

BERKELEY ANALYTICAL ASSOCIATES, LLC

815 Harbour Way South, Suite 6
Richmond, CA 94804
Ph. 510-236-2325; Fax 510-236-2335
E-mail baalab@berkeleyanalytical.com

PRODUCT VOC EMISSION TEST RESULTS

Report Certification

Report Number & Date: 342-001-03A-Apr1608 -- 4/16/2008

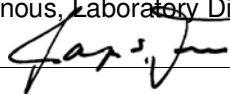
Recalculation Job:

Original Specimen ID (if recalc job):

Protocol or test method/criteria: CA DHS Section 01350 protocol

Certified By:

Raja S. Tannous, Laboratory Director

Signature 

Date April 16, 2008

Client Information

Client: Formulators
City/State/Country: Santa Ana, CA USA
Contact name/Title: Benny Dickens, President/Formulator
Contact Address: 1790 S. Boyd St., Santa Ana CA 92705
Phone number: 714-429-9804

Manufacturer Information

Manufacturing company: Formulators
Product name: Hydro-Seal MEMBRANE
Product sample ID: 415
Product category: Coatings for Concrete and Masonry (09980)
Product subcategory: Sealer
Manufacturer ID: 10011
Date manufactured: 2/25/2008
Date collected: 2/25/2008
Date shipped: 2/28/2008

Sample/Specimen Information

Date received: 3/4/2008
Specimen ID (Lab tracking No.): **342-001-03A**
Specimen preparation: Applied two coats using brush. 1.57 grams was applied over 6" by 6" tile followed with 1.77 grams as the second coat.
Conditioning period start & duration: 3/21/2008, 10 days
Test period start & duration: 3/31/2008, 96 hours

Protocol -- Emission tests are performed following California Dept. of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," CA/DHS/EHLRB/R-174, 07/15/04 (http://www.cal-iaq.org/VOC/Section01350_7_15_2004_FINAL_PLUS_ADDENDUM-2004-01.pdf). This practice is based on ASTM D 5116, "Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products" and incorporates the chamber testing portion of California Specification 01350 (<http://www.ciwmb.ca.gov/GreenBuilding/Specs/Section01350/>). Project-specific results are calculated as described in Specification 01350.

Table 1. Chamber Conditions for Test Period **

| Parameter | Symbol | Units | Value |
|----------------------|----------------|--------------------------------|--------|
| Product exposed area | A _c | m ² | 0.0232 |
| Chamber volume | V _c | m ³ | 0.067 |
| Loading ratio | L _c | m ² m ⁻³ | 0.35 |
| Inlet air flow rate | Q | m ³ h ⁻¹ | 0.068 |
| Ventilation rate | a _c | h ⁻¹ | 1.01 |
| Temperature | | °C | 22.6 |
| Relative humidity | | % | 49.0 |

** Specified ranges: 22°C to 24°C, RH 45% to 55%, and Q 0.064 to 0.070 (small chamber) or 5.81 to 6.42 (mid-size chamber)

Table 2. Parameters used to calculate building VOC concentrations

| Bldg. Component/ Material | Floor - Floor Covering (any) | Parameter | Symbol | Units | Building Type* |
|------------------------------|------------------------------|-----------------|--------|--|----------------|
| <u>Standard Classroom</u> | | | | | |
| Product exposed area | | A _B | | m ² | 89.2 |
| Building volume | | V _B | | m ³ | 231.1 |
| Ceiling height | | | | m | 2.59 |
| Loading ratio | | L _B | | m ² m ⁻³ | 0.386 |
| Ventilation rate | | a _B | | h ⁻¹ | 0.90 |
| Ventilation vol. fraction | | V _{fB} | | | 0.90 |
| Vent. flow rate per area | | | | (m ³ h ⁻¹) / m ² | 2.10 |
| <u>Standard Office Space</u> | | | | | |
| Product exposed area | | A _B | | m ² | 11.1 |
| Building volume | | V _B | | m ³ | 30.6 |
| Ceiling height | | | | m | 2.74 |
| Loading ratio | | L _B | | m ² m ⁻³ | 0.365 |
| Ventilation rate | | a _B | | h ⁻¹ | 0.75 |
| Ventilation vol. fraction | | V _{fB} | | | 0.90 |
| Vent. flow rate per area | | | | (m ³ h ⁻¹) / m ² | 1.85 |

* Standard building types are: (1) School classroom defined in Table 7.4, CA/DHS/EHLB/R-174, 07/15/04; (2) Office space (individual) defined in Table 7.5, CA/DHS/EHLB/R-174, 07/15/04; and (3) Large office building with volume ceiling height from East End Project, Products Passed Section 01350, Calif. Integrated Waste Management Board. For floor products ceiling panels, 100% coverage is assumed. For wall paint and wallcoverings, exposed area is wall paint area for the building (<http://www.ciwmb.ca.gov/GreenBuilding/Specs/EastEnd/>).

Table 3. Pass/fail results of emission test for identified VOCs with chronic RELs
 (Only VOCs detected above quantitation limits are reported)

| Substance | CAS No. | $\frac{1}{2}$ REL $\mu\text{g m}^{-3}$ | Building Type |
|------------------|---------|---|---------------|
| No VOCs detected | None | None | PASS |

Table 4. List of emitted VOCs* (Only VOCs detected above quantitation limits are reported. Individual VOCs with chronic RELs and/or on other lists of toxicants are shown first, followed by unlisted abundant compounds)

| Substance | CAS No. | Surrogate? | Chronic REL $\mu\text{g m}^{-3}$ | CARB TAC Category | Prop 65 List? |
|--------------------------------------|---------|------------|-------------------------------------|-------------------|---------------|
| 1-Chloro-4-(trifluoromethyl) benzene | 98-56-6 | Yes | | | |

Table 5. Emission Test Results for Individual VOCs*

| Substance | 96-h Chamber Concentration $\mu\text{g m}^{-3}$ | Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$ | Building Concentration $\mu\text{g m}^{-3}$ |
|--------------------------------------|--|--|--|
| | | | <u>Standard Classroom</u> |
| 1-Chloro-4-(trifluoromethyl) benzene | 24.3 | 70.6 | 33.6 |
| Substance | 96-h Chamber Concentration $\mu\text{g m}^{-3}$ | Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$ | Building Concentration $\mu\text{g m}^{-3}$ |
| | | | <u>Standard Office Space</u> |
| 1-Chloro-4-(trifluoromethyl) benzene | 24.3 | 70.6 | 38.1 |

* Parameters and reported values are defined and explained in Table 8

Table 6. TVOC Chamber & Building Concentrations for Different Test Periods

| Test Duration | Chamber Conc. $\mu\text{g m}^{-3}$ | Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$ | Building Conc. $\mu\text{g m}^{-3}$ |
|------------------------------|---------------------------------------|--|--|
| <u>Standard Classroom</u> | | | |
| 24-h | 36 | 106 | 51 |
| 48-h | 33 | 96 | 46 |
| 96-h | 24 | 71 | 34 |
| <u>Standard Office Space</u> | | | |
| 24-h | 36 | 106 | 57 |
| 48-h | 33 | 96 | 52 |
| 96-h | 24 | 71 | 38 |

Table 7. Formaldehyde Chamber & Building Concentrations for Different Test Periods

| Test Duration | Chamber Conc. $\mu\text{g m}^{-3}$ | Emission Factor $\mu\text{g m}^{-2} \text{ h}^{-1}$ | Building Conc. $\mu\text{g m}^{-3}$ |
|------------------------------|---------------------------------------|--|--|
| <u>Standard Classroom</u> | | | |
| 24-h | LQ | LQ | LQ |
| 48-h | LQ | LQ | LQ |
| 96-h | LQ | LQ | LQ |
| <u>Standard Office Space</u> | | | |
| 24-h | LQ | LQ | LQ |
| 48-h | LQ | LQ | LQ |
| 96-h | LQ | LQ | LQ |

Table 8. Pictures of The Tested Specimen



Table 9. Definition of Parameters and Notes to Tables

| Parameter/Value | Definition |
|-------------------------------------|---|
| CAS No. | Chemical Abstract Service identification number |
| Surrogate? | “Yes” indicates compound was quantified by GC/MS total-ion-current (TIC) method using toluene as calibration reference |
| Chronic REL | Chronic Reference Exposure Level (REL) established by Calif. Office of Environmental Health Hazard Assessment, Feb. 2005 and adopted by Section 01350 as target IAQ limit for building; for formaldehyde, IAQ limit is interim Indoor REL of $33 \mu\text{g m}^{-3}$. No product may contribute more than $\frac{1}{2}$ IAQ limit for an REL compound, with the exception of acetaldehyde for which the full REL is allowed. |
| CARB TAC Cat. | Toxic Air Contaminant (TAC) on Calif. Air Resources Board list, Dec. 1999, with toxic category indicated |
| Prop 65 List? | “Yes” indicates compound is chemical known to cause cancer or reproductive toxicity listed by Calif. Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), Mar. 2005 |
| 96-h Chamber Conc. | Measured chamber VOC concentration at 96-h time point minus any analytical blank or blank concentration for empty chamber operated following same procedure. Lower limit of quantitation (LOQ) for individual VOCs on lists of toxicants is $2 \mu\text{g m}^{-3}$, based on a 2 ng limit for a 1-liter sample. LOQ for TVOC is $20 \mu\text{g m}^{-3}$. LOQ for formaldehyde and acetaldehyde is given below |
| Emission Factor | Mass of compound emitted per square meter of exposed surface per hour (calculations shown below). Reporting limits for emission factors are established by LOQ or reporting limit for chamber concentration and specimen’s exposed surface area |
| Classroom/Office/Office Bldg. Conc. | Concentrations for school classroom, small office (individual), large office building, or specific project building calculated using parameters given in Table 2 (calculations shown below) |
| TVOC | Total Volatile Organic Compounds quantified by GC/MS TIC method using toluene as calibration reference |
| Formaldehyde & acetaldehyde | Volatile aldehydes quantified by HPLC following ASTM Method D 5197-97. LOQ for formaldehyde and acetaldehyde is $\sim 1 \mu\text{g m}^{-3}$ |
| Individual VOCs | Quantified by thermal desorption GC/MS following EPA Methods TO-1 and TO-17. Compounds are quantified using multipoint calibrations prepared with pure substances unless otherwise indicated (see Surrogate?). VOCs with chronic RELs are listed first, followed by other TAC and Prop. 65 compounds. Additional abundant VOCs at or above reporting limit of $5 \mu\text{g m}^{-3}$ are listed last. VOCs are listed in order of decreasing volatility within each group |
| “<” | “Less than” concentrations established by LOQ |
| “HC” | Hydrocarbon compound |
| “LQ” | Indicates calculated value is below quantitation based on concentration LOQ |
| “na” | Not applicable |

Equations Used in Calculations

An emission factor (EF) in $\mu\text{g m}^{-2} \text{h}^{-1}$ for a chemical substance in a chamber test is calculated using Equation 1:

$$EF = (Q (C - C_o)) / A_c \quad (1)$$

where C is the chamber concentration of the substance ($\mu\text{g m}^{-3}$) and C_o is the corresponding substrate or chamber blank concentration ($\mu\text{g m}^{-3}$). The other parameters are defined in Table 1. For an emitting unit, such as a chair, the number of units, N, is substituted for surface area, A_c , and EF is expressed as $\mu\text{g/unit-h}$.

A building concentration (C_B) in $\mu\text{g m}^{-3}$ can be estimated from the EF using Equation 2:

$$C_B = (EF * A_B) / Q_B \quad (2)$$

where A_B is the area of the product in the building space and Q_B is the outdoor air flow rate to the space.

An EF in $\mu\text{mol m}^{-2} \text{h}^{-1}$ for an individual VOC in a chamber test is calculated from the above EF using Equation 3:

$$EF (\mu\text{mol m}^{-2} \text{h}^{-1}) = EF (\mu\text{g m}^{-2} \text{h}^{-1}) / MW \quad (3)$$

where MW is the molecular weight (molar mass) of the respective compound.

A chamber concentration in ppb (molar basis) for an individual VOC is calculated from the chamber concentration ($C - C_o$) in $\mu\text{g m}^{-3}$ using Equation 4:

$$\text{Chamber concentration (ppb)} = (C - C_o) \times 24.45 / MW \quad (4)$$

where 24.45, in L/mol, is the molar volume of air at standard conditions (1 atm pressure, 25° C).

For a furniture component, the workstation concentration of formaldehyde and total aldehydes in ppb can be estimated from the corresponding aldehyde EF ($\mu\text{mol m}^{-2} \text{h}^{-1}$) using Equation 5:

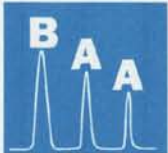
$$\text{WS Aldehyde concentration (ppb)} = (EF_{\text{aldehyde}})(A_{\text{ws}})(24.45) / Q_{\text{ws}} \quad (5)$$

where A_{ws} is the surface area of the component in the workstation (m^2) and Q_{ws} is the outdoor air flow rate to the workstation (m^3/h).

Comments

The emission factor calculations was based on the area of the 6" by 6" tile. Coverage of adhesive was 144.0 grams per m2 based on the total of two coats of 3.34 grams.

END OF REPORT



Berkeley Analytical Associates, LLC

815 Harbour Way South, Suite 6
Richmond, CA 94804-3612
Phone: 510-236-2325 Fax: 510-236-2335
e-mail: baalab@berkeleyanalytical.com

CHAIN OF CUSTODY PRODUCT / MATERIAL VOC EMISSION TEST

2007 Update

(Note: a separate COC must be filled for each product sample)

Client Information*

| |
|--|
| Company: Formulators |
| Street Address: 1790 S Boyd |
| City/State: Santa Ana/CA |
| Zip/Postal Code: 92705 |
| Country: US |
| Contact (for reporting): Benny Dickens |
| Contact Title: President/Formulator |
| Phone/Fax Numbers: 714-429-9804p 714-429-9804f |
| Email Address: b.dickens@formulatorsonline.com |

Manufacturer Information (if different from client)

| |
|---------------------|
| Company: |
| City/State/Country: |
| Contact Name/Title: |
| Phone Number: |

Sample Details

| | |
|---|--|
| Product Name*: Hydro-Seal MEMBRANE | |
| Manufacturer Product ID #: 10011 | |
| Sample Internal ID #: 415 | |
| Date Manufactured*: 02/25/08 | |
| Product Category & Use*: Flooring - Adhesive | |
| Sample Construction Material*: Modified Urethane | |
| Plant Name & Location*: Formulators, Santa Ana CA | |
| Collection Location within Plant: | |
| Date & Time Collected* : 02/25/08 | |
| Number of Sample Pieces*: 1 x 4oz | Photo(s) of Collection Location: <i>Attach</i> |
| Sample Collected by*: Jaime | |
| Phone/Fax Numbers*: Same As Above | |
| Email Address*: Same As Above | |

Shipping Details*

| |
|----------------------------|
| Packed & Shipped By: Jaime |
| Shipping Date: |
| Carrier/Airbill Number: |

Test Protocol (Check One)*

| | | |
|---------------------------------------|-------------------------------------|-------------------------------------|
| CA DHS Section 01350 | <input checked="" type="checkbox"/> | 10 d conditioning, 24 h, 48 h, 96 h |
| BIFMA - small chamber | <input type="checkbox"/> | 72 h, 168 h |
| BIFMA - mid-size chamber | <input type="checkbox"/> | 72 h, 168 h |
| 01350 Screening (specify test points) | <input type="checkbox"/> | |
| BIFMA Screening (specify test points) | <input type="checkbox"/> | |
| Other, specify below: | <input type="checkbox"/> | |

Test Data Application Program (Check if Applicable)

| | | |
|---|-------------------------------------|--|
| CHPS | <input checked="" type="checkbox"/> | |
| FloorScore | <input checked="" type="checkbox"/> | |
| CRI Greenlabel | <input type="checkbox"/> | |
| CRI Greenlabel Plus | <input type="checkbox"/> | |
| SCS Indoor Advantage, furniture | <input type="checkbox"/> | |
| SCS Indoor Advantage Gold, furniture | <input type="checkbox"/> | |
| SCS Indoor Advantage Gold, bldg product | <input type="checkbox"/> | |

Copy to Certifier (If Applicable)

| |
|---------------|
| Organization: |
| Contact: |

Notes or Comments from Client / Manufacturer

| |
|--|
| |
|--|

For BAA Use Only

| |
|---|
| Condition of Shipping Package: |
| Condition of Sample: |
| Lab Tracking Number: <i>342-001-03A</i> |

Sample Handling

| Relinquished By* | Received By* | Signature* | Date* | Company* |
|------------------|--------------------|-----------------------------|---------------------------------|--------------------|
| Benny Dickens | <i>FARID MAIRI</i> | <i>[Signature]</i> MAIRI | <i>2/28/08</i> <i>3/4/08</i> | Formulators BAA |