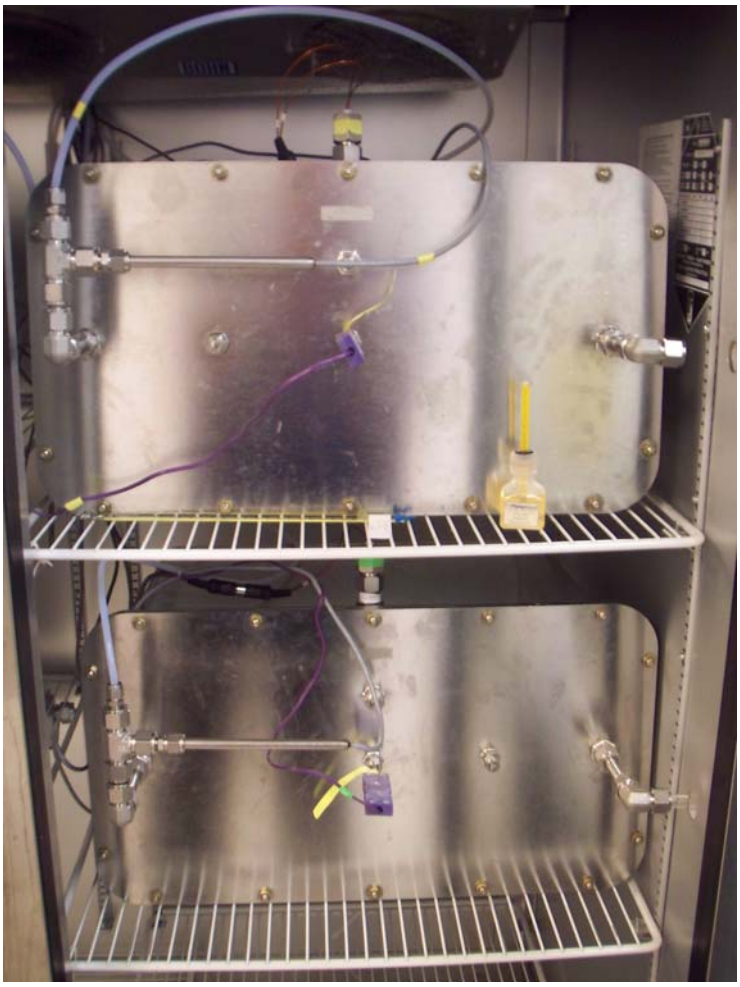
Dynamic Small-Scale Chamber Emissions Testing



Compliance Report per
California Department of Public Health Standard Method
Version 1.1

Part A: Prestige 70 Film

Part B: Night Vision 15 Film

Part C: Ceramic 30 Film

Part D: Neutral 35 Film

Prepared for:

3M

3M Center 235-3D-02
St. Paul, MN 55144-1000

Submitted by:

Materials Analytical Services, LLC
3945 Lakefield Court
Suwanee, Georgia 30024

A2LA ACCREDITED
Testing Cert. #2925.01

April 10, 2014

MAS Project No: 1400316

MAS CERTIFIED GREEN for a healthier indoor environment

April 10, 2014

Ms. Jen Daly
Laboratory Technician
3M Renewable Energy Division
3M Center 235-3D-02
St. Paul, MN 55144-1000

Subject: **Dynamic Small-Scale Chamber Emissions Testing**
Compliance Report per California Department of Public Health Standard Method Version 1.1
3M Window Film
MAS Project No.: 1400316

Dear Ms. Daly:

Materials Analytical Services, LLC (MAS) is pleased to submit this report for emissions testing relative to potential VOC off-gassing from an application of the Prestige 70, Night Vision 15, Ceramic 30, and Neutral 35 window films submitted in March 2014. This report summarizes our testing procedures and the results of our analytical measurements.

This project was conducted in general accordance with the emission testing guidelines specified under ASTM D 5116-10. Specific testing parameters and VOC emission limits were based on the California Department of Public Health (CDPH) *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Test Chambers Version 1.1* (Section 01350). This testing protocol was implemented to bracket a broad range of similarly formulated, lower emitting products under a single test contained herein.

Based on our test results, the Prestige 70, Night Vision 15, Ceramic 30, and Neutral 35 window films tested are **compliant** with the performance standard established for low-emitting wall systems under the Collaborative for High Performance Schools (CHPS) and the LEED v4 programs. Qualified project uses of the window films may be eligible for credit points under Ceiling and Wall Systems Program. By successful conformance with the CHPS & LEED standards, the window films also meet the criteria of **MAS Certified Green®** Program.

MAS is pleased to have been of service to you. If you have any questions or comments, or if we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

MATERIALS ANALYTICAL SERVICES, LLC

Robert D. Schmitter
Manager, Emissions Group

William R. Stapleton
Senior Chemist

Appendices: Appendix A – Chain-of-Custody
Appendix B – List of Bracketed Products
Appendix C – General Testing Parameters and Data

MAS LLC - ATLANTA
Corporate Headquarters
3945 Lakefield Court · Suwanee, GA 30024
(770) 866-3200 · Fax (770) 866-3259

COMPLIANCE EMISSIONS TEST

By California Dept. of Public Health Standard Method Version 1.1
Window Film Evaluation
MAS Project No.: 1400316

SAMPLE DESCRIPTION & TESTING PARAMETERS

Sample specifics as described in the accompanying chain-of custody (Appendix A) and a timeline of milestone dates relative to sampling and analysis are summarized below:

Product Name: Prestige 70	**MAS Assigned ID:** 1400316-01
Manufacturer: 3M 3M Center 235-3D-02 St. Paul, MN 55144-1000	**Product Description:** 70-0063-4912-3; polyethylene window film
Manufacture Date: March 7, 2014	**Testing Period:** March 14-28, 2014
Collection Date: March 11, 2014	**In-Chamber Sampling Dates:** March 25 @ 24 hrs; March 26 @ 48 hrs; March 28 @ 96 hrs
Shipping Date: March 11, 2014	**Date of Sample Analysis:** April 4, 2014
Laboratory Arrival Date: March 13, 2014	**Age of Sample at Testing:** 7 days

3M Prestige 70 Window Film as tested

Product Name: Night Vision 15	**MAS Assigned ID:** 1400316-02
Manufacturer: 3M 3M Center 235-3D-02 St. Paul, MN 55144-1000	**Product Description:** 70-0064-3715-9; polyethylene window film
Manufacture Date: March 7, 2014	**Testing Period:** March 21-April 4, 2014
Collection Date: March 11, 2014	**In-Chamber Sampling Dates:** April 1 @ 24 hrs; April 2 @ 48 hrs; and April 4 @ 96 hrs
Shipping Date: March 11, 2014	**Date of Sample Analysis:** April 5, 2014
Laboratory Arrival Date: March 13, 2014	**Age of Sample at Testing:** 14 days

3M Night Vision 15 Window Film as tested

Product Name: Ceramic 30	**MAS Assigned ID:** 1400316-03
Manufacturer: 3M 3M Center 235-3D-02 St. Paul, MN 55144-1000	**Product Description:** 70-0066-6377-0; polyethylene window film
Manufacture Date: March 7, 2014	**Testing Period:** March 14-28, 2014
Collection Date: March 11, 2014	**In-Chamber Sampling Dates:** March 25 @ 24 hrs; March 26 @ 48 hrs; March 28 @ 96 hrs
Shipping Date: March 11, 2014	**Date of Sample Analysis:** April 5, 2014
Laboratory Arrival Date: March 13, 2014	**Age of Sample at Testing:** 7 days

3M Ceramic 30 Window Film as tested

Product Name: Neutral 35	**MAS Assigned ID:** 1400316-04
Manufacturer: 3M 3M Center 235-3D-02 St. Paul, MN 55144-1000	**Product Description:** 70-0066-6362-2; polyethylene window film
Manufacture Date: March 7, 2014	**Testing Period:** March 21-April 4, 2014
Collection Date: March 11, 2014	**In-Chamber Sampling Dates:** April 1 @ 24 hrs; April 2 @ 48 hrs; and April 4 @ 96 hrs
Shipping Date: March 11, 2014	**Date of Sample Analysis:** April 5, 2014
Laboratory Arrival Date: March 13, 2014	**Age of Sample at Testing:** 14 days

3M Neutral 35 Window Film as tested

SAMPLE HANDLING & EMISSIONS TESTING

Each window film sample was prepared for testing by cutting a 15 cm x 15 cm section from the submitted roll, which was then adhered to a clean glass plate with non-emitting aluminum tape. Each plate was placed inside one of MAS's small-scale (53 liter) stainless steel emissions chambers and positioned on the floor in the center of the chamber to facilitate even air circulation around the sample.

Emissions from the samples were collected and analyzed in general accordance with ASTM D 5116-10 *Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products*. The specific parameters for sample conditioning, collection of samples and analysis of compounds of interest were conducted in accordance with the California Department of Public Health (CDPH) *Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.1*, for comparison to the Leadership in Energy and Environmental Design (LEED) standard, and the Collaborative for High Performance Schools (CHPS) criteria for Low Emitting Materials; and **MAS Certified Green®** Program standard chamber emissions testing procedures. General testing parameters and data are presented in Appendix C.

TESTING RESULTS

In order to compare the chamber derived data to the standards established under CDPH Standard Method Version 1.1 and the CHPS criteria for Low Emitting Materials an emission factor for each tested sample is calculated based on the 96 hour data following ten days of in-chamber conditioning. This emission factor is then applied to the defined parameters of that product in a typical school classroom and private office environment accounting for the specified room sizes and ventilation rates.

CDPH modeling parameters define a typical classroom as having a total window surface area of 4.46 square meters, and a typical private office as having a total window surface area of 1.49 square meters. For purposes of this report, a typical application was assumed to be the total window surface area. The results of the modeling data are presented in the following tables.

PART A: Prestige 70 Window Film

Table A-I
Emission Factors and Predicted 96-Hour Airborne Concentrations for the Prestige 70 Window Film in Typical Building Environments

VOC Name	Calculated Emission Factor ($\mu g/m^2hr$)	Predicted Airborne Concentration ($\mu g/m^3$)		Target CREL Limits ($\mu g/m^3$)	Testing Comment
	96^{th} hour (4 days)	Classroom	Private Office		
Total VOCs (TVOC)	36	0.85	2.6	NA	NA/NA
formaldehyde	<3.6	<0.085	<0.26	9	PASS/PASS
acetaldehyde	<3.3	<0.077	<0.23	70	PASS/PASS
isopropanol	<3.1	<0.074	<0.22	3500	PASS/PASS
1,1-dichloroethylene	<3.1	<0.074	<0.22	35	PASS/PASS
methylene chloride	<3.1	<0.074	<0.22	200	PASS/PASS
carbon disulfide	<3.1	<0.074	<0.22	400	PASS/PASS
MTBE	<3.1	<0.074	<0.22	4000	PASS/PASS
vinyl acetate	<3.1	<0.074	<0.22	100	PASS/PASS
hexane	<3.1	<0.074	<0.22	3500	PASS/PASS
chloroform	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol	<3.1	<0.074	<0.22	30	PASS/PASS
1,1,1-trichloroethane	<3.1	<0.074	<0.22	500	PASS/PASS
benzene	<3.1	<0.074	<0.22	30	PASS/PASS
1-methoxy-2-propanol	<3.1	<0.074	<0.22	3500	PASS/PASS
carbon tetrachloride	<3.1	<0.074	<0.22	20	PASS/PASS
1,4-dioxane	<3.1	<0.074	<0.22	1500	PASS/PASS
trichloroethylene	<3.1	<0.074	<0.22	300	PASS/PASS
epichlorohydrin	<1.6	<0.038	<0.12	1.5	PASS/PASS
2-ethoxyethanol	<3.1	<0.074	<0.22	35	PASS/PASS
n,n-dimethylformamide	<3.1	<0.074	<0.22	40	PASS/PASS
toluene	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol acetate	<3.1	<0.074	<0.22	45	PASS/PASS
tetrachloroethylene	<3.1	<0.074	<0.22	17.5	PASS/PASS
chlorobenzene	<3.1	<0.074	<0.22	500	PASS/PASS
ethylbenzene	<3.1	<0.074	<0.22	1000	PASS/PASS
m & p-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
styrene	<3.1	<0.074	<0.22	450	PASS/PASS
o-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
phenol	<3.1	<0.074	<0.22	100	PASS/PASS

1,4-dichlorobenzene	<3.1	<0.074	<0.22	400	PASS/PASS
isophorone	<3.1	<0.074	<0.22	1000	PASS/PASS
naphthalene	<1.6	<0.038	<0.12	4.5	PASS/PASS

CONCLUSIONS

Based on the emissions test data, MAS offers the following findings and conclusions:

- Predicted emission concentrations of the Prestige 70 window film at the 14 day test point in both a classroom and private office environment are **compliant** with the specified California Department of Public Health (CDPH) regulated CREL compound limits.
- Based on the findings presented in Table I, the Prestige 70 window film is **compliant** with the performance standards established for low-emitting materials under the Collaborative for High Performance Schools (CHPS) Section EQ2.2.6 Ceiling and Wall Systems criteria.
- The Prestige 70 window film is **compliant** with the general emissions evaluation for window films as specified in the LEED v4 rating system. In accordance with LEED v4 reporting requirements, the estimated TVOC emissions for the Prestige 70 window film are at concentrations of less than 0.5 mg/m^3.
- Qualified project uses of the Prestige 70 window film may be eligible for credit points under the CHPS and LEED v4 programs. By successful conformance with the CHPS and LEED v4 standards, the Prestige 70 window film also meets the criteria of **MAS Certified Green®** Program.

PART B: Night Vision 15 Window Film

Table B-I
Emission Factors and Predicted 96-Hour Airborne Concentrations for the Night Vision 15 in Typical Building Environments

VOC Name	Calculated Emission Factor (µg/m^{2}hr)	Predicted Airborne Concentration (µg/m^3)		Target CREL Limits (µg/m^3)	Testing Comment
	96th hour (4 days)	Classroom	Private Office		
Total VOCs (TVOC)	34	0.80	2.4	NA	NA/NA
formaldehyde	<3.6	<0.085	<0.26	9	PASS/PASS
acetaldehyde	<3.3	<0.077	<0.23	70	PASS/PASS
isopropanol	<3.1	<0.074	<0.22	3500	PASS/PASS
1,1-dichloroethylene	<3.1	<0.074	<0.22	35	PASS/PASS
methylene chloride	<3.1	<0.074	<0.22	200	PASS/PASS
carbon disulfide	<3.1	<0.074	<0.22	400	PASS/PASS
MTBE	<3.1	<0.074	<0.22	4000	PASS/PASS
vinyl acetate	<3.1	<0.074	<0.22	100	PASS/PASS
hexane	<3.1	<0.074	<0.22	3500	PASS/PASS

chloroform	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol	<3.1	<0.074	<0.22	30	PASS/PASS
1,1,1-trichloroethane	<3.1	<0.074	<0.22	500	PASS/PASS
benzene	<3.1	<0.074	<0.22	30	PASS/PASS
1-methoxy-2-propanol	<3.1	<0.074	<0.22	3500	PASS/PASS
carbon tetrachloride	<3.1	<0.074	<0.22	20	PASS/PASS
1,4-dioxane	<3.1	<0.074	<0.22	1500	PASS/PASS
trichloroethylene	<3.1	<0.074	<0.22	300	PASS/PASS
epichlorohydrin	<1.6	<0.038	<0.12	1.5	PASS/PASS
2-ethoxyethanol	<3.1	<0.074	<0.22	35	PASS/PASS
n,n-dimethylformamide	<3.1	<0.074	<0.22	40	PASS/PASS
toluene	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol acetate	<3.1	<0.074	<0.22	45	PASS/PASS
tetrachloroethylene	<3.1	<0.074	<0.22	17.5	PASS/PASS
chlorobenzene	<3.1	<0.074	<0.22	500	PASS/PASS
ethylbenzene	<3.1	<0.074	<0.22	1000	PASS/PASS
m & p-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
styrene	<3.1	<0.074	<0.22	450	PASS/PASS
o-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
phenol	<3.1	<0.074	<0.22	100	PASS/PASS
1,4-dichlorobenzene	<3.1	<0.074	<0.22	400	PASS/PASS
isophorone	<3.1	<0.074	<0.22	1000	PASS/PASS
naphthalene	<1.6	<0.038	<0.12	4.5	PASS/PASS

CONCLUSIONS

Based on the emissions test data, MAS offers the following findings and conclusions:

- Predicted emission concentrations of the Night Vision 15 window film at the 14 day test point in both a classroom and private office environment are **compliant** with the specified California Department of Public Health (CDPH) regulated CREL compound limits.
- Based on the findings presented in Table I, the Night Vision 15 window film is **compliant** with the performance standards established for low-emitting materials under the Collaborative for High Performance Schools (CHPS) Section EQ2.2.6 Ceiling and Wall Systems criteria.
- The Night Vision 15 window film is **compliant** with the general emissions evaluation for window films as specified in the LEED v4 rating system. In accordance with LEED v4 reporting requirements, the estimated TVOC emissions for the Night Vision 15 window film are at concentrations of less than 0.5 mg/m^3.
- Qualified project uses of the Night Vision 15 window film may be eligible for credit points under the CHPS and LEED v4 programs. By successful conformance with the CHPS and LEED v4 standards, the Night Vision 15 window film also meets the criteria of **MAS Certified Green®** Program.

PART C: Ceramic 30 Window Film

Table C-I
Emission Factors and Predicted 96-Hour Airborne Concentrations for the Ceramic 30 Window Film in Typical Building Environments

VOC Name	Calculated Emission Factor ($\mu g/m^2hr$)	Predicted Airborne Concentration ($\mu g/m^3$)		Target CREL Limits ($\mu g/m^3$)	Testing Comment
	96^{th} hour (4 days)	Classroom	Private Office		
Total VOCs (TVOC)	32	0.76	2.3	NA	NA/NA
formaldehyde	<3.6	<0.085	<0.26	9	PASS/PASS
acetaldehyde	<3.3	<0.077	<0.23	70	PASS/PASS
isopropanol	<3.1	<0.074	<0.22	3500	PASS/PASS
1,1-dichloroethylene	<3.1	<0.074	<0.22	35	PASS/PASS
methylene chloride	<3.1	<0.074	<0.22	200	PASS/PASS
carbon disulfide	<3.1	<0.074	<0.22	400	PASS/PASS
MTBE	<3.1	<0.074	<0.22	4000	PASS/PASS
vinyl acetate	<3.1	<0.074	<0.22	100	PASS/PASS
hexane	<3.1	<0.074	<0.22	3500	PASS/PASS
chloroform	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol	<3.1	<0.074	<0.22	30	PASS/PASS
1,1,1-trichloroethane	<3.1	<0.074	<0.22	500	PASS/PASS
benzene	<3.1	<0.074	<0.22	30	PASS/PASS
1-methoxy-2-propanol	<3.1	<0.074	<0.22	3500	PASS/PASS
carbon tetrachloride	<3.1	<0.074	<0.22	20	PASS/PASS
1,4-dioxane	<3.1	<0.074	<0.22	1500	PASS/PASS
trichloroethylene	<3.1	<0.074	<0.22	300	PASS/PASS
epichlorohydrin	<1.6	<0.038	<0.12	1.5	PASS/PASS
2-ethoxyethanol	<3.1	<0.074	<0.22	35	PASS/PASS
n,n-dimethylformamide	<3.1	<0.074	<0.22	40	PASS/PASS
toluene	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol acetate	<3.1	<0.074	<0.22	45	PASS/PASS
tetrachloroethylene	<3.1	<0.074	<0.22	17.5	PASS/PASS
chlorobenzene	<3.1	<0.074	<0.22	500	PASS/PASS
ethylbenzene	<3.1	<0.074	<0.22	1000	PASS/PASS
m & p-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
styrene	<3.1	<0.074	<0.22	450	PASS/PASS
o-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
phenol	<3.1	<0.074	<0.22	100	PASS/PASS
1,4-dichlorobenzene	<3.1	<0.074	<0.22	400	PASS/PASS

isophorone	<3.1	<0.074	<0.22	1000	PASS/PASS
naphthalene	<1.6	<0.038	<0.12	4.5	PASS/PASS

CONCLUSIONS

Based on the emissions test data, MAS offers the following findings and conclusions:

- Predicted emission concentrations of the Ceramic 30 window film at the 14 day test end point in both a classroom and private office environment are **compliant** with the specified California Department of Public Health (CDPH) regulated CREL compound limits.
- Based on the findings presented in Table I, the Ceramic 30 window film is **compliant** with the performance standards established for low-emitting materials under the Collaborative for High Performance Schools (CHPS) Section EQ2.2.6 Ceiling and Wall Systems criteria.
- The Ceramic 30 window film is **compliant** with the general emissions evaluation for window films as specified in the LEED v4 rating system. In accordance with LEED v4 reporting requirements, the estimated TVOC emissions for the Ceramic 30 Window Film are at concentrations of less than 0.5 mg/m^3.
- Qualified project uses of the Ceramic 30 window film may be eligible for credit points under the CHPS and LEED v4 programs. By successful conformance with the CHPS and LEED v4 standards, the Ceramic 30 window film also meets the criteria of **MAS Certified Green®** Program.

PART D: Neutral 35 Window Film

Table D-I
Emission Factors and Predicted 96-Hour Airborne Concentrations for the Neutral 35 Window Film in Typical Building Environments

VOC Name	Calculated Emission Factor (µg/m^{2}hr)	Predicted Airborne Concentration (µg/m^3)		Target CREL Limits (µg/m^3)	Testing Comment
	96th hour (4 days)	Classroom	Private Office		
Total VOCs (TVOC)	46	1.1	3.3	NA	NA/NA
formaldehyde	<3.6	<0.085	<0.26	9	PASS/PASS
acetaldehyde	<3.2	<0.077	<0.23	70	PASS/PASS
isopropanol	<3.1	<0.074	<0.22	3500	PASS/PASS
1,1-dichloroethylene	<3.1	<0.074	<0.22	35	PASS/PASS
methylene chloride	<3.1	<0.074	<0.22	200	PASS/PASS
carbon disulfide	<3.1	<0.074	<0.22	400	PASS/PASS
MTBE	<3.1	<0.074	<0.22	4000	PASS/PASS
vinyl acetate	<3.1	<0.074	<0.22	100	PASS/PASS
hexane	<3.1	<0.074	<0.22	3500	PASS/PASS
chloroform	<3.1	<0.074	<0.22	150	PASS/PASS

2-methoxyethanol	<3.1	<0.074	<0.22	30	PASS/PASS
1,1,1-trichloroethane	<3.1	<0.074	<0.22	500	PASS/PASS
benzene	<3.1	<0.074	<0.22	30	PASS/PASS
1-methoxy-2-propanol	<3.1	<0.074	<0.22	3500	PASS/PASS
carbon tetrachloride	<3.1	<0.074	<0.22	20	PASS/PASS
1,4-dioxane	<3.1	<0.074	<0.22	1500	PASS/PASS
trichloroethylene	<3.1	<0.074	<0.22	300	PASS/PASS
epichlorohydrin	<1.6	<0.038	<0.12	1.5	PASS/PASS
2-ethoxyethanol	<3.1	<0.074	<0.22	35	PASS/PASS
n,n-dimethylformamide	<3.1	<0.074	<0.22	40	PASS/PASS
toluene	<3.1	<0.074	<0.22	150	PASS/PASS
2-methoxyethanol acetate	<3.1	<0.074	<0.22	45	PASS/PASS
tetrachloroethylene	<3.1	<0.074	<0.22	17.5	PASS/PASS
chlorobenzene	<3.1	<0.074	<0.22	500	PASS/PASS
ethylbenzene	<3.1	<0.074	<0.22	1000	PASS/PASS
m & p-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
styrene	<3.1	<0.074	<0.22	450	PASS/PASS
o-xylene	<3.1	<0.074	<0.22	350	PASS/PASS
phenol	<3.1	<0.074	<0.22	100	PASS/PASS
1,4-dichlorobenzene	<3.1	<0.074	<0.22	400	PASS/PASS
isophorone	<3.1	<0.074	<0.22	1000	PASS/PASS
naphthalene	<1.6	<0.038	<0.12	4.5	PASS/PASS

CONCLUSIONS

Based on the emissions test data, MAS offers the following findings and conclusions:

- Predicted emission concentrations of the Neutral 35 window film at the 14 day test end point in both a classroom and private office environment are **compliant** with the specified California Department of Public Health (CDPH) regulated CREL compound limits.
- Based on the findings presented in Table I, the Neutral 35 window film is **compliant** with the performance standards established for low-emitting materials under the Collaborative for High Performance Schools (CHPS) Section EQ2.2.6 Ceiling and Wall Systems criteria.
- The Neutral 35 Window Film is **compliant** with the general emissions evaluation for window films as specified in the LEED v4 rating system. In accordance with LEED v4 reporting requirements, the estimated TVOC emissions for the Neutral 35 window film are at concentrations of less than 0.5 mg/m^3.
- Qualified project uses of the Neutral 35 window film may be eligible for credit points under the CHPS and LEED v4 programs. By successful conformance with the CHPS and LEED v4 standards, the Neutral 35 window film also meets the criteria of **MAS Certified Green®** Program.

LIMITATIONS

This report is intended for the use of 3M only. If other parties wish to rely on this report, please have them contact us so that a mutual understanding and agreement of the terms and conditions for our services can be established prior to their use of this information. This report shall not be reproduced, except in full, without the written approval of Materials Analytical Services, LLC.

Emissions generally decay over time, and the representativeness of the analytical data reported is directly dependant upon the age and conditions under which the tested sample was received.

All MAS-issued certifications for product emissions testing are valid for a period of one year from the date of this report. Compliance certifications are strictly limited to only the referenced product tested and/or specific variations explicitly referenced in this report.

APPENDIX A

Chains-of-Custody

1400316

MAS

Materials Analytical Services LLC
3945 Lakefield Court
Suwanee, Georgia 30024
Phone: 770-866-3200
Fax: 770-866-3259

California Department of Public Health (CDPH)

Standard Method (section 01350)

Emission Testing
Chain-of-Custody

Client Information	
Company:	3m
Street Address:	3m Center 235-3D-02
City/State:	St. Paul, MN
Zip/Postal Code:	55144-1000
Country:	USA
Contact Name:	Jen Daly
Title:	Technician
Phone Number:	651-737-1281
Fax Number:	
Email Address:	JDaly@mmm.com

Testing Specifications (per MAS) check appropriate test below
□ R&D (custom): Specify Details
□ 24-hour Comparative R&D Test
□ 72-hour Comparative R&D Test
☒ 14-day CDPH Compliance Test
□ CARB Formaldehyde Test

Manufacturer Information (if different than client)	
Company:	
City/State/Country:	
Contact Name/Title:	
Phone Number:	

Construction Details (as applicable)
Covering Type: Fabric □ (Primary Fiber type: _____), Vinyl □, Leather □
Plastic Type(s): Nylon □, PVC □, PE ☒, PP □, PU □, PS □, PC □, ABS □, Acrylic □, Lexan □
Substrate Type(s): MDF □, Particle Board □, Plywood □, Solid Wood □, Other □
Outer Finish Type(s): Oil Base □, Water Base □, Catalyzed/Conversion Var □, Polyurethane □, Plastic Laminate □, Melamine □, UV □, Other □
Foam Type: Polyurethane □, Memory □, Latex □, Evlon □, High Resilience □, High Density □
Paint Type: Latex □, Oil □, Low VOC □, No VOCs □, PowderCoat □, Chrome □

Sample Details	
Unique Sample ID (if applicable):	
Product Name & Catalog #:	Prestige 70 70-0063-4912-3
Product Type: Ceiling/Wall Panels □, Flooring □, Trim □, Wall Paint □, Wall Coverings □, Thermal Insulation □, Adhesives □, Ceiling Tiles □, Other ☒	
Date of Product Manufacturing Completion:	3/7/14
Sample Location: Factory □, Warehouse □, Production Stack/Roll ☒, Container □	
Sample Submitted by:	Jen Daly
Date of Sample Shipment:	3/11/14
Number of Boxes or Pallets:	1

Special Notes or Comments from Manufacturer:

Laboratory Receipt (to be completed by Laboratory Representative)	
Received By:	NSeals
Received Date:	3-13-14
Condition of Shipping Package:	OK
Condition of Sample:	OK
Remarks:	

Shipping Details	
Packed By:	Jen Daly
Shipping Date:	3/11/14
Carrier/Airbill Number:	

Sample Handling

Relinquished By	Company	Received By	Company	Date/Time
3m	Jen Daly	NSeals	MAS	3-13-14 9:15am

2

1400316

MAS

Materials Analytical Services LLC
3945 Lakefield Court
Suwanee, Georgia 30024
Phone: 770-866-3200
Fax: 770-866-3259

California Department of Public Health

Standard Method (section 01350)

Emission Testing
Chain-of-Custody

Client Information	
Company:	3m
Street Address:	3m Center 235-3D-02
City/State:	St. Paul, MN
Zip/Postal Code:	55144-1000
Country:	USA
Contact Name:	Jen Daly
Title:	Technician
Phone Number:	651-737-1281
Fax Number:	
Email Address:	JDaly@mmm.com

Testing Specifications (per MAS) check appropriate test below
☐ **R&D (custom)**: Specify Details
☐ **24-hour Comparative R&D Test**
☐ **72-hour Comparative R&D Test**
☒ **14-day CDPH Compliance Test**
☐ **CARB Formaldehyde Test**

Manufacturer Information (if different than client)	
Company:	
City/State/Country:	
Contact Name/Title:	
Phone Number:	

Construction Details (as applicable)
Covering Type: Fabric ☐ (Primary Fiber type: _____), Vinyl ☐, Leather ☐
Plastic Type(s): Nylon ☐, PVC ☐, PE ☒, PP ☐, PU ☐, PS ☐, PC ☐, ABS ☐, Acrylic ☐, Lexan ☐
Substrate Type(s): MDF ☐, Particle Board ☐, Plywood ☐, Solid Wood ☐, Other ☐
Outer Finish Type(s): Oil Base ☐, Water Base ☐, Catalyzed/Conversion Var ☐, Polyurethane ☐, Plastic Laminate☐, Melamine ☐, UV☐ , Other ☐
Foam Type: Polyurethane ☐, Memory ☐, Latex ☐, Evlon ☐, High Resilience ☐, High Density ☐
Paint Type: Latex ☐, Oil ☐, Low VOC ☐, No VOCs ☐, PowderCoat ☐, Chrome ☐

Sample Details	
Unique Sample ID (if applicable):	
Product Name & Catalog #:	Night Vision 15 70-0064-3715-9
Product Type: Ceiling/Wall Panels ☐, Flooring ☐, Trim ☐, Wall Paint ☐, Wall Coverings ☐, Thermal Insulation ☐, Adhesives ☐, Ceiling Tiles ☐, Other ☒	
Date of Product Manufacturing Completion:	3/7/14
Sample Location: Factory ☐, Warehouse ☐, Production Stack/Roll ☒, Container ☐	
Sample Submitted by:	Jen Daly
Date of Sample Shipment:	3/11/14
Number of Boxes or Pallets:	1

Special Notes or Comments from Manufacturer:

Laboratory Receipt (to be completed by Laboratory Representative)	
Received By:	RSeals
Received Date:	3-13-14
Condition of Shipping Package:	OK
Condition of Sample:	OK
Remarks:	

Shipping Details	
Packed By:	Jen Daly
Shipping Date:	3/11/14
Carrier/Airbill Number:	

Sample Handling

Relinquished By	Company	Received By	Company	Date/Time
3M	Jen Daly	RSeals	MAS	3-13-14 9.15am

2

Materials Analytical Services LLC
3945 Lakefield Court
Suwanee, Georgia 30024
Phone: 770-866-3200
Fax: 770-866-3259

California Department of Public Health

Standard Method (section 01350)

Emission Testing
Chain-of-Custody

400316

Client Information	
Company:	3m
Street Address:	3m Center 235-3D-02
City/State:	St. Paul, MN
Zip/Postal Code:	55144-1000
Country:	USA
Contact Name:	Jen Daly
Title:	Technician
Phone Number:	651-737-1281
Fax Number:	
Email Address:	JJDaly@mmm.com

Manufacturer Information (if different than client)	
Company:	
City/State/Country:	
Contact Name/Title:	
Phone Number:	

Sample Details	
Unique Sample ID (if applicable):	Ceramic 30
Product Name & Catalog #:	70-0066-6377-0
Product Type: Ceiling/Wall Panels □, Flooring □, Trim □, Wall Paint □, Wall Coverings □, Thermal Insulation □, Adhesives □, Ceiling Tiles □, Other X	
Date of Product Manufacturing Completion:	3/7/14
Sample Location: Factory □, Warehouse □, Production Stack/Roll X, Container □	
Sample Submitted by:	Jen Daly
Date of Sample Shipment:	3/11/14
Number of Boxes or Pallets:	1

Shipping Details	
Packed By:	Jen Daly
Shipping Date:	3/11/14
Carrier/Airbill Number:	

Testing Specifications (per MAS) check appropriate test below
□ R&D (custom): Specify Details
□ 24-hour Comparative R&D Test
□ 72-hour Comparative R&D Test
X 14-day CDPH Compliance Test
□ CARB Formaldehyde Test

Construction Details (as applicable)
Covering Type: Fabric □ (Primary Fiber type: _____), Vinyl □, Leather □
Plastic Type(s): Nylon □, PVC □, PE X, PP □, PU □, PS □, PC □, ABS □, Acrylic □, Lexan □
Substrate Type(s): MDF □, Particle Board □, Plywood □, Solid Wood □, Other □
Outer Finish Type(s): Oil Base □, Water Base □, Catalyzed/Conversion Var □, Polyurethane □, Plastic Laminate □, Melamine □, UV □, Other □
Foam Type: Polyurethane □, Memory □, Latex □, Evlon □, High Resilience □, High Density □
Paint Type: Latex □, Oil □, Low VOC □, No VOCs □, PowderCoat □, Chrome □

Special Notes or Comments from Manufacturer:

Laboratory Receipt (to be completed by Laboratory Representative)	
Received By:	Neal
Received Date:	3-13-14
Condition of Shipping Package:	OK
Condition of Sample:	OK
Remarks:	

Sample Handling

Relinquished By	Company	Received By	Company	Date/Time
3M	Jen Daly	Neal	MAS	3-13-14 9:15am

1400316

MAS

Materials Analytical Services LLC
3945 Lakefield Court
Suwanee, Georgia 30024
Phone: 770-866-3200
Fax: 770-866-3259

California Department of Public Health

Standard Method (section 01350)

Emission Testing
Chain-of-Custody

Client Information	
Company:	3m
Street Address:	3m Center 235-3D-02
City/State:	St. Paul MN
Zip/Postal Code:	55144-1000
Country:	USA
Contact Name:	Jen Daly
Title:	Technician
Phone Number:	651-737-1281
Fax Number:	
Email Address:	JJDaly@mmm.com

Testing Specifications (per MAS) check appropriate test below
□ R&D (custom): Specify Details
□ 24-hour Comparative R&D Test
□ 72-hour Comparative R&D Test
☒ 14-day CDPH Compliance Test
□ CARB Formaldehyde Test

Manufacturer Information (if different than client)	
Company:	
City/State/Country:	
Contact Name/Title:	
Phone Number:	

Construction Details (as applicable)
Covering Type: Fabric □ (Primary Fiber type: _____), Vinyl □, Leather □
Plastic Type(s): Nylon □, PVC □, PE ☒, PP □, PU □, PS □, PC □, ABS □, Acrylic □, Lexan □
Substrate Type(s): MDF □, Particle Board □, Plywood □, Solid Wood □, Other □
Outer Finish Type(s): Oil Base □, Water Base □, Catalyzed/Conversion Var □, Polyurethane □, Plastic Laminate□, Melamine □, UV□ , Other □
Foam Type: Polyurethane □, Memory □, Latex □, Evlon □, High Resilience □, High Density □
Paint Type: Latex □, Oil □, Low VOC □, No VOCs □, PowderCoat □, Chrome □

Sample Details	
Unique Sample ID (if applicable):	
Product Name & Catalog #:	Neutral 35 70-0066-6362-2
Product Type: Ceiling/Wall Panels □, Flooring □, Trim □, Wall Paint □, Wall Coverings □, Thermal Insulation □, Adhesives □, Ceiling Tiles □, Other ☒ window	
Date of Product Manufacturing Completion:	3/7/14
Sample Location: Factory □, Warehouse □, Production Stack/Roll ☒, Container □	
Sample Submitted by:	Jen Daly
Date of Sample Shipment :	3/11/14
Number of Boxes or Pallets:	1

Special Notes or Comments from Manufacturer:

Laboratory Receipt (to be completed by Laboratory Representative)	
Received By:	AJeals
Received Date:	3-13-14
Condition of Shipping Package:	OK
Condition of Sample:	OK
Remarks:	

Shipping Details	
Packed By:	Jen Daly
Shipping Date:	3/11/14
Carrier/Airbill Number:	

Sample Handling

Relinquished By	Company	Received By	Company	Date/Time
3m	Jen Daly	AJeals	MAS	3-13-14 9:15a

APPENDIX B

Emissions Testing & Bracketing Program for 3M

Qualified Products and Options*

Effective April 2014 – April 2015

Prestige Series Window Film

Night Vision Series Film

Ceramic Series Window Film

Traditional Series Window Film

Includes all offerings within each series, all thicknesses and widths, and Affinity, Neutral, Silver, Nickel, and Amber films

APPENDIX C

GENERAL TESTING PARAMETERS AND DATA

Under the provisions of the testing method referenced in this report, testing consisted of the following procedural steps:

- Specific procedures for specimen receiving, handling, and preparation.
- Storage of test specimens in original shipping containers prior to emissions testing for up to 10 days in a ventilated and conditioned room maintained at a temperature of 23 ± 2°C and a relative humidity of 50% ± 15%.
- For quality assurance purposes the emission chamber was purged and the interior thoroughly cleaned prior to all new product tests. Air samples were collected and analyzed from the chamber exhaust prior to loading to establish background levels.
- Collection of air samples at method-specified intervals from the chamber exhaust port utilizing mass flow controllers calibrated at 200 cc/min for VOCs and at 300 cc/min for aldehydes.
- Tenax TA® tubes (drawn in duplicate) are used for VOC analysis which is performed by thermal desorption gas chromatography/mass spectrometry (TD-GC/MS) using a modified EPA TO-17 method. Samples are also collected on DNPH tubes for aldehyde analysis which is performed using high performance liquid chromatography (HPLC) using a modified NIOSH 2016 method.
- Instrument calibration, analysis of quality control samples and quantitation of the CDPH target list of 35 chemicals of concern.
- Reporting and speciation of top 10 tentatively identified compounds.

The operational parameters for the small emission chamber utilized for this project included:

Parameter	Value	Parameter	Value
Chamber Volume	0.053 m^3	Area Specific Flow Rate	2.356 m h^{-1}
Loading Factor	0.425 m^2/m^3	Temperature	23 $\pm$ 1 ºC
Air Exchange Rate	1.0 $\pm$ 0.05 h^{-1}	Relative Humidity	50 $\pm$ 5%

The emissions testing protocol was designed to measure the release of volatile organic compounds from a given material over time. The results of the emissions testing are summarized in the tables presented on the following pages. Actual emissions measured are characterized as a concentration in micrograms per cubic meter ($\mu g/m^3$) and as an emission factor in micrograms emitted per square meter of material per hour ($\mu g/m^2hr$).

Total volatile organic compounds (TVOC) are defined as the compounds eluting between hexane (*n*-C_5) and hexadecane (*n*-C_{17}) and in this protocol quantified as toluene *(note that there are no specific TVOC limits specified under CDPH)*. The measured concentration of total volatile organic compounds (TVOC) obtained at each of the three sampling intervals is presented in Table AC-I, BC-I, CC-I, and DC-I.

PART A: Prestige 70 Window Film

Table AC-I
Total Volatile Organic Compounds (TVOC) between n-C_5 and n-C_{17} Measured by GC/MS*

Sample ID#	Sample Interval in hours	TVOC Concentration in µg/m^3	TVOC Emission Factor in µg/m^2 h
1400316-01	24	24	56
	48	27	63
	96	15	36

*TVOC values are background corrected

The measured concentrations of formaldehyde and acetaldehyde obtained at each of the three sampling intervals are presented in Table AC-II.

Table AC-II
Formaldehyde and Acetaldehyde Concentrations as Measured by HPLC

Sample ID#	Sample Interval in hours	Target Compound	Concentration in µg/m^3	Emission Factor in µg/m^2 h
1400316-01	24	Formaldehyde	<1.5	<3.6
	48	Formaldehyde	<1.5	<3.6
	96	Formaldehyde	<1.5	<3.6
	24	Acetaldehyde	<1.4	<3.3
	48	Acetaldehyde	<1.4	<3.3
	96	Acetaldehyde	<1.4	<3.3

Ten individual volatile organic compounds (IVOC) were identified by GC/MS after 96 hours of off-gassing from the sample. These are presented in Table AC-III.

Table AC-III
Speciation of all Tentatively Identified IVOCs* by GC/MS after 96 hours

Sample ID#	CAS Number	Tentatively Identified Compounds	Concent. (µg/m^3)	Emission Factor (mg/m^2 h)
1400316-01	71-36-3	1-butanol	4.3	10
	123-42-2	4-hydroxy-4-methyl-2-pentanone	1.9	4.5
	No other IVOCs were detected above the laboratory detection limits			

*All IVOCs detected were identified using the average response factor of toluene calibration standards.

PART B: Night Vision 15 Window Film

Table BC-I
Total Volatile Organic Compounds (TVOC) between n-C_5 and n-C_{17} Measured by GC/MS*

Sample ID#	Sample Interval in hours	TVOC Concentration in µg/m^3	TVOC Emission Factor in µg/m^2 h
1400316-02	24	16	38
	48	13	31
	96	14	34

*TVOC values are background corrected

The measured concentrations of formaldehyde and acetaldehyde obtained at each of the three sampling intervals are presented in Table BC-II.

Table BC-II
Formaldehyde and Acetaldehyde Concentrations as Measured by HPLC

Sample ID#	Sample Interval in hours	Target Compound	Concentration in µg/m^3	Emission Factor in µg/m^2 h
1400316-02	24	Formaldehyde	<1.5	<3.6
	48	Formaldehyde	<1.5	<3.6
	96	Formaldehyde	<1.5	<3.6
	24	Acetaldehyde	<1.4	<3.3
	48	Acetaldehyde	<1.4	<3.3
	96	Acetaldehyde	<1.4	<3.3

Ten individual volatile organic compounds (IVOC) were identified by GC/MS after 96 hours of off-gassing from the sample. These are presented in Table BC-III.

Table BC-III
Speciation of all Tentatively Identified IVOCs* by GC/MS after 96 hours

Sample ID#	CAS Number	Tentatively Identified Compounds	Concent. (µg/m^3)	Emission Factor (mg/m^2 h)
1400316-02	123-42-2	4-hydroxy-4-methyl-2-pentanone	1.7	4.1
	No other IVOCs were detected above the laboratory detection limits			

*All IVOCs detected were identified using the average response factor of toluene calibration standards.

PART C: Ceramic 30 Window Film

Table CC-I
Total Volatile Organic Compounds (TVOC) between n-C_5 and n-C_{17} Measured by GC/MS*

Sample ID#	Sample Interval in hours	TVOC Concentration in µg/m^3	TVOC Emission Factor in µg/m^2 h
1400316-03	24	15	36
	48	8.5	20
	96	14	32

*TVOC values are background corrected

The measured concentrations of formaldehyde and acetaldehyde obtained at each of the three sampling intervals are presented in Table CC-II.

Table CC-II
Formaldehyde and Acetaldehyde Concentrations as Measured by HPLC

Sample ID#	Sample Interval in hours	Target Compound	Concentration in µg/m^3	Emission Factor in µg/m^2 h
1400316-03	24	Formaldehyde	<1.5	<3.6
	48	Formaldehyde	<1.5	<3.6
	96	Formaldehyde	<1.5	<3.6
	24	Acetaldehyde	<1.4	<3.3
	48	Acetaldehyde	<1.4	<3.3
	96	Acetaldehyde	<1.4	<3.3

Ten individual volatile organic compounds (IVOC) were identified by GC/MS after 96 hours of off-gassing from the sample. These are presented in Table CC-III.

Table CC-III
Speciation of all Tentatively Identified IVOCs* by GC/MS after 96 hours

Sample ID#	CAS Number	Tentatively Identified Compounds	Concent. (µg/m^3)	Emission Factor (mg/m^2 h)
1400316-03	71-36-3	1-butanol	3.8	8.9
	123-42-2	4-hydroxy-4-methyl-2-pentanone	2.9	6.9
	No other IVOCs were detected above the laboratory detection limits			

*All IVOCs detected were identified using the average response factor of toluene calibration standards.

PART D: Neutral 35 Window Film

Table DC-I
Total Volatile Organic Compounds (TVOC) between n-C_5 and n-C_{17} Measured by GC/MS*

Sample ID#	Sample Interval in hours	TVOC Concentration in µg/m^3	TVOC Emission Factor in µg/m^2 h
1400316-04	24	6.0	14
	48	7.7	18
	96	20	46

*TVOC values are background corrected

The measured concentrations of formaldehyde and acetaldehyde obtained at each of the three sampling intervals are presented in Table DC-II.

Table DC-II
Formaldehyde and Acetaldehyde Concentrations as Measured by HPLC

Sample ID#	Sample Interval in hours	Target Compound	Concentration in µg/m^3	Emission Factor in µg/m^2 h
1400316-04	24	Formaldehyde	<1.5	<3.6
	48	Formaldehyde	<1.5	<3.6
	96	Formaldehyde	<1.5	<3.6
	24	Acetaldehyde	<1.4	<3.3
	48	Acetaldehyde	<1.4	<3.3
	96	Acetaldehyde	<1.4	<3.3

Ten individual volatile organic compounds (IVOC) were identified by GC/MS after 96 hours of off-gassing from the sample. These are presented in Table DC-III.

Table DC-III
Speciation of all Tentatively Identified IVOCs* by GC/MS after 96 hours

Sample ID#	CAS Number	Tentatively Identified Compounds	Concent. (µg/m^3)	Emission Factor (mg/m^2 h)
1400316-04	71-36-3	1-butanol	<1.3	<3.1
	123-42-2	4-hydroxy-4-methyl-2-pentanone	1.0	2.5
	No other IVOCs were detected above the laboratory detection limits			

*All IVOCs detected were identified using the average response factor of toluene calibration standards.