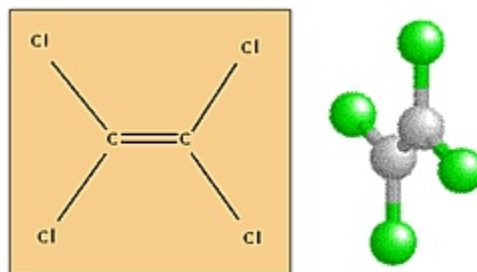


About PCE

Tetrachloroethylene (PCE) is a synthetic chemical that is widely used for dry cleaning of fabrics and for metal-degreasing operations. PCE has relatively low solubility in water and has medium-to-high mobility in soil. It tends to volatilize (evaporate) from surface environments; however, it may persist in subsurface soil and groundwater for months or years, depending on subsurface conditions.

PCE in the Environment — PCE may be released to the environment through industrial emissions from dry cleaners and other industrial facilities that use PCE. Although releases are primarily to the atmosphere, PCE is also released to surface water and land in sewage sludges, in other liquid and solid waste, and through accidental spills or leaks.



If sufficient quantities are released to soils, the PCE percolates down to the water table, where it dissolves into groundwater and forms a "plume" of contaminated groundwater. The contaminant plume then migrates in the direction of groundwater flow.

EPA (1982) has estimated that 80-90% of the PCE used annually in the United States is released to the environment, particularly to the atmosphere. A major portion of the atmospheric releases are attributed to evaporative losses in the dry cleaning industry. Other atmospheric emissions occur from metal degreasing uses, production of fluorocarbons and other chemicals, textile industry uses, and miscellaneous solvent-associated applications.

PCE and Human Health — The effects of PCE on human health depend upon how much exposure occurs and the length and frequency of the exposure. The U.S. Environmental Protection Agency (EPA) evaluates long-term health concerns based on 30 years of continuous (24 hours per day) exposure.

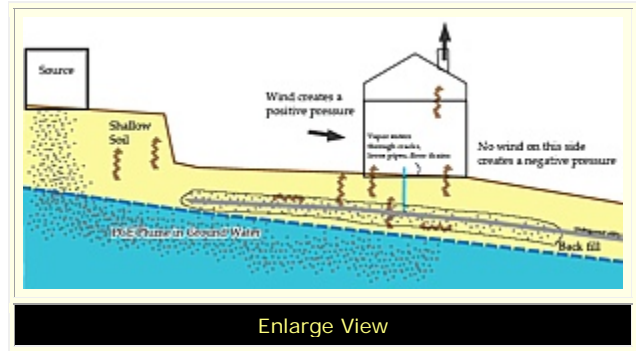
Health-protective levels have also been established by the Agency for Toxic Substances and Disease Registry (ATSDR) for short-term exposure. ATSDR reviewed data from occupational exposures of dry-cleaning workers and found that there were observable neurological effects, including delayed response times to visual cues and respiratory irritation. These effects were temporary and went away after exposure ended.

Exposure Pathways — Exposure to PCE occurs primarily through ingestion or inhalation. You can be exposed to PCE via inhalation, by using certain consumer products. Products that may contain it include water repellents, silicone lubricants, fabric finishers, spot removers, adhesives, and wood cleaners. When you bring clothes home from the dry cleaners, the clothes release small amounts of PCE into the air.

PCE can evaporate from contaminated groundwater, and these vapors may migrate upward as soil gas and travel into homes or buildings overlying the contaminant plume. This process is called "vapor intrusion". Occupants of the building are then exposed by breathing the vapors that have entered the indoor air.

Short-term Exposure

PCE has been used safely as a general anesthetic agent, so at high concentrations, it is known to produce loss of consciousness. When concentrations in air are high (particularly in closed, poorly ventilated areas) single exposures can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. These symptoms occur almost entirely in work (or hobby) environments when individuals have been accidentally exposed to high concentrations or have intentionally abused PCE to get a "high." In industrial settings, most workers are exposed to levels lower than those causing dizziness, sleepiness, and other nervous system effects



Long-term Exposure

Long-term exposure at lower concentrations is a potential health concern. In residences with low concentrations, the main concern is whether the chemicals may pose an unacceptable risk of chronic health effects due to long-term exposure to these low levels. A complicating factor in evaluating the potential chronic risk from vapor intrusion is the potential presence of some of the same chemicals at or above background concentrations from the outdoor air and/or emission sources in the building (e.g., household solvents, adhesives, cleaners).

Regulations — The drinking water standard for PCE is 5 parts per billion (ppb), measured as 5 micrograms per liter ($\mu\text{g/L}$); that's the equivalent of \$5 dollars out of \$1 billion dollars.

Chemistry — PCE is called a "dense" liquid because it is heavier than water (PCE is about 1.6 times heavier than water); it is "non-aqueous" because it's only slightly soluble in water (150 to 200 mg/L or 150 to 200 parts per million); it's considered a "volatile organic compound" (VOC) because it evaporates readily. PCE contains two carbon atoms linked by a double bond and four chlorine atoms, MW = 165.83
