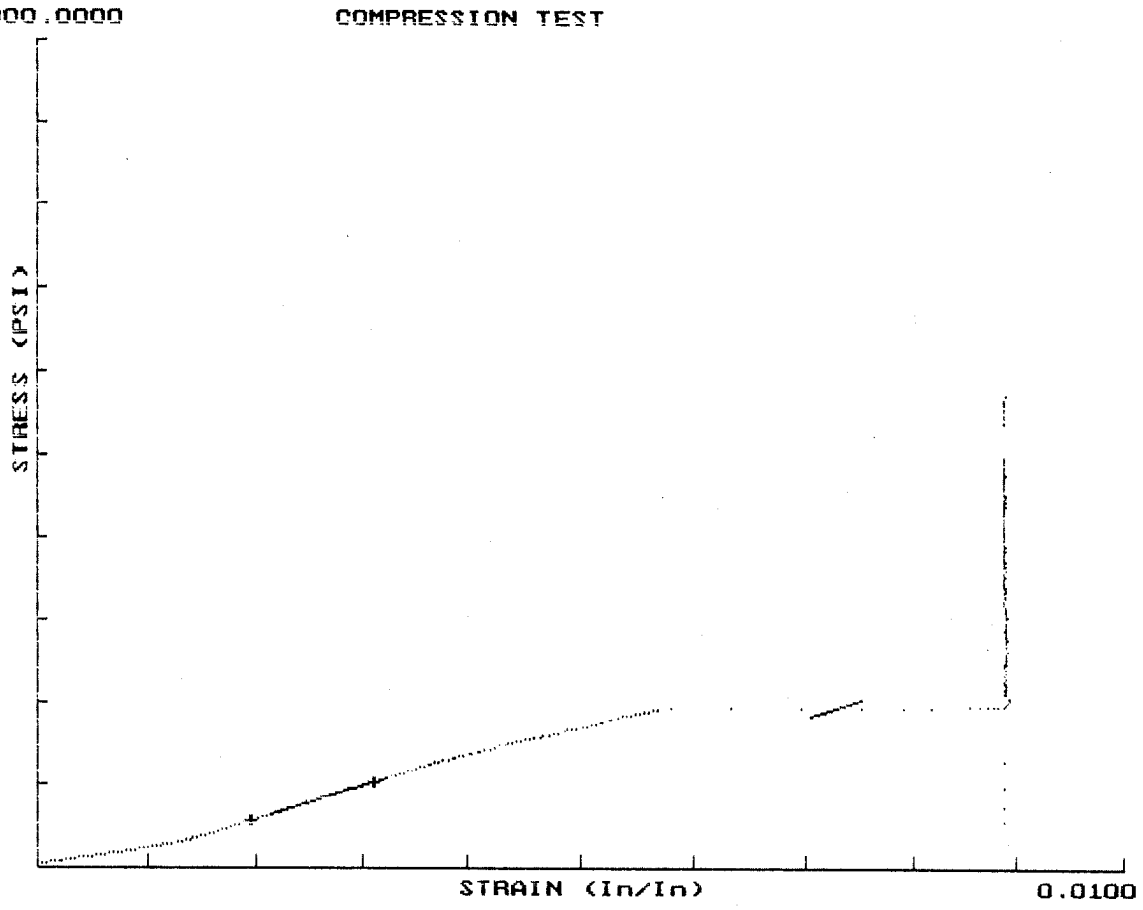


Compression Test Results

Specimen Number => 1	Thu., May. 8, 1997
Sample type identification:	D695, FIBERGLASS COATINGS, IRS PNL #3, 0 DEG
Gage Length	0.5 In
Extensometer type:	Other Type Extensometer
File Set Names:	K7059001 K7059001

Width = 0.503 In Thickness= 0.098 In AREA = 0.049 In^2

Youngs Modulus	=	1235585 PSI			
Yield Stress	=	6222 PSI			
Yield Strain	=	0.714 %			
Values at Peak Load:	937.8 Lbs,	19130.5 PSI,	0.602 In,	0.901 %	
Values at Break Load:	934.1 Lbs,	19054.8 PSI,	0.608 In,	0.902 %	

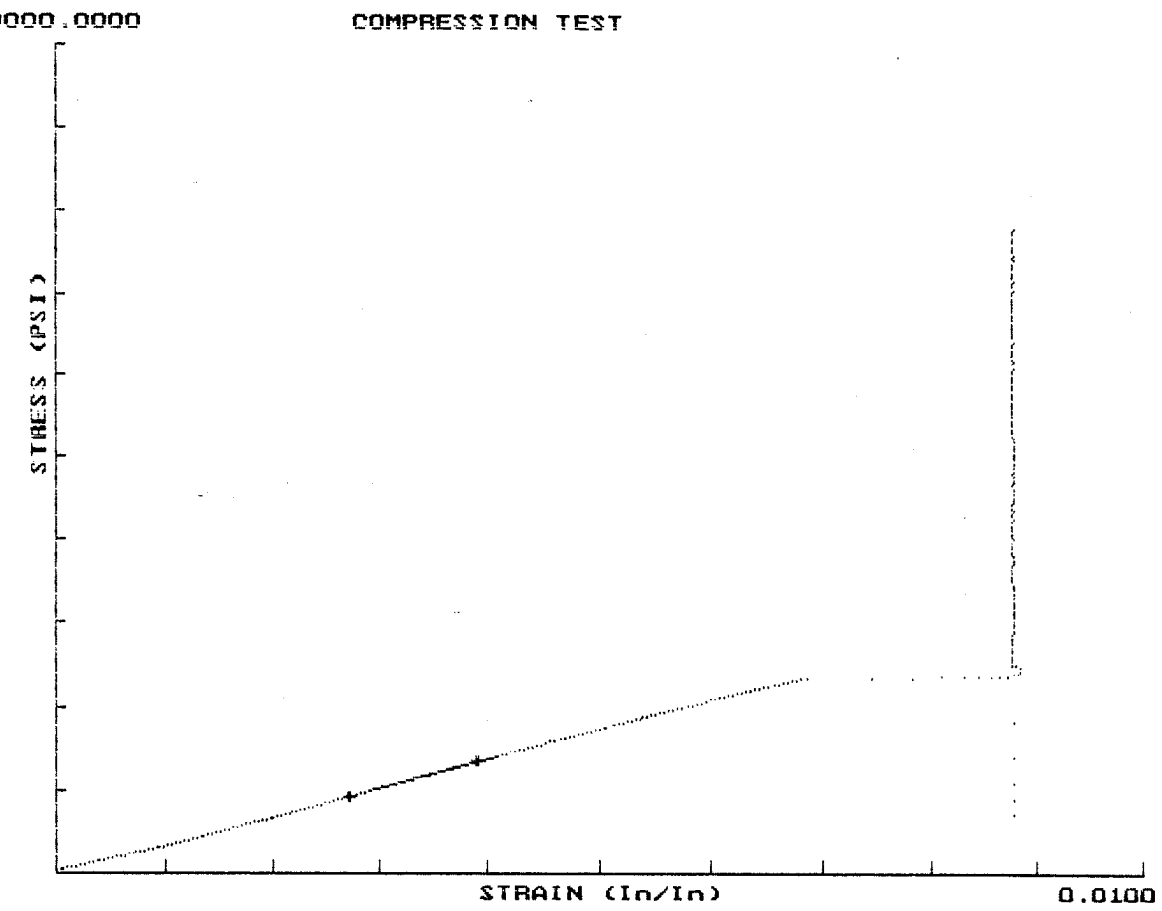


Compression Test Results

Specimen Number => 2	Thu., May. 8, 1997
Sample type identification:	D695, FIBERGLASS COATINGS, IRS PNL #3, 0 DEG
Gage Length	0.5 In
Extensometer type:	Other Type Extensometer
File Set Names:	K7059001 K7059001

Width = 0.512 In Thickness= 0.099 In AREA = 0.051 In^2

Youngs Modulus	=	1645935 PSI		
Yield Stress	=	7741 PSI		
Yield Strain	=	0.701 %		
Values at Peak Load:	1167.1 Lbs,	22947.1 PSI,	0.229 In,	0.889 %
Values at Break Load:	1167.1 Lbs,	22947.1 PSI,	0.230 In,	0.889 %

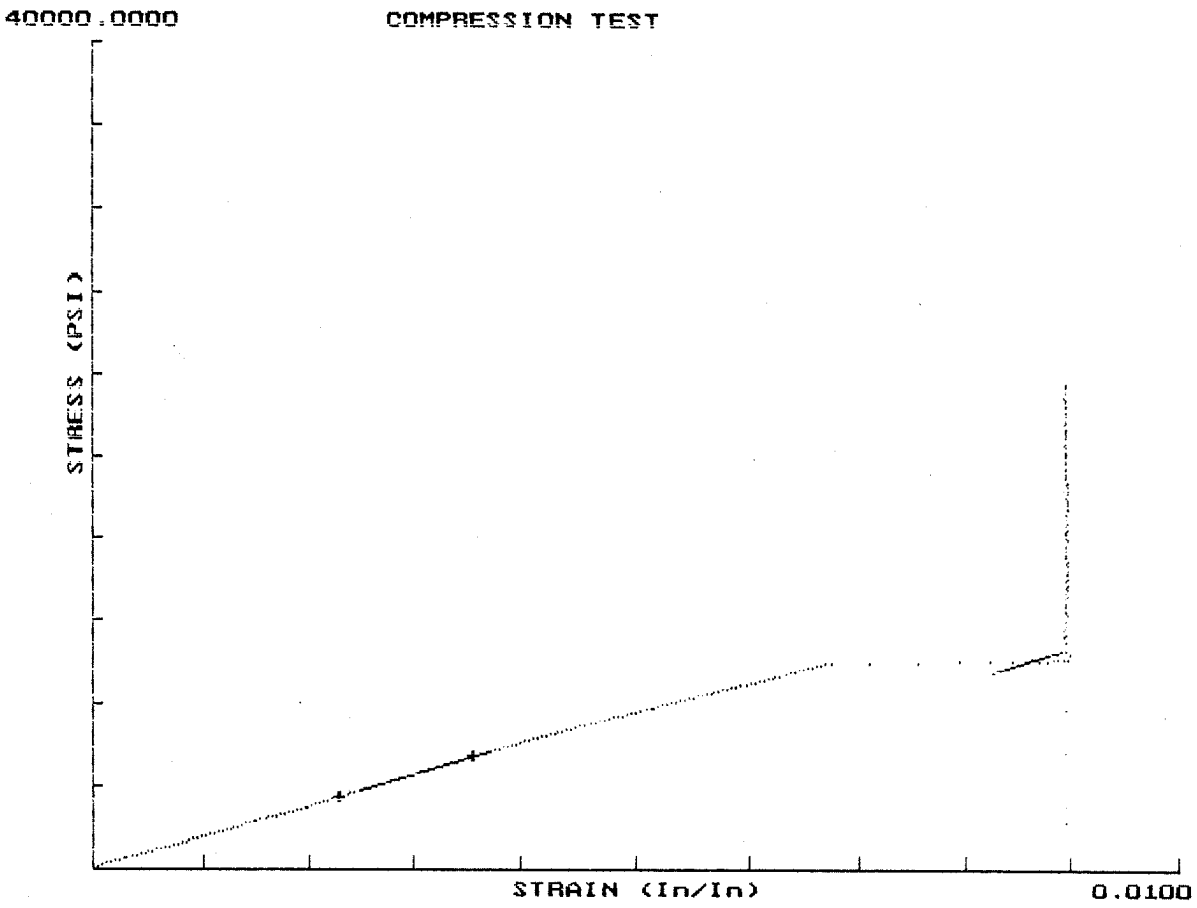


Compression Test Results

Specimen Number => 3	Thu., May. 8, 1997
Sample type identification:	D695, FIBERGLASS COATINGS, IRS PNL #3, 0 DEG
Gage Length	0.5 In
Extensometer type:	Other Type Extensometer
File Set Names:	K7059001 K7059002

Width = 0.507 In Thickness= 0.106 In AREA = 0.054 In^2

Youngs Modulus	=	1423058 PSI			
Yield Stress	=	18674 PSI			
Yield Strain	=	0.877 %			
Values at Peak Load:		1683.6 Lbs,	31239.7 PSI,	0.258 In,	0.877 %
Values at Break Load:		1682.2 Lbs,	31213.8 PSI,	0.258 In,	0.877 %

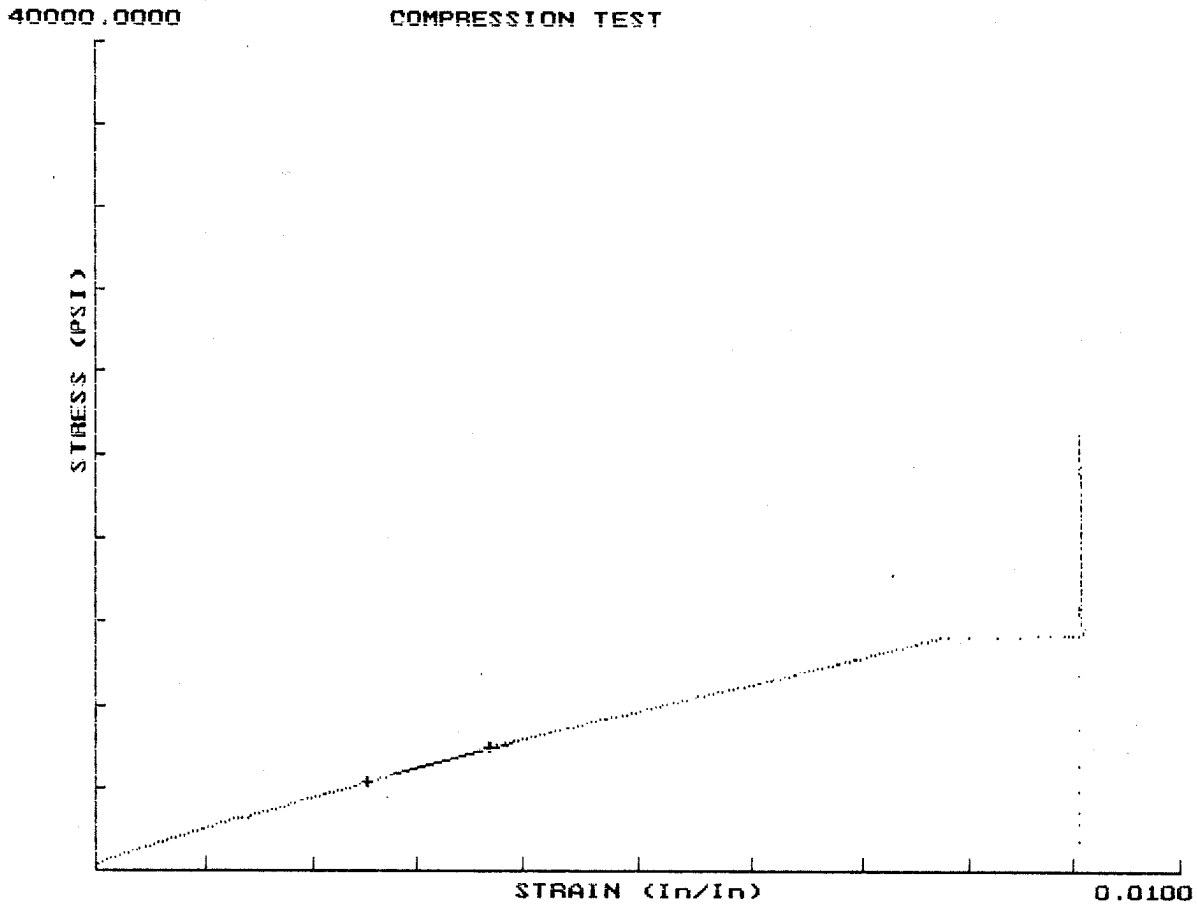


Compression Test Results

Specimen Number =>	5	Thu., May. 8, 1997
Sample type identification:		D695, FIBERGLASS COATINGS, IRS PNL #3, 0 DEG
Gage Length		0.5 In
Extensometer type:		Other Type Extensometer
File Set Names:		K7059001 K7059004

Width = 0.507 In Thickness= 0.102 In AREA = 0.052 In^2

Youngs Modulus	=	1522704 PSI			
Yield Stress	=	10061 PSI			
Yield Strain	=	0.863 %			
Values at Peak Load:	1228.4 Lbs,	23661.3 PSI,	0.174 In,	0.895 %	
Values at Break Load:	1146.3 Lbs,	22078.7 PSI,	0.174 In,	0.895 %	



Compression Test Results

Specimen Number => 6	Thu., May. 8, 1997
Sample type identification:	D695, FIBERGLASS COATINGS, IRS PNL #3, 0 DEG
Gage Length	0.5 In
Extensometer type:	Other Type Extensometer
File Set Names:	K7059001 K7059005

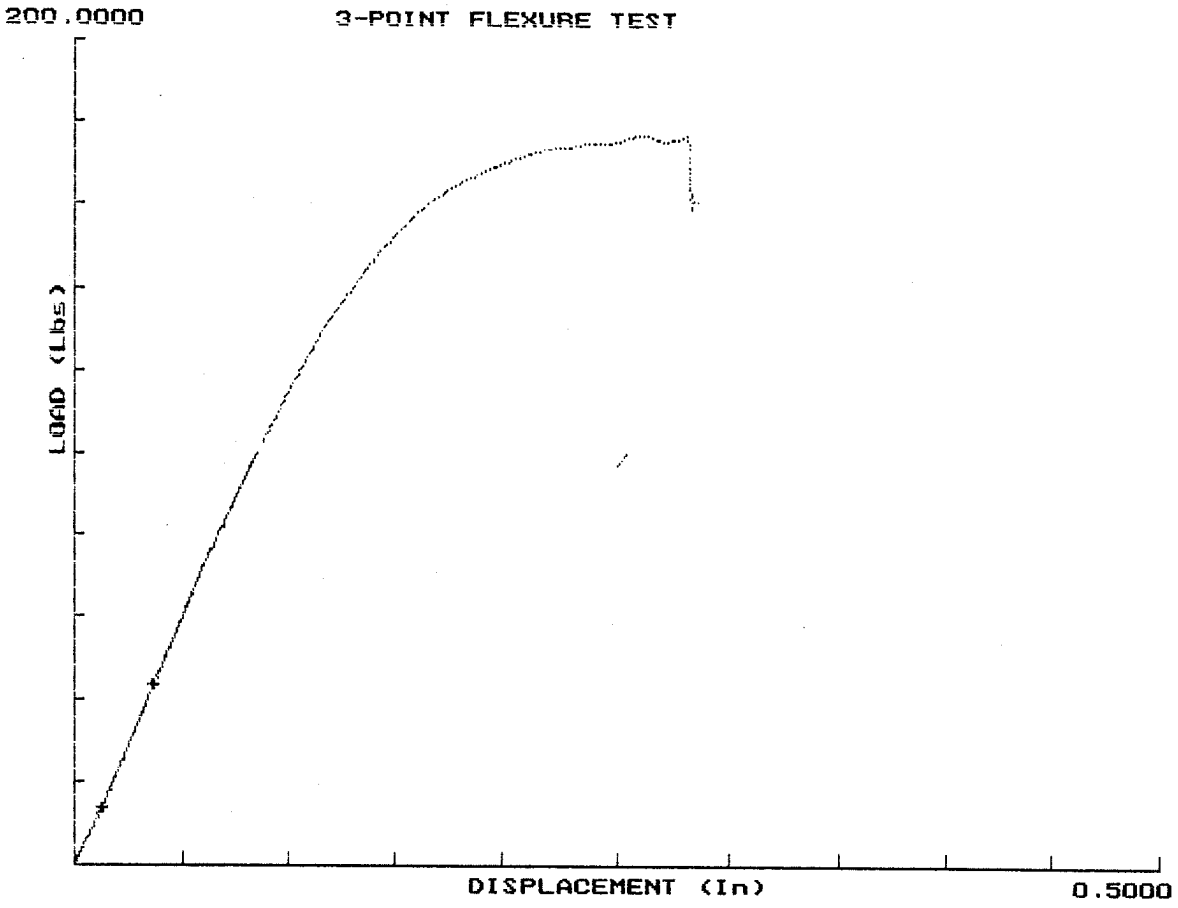
Width = 0.504 In Thickness= 0.096 In AREA = 0.048 In^2

Youngs Modulus	=	1402123 PSI			
Yield Stress	=	16121 PSI			
Yield Strain	=	0.906 %			
Values at Peak Load:	1014.5 Lbs,	20998.1 PSI,	0.179 In,	0.906 %	
Values at Break Load:	458.8 Lbs,	9496.0 PSI,	0.180 In,	0.906 %	

3-Point Flexure Test, Group Summary
Wed., May. 7, 1997
Group Population Count = 5

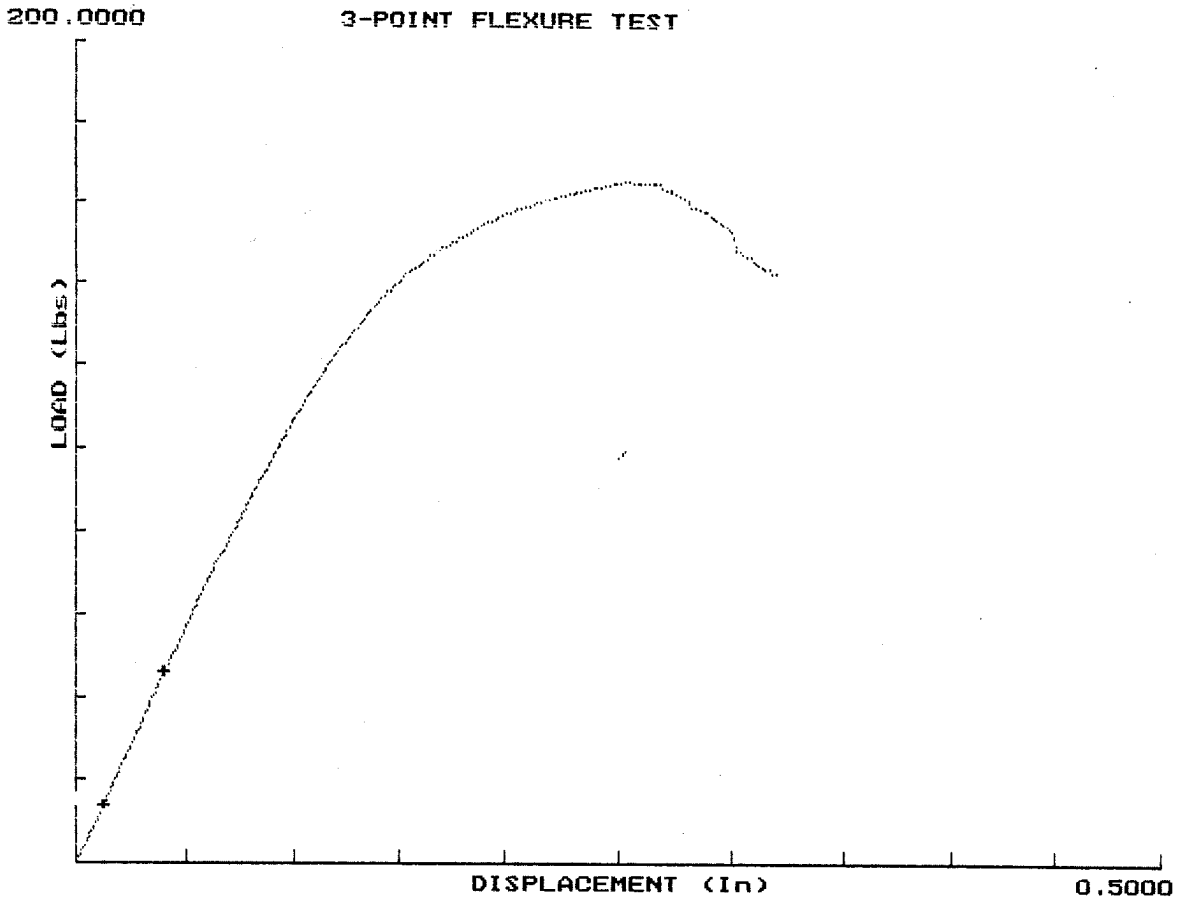
Sample type identification:	D790, FIBERGLASS COATINGS, IRS PNL#3, 0 DEG.
Span Length:	1.5
Flexure Test is	3 Point
File Set Names:	G7059001 G7059004
Initial Crosshead Velocity:	0.000 In/Min

	Avg.	Std. Dev.	Coef. of Var. (%)
MODULUS (PSI)	821548.96	84479.62	10.28
LOAD (Lbs)	157.9309	17.3177	10.97
STRESS (PSI)	33265.63	3038.37	9.13
STRAIN (%)	10.08337	1.55397	15.41



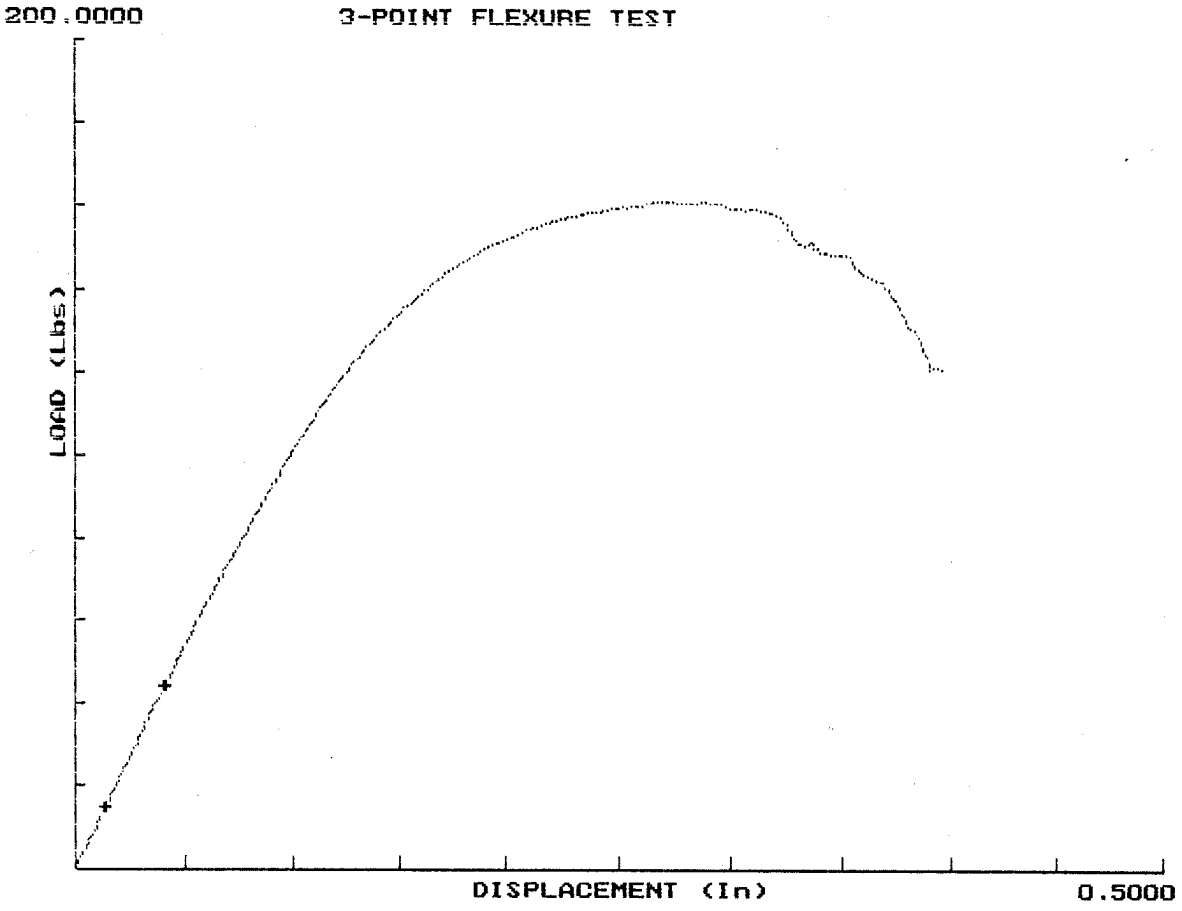
3-Point Flexure Test
Specimen Number => 1
Wed., May. 7, 1997
Width = 0.980 In Thickness= 0.105 In AREA = 0.103 In^2

Youngs Modulus	=	938497 PSI		
Values at Peak Load:	177.1 Lbs,	36875.6 PSI,	0.260 In,	7.279 %
Values at Peak Disp.:	161.1 Lbs,	33549.5 PSI,	0.285 In,	7.969 %



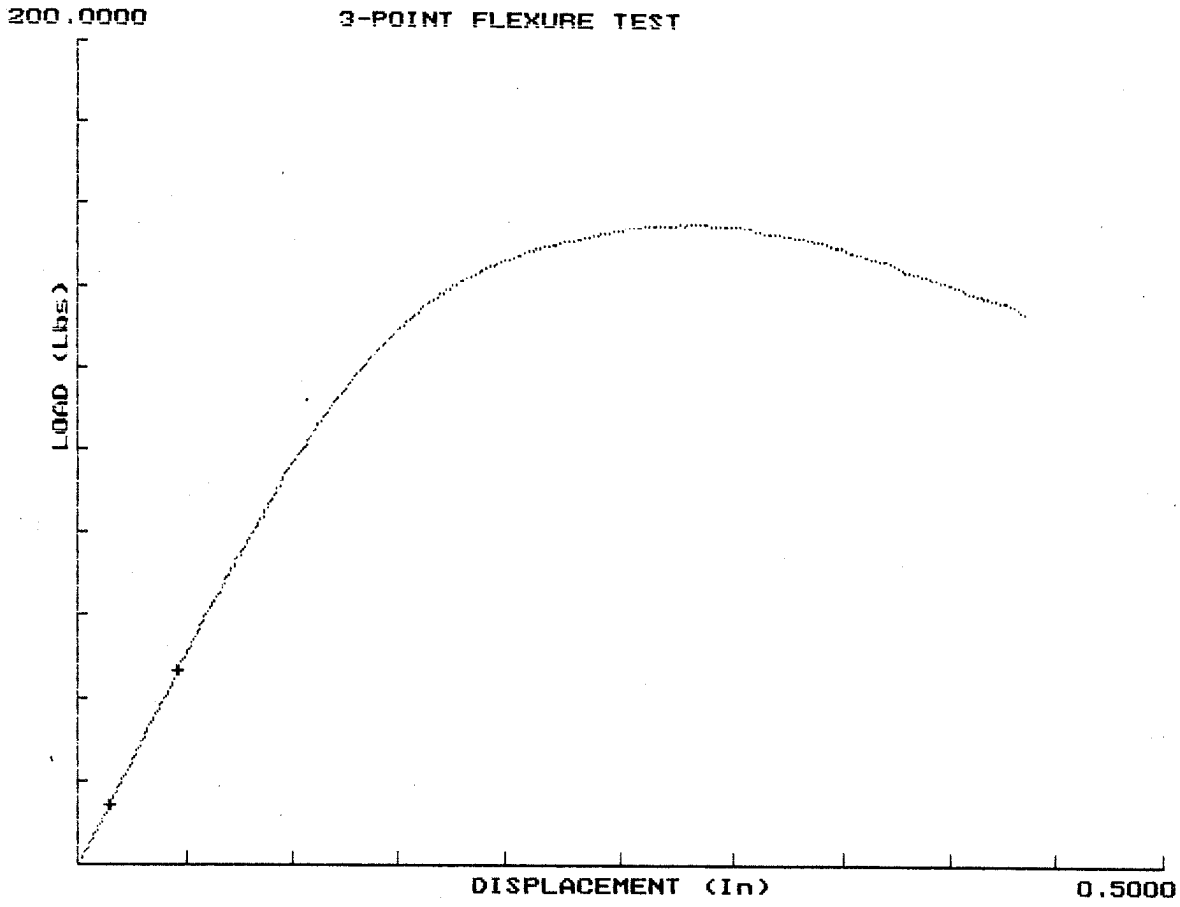
3-Point Flexure Test
Specimen Number => 2
Wed., May. 7, 1997
Width = 0.992 In Thickness= 0.106 In AREA = 0.105 In^2

Youngs Modulus = 837588 PSI
Values at Peak Load: 165.4 Lbs, 33393.3 PSI, 0.254 In, 7.194 %
Values at Peak Disp.: 142.7 Lbs, 28799.2 PSI, 0.318 In, 8.979 %



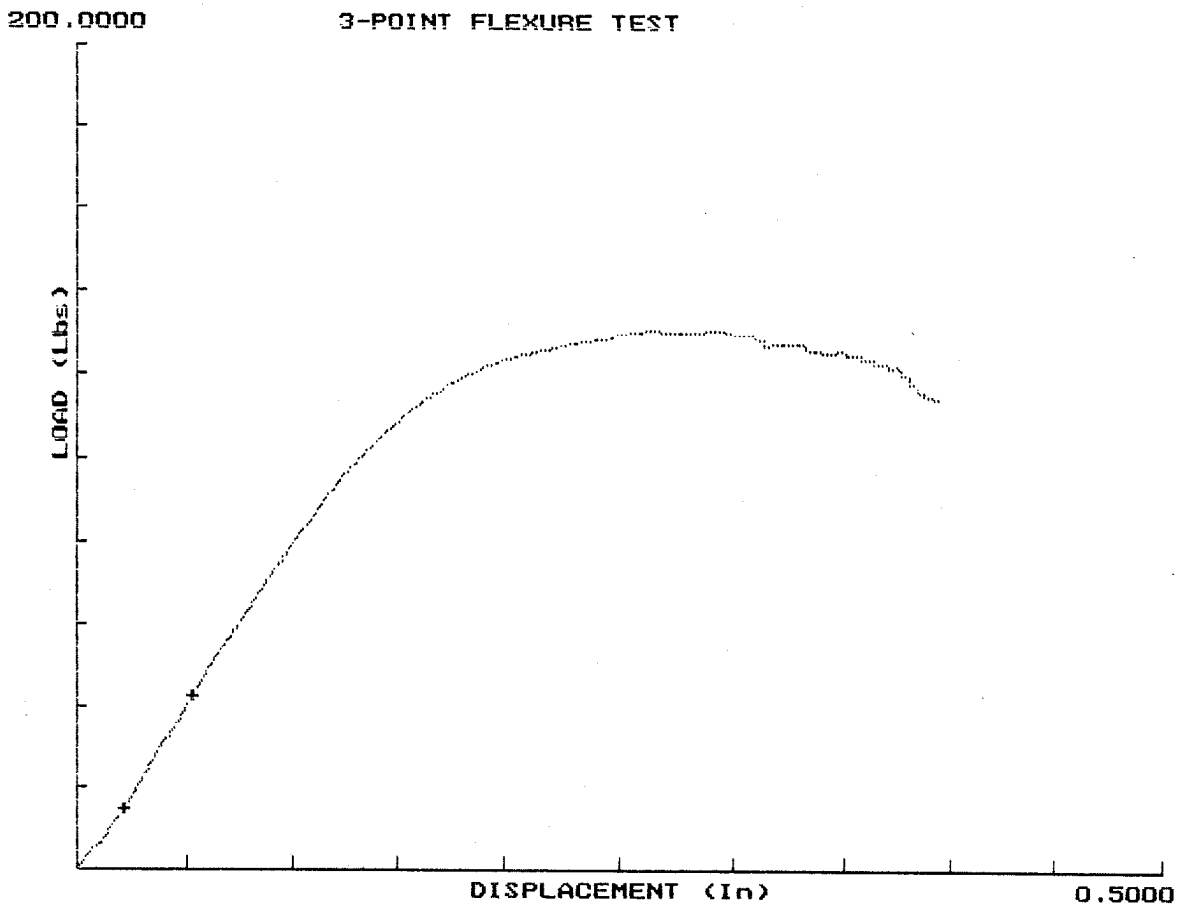
3-Point Flexure Test
Specimen Number => 3
Wed., May. 7, 1997
Width = 0.997 In Thickness= 0.106 In AREA = 0.106 In^2

Youngs Modulus = 762162 PSI
Values at Peak Load: 161.4 Lbs, 32408.9 PSI, 0.270 In, 7.636 %
Values at Peak Disp.: 121.4 Lbs, 24384.5 PSI, 0.394 In, 11.135 %



3-Point Flexure Test
Specimen Number => 4
Wed., May. 7, 1997
Width = 0.982 In Thickness= 0.101 In AREA = 0.099 In^2

Youngs Modulus = 849471 PSI
Values at Peak Load: 155.4 Lbs, 34907.0 PSI, 0.278 In, 7.480 %
Values at Peak Disp.: 134.5 Lbs, 30201.7 PSI, 0.433 In, 11.675 %



3-Point Flexure Test
Specimen Number => 5
Wed., May. 7, 1997
Width = 0.981 In Thickness= 0.102 In AREA = 0.100 In^2

Youngs Modulus = 720027 PSI
Values at Peak Load: 130.4 Lbs, 28743.4 PSI, 0.262 In, 7.131 %
Values at Peak Disp.: 114.2 Lbs, 25172.5 PSI, 0.392 In, 10.659 %

ASTM D 2583 INDENTATION HARDNESS OF RIGID PLASTICS
BY MEANS OF A BARCOL IMPRESSOR

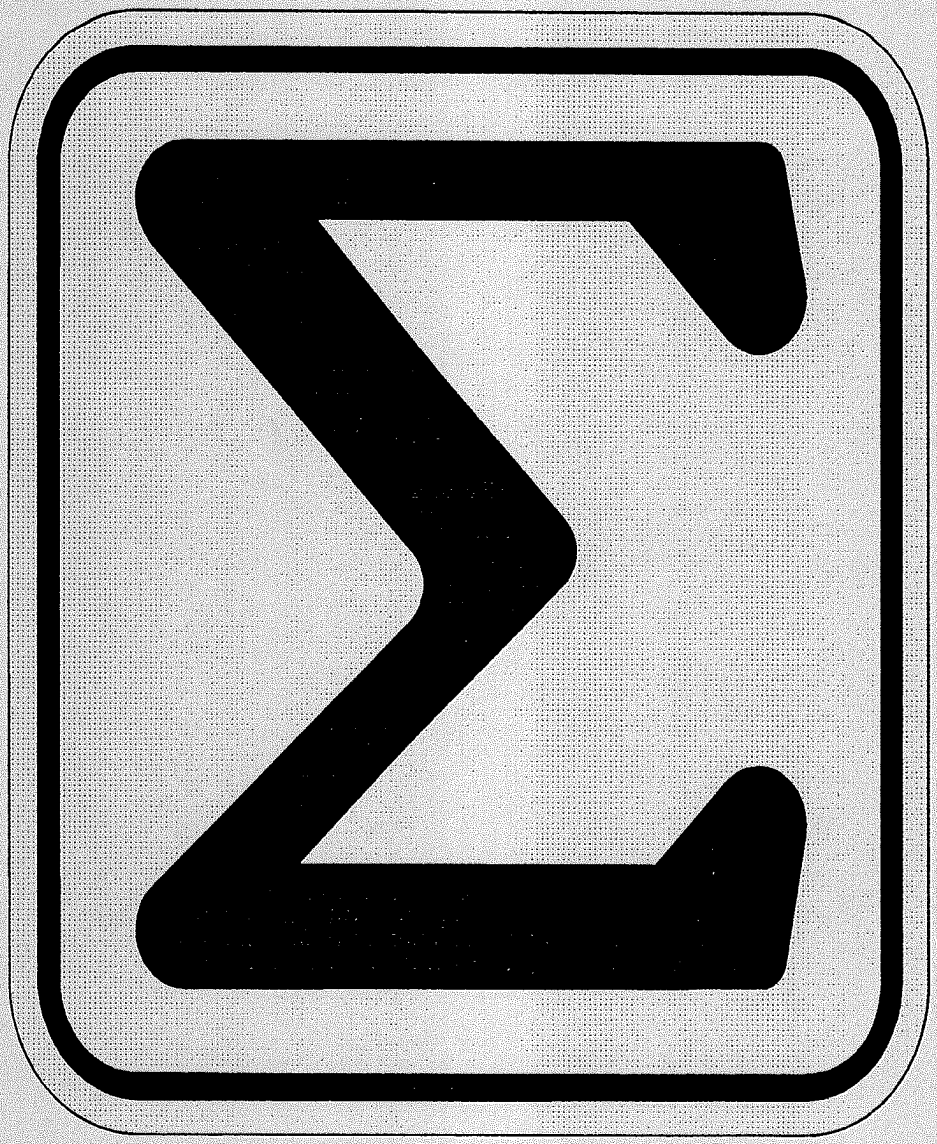
Client: FIBERGLASS COATINGS
Report Number: 97SL059
Description: "IRS #1" PANEL

READING #	MOLD SIDE	
1	82	
2	82	
3	85	
4	78	
5	61	L
6	83	
7	86	
8	81	
9	82	
10	78	
11	87	H
12	83	
13	84	
14	77	
15	82	
16	74	
Average:	81.21	

NOTES:
1) "Average" represents the average of the remaining 14 readings after the high and low readings have been eliminated.
2) H= high reading
3) L= low reading

Sigma Labs

CHEMICAL ANALYSIS



Sigma Labs

SPECTRALAB, INC.
Laboratory and Consulting Services
6345 82nd Avenue North
Pinellas Park, FL 33781
813-545-2297

SPL1876
5/12/97

SPECTRALAB TEST REPORT FOR SIGMA LABS

REQUESTED BY: Rocco Ferri (97SL089)

SUBJECT: Heat Deflection Temperature of Epoxy Laminate

SUBMITTED SAMPLE: Epoxy/Glass Laminate ~1/8" thick

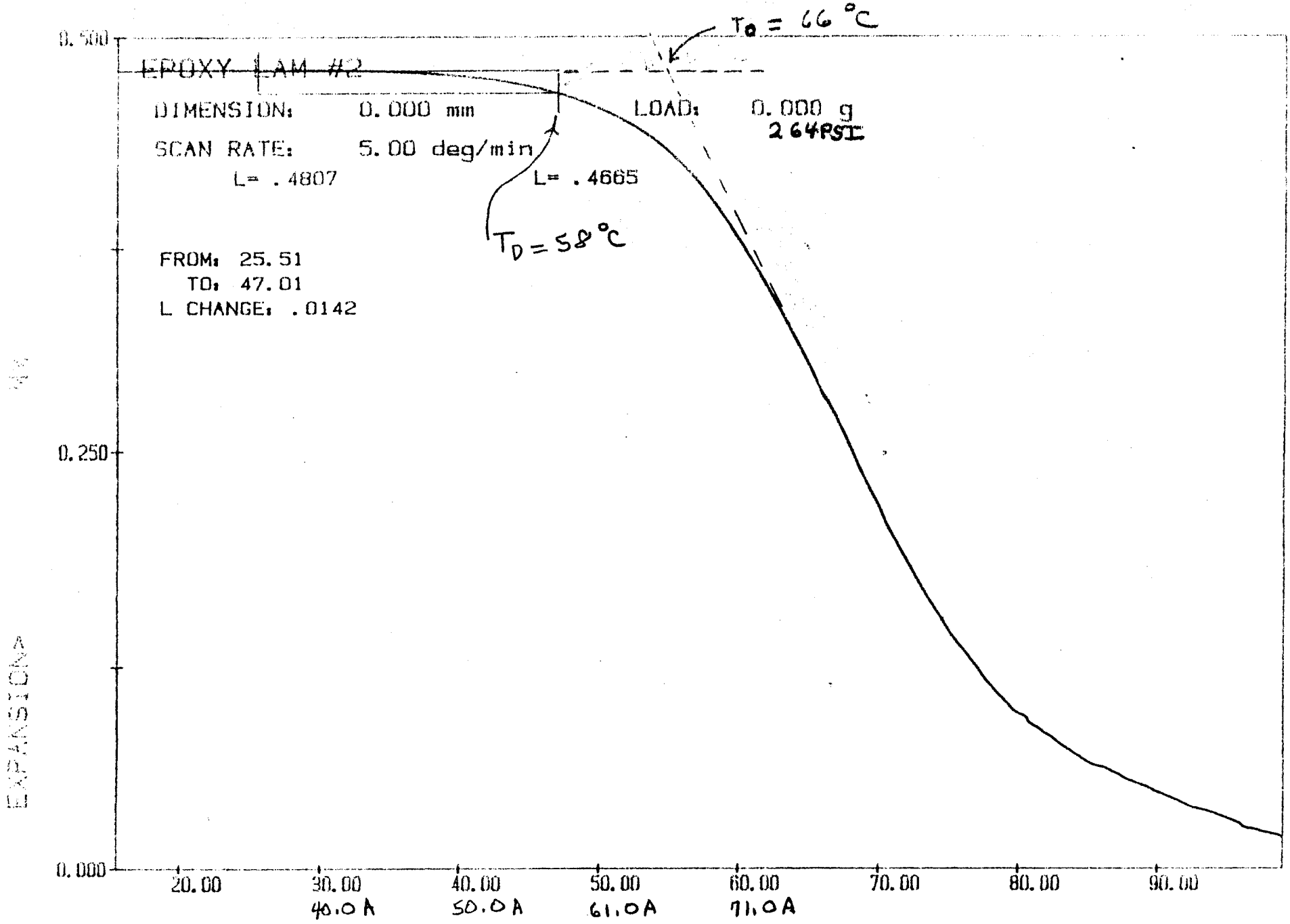
SUMMARY OF RESULTS:
Heat deflection temperature @ 264 PSI was 59.5 ± 1.5 °C.

PROCEDURES/RESULTS:
Two 25 mil thick laminate samples were cut parallel to the glass fabric plane. The samples were tested in duplicate using a thermomechanical analyzer (TMA) under the following conditions:

Scan Rate: 5°C/minute
Load: 264 PSI
Deflection Temperature (Td): Taken at 0.2% strain per ASTM D648
Distortion Temperature (To): Extrapolated onset (comparable to Tg).

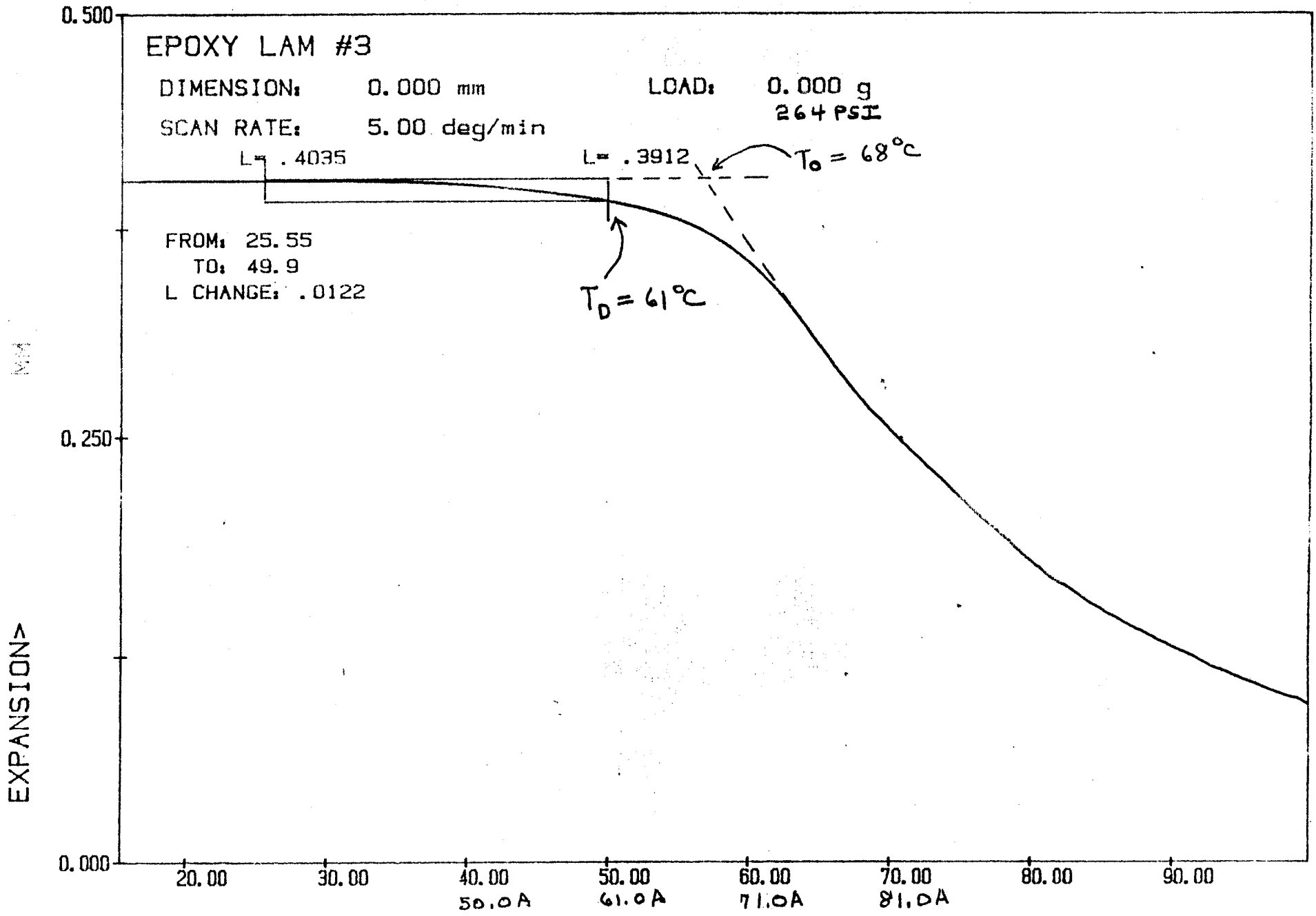
TMA curves for each sample run are attached. All temperatures were corrected to compensate for program temperature error.

Jack Brand 5/12/97
Jack Brand
Lab Director



CR FILE: 1876B.TM TMA

DATE: 96/05/09 TIME: 11:09



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DATE: 96/05/09 TIME: 11:45