**BERKELEY ANALYTICAL**
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# VOC Emissions from Building Products

## *Customer & Building Product Sample Information*

| **Report Certification** | |
|---|---|
| Report number | 1036-001-01A-Apr1818 |
| Report date | Apr 18, 2018 |
| Certified by (Name/Title) | Raja S. Tannous, Laboratory Director |
| Signature | |
| Date | *April 18, 2018* |

| **Standards** | |
|---|---|
| Test method | CDPH/EHLB/Standard Method V1.2 (Sect. 01350) |
| Acceptance criteria | CDPH/EHLB/Standard Method V1.2 |
| Modeling scenario(s) | CDPH/EHLB/Standard Method V1.2 Standard Classroom & Office |
| Product type | Elastomeric joint sealant for tile/stone |

| **Customer Information** | |
|---|---|
| Manufacturer or organization | Laticrete International |
| City/State/Country | Bethany, CT |
| Contact name/Title | Mitch Hawkins, Technical Services Manager |
| Phone number | 203.393.4619 |

| **Product Sample Information*** | |
|---|---|
| Manufacturer (if not customer) | Silco |
| Product name / Number | Latasil / 6244-0120-2 |
| Product CSI category | Non-full spread adhesive and sealants |
| Customer sample ID | not provided |
| Manufacturing location | Laticrete Bethany, CT |
| Date sample manufactured | Feb 1, 2018 |
| Date sample collected | Mar 14, 2018 |
| Date sample shipped | Mar 14, 2018 |
| Date sample received by lab | Mar 21, 2018 |
| Condition of received sample | No observed problems |
| Lab sample tracking number | **1036-001-01A** |
| Conditioning start date & duration | Mar 23, 2018; 10 days |
| Chamber test start date & duration | Apr 2, 2018; 4 days (96 hours) |
| Total test start date & duration | Mar 23, 2018; 14 days (336 hours) |

*Chain-of-custody (COC) form for product sample is attached to this report

## *Conformity Assessment – CDPH VOC Concentration Criteria*

**VOC Emission Test Results** – The product sample was tested for emissions of VOCs following California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017. The chamber test results were modeled to one or more scenario(s) defined in CDPH Standard Method V1.2. The modeled indoor VOC concentrations then were compared to the acceptance criteria defined in CDPH Standard Method V1.2 to determine compliance of the product sample to the standard. The modeling scenario(s) are detailed in Table 3, and the predicted indoor VOC concentrations at 336 hours are given in Table 6 of this report. The allowable concentrations used as acceptance criteria are reproduced in Appendix B of this report. Table 1 summarizes the pass/fail results based on the predicted indoor air concentrations of individual VOCs of concern in the modeled scenario(s).

**TVOC Concentration Range –** USGBC's LEED v4 rating systems for buildings include a requirement for reporting of the predicted TVOC concentration in one of three range categories, i.e., ≤0.5 mg/m$^3$, >0.5 to 4.9mg/m$^3$, and ≥5.0 mg/m$^3$. Table 1 includes the TVOC concentration range in the modeled scenario(s).

**Table 1**. Pass/Fail results based on the test method and identified modeling scenarios. Only detected individual VOCs with defined acceptance criteria are listed. The TVOC concentration range also is shown

| Chemical | CAS No | Allowable Concentration (µg/m$^3$) | Predicted Concentration (Pass/Fail) | |
|---|---|---|---|---|
| | | | Classroom | Office |
| No formaldehyde or other target CREL VOCs were detected | -- | -- | **Pass** | **Pass** |
| TVOC[a] | -- | -- | ≤ 0.5 mg/m$^3$ | ≤ 0.5 mg/m$^3$ |

[a] Reporting of TVOC range is for information only; TVOC is not a Pass/Fail criterion

## *Test Method for Building Product Samples*

**Test Specimen Preparation** – Using a caulk gun, applied 21.26 grams into an 8" long x 3/8" wide x 3/8''deep channel. Total volume was 1.125 $in^3$ . Exposed area was based on unit or tube fraction of 0.06. Photographs of the tested specimen are shown later in this report. The test results presented herein are specific to this item.

**Test Protocol Summary*** – This VOC emission test was performed following California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017. This version of the standard is identical to CDPH/EHLB/Standard Method V1.1, 2010 except that the benzene allowable concentration is lower. Note: this standard derives from California architectural Specification 01350 and frequently is referred to as "Section 01350." The chamber test prescribed in the standard follows the guidance of ASTM Standard Guide D 5116. Chemical sampling and analyses were performed following U.S. EPA Compendium Method TO-17 and ASTM Standard Method D 5197. The product specimen was prepared from the supplied product sample and was placed directly into the conditioning environment and maintained at controlled conditions of air flow rate, temperature and relative humidity for ten days. At the end of this period, the specimen was transferred directly to a small-scale chamber. The chamber conditions for the 96-h test period are summarized in Table 2. Air samples were collected from the chamber at 24 h, 48 h and 96 h elapsed time. Samples for the analysis of individual VOCs and TVOC were collected on multisorbent tubes containing Tenax-TA backed by a carbonaceous sorbent. Samples for the analysis of low molecular weight aldehydes were collected on treated DNPH cartridges. VOC samples were analyzed by thermal desorption GC/MS. TVOC was calculated using toluene as the calibration reference. Individual VOCs (iVOCs) were quantified using multi-point (4 or more points) with calibration curves prepared with pure standards, unless otherwise noted. iVOCs without pure standards were quantified based on their total-ion-current responses using toluene as the calibration reference. Formaldehyde and acetaldehyde were analyzed by HPLC and quantified using multi-point (4 or more points) calibration curves. The analytical instruments and their operating parameters are described in Appendix A.

**Availability of Data** – All data, including but not limited to raw instrument files, calibration files, and quality control checks used to generate the test results will be made available to the customer upon request.

**Table 2**. Chamber conditions for test period

| Parameter | Symbol | Units | Value |
|---|---|---|---|
| Tested specimen exposed units | $N_S$ | -- | 0.06 |
| Chamber volume | $V_C$ | $m^3$ | 0.067 |
| Avg. Inlet gas flow rate & Range | $Q_C$ | $m^3/h$ | 0.067 (0.064-0.070) |
| Avg Temperature & Range | | $^oC$ | 23.3 (22-24) |
| Avg Relative humidity & Range | | % | 51 (45-55) |
| Duration | | h | 96 |

*All standards identified in this section are included in Berkeley Analytical's scope of ISO/IEC17025 accreditation, Testing Laboratory TL-383, International Accreditation Service, www.iasonline.org

## *Modeling Parameters for Building Products*

**Modeling Parameters** – CDPH/EHLB/Standard Method Version 1.2 describes the modeling procedures and parameters for estimating the impact of VOC emissions from a building product on indoor air concentrations in a standard classroom and a standard office space. The dimensions and ventilation of the spaces and the exposed surface areas of major materials are prescribed. The modeling scenario(s) and parameters applicable to this test are listed in Table 3.

**Table 3**. Parameters used for estimating VOC air concentrations at 336 hours for the modeling scenarios

| Parameter | Symbol | Units | Value | |
|---|---|---|---|---|
| | | | Classroom | Office |
| Product exposed units* | $N_{P_B}$ | -- | 17 | 2.6 |
| Building volume | $V_B$ | $m^3$ | 231 | 30.6 |
| Floor/Ceiling Area | $A_B$ | $m^2$ | 89.2 | 11.15 |
| Ceiling height | $H_B$ | m | 2.59 | 2.74 |
| Outdoor air (OA) flow rate | $Q_B$ | $m^3/h$ | 191 | 20.7 |
| Unit-specific air flow rate | $q_A$ | $m^3$/unit-h | 11.24 | 7.96 |

See attached rational and calculations letter from customer.

## *VOC Emission Test Results*

**Chamber Background Concentrations** – Background concentrations measured at time zero are reported in Table 4. The background concentrations of TVOC, formaldehyde, acetaldehyde, and reported iVOCs are listed.

**Table 4**. Chamber background VOC concentrations at time zero

| Chemical/Chemical Group | CAS No | Chamber Conc (µg/m$^3$) |
|---|---|---|
| 2-Propanone (acetone) | 67-64-1 | 3.5 |
| Acetaldehyde | 75-07-0 | LQ |
| Ethanol | 64-17-5 | 2.5 |
| Formaldehyde | 50-00-0 | LQ |
| Nonanal | 124-19-6 | 3.0 |
| TVOC | -- | LQ |

**Emitted VOCs** – Individual VOCs (iVOCs) detected in the test and present above the lower limits of quantitation in chamber air are reported in Table 5. All iVOCs with CRELs and/or on other lists of toxicants of concern are listed first. Next, all frequently occurring iVOCs with pure standard calibrations are listed. Additionally, the 10 most abundant iVOCs quantified using toluene as the reference standard are listed; identifications of these compounds are considered tentative. Reporting of fewer than 10 iVOCs indicates that fewer than 10 chemicals met these criteria.

**Table 5**. Listed and abundant iVOCs detected above lower limits of quantitation in 96-h air sample

| Chemical | CAS No | Surrogate?* | CREL (µg/m$^3$) | CARB TAC Category | Prop 65 List? |
|---|---|---|---|---|---|
| 2-Butanone (methyl ethyl ketone) | 78-93-3 | | | T-IIa | |
| 2-Butoxyethanol (ethylene glycol monobutyl ether) | 111-76-2 | | | T-IIa | |
| 2-Propanone (acetone) | 67-64-1 | | | | |
| Decamethylcyclopentasiloxane | 541-02-6 | | | | |
| Hexamethylcyclotrisiloxane | 541-05-9 | Yes | | | |
| 2-Butanone oxime | 96-29-7 | Yes | | | |
| Octamethylcyclotetrasiloxane | 556-67-2 | Yes | | | |
| C11 Branched alkane isomers (RT16.00min-16.72min) | -- | Yes | | | |
| Dodecamethylcyclohexasiloxane | 540-97-6 | Yes | | | |
| Siloxane Compound | -- | Yes | | | |

*"Yes" response indicates iVOC quantified using toluene as the calibration reference; all other iVOCs quantified using pure standards

## VOC Emission Test Results, Continued

**VOC Emission Factors and Estimated Indoor Air Concentrations** – The 96-h chamber sample was analyzed for iVOCs including formaldehyde and acetaldehyde. The emission factors for iVOCs presented in Table 6 were calculated from the chamber parameters, the exposed area of the test specimen and the measured 96-h chamber concentrations corrected for any chamber background concentrations. The emission factors were used to predict the indoor air concentrations of iVOCs for the modeling scenario(s) applicable to this test as shown in Table 3. See Equations for calculation methods.

**Table 6**. Measured chamber concentrations at 96 h, calculated emission factors, and estimated indoor air concentrations of individual VOCs for the modeling scenarios

| Chemical | Chamber Concentration (µg/m³) | Emission Factor (µg/unit-h)) | Estimated Indoor Air Concentration (µg/m³) | |
|---|---|---|---|---|
| | | | Classroom | Office |
| 2-Propanone (acetone) | 3.7 | 4.1 | 0.4 | 0.5 |
| 2-Butanone (methyl ethyl ketone) | 53.2 | 59.4 | 5.3 | 7.5 |
| Hexamethylcyclotrisiloxane | 12.5 | 14.0 | 1.2 | 1.8 |
| 2-Butanone oxime | 1468.5 | 1639.8 | 145.9 | 206.0 |
| 2-Butoxyethanol (ethylene glycol monobutyl ether) | 2.6 | 2.9 | 0.3 | 0.4 |
| Octamethylcyclotetrasiloxane | 158.4 | 176.9 | 15.7 | 22.2 |
| C11 Branched alkane isomers (RT16.00min-16.72min) | 35.0 | 39.1 | 3.5 | 4.9 |
| Decamethylcyclopentasiloxane | 112.8 | 126.0 | 11.2 | 15.8 |
| Dodecamethylcyclohexasiloxane | 111.5 | 124.5 | 11.1 | 15.6 |
| Siloxane Compound | 17.0 | 19.0 | 1.7 | 2.4 |

## VOC Emission Test Results, Continued

**Quality Measurements** – Chamber samples collected at 24, 48 and 96 hours were analyzed for total VOCs (TVOC). Because the TVOC response per unit mass of a chemical is highly dependent upon the specific mixture of iVOCs, the measurement of TVOC is semi-quantitative. TVOC primarily is used as a quality measure to determine if the VOC emissions from a product are relatively constant or generally declining over the test period. Some programs may require the reporting of predicted indoor air TVOC concentrations or concentration ranges in mg/m$^3$. TVOC emission factors and predicted TVOC concentrations are shown in Table 7. Aldehyde samples collected at 24, 48 and 96 hours were analyzed for formaldehyde as another quality measure. Formaldehyde emission factors are shown in Table 8. Product claims related to formaldehyde content may be based, in part, on formaldehyde emission factors.

**Table 7**. TVOC chamber concentrations at 24, 48, and 96 h with corresponding emission factors and predicted indoor air concentrations (mg/m$^3$)

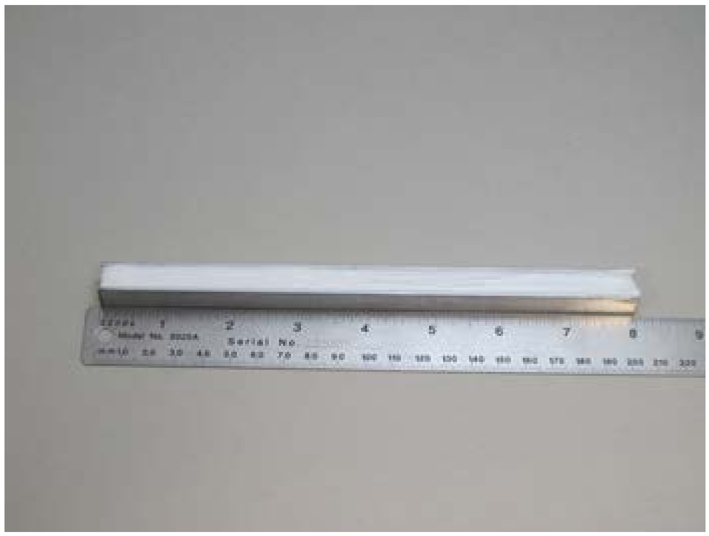
| Elapsed Time (h) | Chamber Concentration (µg/m$^3$) | Emission Factor (µg/unit-h) | Estimated Indoor Air Concentration (mg/m$^3$) | |
|---|---|---|---|---|
| | | | Classroom | Office |
| 24 | 3793 | 4235.5 | 0.377 | 0.532 |
| 48 | 3368 | 3760.9 | 0.335 | 0.472 |
| 96 | 2041 | 2279.1 | 0.203 | 0.286 |

**Table 8**. Formaldehyde chamber concentrations at 24, 48, and 96 h with corresponding emission factors

| Elapsed Time (h) | Chamber Concentration (µg/m$^3$) | Emission Factor (µg/unit-h) |
|---|---|---|
| 24 | LQ | LQ |
| 48 | LQ | LQ |
| 96 | LQ | LQ |

## *Photographs of Tested Product Specimen*

**Photo Documentation** – The product sample specimen is photographed immediately following specimen preparation and prior to initiating the conditioning period. Typically, the top and bottom faces of the specimen are photographed. Bottom faces may show a stainless steel plate or other substrate if prescribed by the standard.



## Definitions, Equations, and Comments

**Table 9**. Definitions of parameters

| Parameter/Value | Definition |
|---|---|
| CARB TAC | Toxic Air Contaminant (TAC) on California Air Resources Board list, with toxic category indicated |
| CAS No. | Chemical Abstract Service registry number providing unique chemical ID |
| Chamber Conc. | Measured chamber VOC concentration at time point minus any analytical blank or background concentration for empty chamber measured prior to test. Lower limit of quantitation (LQ) or reporting limit for individual VOCs is 2 µg/m$^3$ unless otherwise noted |
| Indoor Air Conc. | Estimated indoor air concentration in standard modeled environment calculated from the emission factors from test results and the modeling parameters in Table 3 using the equations given below |
| CREL | Chronic non-cancer Reference Exposure Level established by Cal/EPA OEHHA (http://www.OEHHA.ca.gov/air/allrels.html) |
| Emission Factor | Mass of compound emitted per unit area per hour (calculation shown below). Reporting limits for emission factors are established by LQ or reporting limit for chamber concentration and specimen area tested |
| Formaldehyde & acetaldehyde | Volatile aldehydes quantified by HPLC following ASTM Standard Method D 5197. LQs for formaldehyde and acetaldehyde are 1.1 µg/m$^3$ and 2 µg/m$^3$, respectively |
| Individual VOCs | Quantified by thermal desorption GC/MS following EPA Method TO-17. Compounds quantified using multi-point calibrations prepared with pure chemicals unless otherwise indicated. VOCs with chronic RELs are listed first, followed by other TAC and Prop. 65 compounds. Additional abundant VOCs at or above reporting limit of 2 µg/m$^3$ are listed last |
| LQ | Indicates calculated value is below its lower limit of quantitation |
| Prop 65 list | "Yes" indicates the compound is a chemical known to cause cancer or reproductive toxicity according to California Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65) |
| TVOC | Total Volatile Organic Compounds eluting over retention time range bounded by n-pentane and n-heptadecane and quantified by GC/MS TIC method using toluene as calibration reference. LQ for TVOC is 20 µg/m$^3$ |
| "na" | Not applicable |
| "<" | Less than value established by LQ |

**Equations Used in Calculations** – An emission factor (EF) in µg/m$^2$-h for a chemical in a chamber test of a building product sample is calculated using Equation 1:

$$EF = (Q_c (C - C_o)) / A_S \qquad (1)$$

where $Q_c$ is the chamber inlet air flow rate (m$^3$/h), C is the VOC chamber concentration (µg/m$^3$), $C_O$ is the corresponding chamber background VOC concentration (µg/m$^3$), and $A_S$ is the tested specimen exposed area (m$^2$).

## *Definitions, Equations, and Comments, Continued*

The indoor air concentration ($C_B$) for the modeled space in µg/m$^3$ is estimated using Equation 2 and the parameters defined in Table 3:

$$C_B = (EF \times A_{P_B}) / Q_B \qquad (2)$$

where $A_{P_B}$ is the exposed area of the product in the building (m$^2$) and $Q_B$ is the outside air flow rate (m$^3$/h).

**Comments**: The product loading in the private office scenario is described in the attached letter provided by the customer.

**END OF REPORT**

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## Appendix A
## Analytical Instruments & Operating Parameters

**Table A1**. Description of analytical instrument components

| Component | Description |
|---|---|
| HPLC | 1260 Infinity Quaternary LC, G1314F VW Detector, Agilent |
| Analytical column | Poroshell 120 EC-C18, Agilent |
| Column dimensions | 2.1 mm x 100 mm |
| Thermal desorber | Unity / TD100, Markes International, Ltd. |
| Gas chromatograph | Model 7890A, Agilent |
| Analytical column | DB-624, J&W Scientific |
| Column dimensions | 1 µm film, 0.18 mm ID, 20 m |
| Mass spectrometer | Model 5975C MSD, Agilent |

**Table A2**. HPLC operating parameters for analysis of formaldehyde and acetaldehyde

| Parameter | Value |
|---|---|
| Solvent A | 65/35% $H_2O$/Acetonitrile |
| Solvent B | 100% Acetonitrile |
| Flow rate | 0.3 mL/min |
| End time | 11 min |
| Detector wavelength | 360 nm |

**Table A3**. Thermal desorption GC/MS parameters used for analysis of iVOCs and TVOC

| Parameter | Value |
|---|---|
| Thermal desorption | |
| Tube desorb temperature | 285 °C |
| Trap temperature | -5 °C |
| Trap desorb temperature | 300 °C |
| Trap desorb split ratio | 10:1 |
| Gas chromatograph | |
| Initial temperature | 40 °C |
| Initial temperature time | 6.0 min |
| Final temperature | 225 °C |
| Final temperature time | 3 min |
| Mass spectrometer | |
| Low scan mass, *m/z* | 30 amu |
| High scan mass, *m/z* | 450 amu |
| Scan rate | 3.42 Hz |

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## Appendix B
## Target CREL VOCs and Their Maximum Allowable Concentrations
## Copied from CDPH/EHLB/Standard Method Version 1.2, 2017, Table 4-1

| No. | Compound Name | CAS No. | Allowable Conc. ($\mu g/m^3$) |
|---|---|---|---|
| 1 | Acetaldehyde | 75-07-0 | 70 |
| 2 | Benzene | 71-43-2 | 1.5 |
| 3 | Carbon disulfide | 75-15-0 | 400 |
| 4 | Carbon tetrachloride | 56-23-5 | 20 |
| 5 | Chlorobenzene | 108-90-7 | 500 |
| 6 | Chloroform | 67-66-3 | 150 |
| 7 | Dichlorobenzene (1,4-) | 106-46-7 | 400 |
| 8 | Dichloroethylene (1,1) | 75-35-4 | 35 |
| 9 | Dimethylformamide (N,N-) | 68-12-2 | 40 |
| 10 | Dioxane (1,4-) | 123-91-1 | 1,500 |
| 11 | Epichlorohydrin | 106-89-8 | 1.5 |
| 12 | Ethylbenzene | 100-41-4 | 1,000 |
| 13 | Ethylene glycol | 107-21-1 | 200 |
| 14 | Ethylene glycol monoethyl ether | 110-80-5 | 35 |
| 15 | Ethylene glycol monoethyl ether acetate | 111-15-9 | 150 |
| 16 | Ethylene glycol monomethyl ether | 109-86-4 | 30 |
| 17 | Ethylene glycol monomethyl ether acetate | 110-49-6 | 45 |
| 18 | Formaldehyde | 50-00-0 | 9* |
| 19 | Hexane (n-) | 110-54-3 | 3,500 |
| 20 | Isophorone | 78-59-1 | 1,000 |
| 21 | Isopropanol | 67-63-0 | 3,500 |
| 22 | Methyl chloroform | 71-55-6 | 500 |
| 23 | Methylene chloride | 75-09-2 | 200 |
| 24 | Methyl t-butyl ether | 1634-04-4 | 4,000 |
| 25 | Naphthalene | 91-20-3 | 4.5 |
| 26 | Phenol | 108-95-2 | 100 |
| 27 | Propylene glycol monomethyl ether | 107-98-2 | 3,500 |
| 28 | Styrene | 100-42-5 | 450 |
| 29 | Tetrachloroethylene | 127-18-4 | 17.5 |
| 30 | Toluene | 108-88-3 | 150 |
| 31 | Trichloroethylene | 79-01-6 | 300 |
| 32 | Vinyl acetate | 108-05-4 | 100 |
| 33-35 | Xylenes, technical mixture (m-, o-, and p- xylene combined) | 108-38-3, 95-47-6, 106-42-3 | 350 |

*All maximum allowable concentrations are one half the corresponding CREL adopted by Cal/EPA OEHHA with the exception of formaldehyde for which the full CREL of 9 $\mu g/m^3$ is allowed.

**berkeley analytical**

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## Chain of Custody for Building Product/ Material VOC Emission Test

A Separate COC must be completed for EACH product/material sample

A link to Berkeley Analytical's Services Agreement is included in this workbook. By submitting samples, customer acknowledges and accepts these terms & conditions unless a prior written contract is in effect.

| | |
|---|---|
| Berkeley Analytical Quotation Number: | Invoice # 56872 |
| Purchase Order (enter company & number): | LATICRETE P.O. # 140272 |

| Customer Information * |
|---|
| Company: LATICRETE International, Inc |
| Street Address: 1 Laticrete Park North |
| City/State/Zip(postal code): Bethany, CT 06524 |
| Country: USA |
| Contact Name & Title (for reporting): Mitch Hawkins Technical Services Manager |
| Contact Phone/Fax Numbers: 203.393.4619 |
| Contact E-mail Address: wmhawkins@laticrete.com |
| Financially Responsible Co. (if different): |

| Manufacturer Information (if different from customer) |
|---|
| Company: Silco |
| City/State/Country: Mentor, OH USA |
| Contact Name/Title: John Boland |
| Phone Number/E-mail Address: jboland@silco-inc.com |

| Sample Details | |
|---|---|
| Product Commercial Name*: LATASIL | |
| Product Commercial Part No.(if not part of the name)*: 6244-0120-2 | |
| Manufacturer Sample Tracking ID: | |
| Date Manufactured*: February 2018 | |
| Product Category & Use*: 07 92 13 Elastomeric joint sealant for tile/stone | |
| Sample Construction Material*: Silicone | |
| Plant Name & Location*: LATICRETE Bethany, CT | |
| Collection Location within Plant: LATICRETE Bethany - Aisle F44 Bin 01E | |
| Date & Time Collected* : March 14, 2018 9:22 AM EST | |
| Number of Sample Pieces*: 1 | Photo(s) of Collection Location: Attach |
| Sample Collected by*: Mitch Hawkins | |
| Phone/Fax Numbers*: 203-393-4619 | |
| E-mail Address*: wmhawkins@laticrete.com | |

| Shipping Details* | |
|---|---|
| Packed & Shipped By: | ANTHONY RAINONE |
| Shipping Date: | 3-14-18 |
| Carrier/Airbill Number: | UPS |

| Requested Test (automatically filled from BldgProdWorksheet Selections) | |
|---|---|
| Test to be performed * | CDPH Std. Method V1.2 |
| Modeling scenario | Office & Classroom |
| Test schedule (screening tests only) | |
| Target chemicals & chemical groups (screening) | |
| CARB ATCM test, schedule | |
| Test results application(s) | LEED, CHPS, Other, see instructions |

| For Berkeley Analytical Use: | |
|---|---|
| Report ID | RPT66 |
| Billing Reference | |

**Customer Instructions for Sample Prep., Test Type, schedule, etc. (filled from BldProdWorksheet)**

| Customer Request for Laboratory Certificate of Compliance | |
|---|---|
| Indicate if you are ordering a Laboratory Certificate of Compliance: | Yes |

Laboratory certificates are available for the compliance test(s) listed on the BldgProdWorksheet. Berkeley Analytical's laboratory test results and associated certificates are specific to the tested item. Claims made by the customer regarding the broader representativeness of the test results and certificate are the sole responsibility of the customer.

| Customer Authorizes Laboratory to Submit Copies of Test Report to: |
|---|
| Contact/E-mail Address: wmhawkins@laticrete.com |
| Organization: LATICRETE International, Inc. |
| Contact/E-mail Address: rjblair@laticrete.com |
| Organization: LATICRETE International, Inc. |

| For Berkeley Analytical Use Only | |
|---|---|
| Condition of Shipping Package: | OK |
| Condition of Sample: | OK |
| Lab Tracking Number: | 1036-001-01A |

Asterisk (*) See Notes Tab

**Sample Handling**

| Relinquished By* | Received By* | Signature* | Date* | Company* |
|---|---|---|---|---|
| Mitch Hawkins | | Mitch Hawkins | 14-Mar-18 | LATICRETE International |
| | ALEC HUANG | Alec Huang | 3-22-2018 | BKA |

**CERTIFIED ISO 9001:2015**

April 10, 2018

Alex Huang
Berkeley Analytical
815 Harbour Way
Suite 6
Richmond, CA 94804

**RE: VOC Emission Testing: CDPH Standard Method v1.2; Non-Full Spread Adhesive/Sealant Application Calculations**

Dear Mr. Huang,

Below are the rational and the calculations for quantity of LATICRETE® LATASIL™ that would be used in the standard school classroom and the standard private office defined in CDPH Standard Method V1.2.

CLASSROOM

Using a 40' x 24' x 8.5' standard school classroom with a tiled floor and a 4' high tiled wainscot as the basis for this scenario, we have the following information. Using the Tile Council of North America EJ-171 as our guideline for movement joint placement assuming tile that is 3/8" thick and a grout joint of ¼". A movement joint will be placed at the change of plane at all walls and one joint placed in the middle of the tile installation, in both directions. This means that there will be 3 joints which are 40' long and 3 joints which are 24' long. Total volume ($in^3$) will be calculated using the following formula;

40' x 12" = 480"
480" x 0.375" x 0.25" = 45 $in^3$
45 $in^3$ x 3 = 135 $in^3$

24' x 12" = 288"
288" x 0.375" x 0.25" = 27 $in^3$
27 $in^3$ x 3 = 81 $in^3$

The wainscot is 4' high, and, since the length of the wainscot at the floor is already calculated in the above, we will only use the LATICRETE LATASIL at the changes of plane and at the top of the wainscot (assuming chair rail is installed).

4' x 12" = 48"
48" x 0.375" x 0.25" = 4.5 $in^3$
4.5 $in^3$ x 8 = 36 $in^3$

40' x 12" = 480"
480" x 0.375" x 0.25" = 45 $in^3$
45 $in^3$ x 1 = 45 $in^3$

24' x 12" = 288"
288" x 0.375" x 0.25" = 27 $in^3$
27 $in^3$ x 1 = 27 $in^3$

The total volume of LATICRETE LATASIL in the classroom scenario would be 324 $in^3$, which equates to about 17 tubes of LATASIL.

OFFICE

Using a 12’ x 10’ x 9’ standard private office with a tiled floor as the basis for this scenario, we have the following information. Using the Tile Council of North America EJ-171 as our guideline for movement joint placement and assuming tile that is 3/8” thick and a grout joint of ¼”. A movement joint will be placed at the change of plane at all walls and tiled cove base. This means that there will be joints only where the tile meets the cove base at two walls which are 12’ long 2 walls which are 10’ long. Total volume ($in^3$) will be calculated using the following formula;

12’ x 12” = 144”
144” x 0.375” x 0.25” = 13.5 $in^3$
13.5 $in^3$ x 2 = 27 $in^3$

10’ x 12” = 120”
120” x 0.375” x 0.25” = 11.25 $in^3$
11.25 $in^3$ x 2 = 23 $in^3$

The total volume of LATICRETE LATASIL in the classroom scenario would be 50 $in^3$, which equates to about 2.6 tubes of LATASIL.

The Tile Council of North America guidelines state, for interior movement joints that they be placed a maximum of 25’ in each direction. A worst case scenario, following these guidelines would mean that a movement be placed in the center of the tiled floor in each direction, and in the center of each of the wainscot walls in the classroom. The office scenario is so small that movement joints would not be installed in the field of the tile floor, so they would only be located where the floor tile meets the cove base.

I hope this information is useful.

Sincerely,

Mitch Hawkins
Technical Service Manager
LATICRETE International, Inc.

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