



POLYSHEETING DATA SHEETS

WOVEN & STRING REINFORCED POLYETHYLENE PLASTIC SHEETING FILM

STORK	Twin City Testing Corporation Date: June 28, 2001
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STORK / TWIN CITY TESTING CORPORATION 662 Cromwell Avenue St. Paul, Minnesota 55114	
<i>MATERIAL PROPERTY TESTING CONDUCTED ON 3 PLY AND 5 PLY REINFORCED POLY FILMS</i>	

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The test result contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

NORKAN INC

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INTRODUCTION:

This report presents the results of material property testing that was conducted on two Reinforced Poly Films that were submitted by Norkan INC. This testing was requested on May 30, 2001 with the testing completed on June 28, 2001.

The scope of our work was limited to Mullen Burst Testing, Tensile Testing, Grab Test Strength, Trapezoid Tear Strength and Weight Testing and providing a report of those results on the samples Submitted on June 5, 2001

SUMMARY OF RESULTS:

Specimen Description	Weight (psf)	Weight (pcf)	Mullen Burst, ASTM D741 (lbs/in ²)
3-PLY	0.03	0.21	130
5-PLY	0.04	0.28	222

Specimen Description	Material Description	Tensile Strength, ASTM D882		Trapezoid Tear Strength, ASTM D751		Grab tensile Strength, ASTM D5034	
		Yield Stress (psi)	Elongation (%)	Peak Load (lbf)	Elongation (%)	Peak Load (lbf)	Elongation (%)
3-PLY	Machine	1604	19.9	70	176.6	51	1.2
3-PLY	Transverse	648	38.3	14	401.4	28	7.5
5-PLY	Machine	1833	19.6	124	209.7	109	1.1
5-PLY	Transverse	628	58.5	24	251.4	48	16.3

Results are based on five specimen averages

SPECIMEN IDENTIFICATION:

The two specimens of Reinforced Poly Films were submitted by Norkan Inc. A 3-ply, 6 mil film with a reinforced single nylon crisscrossing weave and a 5 ply, 10 mil film with a reinforced double nylon crisscrossing weave. The machine direction of each sample was identified as the same direction that single nylon reinforcement ran over the crisscrossing weave. The transverse direction was 90 degrees to the machine direction.



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TEST METHOD:

Weight

Ten - 3" W x 8" L samples were weighed and measured for thickness. The mean for these samples was then calculated. These samples were all cut with length being in the machine direction.

Mullen Burst Test

The testing was conducted in accordance with ASTM D751-00 "Standard Test Methods for Coated Fabrics" Sec 18-21. Ten samples from each specimen were tested by use of a diaphragm tester. Pressure was applied at a constant rate until rupture occurred. The average bursting strength of the specimen was the arithmetic mean of the ten samples.

Tensile Strength Test

The testing was conducted in accordance with ASTM D882-00 "Standard Test Method for Tensile Properties of Thin Plastic Sheeting." Five samples in each direction with dimensions 1" x 10" were cut from each specimen. Each sample was measured in three locations within the gage length for width and thickness, and these measurements were averaged and used to compute the cross sectional area. A MTS universal testing machine pulled the sample in tension at a speed of 20 inches per minute. The machine's software determined the yield load of each sample, and calculated a yield strength ROI" each by dividing this load by the cross sectional area.

Trapezoid Tear Strength

The testing was conducted in accordance with ASTM D751-00 "Standard Test Methods for Coated Fabrics" Sec 37-40. Five samples in each direction with dimensions 3" x 6" were cut from each specimen. Each sample was measured in three locations within the gage length for width and thickness, and these measurements were averaged and used to compute the cross sectional area. A 0.625" cut was made at the center of edge of a 1" x 4" trapezoid that was marked on the 3" x 6" sample. The MTS universal testing machine grips were then positioned on the sample so that they aligned with the diagonal lines of the trapezoid shape. The machine pulled the sample in tension at a speed of 12 inches per minute. The machine's software determined the peak load of each sample.

Grab Tensile Strength

The testing was conducted in accordance with ASTM D5034-95 "Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)." Five samples in each direction with dimensions 4" x 6" were cut from each specimen. Each sample was measured in three locations within the gage length for width and thickness, and these measurements were averaged and used to compute the cross sectional area. A MTS universal testing machine pulled the sample in tension at a speed of 12 inches per minute. The machine's software determined the peak load and elongation at peak load of each sample.



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TEST EQUIPMENT:		
<u>Manufacturer</u>	ID #	
MTS Universal Testing Machine Qtest/50LP	System 1532	
Mullen Tester	MM130-021	
Mitutoyo Digital Caliper	MM160-068	

REMARKS:

Remaining samples will be discarded in 30 days unless otherwise notified



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TENSILE PROPERTIES ASTM D882

Sample Identification	Specimen	Avg. Width, in.	Avg. Thickness, in.	Yield Stress psf	Elongation %
Machine 3 PLY	1	1.031	0.011	1363.8	16.6
	2	1.005	0.010	1443.1	16.8
	3	1.018	0.010	1809.5	24.5
	4	1.042	0.010	1335.1	19.2
	5	1.002	0.009	2066.8	22.3
	Average Std Dev				803.6 321.1
Transverse 3 PLY	1	1.004	0.010	602.1	18.6
	2	0.992	0.009	677.1	16.6
	3	0.977	0.009	683.9	71.9
	4	0.999	0.010	598.9	41.0
	5	1.020	0.009	675.4	43.5
	Average Std Dev				647.5 43.0

*Test Equipment: MTS universal testing machine, mdl. QTest/501P, Sys. No. 1532, Cal. 12-5-00, due 12-5-01
Mitutoyo digital caliper, MM 160-068, Cal. 5-25-00, due 5-25-01.*

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Sample Identification	Specimen	Avg. Width, in.	Avg. Thickness, in.	Yield Stress psf	Elongation %
Machine 5 PLY	1	0.986	0.02	1675.2	15.3
	2	0.997	0.017	1796.7	20.5
	3	1.018	0.015	2014.0	20.4
	4	1.007	0.016	1917.3	21.0
	5	0.996	0.019	1760.5	21.0
	Average Std Dev			1832.7 133.5	19.6 2.4
Transverse 5 PLY	1	1.004	0.018	609.8	80.5
	2	0.961	0.020	602.5	40.4
	3	0.982	0.017	639.6	83.9
	4	0.986	0.017	716.8	23.2
	5	0.986	0.019	573.3	64.4
	Average Std Dev			628.4 54.8	58.5 26.2

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TRAPEZOID TEAR STRENGTH PROPERTIES

Sample Identification	Specimen	Peak Load lb	Elongation %
Machine 3 PLY	1	66.61	117.00
	2	61.91	221.10
	3	80.16	173.20
	4	75.89	188.60
	5	65.37	182.90
	Average	69.99	176.56
	Std Dev	7.69	37.84
Transverse 3 PLY	1	13.80	295.10
	2	14.18	481.10
	3	15.27	450.30
	4	13.74	*****
	5	14.30	379.20
	Average	14.26	401.43
	Std Dev	0.61	82.74

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TRAPEZOID TEAR STRENGTH PROPERTIES

Sample Identification	Specimen	Peak Load lb	Elongation %
Machine 5 PLY	1	102.85	198.70
	2	96.81	223.60
	3	128.60	189.80
	4	145.50	227.90
	5	148.13	208.60
	Average	124.38	209.72
	Std Dev	23.73	16.15
Transverse 5 PLY	1	22.65	172.50
	2	24.39	273.70
	3	21.52	264.20
	4	21.46	333.30
	5	29.87	213.10
	Average	23.98	251.36
	Std Dev	3.50	61.36

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GRAB TENSILE PROPERTIES
ASTM D5034-95

Sample Identification	Specimen	Peak Load lb	Elongation at pk ld %
Machine 3 PLY	1	41.68	1.24
	2	52.66	1.13
	3	56.55	0.91
	4	52.94	1.34
	5	51.82	1.33
	Average Std Dev	51.13 5.59	1.19 0.18
Transverse 3 PLY	1	28.12	9.07
	2	26.32	3.06
	3	27.84	7.39
	4	28.84	11.05
	5	27.19	6.75
	Average Std Dev	27.66 0.96	7.46 2.97

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GRAB TENSILE PROPERTIES ASTM D5034-95

Sample Identification	Specimen	Peak Load lb	Elongation at pk ld %
Machine 5 PLY	1	96.62	1.13
	2	109.84	0.94
	3	138.77	1.01
	4	94.91	1.36
	5	104.36	0.82
	Average Std Dev	108.90 17.75	1.05 0.21
Transverse 5 PLY	1	46.26	16.52
	2	48.50	16.57
	3	46.82	15.12
	4	51.70	17.67
	5	45.63	15.81
	Average Std Dev	47.78 2.44	16.34 0.95

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