

## **GREENGUARD AgBB+ Verification Program**

### **1.0 Background**

#### **1.1 Purpose**

The GREENGUARD Environmental Institute (GEI) introduces GREENGUARD AgBB+, a verification program used in conjunction with participation in one of the GREENGUARD certification programs. This verification demonstrates compliance with the emissions criteria of the German AgBB protocol “Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOC and SVOC) from Building Products;”<sup>1</sup> the VOC, SVOC and formaldehyde emissions requirements of the German Institute for Building Technology (DIBt) health related evaluation of construction products;<sup>2</sup> the VOC limits required for the A+ class in the French VOC emissions labeling regulation;<sup>3</sup> and the French CMR emissions requirements.<sup>4,5</sup> Products that are GREENGUARD certified and AgBB+ verified meet important European Union (EU) and U.S. market requirements for VOC emissions.

#### **1.2 Scope**

AgBB+ verification is applicable to GREENGUARD certified building construction materials and finishing products. Emissions data collected as part of a GREENGUARD certification program are evaluated against product emissions criteria for total volatile organic compounds (TVOC), total semi-volatile organic compounds (TSVOC), EU Directive 67/548/EEC category 1 and 2 carcinogens, Lowest Concentration of Interest (LCI) values, and formaldehyde. These criteria are consolidated from the AgBB protocol, the DIBt health related evaluation of construction products, the French VOC emissions labeling regulation, and French CMR emissions requirements.

### **2.0 Requirements**

#### **2.1 Emissions Testing**

Product emissions are measured following the testing requirements of the most recent versions of the GREENGUARD test method ([GGTM.P066](#)) “Standard Method for Measuring and Evaluating Chemical Emissions from Building Materials, Finishes and Furnishings Using Dynamic Environmental Chambers,”<sup>6</sup> ISO 16000-3 “Determination of Formaldehyde and Other Carbonyl Compounds – Active Sampling Method,”<sup>7</sup> ISO 16000-6 “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,”<sup>8</sup> ISO 16000-9 “Determination of the Emission of Volatile Organic Compounds from Building Products and Furnishing – Emission Test Chamber Method,”<sup>9</sup> ISO 16000-11 “Determination of the Emission of Volatile Organic Compounds from Building Products and Furnishing — Sampling, Storage of Samples and Preparation of Test Specimens,”<sup>10</sup> and/or the AgBB “Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOC and SVOC) from Building Products.”

## 2.2 Emissions Criteria

Product emissions are required to meet the following criteria and be certified under one of GEI's low emitting product certification programs.

Parameter	Criteria	
	3 days	28 days <sup>i</sup>
TVOC (mg/m <sup>3</sup> ) <sup>ii</sup>	≤ 10	≤ 1.0
Cat 1 & 2 Carcinogenic VOCs (mg/m <sup>3</sup> ) <sup>iii</sup>	Σ ≤ 0.01	≤ 0.001 Each
VOCs with an LCI (R-value) <sup>iv</sup>	-	≤ 1
French VOC Regulation Emission Class <sup>v</sup>	-	A+
French Regulation CMR VOCs <sup>vi</sup>	-	≤ 0.001 Each
VOCs unidentified or without an LCI (mg/m <sup>3</sup> ) <sup>vii</sup>	-	ΣVOC ≤ 0.1
TSVOC (mg/m <sup>3</sup> ) <sup>viii</sup>	-	≤ 0.1
Formaldehyde (mg/m <sup>3</sup> ) <sup>ix,x</sup>	-	≤ 0.01

<sup>i</sup> Tests can be stopped after 7 days if the value determined for formaldehyde is below the 28 day limit, all other criteria, including the R values, are below 50% of the 28 day values, and no significant increase in the concentration of individual substances compared to the measurement on the third day is determined. Break-off Criteria for Emission Tests in the Framework of Approval Tests for the Health Assessment of Construction Products in Interiors. [http://www.dibt.de/en/Referat\\_II4.html](http://www.dibt.de/en/Referat_II4.html)

<sup>ii</sup> Defined to be the total response of measured VOCs falling within the C<sub>6</sub> – C<sub>16</sub> range, with responses calibrated to a toluene surrogate.

<sup>iii</sup> EU Directive 67/548/EEC. A list of Cat 1 and 2 compounds can be found at <http://www.dguv.de/ifa/de/fac/kmr/index.jsp>. Applicable supplemental information includes the most recent evaluation mask used by DIBt, [http://www.dibt.de/index\\_eng.html](http://www.dibt.de/index_eng.html).

<sup>iv</sup> Assessed for all VOCs and SVOCs detected above 0.005 mg/m<sup>3</sup> which have LCIs per section 4.3.2 of reference #1. The ratio R determined using the following equation:  $R = \sum C_i / LCI_i$ , where C<sub>i</sub> is the concentration of compound i and LCI<sub>i</sub> is the lowest concentration of interest for compound i. LCIs or Lowest Concentration of Interest chemicals correspond to German Niedrigste Interessierende Konzentration (NIK) Chemicals as specified in reference #1.

<sup>v</sup> French A+ limits for formaldehyde, acetaldehyde, toluene, tetrachloroethylene, xylene, 1,2,4-trimethylbenzene, 1,4-dichlorobenzene, ethylbenzene, 2-butoxyethanol, and styrene,

<sup>vi</sup> French CMR limits for trichloroethylene, benzene, bis 2-ethylhexyl phthalate, and dibutyl phthalate.

<sup>vii</sup> The sum of identified VOCs without LCIs and unidentified compounds observed at concentrations ≥ 0.005 mg/m<sup>3</sup>.

<sup>viii</sup> TSVOC is defined to be the total response of measured VOCs falling within the >C<sub>16</sub> – C<sub>22</sub> range.

<sup>ix</sup> The A+ class limit for formaldehyde from "Arrêté du 19 avril 2011 relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils" Ministère De L'Écologie, Du Développement Durable, Des Transports et Du Logement. 13 Mai 2011. Texte 15 sur 192.

<sup>x</sup> Meets the requirement of ≤ 0.12 mg/m<sup>3</sup> at 28 days as specified by DIBt at [http://www.dibt.de/en/Referat\\_II4.html](http://www.dibt.de/en/Referat_II4.html)

### 3.0 Exposure Environment

Exposure concentrations are determined using the exposure model presented in Table 3.1 and the loading factors in Table 3.2. The exposure environment in Table 3.1 and loading factors in Table 3.2 are based on the CEN TC 351 Reference Room.<sup>11</sup>

**Table 3.1 Summary dimensions for the modeling environment**

CEN TC 351 Reference Room	
Length (m)	4
Width (m)	3
Height (m)	2.5
Volume (m <sup>3</sup> )	30
Air Exchange Rate (hr <sup>-1</sup> )	0.5

**Table 3.2 Loading factors and surface areas used to determine exposure concentrations.<sup>xi</sup>**

Loading Factors and Surface Areas		
Intended Use	Loading Factor (m <sup>2</sup> /m <sup>3</sup> )	Surface Area (m <sup>2</sup> )
Walls	1.0	31.4
Ceilings or Floors	0.4	12
Windows	0.07	2
Doors	0.05	1.6
Very Small Surfaces <sup>xii</sup>	0.007	0.2

<sup>xi</sup> As needed, surface areas and loadings for product types not covered in Section 3.0 will be determined based on product use. This information is documented in test reports.

<sup>xii</sup> Examples of very small surfaces include products used for sealant applications.

## 4.0 References

- <sup>1</sup> Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOC and SVOC) from Building Products. Ausschuss zur gesundheitlichen von Bauprodukten (Committee for Health-Related Evaluation of Building Products). May 2010.  
<http://www.umweltbundesamt.de/bauprodukte/agbb.htm>
- <sup>2</sup> German Institute for Building Technology. Deutsches Institut für Bautechnik (DIBt) Division II Section 4 [http://www.dibt.de/en/Referat\\_II4.html](http://www.dibt.de/en/Referat_II4.html)
- <sup>3</sup> “Order of April 19, 2011 regarding the labeling of construction, wall covering, floor, paint and varnish products for emissions of volatile pollutants.” Ministry of Ecology, Sustainable Development, Transportation and Housing. May 13, 2011. Text 15 of 192.
- <sup>4</sup> Decree of 30 April 2009 on the conditions on placing construction and decoration products containing carcinogenic, mutagenic or reprotoxic substances of category 1 or 2 on the market. French Republic. Ministry of Ecology, Energy, Sustainable Development and Regional Development. <http://textes.droit.org/JORF/2009/05/28/0122/0002/>
- <sup>5</sup> Decree of 28 May 2009 amending the Order of April 30, 2009 relating to the conditions for the marketing of construction and decorative products containing carcinogenic, mutagenic or reprotoxic substances of category 1 or 2. French Republic. Ministry of Ecology, Energy, Sustainable Development and Regional Development.  
<http://textes.droit.org/JORF/2009/05/30/0124/0012/>
- <sup>6</sup> Standard Method for Measuring and Evaluating Chemical Emissions from Building Materials, Finishes and Furnishings Using Dynamic Environmental Chambers. GGTM.P066.  
[http://www.greenguard.org/Libraries/GG\\_Documents/GGTM\\_P066\\_BUILDINGMATERIALSFINISHESANDFURNISHINGS8\\_1\\_11.sflb.ashx](http://www.greenguard.org/Libraries/GG_Documents/GGTM_P066_BUILDINGMATERIALSFINISHESANDFURNISHINGS8_1_11.sflb.ashx)
- <sup>7</sup> ISO 16000-3, Indoor air – Part 3:Determination of Formaldehyde and other Carbonyl Compounds – Active Sampling Method. [www.iso.org](http://www.iso.org)
- <sup>8</sup> 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. [www.iso.org](http://www.iso.org)
- <sup>9</sup> ISO 16000-9, Indoor air – Part 9:Determination of the Emission of Volatile Organic Compounds from Building Products and Furnishing – Emission Test Chamber Method. [www.iso.org](http://www.iso.org)
- <sup>10</sup> ISO 16000-11, Indoor air – Part 11:Determination of the Emission of Volatile Organic Compounds from Building Products and Furnishing - Sampling, Storage of Samples and Preparation of Test Specimens. [www.iso.org](http://www.iso.org)
- <sup>11</sup> CEN TC 351 Assessment of Release of Dangerous Substances from Construction Products – Determination of Emissions into Indoor Air, European Reference Room.  
<http://www.cen.eu/CEN/Sectors/TechnicalCommittees/Workshops/CENTechnicalCommittees/Pages/WP.aspx?param=510793&title=CEN%2FTC+351>