



# LEED 2012 RECOMMENDS PRODUCT TESTING OF VOC EMISSIONS





## LEED 2012 Recommends Product Testing of VOC Emissions

With its proposed update to the LEED Green Building Rating System (LEED 2012), the US Green Building Council (USGBC) has taken an important step to strengthen LEED's indoor environmental quality requirements regarding volatile organic compound (VOC) emissions from products and materials. The EQ category features a structural reordering of credits, including a new credit for Low-Emitting Interiors. The goal of this new credit is to reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

To earn points for LEED 2012 EQ Credit for Low-Emitting Interiors, manufacturers must have their product tested in accordance with specified testing standards, as applicable to the product category (see Table 1 at the end of the Technical Brief). Also, for the first time, LEED 2012 EQ Credit for Low-Emitting Interiors proposes explicit requirements for VOC emissions for adhesives, sealants, paints, and coatings. These changes underscore that VOC emissions are a recognized health threat and that neutralizing this threat cannot be achieved by limiting VOC content in product formulations. Direct testing of product emissions is the only surefire way

to determine how much and which VOCs a product or material emits.

Paint serves as an example of why the distinction between chemical emissions and chemical content is so important. Conventional wisdom is that "No-VOC" or "VOC-Free" paint has little to no VOCs emissions and thus would not contribute to the level of VOCs in indoor air. However, results of two comparative studies of VOC content/emissions, conducted by UL Air Quality Sciences (UL AQS), show that VOC emissions from a paint claiming "No-VOC" is not uncommon. The first study also found that low VOC-content" paint produced lower levels of VOC emissions than high VOC-content paint (see Table 2 at the end of the Technical Brief).

To further understand the relationship between VOC content and emissions, UL AQS presented recent research on paint emissions at the 12th International Conference on Indoor Air Quality and Climate in Austin, Texas. Emissions tests over a 14-day period were conducted on 26 paint products with reported VOC content levels from 0 g/L to 150 g/L. The investigators analyzed the products for emissions of VOCs and low molecular weight aldehydes. All of the paints tested also had the following attributes:

- Base formulations, with no added tint
- A range of gloss levels, from flat to gloss
- A range of stated maximum VOC content levels
- Conformed to the LEED NC low-emitting credit criteria for paints and coatings

The results demonstrated that 27% of the samples had formaldehyde emissions levels above the CA CREL, 9 µg/m<sup>3</sup>, the new proposed LEED limit for dry product emissions (with the exception of furniture). Two of the products had ethylene glycol emissions at or above the CA CREL (200 µg/m<sup>3</sup>). Details of this study can be found in the published paper, Paint volatile organic compound emissions and volatile organic compound content comparison study (Mason and Ceragioli 2011). Overall, the results of the UL AQS studies confirmed that there is minimal correlation between measured VOC emissions levels and the stated maximum VOC content level.

Products claim to be low-VOC or no-VOC because they comply with various state and federal VOC content regulations. The problem is that these content-based VOC regulations were developed to help



reduce outdoor VOC emissions that contribute to the formation of ground ozone and smog. They were not developed to reduce indoor VOC emissions or chemical exposure to building occupants. Since not all VOCs contribute to ozone and smog formation, “low-VOC” or “no-VOC” products may still contain certain VOCs that can off gas into the indoor environment.

Many building certification programs and eco-labels have been developed around the world to address national markets as well as local environmental issues. And while several of these programs have criteria for VOC and hazardous chemical content limits, only a few explicitly deal with chemical emissions from building materials and products used indoors (Tichenor 2006); even fewer focus solely on chemical emissions. The USGBC’s recommendation of direct testing for product emissions is a commendable initiative towards promoting healthier built environments.

UL AQS has been at the forefront of developing product emissions testing protocols and standards for more than 20 years. UL AQS maintains strong relationships with key product and building certification programs such as USGBC and LEED®, GREENGUARD, UL Environment, Green Seal, and EcoLogo. UL AQS stands ready to assist product manufacturers in creating low-emitting products, and navigating the complexities of product certification to meet the stringent requirements of these and other programs, both in the US and worldwide.

PRODUCT CATEGORY	REQUIREMENTS	TEST METHOD
Building products, excluding built-in cabinetry, architectural millwork, furniture	VOCs. Must meet testing and emission requirements of California Department of Public Health (CDPH) Standard Method V1.1-2010 Specify which range of TVOC a products falls under after 14 days (336 hrs): Less than or equal to 0.5 mg/m <sup>3</sup> Between 0.5 and 5.0 mg/m <sup>3</sup> Great than or equal to 5.0 mg/m <sup>3</sup> Need to state what exposure scenario used for compliance.	Inside US: California Department of Public Health (CDPH) Standard Method V1.1-2010 Outside US: CDPH Standard Method or German AgBB Testing and Evaluation Scheme (2010)
Wet products (paints, coatings, adhesives)	Same as above but also must state what thicknesses are included and, if applicable, what tints are included within the claim.	Inside US: California Department of Public Health (CDPH) Standard Method V1.1-2010 Outside US: CDPH Standard Method or German AgBB Testing and Evaluation Scheme (2010)
Built-in cabinetry, architectural millwork, including composite woods constituting all or a portion of a product, such as countertops, and cabinetry with composite wood cores and internal components	Formaldehyde: Meet California ARB ATCM for formaldehyde requirements for Ultra-Low-Emitting Formaldehyde (ULEF) resins or No-Added Formaldehyde based resins Steady-state concentrations obtained by European standard EN 717-1 can be used for showing compliance after multiplication with a correction factor of 1.63, as defined in a method comparison by CARB, see Appendix H, Section D	Formaldehyde: ASTM E 1333 or ASTM D6007European Standard EN 717-1
Furniture	Comply with BIFMA e3-2010 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2.	ANSI/BIFMA Standard Method M7.1-2011
Adhesives, sealants-healthcare only	All site-applied adhesives and sealants shall contain no CA Prop 65 listed carcinogen or reproductive toxicant components present at more than 1% of total mass of the product	

Table 1: LEED 2012 Proposed criteria for VOC emissions testing\* (\*LEED 2012 DC & C)



	VOC CONTENT PER LABEL (G / L)	VOC CONTENT PER ASTM (G / L)	TVOC EMISSIONS (MG / M <sup>3</sup> )	PREDICTED AIR LEVELS (24 HR) (MG / M <sup>3</sup> )
Flat latex	0	32	18	0.02
Flat latex 2	118	201	19212	4
Flat latex 3	< 250	166	7179	1
Semi gloss 1	0	22	26	0.06
Semi gloss 2	121	169	581	6
Semi gloss 3	< 250	261	4843	34
Gloss 1	< 250	245	3114	35
Gloss 2	< 250	271	32594	721
Gloss 3	< 250	103	2374	0.6

Table 2: Comparative study of VOC content and VOC emissions from paint products

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GREENGUARD. 2011. Paints and Coatings: VOC Content vs. Emission. GG.1008.IS.11. GREENGUARD Environmental Institute. Marietta, Georgia.

LEED 2012 BD&C. Building Design & Construction: LEED Rating System, Second Public Review Draft. July 2011. U.S. Green Building Council. Washington, DC.

Mason S. and Ceragioli A. 2011. Paint volatile organic compound emissions and volatile organic compound content comparison study. Proceedings of Indoor Air 2011. 12th International Conference on Indoor Air Quality and Climate. Austin, Texas. June 5- 12, 2011. Available online at [http://www.aqs.com/Published\\_Papers/Paint%20and%20VOCs.pdf](http://www.aqs.com/Published_Papers/Paint%20and%20VOCs.pdf).

Tichenor BA. 2006. Criteria for Evaluating Programs That Assess Materials / Products to Determine Impacts on Indoor Air Quality. US Environmental Protection Agency, Office of Radiation and Indoor Air, Indoor Environments Division. Washington, DC. 2006. Available online at [www.epa.gov/iaq/pdfs/tichenor\\_report.pdf](http://www.epa.gov/iaq/pdfs/tichenor_report.pdf).

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