Testing	: **Flexural Properties Of Plastics**	
Test Method	: ASTM D790-10 Procedure A	
Project Number	: P20111235	Purchase Order # : H11-0822
Customer	: Bedford Reinforced Plastics, Inc.	
Attention	: Bridgett Diehl	
Analyst	: D.Loehr	
Date	: May 20, 2011	

A2LA ACCREDITED Cert. No. 0619.01 TESTING LABORATORY

Material	: **BRP-11-4-VE-5-45-1**
Sample Preparation	: Machined by Intertek PTL
Sample Dimensions	: 0.503" x 0.245" x 5.00" (Average)
Sample Type	: ASTM Flex Bar
Span Length (in)	: 3.920
Cross-Head Speed (in/min)	: 0.105
Span-To- Depth Ratio	: 16±1:1
Radius Of Supports (in)	: 0.197
Radius Of Loading Nose (in)	: 0.197
Conditioning	: 40+ hours at 23°C ± 2°C / 50% ± 10% RH
Test Conditions	: 23°C ± 2°C / 50% ± 10% RH
Significance	: ASTM D 790 specifies modulus and strength be reported to 3 significant figures and standard deviation be reported to two significant figures.

Test Temperature	Test Number	Initial Fracture Flexural Stress (PSI)	Maximum Flexural Stress (PSI)	Flexural Modulus (tangent *) (PSI)
73°F	1	87700	89900	3040000
	2	97700	98800	3140000
(Lengthwise)	3	102000	103000	3190000
	4	96300	96500	3200000
	5	-----	84200	2780000
	Average	**95900**	**94500**	**3070000**
	Std. Dev.	6000	7400	170000
150°F	1	-----	84200	3080000
	2	-----	82700	2920000
(Lengthwise)	3	-----	80600	3080000
	4	-----	79900	3010000
	5	-----	80700	3080000
	Average		**81600**	**3030000**
	Std. Dev.		1800	71000
-50°F	1	-----	111000	3250000
	2	-----	112000	3180000
(Lengthwise)	3	94300	96500	2930000
	4	-----	119000	3310000
	5	106000	113000	3190000
	Average	**100000**	**110000**	**3170000**
	Std. Dev.		8300	140000

* = computer generated curve fit

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Testing	: **Flexural Properties Of Plastics**		
Test Method	: ASTM D790-10 Procedure A		
Project Number	: P20111235	Purchase Order # : H11-0822	
Customer	: Bedford Reinforced Plastics, Inc.		
Attention	: Bridgett Diehl		
Analyst	: D.Loehr		
Date	: May 20, 2011		

A2LA ACCREDITED Cert. No. 0619.01 TESTING LABORATORY

Material	: **BRP-11-4-VE-5-45-1**
Sample Preparation	: Machined by Intertek PTL
Sample Dimensions	: 0.503" x 0.245" x 5.00" (Average)
Sample Type	: ASTM Flex Bar
Span Length (in)	: 3.920
Cross-Head Speed (in/min)	: 0.105
Span-To- Depth Ratio	: 16±1:1
Radius Of Supports (in)	: 0.197
Radius Of Loading Nose (in)	: 0.197
Conditioning	: 40+ hours at 23°C ± 2°C / 50% ± 10% RH
Test Conditions	: 23°C ± 2°C / 50% ± 10% RH
Significance	: ASTM D 790 specifies modulus and strength be reported to 3 significant figures and standard deviation be reported to two significant figures.

Test Temperature	Test Number	Initial Fracture Flexural Stress (PSI)	Maximum Flexural Stress (PSI)	Flexural Modulus (tangent *) (PSI)
73°F	1	-----	25700	1820000
	2	-----	23200	1870000
(Crosswise)	3	-----	20200	1770000
	4	-----	22100	1770000
	5	21400	21500	1810000
	Average	**21400**	**22500**	**1810000**
	Std. Dev.		2100	41000
150°F	1	-----	19500	1450000
	2	-----	20800	1520000
(Crosswise)	3	-----	19100	1550000
	4	-----	19300	1530000
	5	-----	16700	1480000
	Average		**19100**	**1510000**
	Std. Dev.		1500	40000
-50°F	1	-----	24700	1930000
	2	-----	25300	1900000
(Crosswise)	3	-----	26800	1970000
	4	-----	28700	1850000
	5	-----	26700	1890000
	Average		**26400**	**1910000**
	Std. Dev.		1600	45000

* = computer generated curve fit

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Testing	: **High Speed Puncture Properties of Plastics**
Test Method	: ASTM D 3763-10
Project Number	: P20111235
Customer	: Bedford Reinforced Plastics, Inc.
Attention	: Bridgett Diehl
Analyst	: J. Goodrich
Date	: May 25, 2011

Purchase Order # : H11-0822

Attachments: 3

ACCREDITED Cert. No. 0619.01 TESTING LABORATORY

Material	: **BRP-11-4-VE-5-45-1**
Test Speed	: 3.3 meters/sec
Specimen Size	: 102mm x 102mm
Specimen Type	: Plaque
Specimen Preparation	: Machined by Intertek PTL
Test Equipment	: Instron Dynatup 8250 Impulse Data Acquisition System v 2.0.0
Tup Diameter	: 12.7mm
Clamp Assembly	: Base Support 76mm diameter
	: Top Support 76mm diameter
Significance	: ASTM D 3763 specifies that results be calculated to three significant figures

Test Condition	Average Thickness (mm)	Average Deflection At Peak Load (mm)	Average Peak Load (Newtons)	Average Energy At Peak Load (Joules)	Average Total Energy (Joules)
23°C ± 2°C / 50% ± 10% RH	6.29	9.05	10600	67.4	150
** 150°F (66°C)	6.22	9.52	10300	70.5	164
*-50°F (- 46°C)	6.36	8.33	11500	62.6	155

For complete analysis of these test results, including individual impact results and standard deviations, refer to the supplied tables and graphs.

*** The test specimens are conditioned at the required temperature for a minimum of 6 hours, removed from the chamber, and impacted within 5 to 8 seconds.**

**** The test specimens are conditioned at the required temperature for a minimum of a 1/2 hour, removed from the chamber, and impacted within 5 to 8 seconds.**

Conversions	
mm to in	÷ by 25.4
Newtons to lbs	÷ by 4.44822
Joules to ft•lbs	÷ by 1.35582
meters/sec to ft/sec	÷ by 0.30479

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Testing	:	**Tensile Properties**
Test Method	:	ASTM D 638-10
Project Number	:	P20111235
Customer	:	Bedford Reinforced Plastics, Inc.
Attention	:	Bridgett Diehl
Analyst	:	J. McCarthy / G. Sime
Date	:	May 31, 2011

Purchase Order # : hase Order # : H11-0822

Attachments: 6

ACCREDITED Cert. No. 0619.01 TESTING LABORATORY

Material	:	**BRP-11-4-VE-5-45-1 LW**
Sample Preparation	:	Machined by Intertek PTL
Sample Type	:	ASTM Type I Tensile Bar
Cross-Head Speed	:	0.2 in/min
Extensometer	:	10% based on 50mm gage length for 73°F and 150°F; 4% based on 25mm gage for -50°F. Meets minimum requirements for Practice E 83: Modulus (Class B-2) / Elongation (Class C).
Conditioning	:	40+ Hours At 23°C ± 2°C / 50% ± 10% RH
Significance	:	ASTM D 638 specifies that strength and modulus be reported to 3 significant figures, elongation and standard deviation be reported to 2 significant figures.

Test Temperature	Test Number	Maximum Tensile Strength (PSI)	Elongation At Break (%)	Modulus Of Elasticity (PSI)
73°F	1	77900	2.3	3950000
	2	80500	2.3	3950000
Average Width : 0.502"	3	76600	2.2	4040000
Average Thickness : 0.248"	4	61300	2.6	3590000
	5	79900	2.2	4160000
	6	73800	2.1	4190000
	Average	**75000**	**2.3**	**3980000**
	Std. Dev.	7100	0.17	220000
150°F	1	57200	1.7	3960000
	2	68300	2.1	4020000
Average Width : 0.503"	3	60800	2.2	3410000
Average Thickness : 0.246"	4	57600	1.9	3420000
	5	71600	2.1	3910000
	Average	**63100**	**2.0**	**3740000**
	Std. Dev.	6500	0.20	300000
-50°F	1	90400	2.8	3870000
	2	98000	2.6	4350000
Average Width : 0.502"	3	91300	2.7	3980000
Average Thickness : 0.248"	4	84500	2.5	4100000
	5	85000	2.4	4080000
	Average	**89800**	**2.6**	**4080000**
	Std. Dev.	5500	0.16	180000

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Testing	:	**Tensile Properties**
Test Method	:	ASTM D 638-10
Project Number	:	P20111235
Customer	:	Bedford Reinforced Plastics, Inc.
Attention	:	Bridgett Diehl
Analyst	:	J. McCarthy / G. Sime
Date	:	May 24, 2011

Purchase Order # : H11-0822

ACCREDITED Cert. No. 0619.01 TESTING LABORATORY

Material	:	**BRP-11-4-VE-5-45-1 CW**
Sample Preparation	:	Machined by Intertek PTL
Sample Type	:	ASTM Type I Tensile Bar
Cross-Head Speed	:	0.2 in/min
Extensometer	:	10% based on 50mm gage length for 73°F and 150°F; 4% based on 25mm gage for -50°F. Meets minimum requirements for Practice E 83: Modulus (Class B-2) / Elongation (Class C).
Conditioning	:	40+ Hours At 23°C ± 2°C / 50% ± 10% RH
Significance	:	ASTM D 638 specifies that strength and modulus be reported to 3 significant figures, elongation and standard deviation be reported to 2 significant figures.

Test Temperature	Test Number	Maximum Tensile Strength (PSI)	Elongation At Break (%)	Modulus Of Elasticity (PSI)
73°F	1	11500	1.8	2050000
	2	11100	1.6	2050000
Average Width : 0.505"	3	12400	1.7	2050000
Average Thickness : 0.249"	4	11600	1.7	1960000
	5	11800	1.8	2000000
	Average	**11700**	**1.7**	**2020000**
	Std. Dev.	480	0.08	41000
150°F	1	10400	1.7	1580000
	2	10100	1.7	1640000
Average Width : 0.503"	3	10000	1.5	1720000
Average Thickness : 0.245"	4	11200	1.7	1700000
	5	7670	1.2	1810000
	6	8260	1.3	2030000
	Average	**9610**	**1.5**	**1750000**
	Std. Dev.	1400	0.22	160000
-50°F	1	13400	2.1	2160000
	2	13900	2.5	2050000
Average Width : 0.503"	3	15000	2.5	2100000
Average Thickness : 0.245"	4	12500	2.3	2090000
	5	11900	1.7	2170000
	Average	**13300**	**2.2**	**2110000**
	Std. Dev.	1200	0.33	50000

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Testing	:	**Determining The Izod Pendulum Impact Resistance Of Plastics**
Test Method	:	ASTM D 256-10 (Method A)
Project Number	:	P20111235 Purchase Order # : H11-0822
Customer	:	Bedford Reinforced Plastics, Inc.
Attention	:	Bridgett Diehl
Analyst	:	D.Loehr
Date	:	May 24, 2011

ACCREDITED Cert. No. 0819.01 TESTING LABORATORY

Material	:	**BRP-11-4-VE-5-45-1**
Sample Preparation	:	Machined and notched by Intertek PTL
Sample Type	:	Notched
Pendulum Capacity	:	16.6 ft•lb.
Conditioning	:	40+ hours at 23°C ± 2°C / 50% ± 10% RH
Conditioning	:	Minimum 6 hours in a freezer at -50° F. Samples removed from freezer and impacted within 5 seconds
Conditioning	:	Minimum 30 minutes in a oven at 150° F. Samples removed from oven and impacted within 5 seconds
Test Conditions	:	See below

Test Condition	Test Number	Width (in)	Depth Under Notch (in)	Impact Strength (ft•lb)	**Impact Strength (ft•lb/in)**	**Break Type**
73°F	1	0.242	0.401	16.533	68.32	Non-Break
	2	0.243	0.401	16.541	68.07	Non-Break
Lengthwise	3	0.242	0.400	16.017	66.19	Non-Break
(Modified number of test specimens)	4	0.247	0.399	10.892	44.10	Partial
	Average	0.244	0.400	Non-break Average	**67.52**	
	Note: The first specimen could not be reported; the result exceeded the energy of the 10 ft•lb. pendulum					
150°F	1	0.245	0.400	15.470	63.14	Non-Break
	2	0.246	0.400	11.198	45.52	Partial
Lengthwise	3	0.245	0.401	12.674	51.73	Partial
	4	0.244	0.401	10.361	42.46	Partial
	5	0.243	0.401	11.525	47.43	Partial
	Average	0.245	0.401	Partial Average	**46.79**	
	Std. Dev.			Std. Dev.	3.88	
-50°F	1	0.244	0.399	16.142	66.16	Non-Break
	2	0.248	0.399	16.522	66.62	Non-Break
Lengthwise	3	0.247	0.398	15.983	64.71	Non-Break
	4	0.243	0.400	16.536	68.05	Non-Break
	5	0.248	0.398	16.555	66.75	Non-Break
	Average	0.246	0.399		**66.46**	
	Std. Dev.				1.20	
	C.O.V. (%)				2	

Note: Non-break specimens are considered a departure from the standard and are not supposed to be reported as a standard result. They are reported here for informational purposes only.

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Testing	:	**Determining The Izod Pendulum Impact Resistance Of Plastics**
Test Method	:	ASTM D 256-10 (Method A)
Project Number	:	P20111235 Purchase Order # : H11-0822
Customer	:	Bedford Reinforced Plastics, Inc.
Attention	:	Bridgett Diehl
Analyst	:	D.Loehr
Date	:	May 24, 2011

ACCREDITED Cert. No. 0619.01 TESTING LABORATORY

Material	:	**BRP-11-4-VE-5-45-1**
Sample Preparation	:	Machined and notched by Intertek PTL
Sample Type	:	Notched
Pendulum Capacity	:	5 ft•lb. 73°F and -50°F
Pendulum Capacity	:	2 ft•lb. 150°F
Conditioning	:	40+ hours at 23°C ± 2°C / 50% ± 10% RH
Conditioning	:	Minimum 6 hours in a freezer at -50° F. Samples removed from freezer and impacted within 5 seconds
Conditioning	:	Minimum 30 minutes in a oven at 150° F. Samples removed from oven and impacted within 5 seconds
Test Conditions	:	See below

Test Condition	Test Number	Width (in)	Depth Under Notch (in)	Impact Strength (ft•lb)	**Impact Strength (ft•lb/in)**	**Break Type**
73°F	1	0.247	0.400	1.629	6.60	Partial
	2	0.246	0.400	1.838	7.47	Partial
Crosswise	3	0.242	0.399	1.435	5.93	Partial
	4	0.243	0.402	1.597	6.57	Partial
	5	0.245	0.401	1.581	6.45	Partial
	Average	0.245	0.400		**6.60**	
	Std. Dev.				0.55	
	C.O.V. (%)				8	
150°F	1	0.243	0.401	1.483	6.10	Partial
	2	0.244	0.400	1.856	7.61	Partial
Crosswise	3	0.244	0.401	1.546	6.34	Partial
	4	0.243	0.399	1.704	7.01	Partial
	5	0.243	0.400	1.499	6.17	Partial
	Average	0.243	0.400		**6.65**	
	Std. Dev.				0.65	
	C.O.V. (%)				10	
-50°F	1	0.243	0.401	1.901	7.82	Partial
	2	0.243	0.401	1.807	7.44	Partial
Crosswise	3	0.243	0.401	1.817	7.48	Partial
	4	0.243	0.400	1.791	7.37	Partial
	5	0.243	0.402	2.000	8.23	Partial
	Average	0.243			**7.67**	
	Std. Dev.				0.36	
	C.O.V. (%)				5	

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TRACE LABORATORIES, INC
5 North Park Drive
Hunt Valley, MD 21030 USA
Telephone: 410/584-9099 / Fax: 410/584-9117
Website: www.tracelabs.com / Email: info@tracelabs.com

TEST REPORT FOR:

BEDFORD REINFORCED PLASTICS, INC.
264 Reynoldsdale Road
Bedford, PA 15522

Attn: Bridgett Diehl

DATE IN:

March 1, 2010

P/O:

H10-0409

TESTING PURPOSE:

Flexural Strength and Density per MIL-PRF-62419A

MATERIAL IDENTIFICATION:

One material

Material tested has not met the specified requirement of MIL-PRF-62419A for Specific Gravity.

APPROVED:

John M. Radman
Senior Technical Director

SAMPLE DISPOSITION: Samples destroyed.

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Website: www.tracelabs.com / Email: info@tracelabs.com

FLEXURAL STRENGTH

REFERENCE:

MIL-PRF-62419A and
ASTM-D-790-07

REQUIREMENT:

Flexural Strength = > 5,400 psi

METHOD:

The thickness and width of each specimen was measured and the cross-sectional area calculated. The specimens were individually tested using a three-point load system on a Tension/Compression Tester. The load nose and supports were aligned so that the axes of the cylindrical surfaces were parallel and the load nose was midway between the supports. The specimens were centered on the supports perpendicular to the loading nose and supports. The support span and applied load were as specified in ASTM-D-790-07 using a 16 to 1 ratio. The load was applied and simultaneous load-deflection data was taken.

The Flexural Strength was calculated as follows:

$S = 3PL / 2bd^2$

Where:

S = Flexural Strength (psi)
P = minimum load (lbs)
L = support span (in)
b = width of beam (in)
d = depth of beam (in)

Testing was performed at –60°F, +72°F, and +160°F. The specimens were allowed to stabilize at specified temperature prior to testing.

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RESULTS:

Temperature	Specimen	Flexural Strength (psi)
-60°F	1	56,300
	2	59,600
	3	62,100
	4	60,100
	5	66,000
	Average	**60,820**
+72°F	1	47,300
(Room Temp)	2	44,600
	3	44,300
	4	46,700
	5	48,000
	Average	**46,180**
+160°F	1	30,900
	2	38,200
	3	30,200
	4	32,900
	5	32,200
	Average	**32,880**

Material tested has met the specified requirements of MIL-PRF-62419A for Flexural Strength.