November 21, 2017

David Gorrell
Everkem Diversified Products Inc
5180 Indiana Ave
Winston Salem, NC 27106

Subject: Project 18729-020AA - Test Results

Thank you for choosing UL Environment, and its ISO/IEC 17025 accredited testing laboratory, for your analytical needs. Everkem Diversified Products Inc's "Fire Stop 814+" was tested by our laboratory for low emitting materials.

Testing was conducted in small environmental chambers following the principles of ASTM D 5116 with the defined product specific test protocols and IAQ emission requirements of the State of California's Indoor Air Quality Program, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers" (aka CA Section 01350).

Calculations were performed using the parameters below to estimate the concentrations of VOCs of concern for use in a classroom environment and in an office environment.

Ventilation Rate	Room Volume	Product Surface Area
CLASSROOM		
0.82 air changes per hour (ACH)	12.2 m x 7.32 m x 2.59 m = 231 m^3 (40 x 24 x 8.5 ft = 8,160 ft^3)	3.4 m
PRIVATE OFFICE		
0.68 air changes per hour (ACH)	3.66 m x 3.05 m x 2.74 m = 30.6 m^3 (12 x 10 x 9 ft = 1,080 ft^3)	1.7 m

The product mentioned above as received and tested meets the Section 1350 requirements for use in a classroom and in an office with the above parameters.

If you have any questions or concerns about the test results, please contact your Account Manager at (888) 485-4733.

Sincerely,

Allyson McFry

Allyson M. McFry
Chemistry Laboratory Director

Released by UL Environment
Date Prepared: November 21, 2017
Product #: 18729-020AA
Report #: 18729-02

INDOOR AIR QUALITY EVALUATION FOLLOWING THE REQUIREMENTS OF CDPH/EHLB/STANDARD METHOD

PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC

MANUFACTURER INFORMATION

Manufacturer	Everkem Diversified Products Inc
Contact Name and Title	David Gorrell, Quality Assurance Director
Contact Address	5180 Indiana Ave Winston Salem, NC 27106
Contact Phone Number	(800) 638-3160

PRODUCT INFORMATION

Product Description	Fire Stop 814+
Manufacturer Product ID	Not provided
Product Category	Adhesives/Sealants
Product Sub-Category	General Construction Adhesives
Manufacturing Location	Not provided
Date Manufactured	August 31, 2017
Date Collected	October 13, 2017
Date Shipped	October 13, 2017
Date Received	October 16, 2017

Released by:

Allyson M. McFry
Chemistry Laboratory Director

UL Environment
2211 Newmarket Parkway, Marietta, GA 30067-9399 USA
T: 888.485.4733 / F: 770.980.0072 / W: UL.com/environment

An ISO/IEC 17025 Accredited IAQ Firm
This test is accredited under the laboratory's ISO/IEC 17025 accreditation issued by ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation AT-1297.

EXECUTIVE SUMMARY

PROJECT DESCRIPTION

UL Environment, and its ISO/IEC 17025 accredited testing laboratories, presents the results of its indoor air evaluation of a product identified as "Fire Stop 814+" submitted by Everkem Diversified Products Inc. UL Environment conducted this study using a product evaluation test protocol following California's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers" (aka CA Section 01350) (1). Test chamber methodology followed the guidance of ASTM D 5116 (2), volatile organic compound (VOC) analysis followed the methodology in EPA TO-17 (3) and ASTM D 6196 (4), and analysis for low molecular weight aldehydes, including formaldehyde and acetaldehyde, followed the methodology in ASTM D 5197 (5). The definition for total VOCs (TVOC) is from ISO 16000-6 (6). The quantifiable level for all compounds is 2 µg/m³. All identified target list compounds are quantified using authentic standards. Identified substances not on one of the designated toxics list are quantified using either authentic standards or surrogates and are notated appropriately.

The product was monitored for emissions of TVOC, individual VOCs, formaldehyde and other aldehydes over the 96-hour test period. Measurements were made and predicted exposures were calculated according to the CA Section 01350 protocol. As specified in this protocol, the results at 96 hours, after 10 days of conditioning, were compared to ½ (one-half) the current Chronic Reference Exposure Levels (CRELs), as adopted from the California OEHHA list (7). All identified VOCs were also compared to the California-EPA OEHHA Proposition 65 list (8) and the California-EPA Air Resource Board list of Toxic Air Contaminants (TACs) (9).

RESULTS

The calculation parameters and results for the tested product identified as "Fire Stop 814+" are shown below:

Environment	Ventilation Rate (ACH)	Room Volume	Product Usage	Product Surface Area	Product Compliance?
CLASSROOM	0.82	12.2 m x 7.32 m x 2.59 m = 231 m³ (40 x 24 x 8.5 ft = 8,160 ft³)	Flame Stop Sealant	3.4 m	Yes
OFFICE	0.68	3.66 m x 3.05 m x 2.74 m = 30.6 m³ (12 x 10 x 9 ft = 1,080 ft³)	Flame Stop Sealant	1.7 m	Yes

TABLE 1

ENVIRONMENTAL CHAMBER STUDY PARAMETERS
PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC

PRODUCT 18729-020AA

Product Description:	ADHESIVES/SEALANTS; Fire Stop 814+
Date Received at UL Environment:	October 16, 2017
Sample Preparation:	The product was received by UL Environment as packaged and shipped by the customer. The package was visually inspected and stored in a controlled environment immediately following sample check-in. Just prior to loading, a ⅜" wide bead 11.5" long was applied to a foil-wrapped plate. The sample was immediately placed inside the environmental chamber, and tested according to the specified protocol.
Conditioning Period:	10/26/2017 - 11/05/2017
Test Period:	11/05/2017 - 11/09/2017
Product Area Exposed:	one-sided area = 0.2920 m
Chamber Volume:	0.0861 m^3
Product Loading Ratio:	3.39 m/m^3
Test Chamber Conditions:	Air change rate: 1.00 ± 0.05 1/h Inlet air flow rate: 0.0861 ± 0.004 m^3/h Temperature*: 21.3ºC - 22.3ºC Relative Humidity: 50% RH ± 5%

*Actual temperature range was outside 23°C ± 1.0°C

TABLE 2

COMPARISON OF DATA TO CA SECTION 01350 TARGET CRELs AT 96 HOURS FOLLOWING 10 DAYS OF CONDITIONING

PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC PRODUCT 18729-020AA; FIRE STOP 814+

Compound Name	CAS Number	½ CREL (µg/m³)	Chamber Concentration (µg/m³)	Emission Factor†† (µg/m•hr)	Classroom Predicted Concentration (µg/m³)**	Office Predicted Concentration (µg/m³)**	Meets ½ CREL? (Classroom/ Office)
Acetaldehyde	75-07-0	70	BQL	BQL			Yes
Benzene	71-43-2	1.5	BQL	BQL			Yes
Carbon disulfide	75-15-0	400	BQL	BQL			Yes
Carbon tetrachloride	56-23-5	20	BQL	BQL			Yes
Chlorobenzene	108-90-7	500	BQL	BQL			Yes
Chloroform	67-66-3	150	BQL	BQL			Yes
Dichlorobenzene (1,4-)	106-46-7	400	BQL	BQL			Yes
Dichloroethylene (1,1)	75-35-4	35	BQL	BQL			Yes
Dimethylformamide (N,N-)	68-12-2	40	BQL	BQL			Yes
Dioxane (1,4-)	123-91-1	1,500	BQL	BQL			Yes
Epichlorohydrin*	106-89-8	1.5	BQL	BQL			Yes
Ethylbenzene	100-41-4	1,000	BQL	BQL			Yes
Ethylene glycol	107-21-1	200	18	5.2	0.1	0.4	Yes
Ethylene glycol monoethyl ether acetate	111-15-9	150	BQL	BQL			Yes
Ethylene glycol monoethyl ether	110-80-5	35	BQL	BQL			Yes

Compound Name	CAS Number	½ CREL (µg/m³)	Chamber Concentration (µg/m³)	Emission Factor†† (µg/m•hr)	Classroom Predicted Concentration (µg/m³)**	Office Predicted Concentration (µg/m³)**	Meets ½ CREL? (Classroom/ Office)
Ethylene glycol monomethyl ether acetate	110-49-6	45	BQL	BQL			Yes
Ethylene glycol monomethyl ether	109-86-4	30	BQL	BQL			Yes
Formaldehyde	50-00-0	9.0***	BQL	BQL			Yes
Hexane (n-)	110-54-3	3,500	BQL	BQL			Yes
Isophorone	78-59-1	1,000	BQL	BQL			Yes
Isopropanol	67-63-0	3,500	BQL	BQL			Yes
Methyl chloroform	71-55-6	500	BQL	BQL			Yes
Methyl t-butyl ether	1634-04-4	4,000	BQL	BQL			Yes
Methylene chloride	75-09-2	200	BQL	BQL			Yes
Naphthalene	91-20-3	4.5	BQL	BQL			Yes
Phenol	108-95-2	100	BQL	BQL			Yes
Propylene glycol monomethyl ether	107-98-2	3,500	BQL	BQL			Yes
Styrene	100-42-5	450	BQL	BQL			Yes
Tetrachloroethylene (perchloroethylene)	127-18-4	18	BQL	BQL			Yes
Toluene	108-88-3	150	BQL	BQL			Yes
Trichloroethylene	79-01-6	300	BQL	BQL			Yes
Vinyl acetate	108-05-4	100	12	3.4	0.1	0.3	Yes
Xylenes (m-, o-, p-)	1330-20-7	350	BQL	BQL			Yes

BQL denotes below quantifiable level of 2 µg/m³ (instrument calibration using authentic standard).
††The emission factor (EF) is calculated from the chamber concentration (CC), the chamber air change rate (N_C), the chamber volume (V_C), and the product area exposed in the chamber (A_C) as: $EF = (CC*V_C*N_C)/A_C$.
*Denotes compound is within volatility range of method but no calibration standard was available.
**The predicted building exposure concentration (BC) is calculated from the emission factor (EF), the building air change rate (N_B), the building room volume (V_B), and the product area exposed in the building room (A_B) as: $BC = (EF*A_B)/(V_B*N_B)$. Prediction based on a standard classroom flame stop sealant usage of 3.4 m in a 231 m³ room with 0.82 ACH or on a standard office flame stop sealant usage of 1.7 m in a 30.6 m³ room with 0.68 ACH.
***Guidance value per CA Standard Method

TABLE 3

CHAMBER CONCENTRATIONS AND EMISSION FACTORS FOR TVOC AND FORMALDEHYDE AT 24, 48, AND 96 HOURS FOLLOWING 10 DAYS OF CONDITIONING

PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC PRODUCT 18729-020AA; FIRE STOP 814+

ELAPSED EXPOSURE HOUR AFTER 10 DAYS CONDITIONING	CHAMBER CONCENTRATION (µg/m³)	EMISSION FACTOR†† (µg/m•hr)
TVOC†		
24	470	140
48	450	130
96	400	120
Formaldehyde‡		
24	BQL	BQL
48	BQL	BQL
96	BQL	BQL

BQL denotes below quantifiable level of 2 µg/m³.
Exposure hours are nominal (± 1 hour).
†Defined as the sum of those VOCs that elute between the retention times of n-hexane (C_6) and n-hexadecane (C_{16}) on a non-polar capillary GC column quantified based on a toluene response factor.
‡ Compound identified and quantified by DNPH derivitization and HPLC/UV analysis.
††The emission factor (EF) is calculated from the chamber concentration (CC), the chamber air change rate (N_C), the chamber volume (V_C), and the product area exposed in the chamber (A_C) as: $EF = (CC*V_C*N_C)/A_C$.

TABLE 4

CHAMBER CONCENTRATIONS, EMISSION FACTORS, AND PREDICTED EXPOSURE CONCENTRATIONS FOR THE TVOC & TEN MOST ABUNDANT IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS (VOCs) AND/OR ALDEHYDES AT 96 HOURS FOLLOWING 10 DAYS OF CONDITIONING

PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC PRODUCT 18729-020AA; FIRE STOP 814+

CAS NUMBER	COMPOUND	CHAMBER CONC. (µg/m³)	EMISSION FACTOR†† (µg/m•hr)	CALCULATED PREDICTED EXPOSURE CONCENTRATION** (µg/m³)	
				Classroom	Office
---	**TVOC‡‡**	**400**	**120**	**2.1**	**9.6**
123-42-2	2-Pentanone, 4-hydroxy-4-methyl-	210	61	1.1	5.0
71-36-3	1-Butanol (N-Butyl alcohol)*†	95	28	0.5	2.3
142-96-1	n-Butyl ether*	60	18	0.3	1.4
123-86-4	Acetate, butyl	52	15	0.3	1.3
107-21-1	1,2-Ethanediol (Ethylene glycol)*†	18	5.2	0.1	0.4
590-01-2	Butyl propionate (Propanoic acid, butyl ester)	12	3.4	0.1	0.3
108-05-4	Vinyl acetate (Acetic acid ethenyl ester)*†	12	3.4	0.1	0.3
141-79-7	3-Penten-2-one, 4-methyl*	6.5	1.9	< 0.1	0.2
25265-77-4	2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate (Texanol Ester Alcohol)	5.9	1.7	< 0.1	0.1
25498-49-1	Tripropylene glycol methyl ether	5.7	1.7	< 0.1	0.1

Exposure hours are nominal (± 1 hour).
VOC data obtained by scanning GC/MS; identification of compound made by retention time and mass spectral characteristics.
†Quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.
*Identification based on NIST mass spectral database only.
‡Compound identified and quantified by DNPH derivitization and HPLC/UV analysis.
††The emission factor (EF) is calculated from the chamber concentration (CC), the chamber air change rate (N_C), the chamber volume (V_C), and the product area exposed in the chamber (A_C) as: $EF = (CC*V_C*N_C)/A_C$.
‡‡Defined as the sum of those VOCs that elute between the retention times of n-hexane (C_6) and n-hexadecane (C_{16}) on a non-polar capillary GC column quantified based on a toluene response factor.
**The predicted building exposure concentration (BC) is calculated from the emission factor (EF), the building air change rate (N_B), the building room volume (V_B), and the product area exposed in the building room (A_B) as: $BC = (EF*A_B)/(V_B*N_B)$. Prediction based on a standard classroom flame stop sealant usage of 3.4 m in a 231 m³ room with 0.82 ACH or on a standard office flame stop sealant usage of 1.7 m in a 30.6 m³ room with 0.68 ACH.

TABLE 5

VOC PREDICTED AIR CONCENTRATIONS AND REGULATORY INFORMATION AT 96 HOURS FOLLOWING 10 DAYS OF CONDITIONING

PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC PRODUCT 18729-020AA; FIRE STOP 814+

CAS NUMBER	COMPOUND IDENTIFIED	CHAMBER CONC. (µg/m³)	EMISSION FACTOR†† (µg/m•hr)	PREDICTED EXPOSURE CONCENTRATION** (µg/m³)		✓ INDICATES PRESENCE ON LIST		
				Classroom	Office	CA PROP 65	CA AIR TOXIC	CREL
107-21-1	1,2-Ethanediol (Ethylene glycol)†	18	5.2	0.1	0.4		✓(IIA)	✓
71-36-3	1-Butanol (N-Butyl alcohol)†	95	28	0.5	2.3		✓(IVB)	
108-05-4	Vinyl acetate (Acetic acid ethenyl ester)†	12	3.4	0.1	0.3		✓(IIA)	✓

†Quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.
‡Compound identified and quantified by DNPH derivitization and HPLC/UV analysis.
††The emission factor (EF) is calculated from the chamber concentration (CC), the chamber air change rate (N_C), the chamber volume (V_C), and the product area exposed in the chamber (A_C) as: $EF = (CC*V_C*N_C)/A_C$.
**The predicted building exposure concentration (BC) is calculated from the emission factor (EF), the building air change rate (N_B), the building room volume (V_B), and the product area exposed in the building room (A_B) as: $BC = (EF*A_B)/(V_B*N_B)$. Prediction based on a standard classroom flame stop sealant usage of 3.4 m in a 231 m³ room with 0.82 ACH or on a standard office flame stop sealant usage of 1.7 m in a 30.6 m³ room with 0.68 ACH.

CAL Prop. 65: California Health and Welfare Agency, Proposition 65 Chemicals
1 = known to cause cancer
2 = known to cause reproductive toxicity

CAL Toxic Air Contaminant:
I) Substances identified as Toxic Air Contaminants, known to be emitted in California, with a full set of health values reviewed by the Scientific Review Panel.
IIA) Substances identified as Toxic Air Contaminants, known to be emitted in California, with one or more health values under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
IIB) Substances NOT identified as Toxic Air Contaminants, known to be emitted in California, with one or more health values under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
III) Substances known to be emitted in California, and are NOMINATED for development of health values or additional health values.
IVA) Substance identified as Toxic Air Contaminants, known to be emitted in California, and are TO BE EVALUATED for entry into Category III.
IVB) Substance NOT identified as Toxic Air Contaminants, known to be emitted in California, and are TO BE EVALUATED for entry into Category III.
V) Substance identified as Toxic Air Contaminants, and NOT KNOWN TO BE EMITTED from stationary source facilities in California based on information from the AB 2588 Air Toxic "Hot Spots" Program and the California Toxic Release Inventory.
VI) Substances identified as Toxic Air Contaminants, NOT KNOWN TO BE EMITTED from stationary source facilities in California, and are active ingredients in pesticides in California.

Chronic REL: California Office of Environmental Health Hazard Assessment (OEHHA), Chronic Reference Exposure Levels
✓ = Found in Listing

REFERENCES

1. The State of California's Indoor Air Quality Program, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers" Version 1.2. https://archive.cdph.ca.gov/programs/IAQ/Documents/CDPH-IAQ_StandardMethod_V1_2_2017.pdf.

2. ASTM D 5116, "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products." ASTM, West Conshohocken, PA, 2010.

3. EPA TO-17, "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air - Second Edition," United States Environmental Protection Agency, www.epa.gov/ttn/amtic/files/ambient/airtox/to-17r.pdf, 1999.

4. ASTM D 6196 "Practice for the Selection of Sorbents and Pumped Sampling/ Thermal Desorption Analysis Procedures for Volatile Organic Compounds in Air." ASTM, West Conshohocken, PA, 2009.

5. ASTM D 5197, "Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology)." ASTM, West Conshohocken, PA, 2009.

6. ISO 16000-6, "Indoor air -- Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID," 2004. http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=30147,

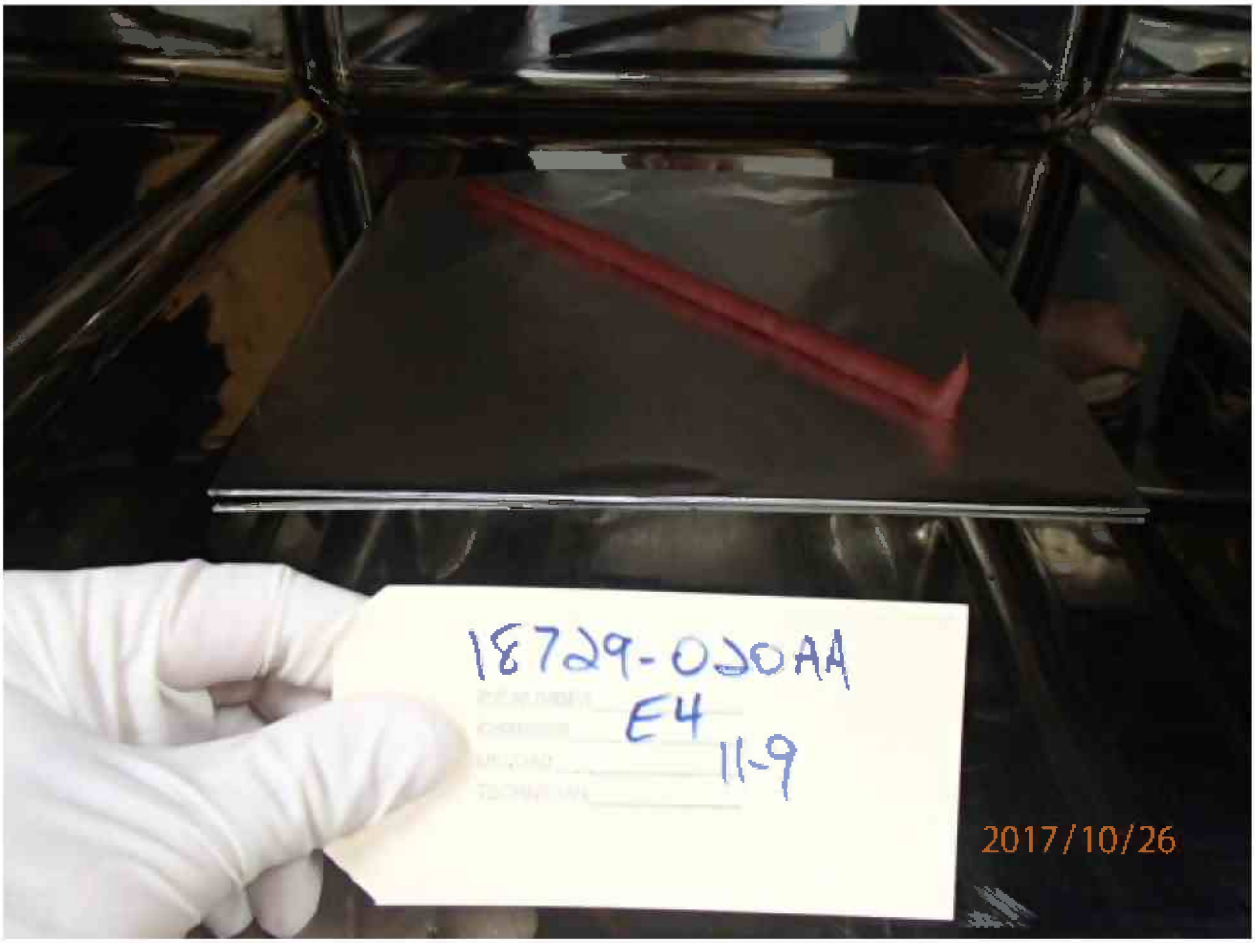
7. California Environmental Protection Agency; Chronic Reference Exposure Levels; The Office of Environmental Health Hazard Assessment (OEHHA); http://www.oehha.ca.gov/air/Allrels.html.

8. California Environmental Protection Agency. Safe Drinking Water & Toxic Enforcement Act of 1986 (Proposition 65): No Significant Risk Levels for Carcinogens; Acceptable Intake Levels for Reproductive Toxicants (Status Report).Sacramento: California Environmental Protection Agency; http://www.oehha.ca.gov/prop65/getNSRLs.html.

9. California Environmental Protection Agency. Air Resources Board. Toxic Air Contaminants (TAC) Identification List; http://www.arb.ca.gov/toxics/cattable.htm

APPENDIX 1

PREPARED FOR: EVERKEM DIVERSIFIED PRODUCTS INC
PRODUCT 18729-020AA; FIRE STOP 814+



APPENDIX 2

CHAIN OF CUSTODY

UL Environment Chain of Custody

IDO 24332

FOR INTERNAL USE ONLY		Test Information	
CURIBG493	Proposal #	___ Specialized Test for Odors	___ Formaldehyde Only ___ 4 Hr ___ 24 Hr
	___ RUSH (Confirm with Account Manager prior to submitting product)	✓ CA 01350 CDPH/EHLB/Standard Method V1.1	___ Office ___ Classroom ___ Residential
Project - Product # 18729-020AA	___ 24 Hr TVOC ___ with Formaldehyde	___ ANSI/BIFMA M7.1 / X7.1 ___ Small Chamber ___ Intermediate Chamber ___ Large Chamber	
Category Adh/Sealants	___ 24 Hr TVOC & IVOCs ___ with Formaldehyde	___ Other (Specify test method, non-standard sample preparation, modeling parameters, application rate for wet products, etc.):	
Subcategory Bead	___ GREENGUARD Screening Test (24 Hr TVOC, IVOCs, and Aldehydes w/modeling)		

Manufacturer and Contact Details			
Company Name	EverKem	Contact Name	David Gorrell
Street Address	5180 Indiana Ave.	Title	Quality Assurance Director
City, State/Province, Zip/Postal Code	Winston-Salem, NC, 27106	Phone Number	1-800-635-3160
Country	USA	E-Mail Address	dgorrell@everkemproducts.com

Product Details			
Sample ID (Used in Report)	~~[illegible]~~ Fire Stop 814	Product Collection Location	Post Production Storage
Product Commercial Name	Fire Stop 814	Product Collection Date/Time (mm/dd/yyyy/hh:mm)	10/13/2017 11:05
Manufacturer's Identification Number	072717A	Product Collected By	David Gorrell
Manufactured Date (mm/dd/yyyy)	08/31/2017	Number of Product Pieces	2 10.1oz tubes

Post Testing Instructions			
___ Return Product (Return Shipper and Manufacturer's Shipping Account # must be provided for product return)		✓ Discard product after testing	
Return Shipper		Manufacturer's Shipping Acct #	
Packed By		Carrier	Fed-Ex
Ship Date (mm/dd/yyyy)	10/13/17	Air Bill #	7731 7274 6141

Signature Tracking Details			
Relinquished By (Manufacturer)		Date & Time (mm/dd/yyyy/hh:mm)	
Signature			

Laboratory Receiving Details - FOR INTERNAL USE ONLY			
Received by (Laboratory)		Date & Time (mm/dd/yyyy/hh:mm)	10/16/17 9:31 AM
Signature	Dan Benton ENCK		
Types of Containers		Shipping Package Notes	
Condition of Shipping Package	X Undamaged ___ Damaged	Product Condition Notes	
Condition of Product	X Acceptable ___ Unacceptable		

White - Project File
Canary - Sample

SHIP TO:
UL Environment
2211 Newmarket Parkway, #106, Marietta, Georgia 30067

00-EN-F0852 Issue 2.0

APPENDIX 3

QUALITY CONTROL PROCEDURES FOR ENVIRONMENTAL CHAMBER EVALUATIONS

UL Environment's IAQ testing laboratories are ISO/IEC 17025 accredited with defined and executed internal and third party verification programs encompassing emission test methods and low level pollutant measurements. UL Environment's quality control/assurance plan is designed to ensure the integrity of the measured and reported data obtained during its product evaluation studies. This QC program encompasses all facets of the measurement program from sample receipt to final review and issuance of reports. As a firm with ISO/IEC 17025 accredited IAQ testing laboratories, UL Environment's product control, testing, data handling, and reporting protocols and procedures are standardized and controlled. UL Environment participates in proficiency and accreditation measurement programs for VOC and emission testing as required by the State of California, Germany Ministry of Health's Blue Angel Program, LGC Standards Air Proficiency Testing Scheme, and GREENGUARD Certification programs. Quality Assurance is maintained through UL Environment's computerized data management system. An electronic "paper trail" for each analysis is also maintained and utilized to track the status of each sample, and to store the results. A complete quality report can be provided upon request and all test data and analysis procedures are available on site for customer review.

Chamber Evaluations

One of the most critical parameters in UL Environment's product evaluations is the measurement of ultratrace levels of gaseous chemicals, typically in the ppb air concentration range. This necessitates a very rigidly maintained effort to control background contributions and contamination. These contributions must be significantly less than those levels being measured for statistically significant data to be obtained. UL Environment addresses this control in many directions including chamber construction materials, air purification and humidification, sampling materials and chemicals, sample introduction, and analysis.

Supply air purity is monitored on a weekly basis, using identical methodology to the chamber testing. The supply air is assured to contain less than 10 $\mu g/m^3$ TVOC, < 10 $\mu g/m^3$ total particles, < 2 $\mu g/m^3$ formaldehyde, and < 2 $\mu g/m^3$ for any individual VOC. Preventative maintenance ensures supply air purity, and corrective action is taken when any potential problems are noted in weekly samples. Supply air filter maintenance is critical for ensuring the purity of the chamber supply air. Chamber background samples are obtained prior to product exposure to ensure contaminant backgrounds meet the required specifications prior to product exposure. Results of this monitoring are maintained at UL Environment and available for on-site inspection.

All environmental chamber procedures are in accordance with ASTM D 5116 and meet the data quality objectives required.

Various measures are routinely implemented in a product's evaluation program. These include but are not limited to:

- appropriate record keeping of sample identifications and tracking throughout the study;

- calibration of all instrumentation and equipment used in the collection and analysis of samples;
- validation and tracking of all chamber parameters including air purification, environmental controls, air change rate, chamber mixing, air velocities, and sample recovery;
- analysis of spiked samples for accuracy determinations;
- duplicate analyses of 10% of all samples evaluated and analyzed;
- multi-point calibration and linear regression of all standardization;
- analysis of controls including chamber backgrounds, sampling media, and instrumental systems.

VOC and Aldehyde Measurements

Precision of TVOC and aldehyde analyses is assessed by the Relative Standard Deviation (%RSD) from duplicate samples, defined as the standard deviation of each data set divided by the mean multiplied by 100. All QC data measurements are calculated based on the 12 month period indicated below. The VOC accuracy is based on recovery of toluene mass spiked onto sorbent material. The aldehyde accuracy is based on LGC Standard formaldehyde proficiency test results, measured by the mean Relative Percent Difference (%RPD). Third party proficiency and round robin testing for low level VOCs for national and international programs are continuously conducted and reported in UL Environment's quarterly Quality Assurance Report, and are available to all customers.

12 Month Period	November 1, 2016 through October 31, 2017	
Precision Mean RSD %	TVOC	6.3
	Total Aldehydes (Including Formaldehyde)	3.9
Accuracy %	VOC – Toluene Recovery	100.5
	Formaldehyde Mean RPD	2.4