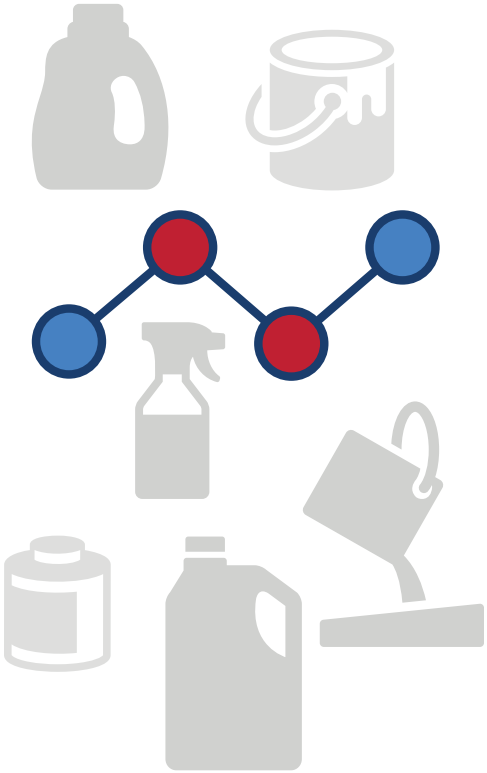
TECHNICAL BRIEF

Chemical Insights
An Institute of Underwriters Laboratories Inc.

Ethylene Glycol — A Common Air Pollutant

Background

Ethylene glycol, or 1,2-ethanediol ($C^2H^6O^2$, CAS # 107-21-1), is a clear, odorless, sweet-tasting liquid that has a low vapor pressure and absorbs water. Ethylene glycol is commonly found in the indoor air and is associated with volatile emissions from various adhesives and sealants, paints and coatings, floor sealants, and industrial cleaners. Ethylene-based glycol ethers are common in most household cleaners. In our most recent database, ethylene glycol has been found in approximately 30% of all tested paints and coating with a mean value of approximately 400 µg/m^3 . It is often in antifreeze, which is commonly stored in household garages and emissions may pass into a house.



Health Concerns

Ethylene glycol exposure can occur through inhalation of sprayed aerosols/mist or vapor and ingestion of contaminated food, water, and surfaces. Ethylene glycol is poorly absorbed through the skin, but can cause some irritation. Systemic toxicity can occur through ingestion and takes only one to four hours to be absorbed through the stomach. Acute exposures may result in eye, nose, throat, and respiratory irritation. Longer term exposure is of concern since ethylene glycol is a reproductive toxin and may affect a fetus. In the body, ethylene glycol is broken down into toxic compounds that affect the central nervous and cardiopulmonary systems and can eventually lead to kidney failure. Ingestion of large amounts can be fatal if untreated.

Acceptable Exposure Levels

Below is a list of some U.S. and global organizations with ethylene glycol exposure limits (Table 1).

Table 1: Ethylene Glycol Exposure and Emission Standards

Organization or Standard	Application	Exposure Limit	Additional Information
CA 01350 Specification	Product emissions	200 µg/m^3	CDPH SM 01350 requires that emission levels for ethylene glycol from building products and materials be equal to or less than 200 µg/m^3 within 14 days after installation. Certification programs like CHPS and GREENGUARD gold have adopted this requirement.
AgBB	General air/ Indoor air	260 µg/m^3	Ausschuss zur gesundheitlichen Bewertung von Bauprodukten (AgBB) sets Lowest Concentration of Interest (LCI) for VOC emissions from building products. LCI for acetophenone is 260 µg/m^3.
Green Building Council Leadership in Environment and Energy Design (LEED)	Indoor air	400 µg/m^3	The LEED rating system specifies a maximum concentration of ethylene glycol in indoor air of 400 µg/m^3. This level applies to clearance testing of air levels before a building or school is occupied.
California Office of Environmental Health Hazard Assessment (OEHHA)	General air/ Indoor air	400 µg/m^3	Inhalation Reference exposure levels (RELs) address non-cancer health effects of volatile organic compounds (VOCs) and provide concentrations below which these health effects have been observed in studies. Ethylene glycol inhalation chronic REL: 400 µg/m^3

Table 1 Continued: Ethylene Glycol Exposure and Emission Standards			
Organization or Standard	**Application**	**Exposure Limit**	**Additional Information**
California Proposition 65 (Prop 65)	General air/ Indoor air	8700 µg/day (ingestion)	Prop 65 maximum allowable dose level for ethylene glycol is 8700 µg/day for its developmental toxicity.
The United States Environmental Protection Agency (U.S. EPA)	General air/ Indoor air	2 mg/kg-day	The U.S. EPA maintains the Integrated Risk Information System (IRIS), a database on information on noncancer and cancer health effects that may result from exposure to various substances in the environment, based on toxicological reviews. Ethylene glycol has the reference dose for oral exposure (RfD) of 2 mg/kg-day for its kidney toxicity.
CDC's Agency for Toxic Substances and Disease Registry (ATSDR)	General air/ Indoor air & oral	Acute inhalation: 2 mg/m^3 Oral: 0.8 mg/kg-day	The CDC's Agency for Toxic Substances and Disease Registry (ATSDR) has developed Minimal Risk Levels (MRLs) which estimate the daily level to which a substance may be exposed without the likelihood of adverse, non-cancer health effects. MRLs are derived for acute (1 - 14 days), intermediate (>14 - 364 days), and chronic (365 days and longer) exposure durations. The ethylene glycol acute inhalation MRL is 2 mg/m^3, the acute and intermediate MRL for oral exposure is 0.8 mg/kg-day
California The Division of Occupational Safety and Health (Cal/OSHA)	General air/ Indoor air	40 ppm (100 mg/m^3)	Ceiling permissible exposure limit (PEL) for ethylene glycol is 40 ppm (100 mg/m^3).
American Conference of Governmental Industrial Hygienists (ACGIH)	Occupational/ Indoor air	TWA: 25 ppm STEL: 50 ppm	Threshold Limit Values (TLV®s) are guidelines for the level of exposure that the typical worker can be exposed to without adverse health effects. They are not quantitative estimates of risk at different exposure levels or by different routes of exposure. The ethylene glycol ceiling TLV-8-hr time weighted average (TWA) is 25 ppm. Short term exposure limit (STEL) is at 50 ppm for vapor fraction, and 10 mg/m^3 for inhalable particulate matter in aerosol form only.

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