AIR QUALITY SCIENCES

May 5, 2011

Mr. Shane Price
1833 East Market Street
Akron, OH 44305

Dear Mr. Price:

Thank you for choosing Air Quality Sciences, Inc. (AQS), an ISO 9001 registered and ISO 17025 accredited testing laboratory, for your analytical needs. R.C.A. Rubber Company's "Flexi Flor" product 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 CDPH/EHLB/Standard Method V1.1 (February 2010) "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/or 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)	89.2 m^2
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)	11.1 m^2

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, Scott Steady at (678) 444-4056 or Art Ceragioli at (678) 444-4060.

Sincerely,

A. McF

Allyson M. McFry
Chemistry Laboratory Director

Enclosure: AQS Report: 17066-01

2211 Newmarket Parkway
Atlanta, GA 30067
770-933-0638 • Fax 770-933-0641

AIR QUALITY SCIENCES

INDOOR AIR QUALITY EVALUATION
FOLLOWING THE REQUIREMENTS OF
CDPH/EHLB/STANDARD METHOD V1.1 (FEBRUARY 2010)

PRODUCT INFORMATION

Product Descri tion	Flexi Flor
Manufacturer Product ID	Not provided
Product Category	Flooring
Product Sub-Category	Resilient
Manufacturing Location	Sample Room
Date Manufactured	04/04/2011
Date Collected	04/13/2011
Date Shipped	04/13/2011
Date Received	04/14/2011

RELEASED BY AIR QUALITY SCIENCES, INC.

May 5, 2011
Date

A. McF

Allyson M. McFry
Chemistry Laboratory Director

AQS Report No. 17066-01

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EXECUTIVE SUMMARY

PROJECT DESCRIPTION

Air Quality Sciences, Inc. (AQS), an ISO 9001 registered and ISO 17025 accredited testing firm, presents the results of its indoor air evaluation of a flooring product identified as "Flexi Flor" submitted by R.C.A. Rubber Company. AQS 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 Version 1.1" (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 flooring 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 product "Flexi Flor" meets the IAQ emission requirements of CA Section 01350. Expected concentrations at 96 hours, following 10 days conditioning, for classrooms and offices were calculated using the parameters specified in CA Section 01350 as shown in the table below:

Ventilation Rate	Room Volume	Product Usage	Product Surface Area
CLASSROOM			
0.82 air changes per hour (ACH)	12.2 m x 7.32 m x 2.59 m = 231 m³ (40 x 24 x 8.5 ft = 8,160 ft³)	Floor	89.2 m²
OFFICE			
0.68 air changes per hour (ACH)	3.66 m x 3.05 m x 2.74 m = 30.6 m³ (12 x 10 x 9 ft = 1,080 ft³	Floor	11.1 m²

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Date Prepared: May 5, 2011
AQS Product #: 17066-010AA
AQS Report #: 17066-01

TABLE 1

ENVIRONMENTAL CHAMBER STUDY PARAMETERS

PRO UCT 17066-010AA

Product Description:	FLOORING; Flexi Flor
Sample Preparation:	Just prior to loading, the product was unpackaged, prepared for the required loading, and placed in a tray to expose the top surface side only. The sample was then placed in the environmental chamber.
Conditioning Period:	04/14/2011 – 04/24/2011
Test Period:	04/24/2011 – 04/28/2011
Product Area Exposed:	one-sided area = 0.0361 m^2
Chamber Volume:	0.0854 m^3
Product Loading Ratio:	0.42 m^2/m^3
Test Chamber Conditions:	Air change rate: 1.00 ± 0.05 1/h Inlet air flow rate: 0.085 ± 0.004 m^3/h Temperature: 23° C ± 1° C Relative Humidity: 50% RH ± 5% RH
Pollutant Emissions Evaluated:	Total Volatile Organic Compounds Individual Volatile Organic Compounds Target List Aldehydes, including Formaldehyde

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TABLE 2

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

PRODUCT 17066-010AA; FLEXI FLOR

Compound Name	CAS Number	½ CREL (µg/m³)	Chamber Concentration (µg/m³)	Emission Factor†† (µg/m²•hr)	Classroom Predicted Concentration (µg/m³)**	Office Predicted Concentration (µg/m³)**	Meets ½ CREL? (Classroom/ Office
Acetaldehyde	75-07-0	70	BQL	BQL			
Benzene	71-43-2	30	BQL	BQL			
Carbon disulfide	75-15-0	400	BQL	BQL			
Carbon tetrachloride	56-23-5	20	BQL	BQL			
Chlorobenzene	108-90-7	500	BQL	BQL			
Chloroform	67-66-3	150	BQL	BQL			
Dichlorobenzene (1,4-)	106-46-7	400	BQL	BQL			
Dichloroethylene (1,1)	75-35-4	35	BQL	BQL			
Dimethylformamide (N,N-)	68-12-2	40	BQL	BQL			
Dioxane (1,4-)	123-91-1	1,500	BQL	BQL			
Epichlorohydrin*	106-89-8	1.5	BQL	BQL			
Ethylbenzene	100-41-4	1,000	BQL	BQL			
Ethylene glycol	107-21-1	200	BQL	BQL			
Ethylene glycol monoethyl ether	110-80-5	35	BQL	BQL			
Ethylene glycol monoethyl ether acetate	111-15-9	150	BQL	BQL			
Ethylene glycol monomethyl ether	109-86-4	30	BQL	BQL			
Ethylene glycol monomethyl ether acetate	110-49-6	45	BQL	BQL			

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Compound Name	CAS Number	½ CREL (µg/m³)	Chamber Concentration (µg/m³)	Emission Factor†† (µg/m²•hr)	Classroom Predicted Concentration (µg/m³)**	Office Predicted Concentration (µg/m³)**	Meets ½ CREL? (Classroom/ Office
Formaldehyde	50-00-0	16.5***	BQL	BQL			
Hexane (n-)	110-54-3	3,500	BQL	BQL			
Isophorone	78-59-1	1,000	BQL	BQL			
Isopropanol	67-63-0	3,500	BQL	BQL			
Methyl chloroform	71-55-6	500	BQL	BQL			
Methyl t-butyl ether	1634-04-4	4,000	BQL	BQL			
Methylene chloride	75-09-2	200	BQL	BQL			
Naphthalene	91-20-3	4.5	BQL	BQL			
Phenol	108-95-2	100	BQL	BQL			
Propylene glycol monomethyl ether	107-98-2	3,500	BQL	BQL			
Styrene	100-42-5	450	3.0	7.1	3.3	3.8	Yes/Yes
Tetrachloroethylene (perchloroethylene)	127-18-4	17.5	BQL	BQL			
Toluene	108-88-3	150	BQL	BQL			
Trichloroethylene	79-01-6	300	BQL	BQL			
Vinyl acetate	108-05-4	100	BQL	BQL			
Xylenes(m-, o-, p-)		350	BQL	BQL			

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 floor usage of 89.2 m² in a 231 m³ room with 0.82 ACH or on a standard office floor usage of 11.1 m² in a 30.6 m³ room with 0.68 ACH.

***Guidance value per CA Standard Method until January 1, 2012.

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TABLE 2

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

PRODUCT 17066-010AA; FLEXI FLOR

ELAPSED EXPOSURE HOUR AFTER 10 DAYS CONDITIONING	CHAMBER CONCENTRATION ($\mu g/m^3$)	EMISSION FACTOR[††] ($\mu g/m^2 \cdot hr$)
TVOC		
24	230	550
48	210	510
96	200	470
Formaldeh de		
24	BQL	BQL
48	BQL	BQL
96	BQL	BQL

BQL denotes below quantifiable level of 2 $\mu g/m^3$.
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: $EF = (CC*V_C*N_C)/A_C$.

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TABLE 3

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

PRODUCT 17066-010AA; FLEXI FLOR

CAS NUMBER	COMPOUND	CHAMBER CONC. (µg/m³)	EMISSION FACTOR†† (µg/m²•hr)	CALCULATED PREDICTED EXPOSURE CONCENTRATION** (µg/m³)	
				Classroom	Office
95-16-9	Benzothiazole	42	100	47	54
57289-16-4	2,6-Naphthalenedione, octahydro-1,1,8a-trimethyl-, cis-*	15	34	16	18
541-05-9	Cyclotrisiloxane, hexamethyl	9.8	23	11	12
544-76-3	Hexadecane (Cetane)	9.6	23	11	12
629-62-9	Pentadecane	9.3	22	10	12
80655-44-3	Decahydro-4,4,8,9,10-pentamethylnaphthalene*	8.5	20	9.5	11
556-67-2	Cyclotetrasiloxane, octamethyl	7.9	19	8.8	10
128-37-0	2,6-Di-tert-butyl-4-methylphenol (BHT)	7.1	17	7.9	9.0
4994-16-5	4-Phenylc clohexene	6.9	16	7.7	8.7
5689-12-3	2H-Inden-2-one, 1,3-dihydro-1,1,3,3-tetramethyl-*	6.7	16	7.5	8.5

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: $EF = (CC*V_C*N_C)/A_C$.
**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 floor usage of 89.2 m² in a 231 m³ room with 0.82 ACH or on a standard office floor usage of 11.1 m² in a 30.6 m³ room with 0.68 ACH.

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TABLE 4

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

PRODUCT 17066-010AA; FLEXI FLOR

CAS NUMBER	COMPOUND IDENTIFIED	CHAMBER CONC. (µg/m³)	EMISSION FACTOR†† (µg/m²•hr)	PREDICTED EXPOSURE CONCENTRATION** (µg/m³)		✓ INDICATES PRESENCE ON LIST		
				Classroom	O ice	CA PROP 65	CA AIR TOXIC	CREL
100-42-5	Styrene	3.0	7.1	3.3	3.8		✓(IIA,III)	✓

†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 floor usage of 89.2 m² in a 231 m³ room with 0.82 ACH or on a standard office floor usage of 11.1 m² 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

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REFERENCES

1. 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 1.1," http://www.cal-iaq.org/vocs/standard-method, 2010.

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

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QUALITY CONTROL PROCEDURES FOR ENVIRONMENTAL CHAMBER EVALUATIONS

Air Quality Sciences, Inc. is an ISO 9001 registered and ISO 17025 accredited testing firm with defined and executed internal and third party verification programs encompassing emission test methods and low level pollutant measurements. AQS' 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 an ISO 9001 registered and ISO 17025 accredited firm, AQS' product control, testing, data handling, and reporting protocols and procedures are standardized and controlled. AQS participates in proficiency and accreditation measurements programs for VOC and emission testing as required by the State of California, Germany Ministry of Health's Blue Angel Program, and GREENGUARD Certification Programs. Quality assurance is maintained through AQS' computerized data management system (ADM). 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 AQS' 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. AQS 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 AQS 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;

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- 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. VOC accuracy is based on recovery of toluene mass spiked onto sorbent material. QC data on TVOC measurements conducted for the 12 month period ending March 31, 2011, showed an average precision measurement of 5.0% RSD based on duplicate measurements and 98.8% recovery based on toluene spikes. Aldehyde accuracy is based on Workplace Analysis Proficiency Scheme (WASP) formaldehyde proficiency test results. QC data on total aldehyde measurements (including formaldehyde) for the 12 month period ending March 31, 2011, showed an average precision measurement of 2.6% RSD based on duplicate measurements and an average accuracy of 2.5% RPD based on WASP results. Performance audits have been conducted on-site at AQS by the U.S. Environmental Protection Agency for several industry test programs. They are favorable and are open for review at AQS. Third party proficiency and round robin testing for low level VOCs for national and international programs are continuously conducted and reported in AQS' quarterly Quality Assurance Report, available to all customers.

Quality assurance is maintained through AQS' computerized data management system (ADM). An electronic "paper trail" for each analysis is also maintained and utilized to track the status of each sample, and to store the results.