

Organic Vapours in Office Buildings By John Dean, C5 Plus

Airborne hydrocarbons in the air of office buildings originate from many sources such as cigarette smoke, printed-paper, cleaning products (e.g. wax strippers), copying machines, carpet adhesives, furnishings, deodorizers, inks, glues, perfumes and even residual solvents from dry cleaned clothes. They are sometimes referred to as volatile organic compounds (VOCs). Little is known about the health effects of low concentrations of various combinations of volatile organic compounds, particularly with respect to infrequent exposures.

Within Alberta the only regulation that applies specifically to human exposure to volatile hydrocarbon vapours is the Chemical Hazards Regulation 393/97, under the Occupational Health and Safety Act. It applies to worker exposures within an industrial work environment and requires the employer to maintain volatile hydrocarbon vapours concentrations as low as reasonably practicable and not great than specified limits, referred to as Occupational Exposure Limits¹ (OEL). Some compounds within the list of volatile hydrocarbons, because they are considered potentially more damaging to human health, have OEL's that are much lower than others. Benzene is one of those compounds.

For the general public who may be exposed to organic vapours, outside of the industrial work environment, it is generally considered important that the vapour concentrations within the home or office building-working environment should be considerably less. The reason is considered to be that, unlike an industrial work environment where the occupants are generally young and robust, the occupants of homes and office buildings often include the very young and the very old. A concentration of 1% of OEL's is typically used as a guideline for those locations. In support of this, Molhave² has indicated that, at volatile hydrocarbon vapours concentrations above 3 mg/m³ (3,000 ug/m³) clinical effects are always expected. Odours are often expected to be significant at 3 mg/m³ (3,000 ug/m³) and there is irritation of the mucous membranes at 8 mg/m³ (8,000 ug/m³). This concentration represents at least 1% of the concentration (of gasoline) considered to be harmful to the health of industrial workers.

Little is known about the health effects of low concentrations of various combinations of volatile organic compounds, particularly with respect to infrequent exposures. Over 900 organic chemicals have been identified in indoor office air, from both synthetic and natural sources. The inherent toxicity of these compounds varies widely; from those that are innocuous to those that are strong irritants or powerful anesthetics. Complicating everything is the presence of reactive gases that can change the nature and characteristics of each compound. Such a reactive gas is ozone. In the office environment, a major source of ozone is electrostatic equipment, such as photocopiers, laser printers and air cleaners that have a corona discharge. Studies have shown that ozone can transmute innocuous organic chemicals into chemicals that are irritating to building occupants.

¹[1] Occupational Exposure Limits are guidelines that refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects. It is recognized that there may be individual workers who may be unusually responsive to lower concentrations because of genetic factors, age, personal habits (such as smoking or drug use) or previous exposures. OEL's are based on information gained from experience, experimental human and animal studies.

¹[2] Molhave L. 1990. Volatile Organic Compounds, Indoor Air Quality and Health. Proceedings of the 5th International Conference on Indoor Air Quality and Climate, Toronto, 1990, Vol. 5, pp 15 - 33. International Conference on Indoor Air Quality and Climate, Ottawa.