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**Advanced Analytical Chemistry & Materials Engineering**

May 8, 2016

Fellert Acoustical Ceilings AB  
Krykangsgatan 6  
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Sweden

Attn: Mr. Michael Rosenberg

Ref: Lab File # RA-0422-1A-16R4

**1. SAMPLE(S):**

One (1) 2' x 2' x 2 1/8" section of **Fellert Even Better 39mm (1.5")** adhered to 5/8" Gypsum Wallboard

**2. ANALYSIS PERFORMED:**

STANDARD METHOD FOR THE TESTING AND EVALUATION OF VOLATILE ORGANIC CHEMICAL EMISSION FROM INDOOR SOURCES USING ENVIRONMENTAL CHAMBERS – Version 1.1 –Emission Testing Method for *California Specification 01350*



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**3. PROJECT DESCRIPTION:**

Rinko & Associates, LLC presents the results of its indoor air evaluation of material identified as : **Fellert Even Better 39mm( 1,5”)**

Rinko & Associates, LLC conducted this using a product evaluation test protocol following the guidance of ASTM D5116, and requirements of California’s Special Environmental Requirements, Specifications Section 01350 .The product was delivered to Rinko & Associates, LLC on April 22, 2016. The product was conditioned for a 10 day period and then tested for 96 hours. Testing parameters are given **TABLE 1**.

The **Fellert Even Better 39mm( 1,5”)** product was monitored for emissions of total volatile organic compounds (TVOC), individual volatile organic compounds (IVOC), formaldehyde and other aldehydes over the test period. Air samples were collected following the placement of the sample in the test chamber. Measurements were made and predicted exposures were calculated according to California’s Section 01350 protocol. All identified VOCs were also compared to the California-EPA OEHHA Proposition 65 list and the California-EPA Air Resource Board list of Toxic Air Contaminants (TACs).



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**4. RESULTS:**

The **Fellert Even Better 39mm(1,5")** product described above under 1.

**SAMPLE(S):** meets the IAQ emission requirements of California's Section 01350. Expected concentrations at 96 hours for classroom and offices were calculated using the parameters specified in California Section 01350 as shown in the Table below:

Ventilation Rate	Room Volume	Surface Area Product Covers
<b>Classroom</b>		
0.90 air changes per hour (ach)	12.19 m x 7.32 m x 2.59 m=231 m <sup>3</sup> (40 x 24 x 8.5 ft = 8,160 ft <sup>3</sup> )	89.2 m <sup>2</sup>
<b>Office</b>		
0.75 air changes per hour (ach)	3.05 m x 3.66 m x 2.74 m=30.6 m <sup>3</sup> (10 x 12 x 9.0 ft = 1080 ft <sup>3</sup> )	11.1 m <sup>2</sup>



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### 5. PRODUCT EVALUATION METHODOLOGIES

#### ENVIRONMENTAL CHAMBER

The **Fellert Even Better 39 mm (1.5")** product was tested in a small sized environmental chamber (0.0944 m<sup>3</sup> in volume), and chemical emissions were analytically measured from an environmental chamber operation and control measures used in this study complied with ASTM D5116 and CA/DHS/EHLB/R-174 practice. Air supply to the chamber was stripped of formaldehyde, VOCs, and other contaminants, so that any contaminant backgrounds present in the empty chamber fall below levels of <10µg/m<sup>3</sup> TVOC, < 10µg/m<sup>3</sup> total particles, < 2µg/m<sup>3</sup> formaldehyde, and < 2µg/m<sup>3</sup> for any individual VOC.

Air supply to the chamber was maintained at a temperature of 23°C±2°C and relative humidity at 50% ±5%. The air exchange rate was 1.00±0.05 air change/hour (ACH).

#### ANALYTICAL MEASUREMENTS

##### Selected Aldehydes

Emissions of selected aldehydes including formaldehyde were measured following ASTM D5197 and USEPA IP-6A, measurement by HPLC (High Performance Liquid Chromatography). Solid sorbent cartridges with 2,4-dinitrophenylhydrazine (DNPH) were used to collect formaldehyde and other low-molecular weight carbonyl compounds in chamber air. The DNPH reagent in the cartridge react with carbonyl compounds to form stable hydrazone derivatives retained by the cartridge.

The hydrazone derivatives were eluted from a cartridge with HPLC-grade acetonitrile. An aliquot of the sample was analyzed for low molecular weight aldehyde hydrazone derivatives using reverse-phase high-performance liquid chromatography (HPLC) using scanning photodiode UV detection. The absorbances of the derivatives were measured at 360 nm. The mass responses of the resulting peaks were determined using multi-point calibration curves prepared from standard solutions of the hydrazone derivatives. Measurements are reported to a quantifiable level of 0.1µg based on a standard air volume collection of 45 L.



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### ANALYTICAL MEASUREMENTS-continued

#### Volatile Organic Compounds

VOC measurements were made using gas chromatography with mass spectrometric detection (GC/MS). Chamber air was collected onto a solid sorbent which was then thermally desorbed into the GC/MS. Instrumentation included a sample concentrator (CDS ATD) and a Trimetrics 850 GC/MS. The sorbent collection technique, separation, and detection analysis methodology has been adapted from techniques presented by the USEPA. The techniques follows USEPA Method IP-1B and ASTM D6196 and is generally applicable to C<sub>6</sub> – C<sub>16</sub> organic chemicals with boiling points ranging from 35°C to 250°C. Measurements are reported to a quantifiable level of 0.04µg based on a standard air volume of 18 L.

Individual VOCs were separated and detected by GC/MS. The TVOC measurements were made by adding all individual VOC responses obtained by the mass spectrometer and calibrating the total mass relative to toluene. Individual VOCs, when detected, were quantified (using authentic calibration standards when available, or relative to toluene as a standard, if not) and identified using Rinko & Associates, LLC's mass spectra database. Other compounds were identified with less certainty using a general mass spectral library available from National Institute of Standards and Technology (NIST). This library contains mass spectral characteristics of more than 75,000 compounds as made available from NIST, the USEPA and the National Institutes of Health (NIH).



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**6. QUALITY CONTROL PROCEDURES FOR ENVIRONMENTAL CHAMBER EVALUATIONS**

Supply air purity is monitored on a weekly basis, using identical methodology to the chamber testing. The supply air is assured to contain  $<10\mu\text{g}/\text{m}^3$  TVOC,  $<10\mu\text{g}/\text{m}^3$  total particles,  $<2\mu\text{g}/\text{m}^3$  formaldehyde, and  $<2\mu\text{g}/\text{m}^3$  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 filters maintenance is critical for ensuring the purity of the chamber supply air.

All environmental chamber procedures are in accordance with ASTM D5116 and meet the data quality objectives required.



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**TABLE 1**

**ENVIRONMENTAL CHAMBER STUDY PARAMETERS**

**PREPARED FOR: Fellert North America**

**Product Description: Fellert Even Better 39mm( 1,5")**

<b>Product Loading:</b>	0.36 m <sup>2</sup> /m <sup>3</sup>
<b>Test Conditions:</b>	1.00±0.05 ACH 50% RH±5% RH 23°C±2°C
<b>Test Period:</b>	04/22/16 –05/6/16
<b>Pollutant Emissions Evaluated:</b>	Total Volatile Organic Compounds, Individual Volatile Organic Compounds Target List Aldehydes, including Formaldehyde
<b>Test Description:</b>	The product was received by Rinko & Associates, LLC on 04/22/16 as packaged and shipped by the customer. Prior to loading, the products were unpackaged, prepared for the required loading, and placed in a conditioning chamber for 10 days. At the end of the conditioning period, the products were placed inside the environment chamber, and tested according to the specified protocol.



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**TABLE 2**

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

**PREPARED FOR: Fellert North America**

**PRODUCT(S) : Fellert Even Better 39mm( 1,5")**

Compound	Chamber Concentration µg/m <sup>3</sup>	Calculated Emission Factor (µg/m <sup>2</sup> • hr)	Calculated Predicted Exposure Concentration (µg/m <sup>3</sup> )***	
			Classroom	Office
None	ND*(<2)	NA**	NA**	NA**

Exposure hours are nominal (+1 hour)

\*ND = None Detected. Method Detection Limit (MDL) is 2µg/m<sup>3</sup>

\*\*NA= Not Applicable

\*\*\*Prediction based on standard classroom floor usage of 89.2 m<sup>2</sup> in a 231.1 m<sup>3</sup> room with 0.9 ACH or standard office floor usage of 11.1 m<sup>2</sup> in a 30.6 m<sup>3</sup> room with 0.75 ACH





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**TABLE 3**

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

**PREPARED FOR: Fellert North America**

**PRODUCT(S): Fellert Even Better 39mm( 1,5")**

Compound Identified	Predicted Exposure Concentration*** µg/m <sup>3</sup>		► Indicates Presence on List		
			Chronic REL	CAL PROP.65	CAL Toxic Air Contaminant
	Classroom	Office			
None	NA**	NA**	NA**	NA**	NA**

\*\*NA= Not Applicable

\*\*\*Prediction based on standard classroom floor usage of 89.2 m<sup>2</sup> in a 231.1 m<sup>3</sup> room with 0.9 ACH or standard office floor usage of 11.1 m<sup>2</sup> in a 30.6 m<sup>3</sup> room with 0.75 ACH

CAL Prop. 65: California Health and Welfare Agency, Proposition 65 Chemicals

CAL Toxic Air Contaminant

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