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PEEL TESTS OF WINDOW FILMS

Name	3M Renewable Energy	Date:	July 3, 20104
Attn:	Paul Neumann	Revision Date:	February 16, 2015
Address:	3M Center, 235-3D-02	Author:	Briana Hinrichs
City, State, Zip:	St. Paul, MN 55144	Report Number:	ESP017051P-S2
		Client Purchase Order Number:	USMMMNY51T

INTRODUCTION

This report presents the results of peel tests conducted on samples of window film. The testing was authorized by Mr. 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 peel tests on the samples submitted and reporting the results.

OBJECTIVE

Determine peel adhesion properties of the window films.

SAMPLE IDENTIFICATION

The samples were identified as follows;
3M™ Safety and Security Film Safety Series S40, S70, S80 and S140.

TEST METHOD

The specimens were allowed to condition at standard laboratory conditions of 72 ± 4°F and 50 ± 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 D3330	Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape	Method A

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

MTS Load Cell, 2250lbf Capacity, S/N 205974, ID MM210-009.1 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

Peel

Sample ID	Specimen	Width, in	Peak Load, lbs	Scatter Peel, lbs/in	Peel Strength, lbs/in
S40	1	2.270	9.76	0.08	3.97
	2	2.258	9.43	0.07	3.99
	3	2.232	8.97	0.09	3.90
	4	2.275	9.36	0.08	3.95
	5	2.256	9.43	0.11	3.87
Average		**2.258**	**9.39**	**0.09**	**3.93**
Standard Deviation		**0.017**	**0.28**	**0.01**	**0.05**
S70	1	2.215	13.25	0.19	5.37
	2	2.254	12.43	0.19	5.04
	3	2.276	12.68	0.24	5.18
	4	2.213	13.47	0.17	5.23
	5	2.279	13.62	0.22	5.44
Average		**2.247**	**13.09**	**0.20**	**5.25**
Standard Deviation		**0.032**	**0.51**	**0.03**	**0.16**
S80	1	2.264	6.57	0.12	2.66
	2	2.250	6.16	0.12	2.55
	3	2.197	5.44	0.15	2.19
	4	2.255	4.38	0.05	1.72
	5	2.201	5.03	0.11	1.97
Average		**2.233**	**5.52**	**0.11**	**2.22**
Standard Deviation		**0.032**	**0.87**	**0.04**	**0.39**
S140	1	2.261	6.45	0.21	2.18
	2	2.290	4.91	0.12	1.62
	3	2.238	5.98	0.22	2.03
	4	2.280	6.16	0.17	2.10
	5	2.209	6.45	0.32	2.15
Average		**2.256**	**5.99**	**0.21**	**2.01**
Standard Deviation		**0.033**	**0.64**	**0.07**	**0.23**

Respectfully submitted,

Briana Hinrichs
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Product Evaluation Department

REVISION NOTES

Revision	Page #, Section, Description	Date
S2	Separated report to be Peel Adhesion data and information only.	02-16-2015