

# GREENGUARD INDOOR AIR QUALITY (IAQ) STANDARD FOR OFFICE EQUIPMENT (HARDCOPY DEVICES)

## 1 Background

### 1.1 Purpose

The GREENGUARD Environmental Institute (GEI) has created this standard to establish a nationally recognized voluntary standard for qualifying office equipment (hardcopy devices) as certified low emitting products for the indoor environment.

### 1.2 Scope

#### 1.2.1 General

The standard is applicable to the determination of organic emissions from office equipment (hardcopy devices). This is a product performance based standard, and the complete toxicity effects of the emissions are beyond the scope of the standard.

Emission criteria as established by Germany's Blue Angle Program for hard copy devices and the accompanying emissions test method (RAL-UZ 122 Appendix 2) are used in this standard with additional requirements for formaldehyde, respirable particles and individual VOCs. Products meeting this standard will also meet the emission requirements of RAL-UZ 122.

The use of environmental test chambers and indoor exposure models to characterize the dynamic emissions from products and their components are well established.

The achievement of test results, that have meaning within the context of the standard, require rigorous sample selection procedures, defined sample collection and handling procedures, and the employment of precise and accurate analytical measurement systems and procedures. Additionally, the manufacturer of the product(s) evaluated in reference to the requirements set forth by the standard must have in place a production quality control system that is capable of assuring products shall be manufactured with consistently close results in similar emissions characteristics over time. Such relevant requirements are set forth in standards and procedures that are referenced by this standard.

This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of the standard to establish appropriate safety and health practices, as well as to determine what regulatory limitations, if any, may exist.

#### 1.2.2 Suitability for Certification

This Standard was created with reference to ISO ISO/IEC 17007:2009 and is suitable for certification purposes.

### 1.3 Process

Certification procedures are presented in **GG.PM.001**, "Program Manual for GREENGUARD Product Certification Programs."

## 2 Terminology

**2.1 Product:** The end result of the manufacturing process, to be offered to the marketplace or as an OEM. A unique item distinguishable by a discrete model number. Specifically, any item supplied by the Manufacturer that the Manufacturer desires to have GREENGUARD certified. An OEM refers to a component product made by one

manufacturer and sold to another company who uses it to make a final product for the marketplace.

### **3 Requirements**

#### **3.1 Emissions Testing**

Product emissions are measured following the testing requirements of **GGTM.P058**, “Method for Measuring Chemical and Particle Emissions from Office Equipment (Hardcopy Devices) Using Dynamic Environmental Chambers” by an accredited indoor air quality testing laboratory recognized by the GEI. The testing and measurement methodologies are consistent with those of ISO/IEC 28360:2007, “Information Technology - Office Equipment - Determination of Chemical Emission Rates from Electronic Equipment” and follow the BAM RAL-UZ 122 Appendix 2 methodology used for Germany's Blue Angel Environmental Label Program.

#### **3.2 Exposure Modeling**

Exposure concentrations (room concentrations) are determined using the model presented in **GGTM.P058** Table 6.2. The office model as detailed in Section 3.2.1 is always used. However, as needed, specialized models (room size, ventilation rate and number of products) are created for specific product use and documented within the certification report(s).

##### **3.2.1 Office Environment**

The GREENGUARD office has dimensions of 3.05 m x 4.27 m x 2.44 m (10' x 14' x 8'), which results in a room volume of 32 m<sup>3</sup> (1130 ft<sup>3</sup>). The room has one 0.914 m x 2.13 m (3' x 7') door and four 1.09 m x 0.94 m (43" x 37") windows. The office is designed for single occupancy. The ventilation rate used is 0.72 ACH and is based on assumed floor occupancy of 7 people per 92.9 m<sup>2</sup> (1000 ft<sup>2</sup>) and ASHRAE Standard 62.1-2007 “Ventilation for Acceptable Indoor Air Quality” using the specified parameters of 5 cfm per person and 0.06 cfm/ft<sup>2</sup> for office spaces in office buildings.

#### **3.3 Emissions Criteria**

GREENGUARD requirements are based on the emission rate (mg/hr) and predicted air concentrations (mg/m<sup>3</sup>) during the print/copy phase of operation as detailed below. Emissions criteria (mg/hr) as required by Germany's Blue Angel Program's RAL-UZ 122 are adopted for use in the GREENGUARD Certification Program for emissions of TVOC, benzene, styrene, ozone, and total dust. Additional criteria for formaldehyde, respirable particles and other individual VOCs are added based on current IAQ requirements and expectations among other public health organizations and specifications. These emission rates are converted to room concentrations (mg/m<sup>3</sup>) according to the exposure model described in Section 3.2.

<i>Monochrome</i>		
<b>Blue Angel &amp; GREENGUARD Acceptable IAQ Criteria</b>		
<b>Emitted Substance</b>	<b>Emission Rate [mg/h]</b>	<b>Room Concentration [mg/m<sup>3</sup>]</b>
TVOC <sup>2,3</sup>	10	≤ 0.4
Benzene <sup>2</sup>	0.05	≤ 0.002
Styrene <sup>2</sup>	1	≤ 0.04
Ozone <sup>2</sup>	1.5	≤ 0.06
Total Dust <sup>3</sup>	4	≤ 0.16
<b>Additional</b> criteria for GREENGUARD certification		
Formaldehyde	1.2	≤ 0.05
Individual VOCs <sup>1</sup>	---	≤ 0.1 TLV
Respirable Particles (PM <sub>10</sub> ) <sup>4</sup>	---	≤ 0.15 mg/m <sup>3</sup>
Listing of measured carcinogens and reproductive toxins as identified by California Proposition 65, the U.S. National Toxicology Program (NTP), and the International Agency on Research on Cancer (IARC) must be provided.		
Any pollutant regulated as a primary or secondary outdoor air pollutant must meet a concentration that will not generate an air concentration greater than that promulgated by the National Ambient Air Quality Standard (U.S. EPA, Code of Federal Regulations, Title 40, and Part 50).		

<i>Color</i>		
<b>Blue Angel &amp; GREENGUARD Acceptable IAQ Criteria</b>		
<b>Emitted Substance</b>	<b>Emission Rate [mg/h]</b>	<b>Room Concentration [mg/m<sup>3</sup>]</b>
TVOC <sup>2,3</sup>	18	≤ 0.8
Benzene <sup>2</sup>	0.05	≤ 0.002
Styrene <sup>2</sup>	1.8	≤ 0.08
Ozone <sup>2</sup>	3	≤ 0.13
Total Dust <sup>3</sup>	4	≤ 0.16
<b>Additional</b> criteria for GREENGUARD certification		
Formaldehyde	1.2	≤ 0.05
Individual VOCs <sup>1</sup>	---	≤ 0.1 TLV
Respirable Particles (PM <sub>10</sub> ) <sup>4</sup>	---	≤ 0.15 mg/m <sup>3</sup>
Listing of measured carcinogens and reproductive toxins as identified by California Proposition 65, the U.S. National Toxicology Program (NTP), and the International Agency on Research on Cancer (IARC) must be provided.		
Any pollutant regulated as a primary or secondary outdoor air pollutant must meet a concentration that will not generate an air concentration greater than that promulgated by the National Ambient Air Quality Standard (U.S. EPA, Code of Federal Regulations, Title 40, Part 50).		

<sup>1</sup> Any VOC not listed must produce an air concentration level no greater than  $1/10$  the Threshold Limit Value (TLV) industrial work place standard (Reference: American Conference of Government Industrial Hygienists, 6500 Glenway, Building D-7, Cincinnati, Ohio 45211-4438).

<sup>2</sup> Styrene, benzene, ozone, total VOCs and total dust levels correspond to the German Blue Angel Environmental Label (BAM) program requirements for emissions from hard copy devices.

<sup>3</sup> Defined to be the total response of measured VOCs falling within the C<sub>6</sub> – C<sub>16</sub> range. Responses calibrated to authentic standards, for a target list defined by BAM. Other VOCs quantified relative to toluene.

<sup>4</sup> Respirable particles are based on the National Air Quality Ambient Standard 24-hour average, promulgated January, 2007. Results based on an 8-hour average.