

GREENGUARD Emissions Criteria

For use with GREENGUARD Certification ProgramSM for Low Emitting Products

Electronic Equipment - Applicable to:

- Computers
- Video Monitors
- Televisions
- DVD Players
- Cable Boxes
- Scanners
- Receivers
- CD Players
- Speakers

	Short-Term (Acute)*	Long-Term (Chronic)*
TVOC (mg/m ³) ¹	≤5.0	≤0.22
Formaldehyde (ppm) ²	≤0.040	≤0.013
Carcinogens ³	NA	Less Than the EPA IUR
Chronic Noncancer Toxins ⁴	NA	Less Than the ATSDR MRL, ½ the CA CREL, and the EPA RfC
Acute Noncancer Toxins ⁵	Less Than the ATSDR MRL and the CA AREL	NA
Developmental/Reproductive Toxins ⁶	Less Than the ATSDR MRL and the CA AREL	NA
Other Individual VOCs ⁷ (Occupational Exposure Levels)	Less Than 1/10 the STEL/C corresponding to the ACGIH TLV and AIHA WEEL (or Less Than the TWA if no STEL/C)	Less Than 1/100 the TWA corresponding to the ACGIH TLV and AIHA WEEL
Total Phthalates (mg/m ³) ⁸	NA	≤0.01
Ozone (ppm)	NA	≤0.05
Respirable Particles (PM _{2.5}) mg/m ³	N/A	≤0.035

NA = Not Applicable

¹Defined to be the total response of measured VOCs falling within the C₆ – C₁₆ range, with responses calibrated to a toluene surrogate.

²Short-term level based on the ATSDR Acute Duration Minimal Risk Level (MRL). Long-term level based on ½ CA-OEHHA determined ALARA (As Low As Reasonably Achievable) value.

³Compared the concentration corresponding to an E-5 risk level for the EPA Inhalation Unit Risk (IUR). Excludes formaldehyde, which is covered by (2) above.

⁴Compared to the EPA Reference Concentration (RfC), CA Chronic Reference Exposure Level (CREL), and the ATSDR Intermediate or Chronic Duration MRL. Intermediate MRLs shall be used if a Chronic MRL is not available for that compound. Excludes Developmental and Reproductive endpoints (see Developmental/Reproductive Toxins).

⁵Compared to ATSDR Acute Duration MRL and CA Acute Reference Exposure Level (AREL). Excludes Developmental and Reproductive endpoints which are covered by Developmental/Reproductive Toxins in (6) below.

⁶Compared to CA ARELs and ATSDR MRLs for chemicals with Developmental or Reproductive endpoints.

⁷For the short-term exposure comparison, any VOC not otherwise listed must produce an air concentration level no greater than 1/10 the Short-Term Exposure Level or Ceiling (STEL/C) listed as an American Conference of Government Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) or American Industrial Hygiene Association (AIHA) Workplace Environmental Exposure Limit (WEEL), or no greater than the Time-Weighted Average TLV or WEEL if no STEL/C available. For the long-term exposure comparison, all VOC's must be less than 1/100 the TWA listed as an ACGIH TLV or AIHA WEEL.

⁸Defined to be the total response of a specific target list of phthalates including dibutyl (DBP), diethylhexyl (DEHD), diethyl (DEP), butylbenzyl (BBP), di-octyl (DOP), and dimethyl (DMP) phthalates (conducted using a modified phthalate specific analytical method, OSHA 104).

***Refer to the attached data application methodology.**

Products meeting these emission criteria also meet the Emission Criteria defined by GREENGUARD for Children & SchoolsSM.

GREENGUARD Certification affirms that a product's emissions fall within the limits selected by GREENGUARD from reputable third-party risk based criteria, as identified above. GREENGUARD program testing is conducted consistent with a defined protocol and does not measure emissions under usage conditions other than those defined in the protocol and does not address potential environmental impact other than chemical emissions.

Application of GREENGUARD Emissions Standard for Electronic Equipment

	Short-Term (Acute)	Long-Term (Chronic)
Step 1		
For All Emission Criteria	The maximum emission rate ($\mu\text{g}/\text{m}^2\text{-hr}$) measured during an 8-hour testing period is combined with product use assumptions (product loading, ventilation rate, building volume) to determine a predicted exposure concentration ($\mu\text{g}/\text{m}^3$) as a result of product use.	The average (8-hour time-weighted) emission rate ($\mu\text{g}/\text{m}^2\text{-hr}$) is combined with product use assumptions (product loading, ventilation rate, building volume) to determine a predicted exposure concentration ($\mu\text{g}/\text{m}^3$) as a result of product use.
Step 2		
TVOC	The maximum predicted TVOC exposure concentration is compared directly to the GREENGUARD TVOC criterion.	The average predicted TVOC exposure concentration is used as a conservative proxy for chronic exposure and is compared directly to the GREENGUARD TVOC criterion.
Formaldehyde	The maximum predicted formaldehyde exposure concentration is compared directly to the GREENGUARD formaldehyde criterion.	The average formaldehyde predicted exposure concentration is used as a conservative proxy for chronic exposure and is compared directly to the GREENGUARD formaldehyde criterion.
Carcinogens (EPA IRIS - Inhalation Unit Risk)	Not applicable to acute exposures.	Individual VOC's detected in the emissions from the product are compared to a database of chemicals for which carcinogenic risks as a result of inhalation exposure have been evaluated by the US EPA. These compounds evaluated by the US EPA will have an established Inhalation Unit Risk (IUR). The IUR can be used to determine the risk level (excess cancers in a given population) posed by exposure to the chemical at a given concentration. Those compounds found to be emitting from the product that have been evaluated by the US EPA for inhalation carcinogenic risks are selected for further analysis. For these compounds, the average predicted exposure concentration is compared to the concentration corresponding to an E-5 risk level (1 excess cancer per population of 100,000 people) for the EPA IUR. The average predicted exposure is used as a conservative proxy for chronic exposure.
Chronic Non-cancer Toxins	Not applicable to acute exposures.	Individual VOC's detected in the emissions from the product are compared to a database of chemicals for which Minimal Risk Levels (ATSDR Chronic MRL's), Reference Concentrations (EPA RfC's), and Chronic Reference Exposure Levels (California CREL's) have been established. Those compounds found to be emitting from the product and having an established Chronic MRL, RfC, and/or CREL are selected for further analysis. For those compounds, the average predicted exposure concentration for each chemical is compared to its corresponding Chronic MRL, RfC, and/or $\frac{1}{2}$ CREL for determination of compliance with the GREENGUARD criteria. The average predicted exposure is used as a conservative proxy for chronic exposure.

Application of GREENGUARD Emissions Standard for Electronic Equipment

Acute Non-cancer Toxins	Individual VOC's detected in the emissions from the product are compared to a database of chemicals for which Minimal Risk Levels (ATSDR Acute MRL's) and Acute Reference Exposure Levels (California ARELs) have been established. Those compounds found to be emitting from the product and having an established MRL and/or AREL with endpoints other than Developmental/Reproductive are selected for further analysis. For those compounds, the maximum predicted exposure concentration for each chemical is compared to its corresponding Acute MRL and/or AREL for determination of compliance with the GREENGUARD criteria.	Not applicable to chronic exposures.
Developmental/ Reproductive Toxins (MRLs and ARELs)	Individual VOC's detected in the emissions from the product are compared to a database of chemicals for which Minimal Risk Levels (ATSDR MRLs) and Acute Reference Exposure Levels (California ARELs) have been established. Those compounds found to be emitting from the product and having an established MRL and/or AREL with Developmental/Reproductive endpoints are selected for further analysis. For those compounds, the maximum predicted exposure concentration for each chemical is compared to its corresponding MRL and/or AREL, with Developmental/Reproductive endpoints, for determination of compliance with the GREENGUARD criteria.	Not applicable to chronic exposures.
Other Individual VOCs (Occupational Exposure Levels)	Individual VOCs detected in the emissions from the product for which an MRL, AREL, or MADL has not been established are compared to databases of chemicals for which Threshold Limit Values (TLVs) or Workplace Environmental Exposure Limits (WEELs) have been established. Those compounds found to be emitting from the product and not having an established MRL, AREL or MADL but having a TLV and/or WEEL are selected for further analysis. For these compounds, the maximum predicted exposure concentration for each chemical is compared to 1/10 th of its corresponding Short Term Exposure Limit or Ceiling value (STEL/C) TLV or WEEL or to the Weighted Average (TWA) TLV or WEEL if no STEL/C exists.	Individual VOCs detected in the emissions from the product for which a NSRL, IUR, Chronic MRL, RfC, or CREL has not been established are compared to databases of chemicals for which Threshold Limit Values (TLVs) or Workplace Environmental Exposure Limits (WEELs) have been established. Those compounds found to be emitting from the product and not having an established NSRL, IUR, Chronic MRL, RfC or CREL but having a TLV and/or WEEL are selected for further analysis. For these compounds, the average predicted exposure concentration for each chemical is compared to 1/100 th of its corresponding Time Weighted Average (TWA) TLV or WEEL for determination of compliance with the GREENGUARD criteria.