

TEST REPORT

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PRODUCT EVALUATED: 3M™ Fire Barrier Silicone Sealant 2000+, 10 fl. oz tube

EVALUATION PROPERTY: CDPH Specification 01350 v1.1: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers v1.1

Report of for compliance with the applicable requirements of the following criteria: CDPH Specification 01350 v1.1: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers v1.1 and LEED v4.

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2 Introduction

Intertek has conducted testing for 3M on 3M™ Fire Barrier Silicone Sealant 2000+, 10 fl. oz tube. Testing was conducted following the standard methods of CDPH Specification 01350 v1.1: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers v 1.1.

3 Test Samples

3.1. SAMPLE SELECTION

Two sample of 3M™ Fire Barrier Silicone Sealant 2000+, 10 fl. oz tube batch 0008823983 was bulk manufactured on 8/04/2016. The bulk material was packaged on 8/04/2016 in standard packaging for 10 oz finished cartridge. The samples were shipped by Alex Write on 8/08/2016. The sample arrived on 8/22/2016 in the Middleton Lab with ID Tracking number: MID1+08221131-001.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The sample was placed in a ½ inch wide by ½ inch deep channel into three aluminum tray, two cut to 18 inches and one 9 inches long. The empty metal channels were weight. The tube was inserted into the applicator gun. The applicator tip was cut to produce about a ½ inch bead of material. About 100g of material was dispensed and discarded. The sample was placed in the tray holders using a single smooth stroke of the gun. Any excess caulk was wiped from the exterior of the channel holder. The metal channels were reweighed after applying the caulk to determine the number of grams of wet caulk per linear meter of ½ inch bead. The sample was immediately transferred to the environmental chamber and the date and time recorded. For Square chambers, the samples can be placed directly on the bottom of the chamber. See appendix 1 for the photo of the sample.

4 Testing and Evaluation Methods

Testing was in accordance with CDPH Specification 01350 v1.1: Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers v1.1.

Testing for the private office, and classroom scenario with Floors, Ceiling and walls, and around windows and doors. The chamber volume is 224.14 with an inlet flow of 224.14 L/hour. The load factor is based on the total surface area of the system in the standard environment, where the product is applied as stated in section 4.3.6 of the standard. 54 inches of sample was used for the 224.14 L chamber so that there was a proportional increase in the sample size to that of the smallest chamber of 50L with a sample length of 10 inches. 10 inches is the maximum required length stated in section 3.4.1 of the standard for caulk preparation. The conditioning started on 9/2/2016 and was completed on 9/12/2016. The average temperature range was 23 °C +/- 2 and 50 +/- 5 %RH. The sampling started on 9/13/2016 and completed 9/16/2016. All GC and LC testing was completed by 10/13/2016.

The VOC for the LC sampling was collected on Sep-Pak DNPH-Silica Cartridges. Collection was performed at 50 ml/min for 20 minutes using a vacuum pump with a mass flow meter. The

Sep-Pak DNPH-Silica Cartridges were stored in the refrigerator until eluted according to the manufactures instructions into 5 ml of ACN. The samples were collected at 24, 48 and 96 hours within the time limitations specified in the standard. Only Formaldehyde is determined at the 24 and 48 hour time point. The Sep-Pak DNPH-Silica Cartridges samples were run on Shimadzu HPLC system using a Waters Symetry C18 5um 3.9 x 150 column. A gradient profile was used to run the standard Aldehyde/Ketone –DNPH Mix.

Target CREL VOCs of Formaldehyde CAS# 50-00-0 and Acetaldehyde CAS# 75-07-0 were found at the 96 hr time point for the HPLC testing. The VOC Acetone CAS# 67-64-1 was found by HPLC and GC/MS testing. Quantification was required using the standard with minimum of a 5 point curve. A check standard was run during the samples to verify system suitability. The results of the findings can be found in Section 4.2.

The VOC for the GC/MS was collected on Thermo Desorption (TD) tubes Atas GL (A100054) fritted linters filled with Tenax GR packing material. Collection was performed at 50 ml/min for 5 minutes using a vacuum pump with a mass flow meter. The TD tubes were verified to be clean before testing. The samples were collected at 24, 48, and 72 and 96 hours within the time limitations specified in the standard, and tested the same day. The samples were run on Shimadzu GC/MS with an ATAS GL High Performance injector for the TD tubes. A Restek Rtx-VMS 40 meter, 0.18 mm ID, 1um df was used.

Direct injection of toluene was used with at least 5 different concentrations was used for determining the concentration of the unknown VOCs. The LOQ for toluene was determined to be 0.008044 ug/m³

Standard Curves diluted with toluene were performed in triplicate for each standard. The standard was run with the same GC temperature profile as the TD tubes. The MS spectra and retention time were used to verify the known compounds. The toluene standard curve was used for ethanol and Acetone unknowns. The total VOC report will be the sum of the unknown and using toluene standard curve, and known VOC using the standard curve for the known compound.

4.1.1. Deviation from Standard Method

A GC/MS instrument contamination of the column resulted in the 24 hour collection unusable. An alternate time point at 72 hours was added to the sampling to verify that the sample was constant or declining as stated in section 8.5 of the standard. It was found that the TVOC were constant (about 10% difference between the TVOC area counts) at the 48 and 72 hour time point and therefore, the 48 and 72 hour time point will be reported.

4.2. RESULTS AND OBSERVATIONS

Exposed surface area for the building scenarios

Private Office	m ²		Classroom	m ²
net wall	33.4		net wall	94.6
ceiling	11.1		Walls and Ceiling	183.8
Floors	11.1			
Total surface	55.6		Total surface	278.4

Specified Units for the specified emission factor: g/linear foot of 1/2 caulk

Collection Time Point	Compound	A _s	A _b	A _{std}	C _{std}	W _s	W _b	W _r	MW _c	MW _{der}	V _m	P _a	t _a	C _a	C _b	C _(ppbv)	C _(ppbv)	Comments
Hrs	name	area	area	area	ug/ml	ug	ug	ug	ug/umol	ug/umol	L	kPa	C	ng/L	ng/L	ppbv	ppbv	
96	Formaldehyde	16.51	9.704	19.0922	0.033	0.142684	0.083865	0.058819	30.031	210.1469	100.35	3.975674	23	0.008376	2.114248	0.006806	1.717814	Below LOQ
96	Acetaldehyde	70.304	2.388	72.2576667	0.163	0.792964	0.026934	0.76603	44.05256	224.17	100.35	3.975674	23	0.150011	37.86419	0.083088	20.97236	70 ppb limit (140/2)
96	Acetone	85.601	6.746	113.3806667	0.161	0.607765	0.047896	0.559869	58.08	238.2001	100.35	3.975674	23	0.136036	34.33682	0.05715	14.42525	No Limit
48	Formaldehyde	0	9.704	19.0922	0.033	0	0.083865	nd	30.031	210.1469	100.35	3.975674	23	nd	nd	nd	nd	none Detected (nd)
24	Formaldehyde	0	9.704	19.0922	0.033	0	0.083865	nd	30.031	210.1469	100.35	3.975674	23	nd	nd	nd	nd	none Detected (nd)

V_s and V_b = 5 ml

All other values not report in the table above is 1

- W_d = W_s-W_b
- W_s = A_s x (C_{std}/A_{std}) x V_s x d_s
- W_b = A_b x (C_{std}/A_{std}) x v_b x d_b
- CA = W_d x (MW_c/MW_{der}) x 100/V_m
- C_{as} = W_d x (MW_c/MW_{der}) x 100/V_s
- CA(ppbv) = C_{As} (ng/L) x 24.4/MW_c
- V_s = V_m x (PA/101.3) x (298/273)+t_a
- W_d Corrected quantity, ug of DNPH derivatives extracted
- W_s Uncorrected analyte mass, ug
- W_b Analyte mass, ug in the blank
- A_s Area count eluted from sample
- A_b Area count from blank
- A_{std} area count from standard
- C_{std} Concentration (ug/ml) of analyte closest to the standard
- v_s total volume (ml) of the sample cartridge eluate
- v_b total volume (ml) of the blank cartridge eluate
- d_s Dilution factor for sample cartridge eluate (1 if sample was not rediluted or v_d/v_a)
- v_d redilution volume (ml)
- v_a Aliquot used for redilution (ml)
- d_b dilution factor for the blank cartridge eluate = 1
- CA Concentration (ng/L) of carbonyl compound in original sample
- C_{As} Concentration (ng/L) of carbonyl compound in original sample under Ideal gas law correction of 25 C and 101.3 kPa

- V_m Total air sample volume (L) under sample in condition
- V_s Standard air sample volume (L) at 25 C and 101.3 kPa
- MW_c molecular weight of carbonyl compound
- MW_{der} molecular weight of the DNPH derivative of the carbonyl compound
- CA(ppbv) Carbonyl compound concentrations in parts per billion by volume (ppbv)
- C_{As}(ppbv) Concentration of carbonyl compound in parts per billion by volume for ideal gas volume nL/nmol, corrected to 25oC
- PA average pressure kPa
- t_a Average Temperature in C

											Testing Scenario:	Private Office	Standard Classroom	
											Product Quantities:	Floors, Ceiling and walls, and around windows and doors	Floors, Ceiling and walls, and around windows and doors	
											Sampling Time (hrs):	48 hr	48 hr	
Compound	CAS Number	Retention Time	Area Count Sample	Area Count Background	Chamber Concentration C _i	Chamber background concentration	Specific Emissions Factor at the sampling time (EF _s)	Specific Estimated Building Concentration C _b for Target VOC using EF _s	Specific Estimated Building Concentration C _b for Target VOC using EF _s					
name	number	minutes	No units	No units	(ug m ⁻³)	(ug m ⁻³)	g/linear foot of 1/2 caulk	(ug m ⁻³)	(ug m ⁻³)					
Ethanol	64-17-5	7.988	1,880,563	0	114.959	0	0.44	1.18	3.18					
2-Propanol	67-63-0	8.316	6,891,363	0	1,821.58	0	6.98	18.76	50.39					
Acetone by GC/MS	67-64-1	8.424	6,418,056	0	376.495	0	1.44	3.88	10.41					
1-Butanol	71-36-3	9.903	5,595,568	0	1,594.00	0	6.11	16.42	44.09					
Formaldehyde by HPLC	50-00-0	Not Detected	Not Detected	0	0	0	0.00	0.00	0.00					
Total GC/MS Unknown VOCs	na	na	3,446,447	0	205.215	0	0.79	2.11	5.68					
Total VOCs	na	na	na	na	4,147.638	na	15.90	42.71	114.73					

										Testing Scenario:	Private Office	Standard Classroom
										Product Quantities:	Floors, Ceiling and walls, and around windows and doors	Floors, Ceiling and walls, and around windows and doors
										Sampling Time (hrs):	72 hr	72 hr
Compound	CAS Number	Retention Time	Area Count Sample	Area Count Background	Chamber Concentration Ct	Chamber background concentration	Specific Emissions Factor at the sampling time (EF _s)	Specific Estimated Building Concentration C _{bi} for Target VOC using EF _s	Specific Estimated Building Concentration C _{bi} for Target VOC using EF _s			
name	number	minutes	No units	No units	(ug m ⁻³)	(ug m ⁻³)	g/foot	(ug m ⁻³)	(ug m ⁻³)	(ug m ⁻³)		
Ethanol	64-17-5	8.04	2,230,161	0	135,110	0	0.52	1.39	3.74			
2-Propanol	67-63-0	8.361	7,742,373	0	2,044.15	0	7.84	21.05	56.54			
Acetone by GC/MS	67-64-1	8.467	8,311,102	0	485,608	0	1.85	5.00	13.43			
1-Butanol	71-36-3	9.915	6,789,230	0	2,462.78	0	9.44	25.36	68.12			
Formaldehyde by HPLC	50-00-0	Not Detected	Not Detected	0	0	0	0.000	0.00	0.00			
Total GC/MS Unknown VOCs	na	na	4,721,713	0	278,720	0	1.07	2.87	7.71			
Total VOCs	na	na	na	na	5,441,762	na	29.86	56.04	150.53			

										Testing Scenario:	Private Office	Standard Classroom
										Product Quantities:	Floors, Ceiling and walls, and around windows and doors	Floors, Ceiling and walls, and around windows and doors
										Sampling Time (hrs):	96 hr	96 hr
Compound	CAS Number	Retention Time	Area Count Sample	Area Count Background	Chamber Concentration Ct	Chamber background concentration	Specific Emissions Factor at the sampling time (EF _s)	Specific Estimated Building Concentration C _{bi} for Target VOC using EF _s	Specific Estimated Building Concentration C _{bi} for Target VOC using EF _s			
name	number	minutes	No units	No units	(ug m ⁻³)	(ug m ⁻³)	g/linear foot of 1/2 caulk	(ug m ⁻³)	(ug m ⁻³)	(ug m ⁻³)		
Ethanol	64-17-5	8.073	1,183,038	0	74,755	0	0.29	0.77	2.07			
2-Propanol	67-63-0	8.391	4,883,555	0	1,296.46	0	4.97	13.35	35.86			
Acetone by GC/MS	67-64-1	8.497	5,320,931	0	313,258	0	1.20	3.23	8.67			
1-Butanol	71-36-3	9.93	3,953,884	0	1,068.77	0	4.10	11.01	29.56			
Formaldehyde by HPLC	50-00-0	1.941	642,185	0	1.72	0	0.01	0.02	0.05			
Acetaldehyde by HPLC	75-07-0	2.598	490,198	0	20.97	0	0.08	0.22	0.58			
Total GC/MS Unknown VOCs	na	na	3,829,537	0	227,296	0	0.87	2.34	6.29			
Total VOCs	na	na	na	na	3,017,653	na	11.57	31.08	83.47			

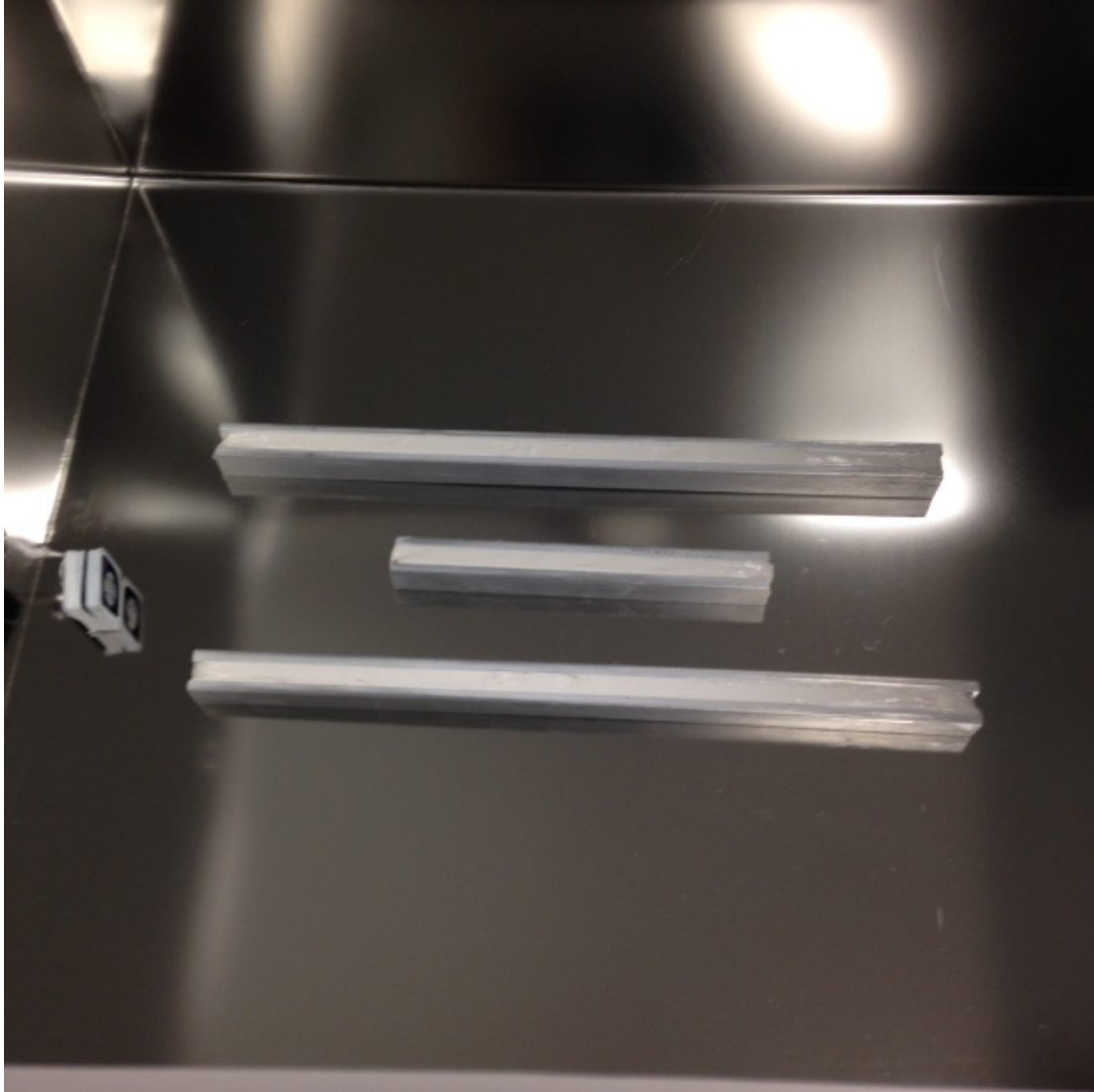
4.3. EXAMINATION OF RESULTS

The results are based on the use of 58.5 g/linear foot of 1/2 caulk in a private office or standard classroom placing caulk on the parameters of using floors, ceilings walls and floors and around doors and windows. The amount of the VOC present in the room are based on the total surface area of the system in the standard environment, where the product is applied, using 54 inches of sample in a 1/2 inch deep by 1/2 inch wide channel of aluminum with a 224.14 liter VOC chamber.

Four Compounds were identified at the 96 hour collection time point by GC/MS. Ethanol CAS#, 64-17-5, Acetone CAS# 67-64-1, 1-Butanol CAS# 71-36-3 and 2 Propanol CAS# 67-63-0. Ethanol, Acetone, and 1-Butanol compounds are not target CREL VOCs. One Target CREL 2 Propanol CAS# 67-63-0 was found, but below the Target CREL VOC allowable Concentration limit of 3500 ppb. The summary for each testing scenario is listed in the result above in section 4.2.

5 Appendix A

Photo of tested sample:



6 Conclusion

Intertek has conducted testing Applegate Insulation, on 3M™ Fire Barrier Silicone Sealant 2000+, 10 fl. oz tube , to evaluate CDPH Specification 01350 v1.1; Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers v1.1.

3M™ Fire Barrier Silicone Sealant 2000+, 10 fl. oz tube complies with limits specified in CDPH Specification 01350 v1.1 February 2010 for private office and classroom. The sample passed the LEED v4 for total VOC and Target Chemical listed in CDPH Standard Method v 1.1 Table 4-1.

The conclusions of this test report may not be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK
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7 Revision Summary

DATE	SUMMARY
Oct 27, 2016	Original date of report
