

# Dynamic Small-Scale Chamber Emissions Testing

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



**Solar Gard® Safety Films with Pressure  
Sensitive Adhesive**  
(Exemplar for Partial Line Bracketing)

Prepared for:



4540 Viewridge Avenue  
San Diego, CA 92123

Submitted by:

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



Testing Cert. #2925.01

December 21, 2012

MAS Project No: 1201748



December 21, 2012

Miguel Detres  
Technical Service Representative  
Solar Gard  
8575 A Somerset Drive  
Largo, FL 33773



**Subject:       Dynamic Small-Scale Chamber Emissions Testing  
                  Compliance Report per California Department of Public Health Standard Method  
                  Version 1.1  
                  Solar Gard® Safety Films with Pressure Sensitive Adhesive  
                  MAS Project No.: 1201748**

Dear Mr. Detres:

Materials Analytical Services, LLC (MAS) is pleased to submit this report for emissions testing relative to potential VOC off-gassing from a sample of Safety Films with Pressure Sensitive Adhesive submitted in December 2012. 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*.

Based on the test results summarized herein, the Safety Film with Pressure Sensitive Adhesive is **compliant** with the performance standard established for low-emitting wall systems under the Collaborative for High Performance Schools (CHPS) and the LEED 2009 for Schools programs. As such, qualified project uses of this product and Window Film with Pressure Sensitive Adhesive and Clear Dry Adhesive products bracketed under this test (see Appendix B) may be eligible for credit points under the CHPS and LEED programs. Further, by successful conformance with the CHPS & LEED standards, the tested and bracketed products 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**

A handwritten signature in black ink, appearing to read 'Robert D. Schmitter'.

Robert D. Schmitter  
Manager, Emissions Group

A handwritten signature in black ink, appearing to read 'William R. Stapleton'.

William R. Stapleton  
Senior Chemist

Appendices:   Appendix A – Chain-of-Custody  
                  Appendix B – List of Compliant Solar Gard® Window Treatments  
                  Appendix C – General Testing Parameters and Data

# COMPLIANCE EMISSIONS TEST

California Department of Public Health Standard Method Version 1.1

Window Film and Adhesive Evaluation

MAS Project No.: 1201748

## SAMPLE DESCRIPTION & TESTING PARAMETERS

Solar Gard® of San Diego, California submitted an exemplar of their Safety Films with Pressure Sensitive Adhesive to MAS for emissions testing (refer to photos below).

The sample was delivered to our Suwanee, Georgia office in a sealed, airtight Mylar bag shipped within an outer cardboard box. The manufacturer and sample specifics as described in the accompanying chain-of custody (see Appendix A) and a timeline of milestones dates relative to sampling and analysis are summarized below.

<b>Product Name:</b> Safety Films with Pressure Sensitive Adhesive	<b>MAS Assigned ID:</b> 1201748
<b>Manufacturer:</b> Solar Gard® 4540 Viewridge Avenue San Diego, CA 92123	<b>Product Description:</b> clear polyester film layer with pressure sensitive adhesive
<b>Manufacture Date:</b> December 2, 2012	<b>Testing Period:</b> Dec. 6 - 20, 2012
<b>Collection Date:</b> December 4, 2012	<b>In-Chamber Sampling Dates:</b> Dec. 17 @ 24 hrs, Dec. 18 @ 48 hrs, and Dec. 20 @ 96 hrs
<b>Shipping Date:</b> December 4, 2012	<b>Date of Sample Analysis:</b> December 19 – 20, 2012
<b>Laboratory Arrival Date:</b> December 5, 2012	



Solar Gard® Safety Films with Pressure Sensitive Adhesive as tested



## SAMPLE HANDLING & EMISSIONS TESTING

The window film and adhesive sample was prepared for testing by cutting a 15 cm x 15 cm section from the submitted roll. The film's protective coating was peeled away from the film, and the film was applied to a clean glass plate according to instructions submitted by Solar Gard®. The plate was placed inside one of MAS's small (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.

Off-gassed emissions from the subject sample were sampled 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 operations 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) for Schools 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 concentration for the tested sample is calculated based on the 96 hour test data collected following ten days of in-chamber conditioning. This emission concentration is then modeled to the defined parameters of that product in typical school classroom and private office environments 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 Table I.

**Table I**  
**Emission Factors and Predicted 96-Hour Airborne Concentrations for the**  
**Solar Gard® Safety Films with Pressure Sensitive Adhesive in Typical Building Environments**

VOC Name	Calculated Emission Factor ( $\mu\text{g}/\text{m}^2/\text{hr}$ )	Predicted Airborne Concentration ( $\mu\text{g}/\text{m}^3$ )		Reference OEHHA ½ CREL Values in $\mu\text{g}/\text{m}^3$	Testing Comment
	96 <sup>th</sup> hour (4 days)	Classroom*	Private Office**		
Total VOCs (TVOC)	<3.1	<1.6	<5.1	NA	NA/NA
formaldehyde	<3.6	<1.8	<5.8	9	PASS/PASS
acetaldehyde	3.5	1.7	5.6	70	PASS/PASS
isopropanol	<3.1	<1.6	<5.0	3500	PASS/PASS
1,1-dichloroethylene	<3.1	<1.6	<5.0	35	PASS/PASS



methylene chloride	<3.1	<1.6	<5.0	200	PASS/PASS
carbon disulfide	<3.1	<1.6	<5.0	400	PASS/PASS
MTBE	<3.1	<1.6	<5.0	4000	PASS/PASS
vinyl acetate	<3.1	<1.6	<5.0	100	PASS/PASS
hexane	<3.1	<1.6	<5.0	3500	PASS/PASS
chloroform	<3.1	<1.6	<5.0	150	PASS/PASS
2-methoxyethanol	<3.1	<1.6	<5.0	30	PASS/PASS
1,1,1-trichloroethane	<3.1	<1.6	<5.0	500	PASS/PASS
benzene	<3.1	<1.6	<5.0	30	PASS/PASS
1-methoxy-2-propanol	<3.1	<1.6	<5.0	3500	PASS/PASS
carbon tetrachloride	<3.1	<1.6	<5.0	20	PASS/PASS
1,4-dioxane	<3.1	<1.6	<5.0	1500	PASS/PASS
trichloroethylene	<3.1	<1.6	<5.0	300	PASS/PASS
epichlorohydrin	<0.80	<0.40	<1.3	1.5	PASS/PASS
2-ethoxyethanol	<3.1	<1.6	<5.0	35	PASS/PASS
n,n-dimethylformamide	<3.1	<1.6	<5.0	40	PASS/PASS
toluene	<3.1	<1.6	<5.0	150	PASS/PASS
2-methoxyethanol acetate	<3.1	<1.6	<5.0	45	PASS/PASS
tetrachloroethylene	<3.1	<1.6	<5.0	17.5	PASS/PASS
chlorobenzene	<3.1	<1.6	<5.0	500	PASS/PASS
ethylbenzene	<3.1	<1.6	<5.0	1000	PASS/PASS
m & p-xylene	<3.1	<1.6	<5.0	350	PASS/PASS
styrene	<3.1	<1.6	<5.0	450	PASS/PASS
o-xylene	<3.1	<1.6	<5.0	350	PASS/PASS
phenol	<3.1	<1.6	<5.0	100	PASS/PASS
1,4-dichlorobenzene	<3.1	<1.6	<5.0	400	PASS/PASS
isophorone	<3.1	<1.6	<5.0	1000	PASS/PASS
naphthalene	<1.6	<0.81	<2.6	4.5	PASS/PASS

\* Assumes two classroom windows, one 4' x 4' and one 4' x 8', in a classroom with total volume of 231m<sup>3</sup> and a ventilation rate of 0.82 h<sup>-1</sup> as defined by CDPH/EHLB/Standard Method V.1.1

\*\* Assumes a private office volume of 30.6m<sup>3</sup> with one 4' x 4' window and a ventilation rate of 0.68 h<sup>-1</sup> as defined by CDPH/EHLB/Standard Method V.1.1

## CONCLUSIONS

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

- Predicted 14-day air concentrations of all CDPH target compounds in both a classroom and private office environment are **below** the specified California Office of Environmental Health Hazard Assessment (OEHHA) ½ CREL limits (Table I).
- Based on the findings summarized in Table I, the film and adhesive manufactured by Solar Gard® is **compliant** with the performance standards established for low-emitting materials



under the Collaborative for High Performance Schools (CHPS) and the LEED for Schools programs. As such, qualified project uses of the Safety Films with Pressure Sensitive Adhesive and all bracketed window treatments (Appendix B) may be eligible for credit points under CHPS EQ2.2.6 for Ceiling and Wall Systems and 1 credit point under the LEED 2009 for Schools standard IEQ 4.6 for Ceiling and Wall Systems under. Further, by successful conformance with the CHPS & LEED standards, the subject product also meets the criteria of **MAS Certified Green®** Program.

## LIMITATIONS

This report is intended for the use of Solar Gard® 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.

It should be noted that emissions generally decay over time; as such 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

## Chain-of-Custody



### Materials Analytical Services LLC

3945 Lakefield Court  
Suwanee, Georgia 30024  
Phone: 770-886-3200  
Fax: 770-886-3259



### Standard Method (section 01350)

Emission Testing  
Chain-of-Custody

Client Information		Testing Specifications (per MAS) check appropriate test below		
Company: Solar Gard®		<input type="checkbox"/> R&D (custom): Specify Details		
Street Address: 4540 Viewridge Avenue		<input type="checkbox"/> 24-hour Comparative R&D Test		
City/State: San Diego, CA		<input type="checkbox"/> 72-hour Comparative R&D Test		
Zip/Postal Code: 92123		<input checked="" type="checkbox"/> 14-day CDPH Compliance Test		
Country: United States				
Contact Name: Miguel Detres				
Title: Technical Services Representative				
Phone Number: O 727-437-1025 M 813-760-9026				
Fax Number: 727-437-1002				
Email Address: miguel.detres@saint-gobain.com				
Manufacturer Information (if different than client)		Construction Details (as applicable)		
Company: Same as above		Covering Type: Fabric <input type="checkbox"/> (Primary Fiber type: _____), Vinyl <input type="checkbox"/> , Leather <input type="checkbox"/>		
City/State/Country:		Plastic Type(s): Nylon <input type="checkbox"/> , PVC <input type="checkbox"/> , PE <input type="checkbox"/> , PP <input type="checkbox"/> , PU <input type="checkbox"/> , PS <input type="checkbox"/> , PC <input type="checkbox"/> , ABS <input type="checkbox"/> , Acrylic <input type="checkbox"/> , Lexan <input type="checkbox"/>		
Contact Name/Title:		Substrate Type(s): MDF <input type="checkbox"/> , Particle Board <input type="checkbox"/> , Plywood <input type="checkbox"/> , Solid Wood <input type="checkbox"/> , Other <input type="checkbox"/>		
Phone Number:		Outer Finish Type(s): Oil Base <input type="checkbox"/> , Water Base <input type="checkbox"/> , Catalyzed/Conversion Var <input type="checkbox"/> , Polyurethane <input type="checkbox"/> , Plastic Laminate <input type="checkbox"/> , Melamine <input type="checkbox"/> , UV <input type="checkbox"/> , Other <input type="checkbox"/>		
		Foam Type: Polyurethane <input type="checkbox"/> , Memory <input type="checkbox"/> , Latex <input type="checkbox"/> , Evlon <input type="checkbox"/> , High Resilience <input type="checkbox"/> , High Density <input type="checkbox"/>		
		Paint Type: Latex <input type="checkbox"/> , Oil <input type="checkbox"/> , Low VOC <input type="checkbox"/> , No VOCs <input type="checkbox"/> , PowderCoat <input type="checkbox"/> , Chrome <input type="checkbox"/>		
Sample Details		Special Notes or Comments from Manufacturer:		
Unique Sample ID (if applicable): Solar Gard Safety Pressure Sensitive Adhesive				
Product Name & Catalog #: Solar Gard				
Product Type: Ceiling/Wall Panels <input type="checkbox"/> , Flooring <input type="checkbox"/> , Trim <input type="checkbox"/> , Wall Paint <input type="checkbox"/> , Wall Coverings <input type="checkbox"/> , Thermal Insulation <input type="checkbox"/> , Adhesives <input type="checkbox"/> , Ceiling Tiles <input type="checkbox"/> , Other X				
Date of Product Manufacturing Completion: 12-2-2012				
Sample Location: Factory <input type="checkbox"/> , Warehouse <input type="checkbox"/> , Production Stack/Roll X, Container <input type="checkbox"/>				
Sample Submitted by: Miguel Detres				
Date of Sample Shipment: 12-4-12				
Number of Boxes or Pallets: 1				
Shipping Details		Laboratory Receipt (to be completed by Laboratory Representative)		
Packed By: Jose Pichardo		Received By: <i>Seal</i>		
Shipping Date:		Received Date: <i>12/5/12</i>		
Carrier/Airbill Number:		Condition of Shipping Package: <i>OK</i>		
		Condition of Sample: <i>OK</i>		
		Remarks:		
Sample Handling				
Relinquished By	Company	Received By	Company	Date/Time
		<i>Seal</i>	<i>MAS</i>	<i>12-5-12</i>

# APPENDIX B

## List of Bracketed CHPS and LEED Compliant Solar Gard® Window Treatments

### Qualified Products

*Effective January 2013 through January 2014*

- Solar Gard® Safety Films with Pressure Sensitive Adhesive\*
- Solar Gard® Window Films with Pressure Sensitive Adhesive
- Solar Gard® Window Films with Clear Dry Adhesive

\* The Solar Gard® Safety Film with Pressure Sensitive Adhesive was tested as a “worst case” product for the bracketing of the other Solar Gard® products listed above based on previous emissions testing and a review of the manufacturer’s product information.



# 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  $23 \pm 2^{\circ}\text{C}$  and a relative humidity of  $50\% \pm 15\%$ .
- For quality assurance purposes the emission chamber was purged and the interior thoroughly cleaned to remove residual compounds prior to all new product tests. In addition, 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 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	Symbol	Units	Value
Chamber Volume	V	$\text{m}^3$	0.053
Loading Factor	L	$\text{unit}/\text{m}^3$	0.425
Air Exchange Rate	a	$\text{h}^{-1}$	$1.0 \pm 0.05$
Area Specific Flow Rate	$q_A$	$\text{m h}^{-1}$	2.4
Temperature	T	$^{\circ}\text{C}$	$23 \pm 1$
Relative Humidity	RH	%	$50 \pm 5$

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. The actual emissions measured are characterized as a concentration in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and as an emission factor in micrograms emitted per square meter of material per hour ( $\mu\text{g}/\text{m}^2/\text{hr}$ ).

Total volatile organic compounds (TVOC) are defined as the compounds eluting between hexane ( $n\text{-C}_5$ ) and hexadecane ( $n\text{-C}_{17}$ ) and in this protocol quantified as toluene (*note that there are no specific TVOC limits specified under CDPH*). There were no measured concentrations of total volatile organic compounds (TVOC) obtained at the three sampling intervals.

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

**Table B-II**  
**Formaldehyde and Acetaldehyde Concentrations as Measured by HPLC**

Sample ID#	Sample Interval in hours	Target Compound	Concentration in $\mu\text{g}/\text{m}^3$	Emission Factor in $\mu\text{g}/\text{m}^2\text{h}$
1201748	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	2.9	6.9
	96	Acetaldehyde	1.5	3.5

No individual volatile organic compounds (IVOC), other than those reported as a requirement of the CDPH Standard Method Version 1.1 in Table I in the body of this report, were identified by GC/MS in quantities above detection limits after 96 hours of off-gassing from the tested product.