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Tear Properties of Window Film

Name	3M Renewable Energy	Date:	July 3, 20104
Attn:	Paul Neumann	Revision Date:	September 18, 2014
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City, State, Zip:	St. Paul, MN 55144	Report Number:	ESP017051P-Ultra 600Tr
		Client Purchase Order Number:	USMMMNY51T

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INTRODUCTION

This report presents the results of tear tests conducted on a sample of window film. The testing was authorized by Paul Neumann of 3M Renewable Energy on June 12, 2014. The testing and data analysis were completed on September 18, 2014.

The scope of our work was limited to conducting tear tests on the sample submitted and reporting the results.

OBJECTIVE

Determine tear properties of the window film.

SAMPLE IDENTIFICATION

The sample was identified as 3M™ Scotchshield™ Safety and Security Film Ultra 600

TEST METHOD

The specimens were allowed to condition at standard laboratory conditions of $72 \pm 4^\circ\text{F}$ and $50 \pm 5\%$ relative humidity for at least 40 hours prior to testing. Testing was done according to ASTM Standards detailed below, with notes of parameters and/or deviations.

Test Method	Test Method Title	Parameters and/or Deviations from Method
ASTM D1004	Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting	Grip separation 1 in. Test speed 2 in./min.

CALIBRATED TEST EQUIPMENT

Honeywell Temp/RH Chart Recorder, S/N 7852 243000007, ID MM190-024 calibrated 8/7/13 calibrated 8/5/14, due 8/5/15

MTS Universal Test Machine, Mdl Qtest / 50LP, System #1532, ID MM210-009.3 & 6 calibrated 4/8/14 due 4/8/15

Interface Load Cell, 225 lbf capacity, S/N 677238, ID PT-163-042 calibrated 4/8/14, due 4/8/15

Mitutoyo Digimatic 8" Calipers, S/N 0006565, ID MM160-068 calibrated 8/8/13, calibrated 8/5/14, due 8/5/15

Mitutoyo Digimatic Indicator, Model C1012CMX, S/N 09040960, ID PT163-021 calibrated 8/8/13, calibrated 8/5/14, due 8/5/15

TEST RESULTS

Tear

Specimen #	Peak Load (lbf)	Extension (in)	Total Energy (in*lbf)	Grave Tear (lbf %)
MD - 1	17.57	0.56	8.05	805
2	19.60	0.53	7.77	777
3	15.17	0.54	6.67	667
4	14.74	0.43	4.54	454
5	21.84	0.69	11.60	1160
6	15.12	0.52	6.05	605
7	18.66	0.48	6.76	676
8	15.26	0.47	5.76	576
9	16.14	0.46	5.85	585
10	14.60	0.48	6.46	646
Average	16.87	0.52	6.95	695.09
Standard Deviation	2.46	0.07	1.92	191.76
TD - 1	15.79	0.48	5.67	567
2	17.55	0.49	6.31	631
3	12.24	0.43	3.93	393
4	15.46	0.47	5.64	564
5	15.76	0.47	6.02	602
6	12.76	0.29	2.82	282
7	13.34	0.43	4.41	441
8	14.87	0.66	7.68	768
9	16.79	0.56	7.77	777
10	12.31	0.40	3.85	385
Average	14.69	0.47	5.41	540.92
Standard Deviation	1.91	0.10	1.64	164.50

Respectfully submitted,



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