

Chemical Profiles

Trichloroethylene

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What are other names or identifying information for trichloroethylene?

CAS Registry No.: 79-01-6

Other Names: TCE; 1,2,3-Trichloroethylene

Main Uses: Degreasing, solvent, chemical intermediate.

Appearance: Clear colourless volatile liquid (sometimes dyed blue).

Odour: Ethereal, chloroform-like

Canadian TDG: UN1710

What is the WHMIS classification?

The Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) does not currently list a classification for trichloroethylene (as reviewed on January 17, 2024).

Note that trichloroethylene dioxide has been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as A2 – Suspected human carcinogen, and by the International Agency for Research on Cancer (IARC) as Class 1 - Carcinogenic to humans.

What are the most important things to know about trichloroethylene in an emergency?

Emergency Overview: Clear colourless volatile liquid. Ethereal odour. Can ignite if strongly heated. Can form very hazardous decomposition products. Can accumulate in hazardous amounts in low-lying areas, especially inside confined spaces. TOXIC if inhaled. May cause respiratory irritation. May cause drowsiness and dizziness. IRRITANT. Causes moderate or severe eye and skin irritation. CANCER HAZARD. May cause cancer. MUTAGEN. May cause genetic defects.

What are the potential health effects of trichloroethylene?

Main Routes of Exposure: Inhalation; skin contact; eye contact.

- **Inhalation:** TOXIC, can cause death. Can irritate the nose and throat. Can harm the nervous system. Symptoms may include headache, nausea, dizziness, drowsiness and confusion. A severe exposure can cause unconsciousness.
- **Skin Contact:** SKIN IRRITANT. Causes moderate to severe irritation. Symptoms include pain, redness, and swelling. The vapour also irritates the skin. Can be absorbed through the skin, but harmful effects are not expected.
- **Eye Contact:** EYE IRRITANT. Causes moderate to severe irritation. At high concentrations: the vapour also irritates the eyes.
- **Ingestion:** Can irritate the mouth, throat and stomach. Can cause effects as described for inhalation.

Effects of Long-Term (Chronic) Exposure: Commercial trichloroethylene contains stabilizers, which may contribute to toxicity. Can cause dry, red, cracked skin (dermatitis) following skin contact. Conclusions cannot be drawn from the limited studies available. May harm the nervous system. Symptoms may include headaches, fatigue, memory loss, irritability, depression and reduced ability to think or reason. The nerves of the face and head (cranial nerves) may be affected by long-term exposure to trichloroethylene or chemicals formed when it decomposes. May cause hearing loss. May harm the liver. May harm the kidneys. May harm the immune system.

- **Carcinogenicity:** Carcinogen. Known to cause: kidney cancer. Has been associated with: liver cancer, cancer of the lymphatic system.
 - International Agency for Research on Cancer (IARC): Group 1 - Carcinogenic to humans.
 - American Conference for Governmental Industrial Hygienists (ACGIH): A2 - Suspected human carcinogen.
 - **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child.
 - **Reproductive Toxicity:** Not known to be a reproductive hazard. Conclusions cannot be drawn from the limited studies available.
 - **Mutagenicity:** MUTAGEN. May cause genetic damage based on animal information.
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What are first aid measures for trichloroethylene?

Inhalation: Take precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment). Move the victim to fresh air. If breathing has stopped, trained personnel should begin artificial respiration (AR). Get medical attention as soon as possible.

Skin Contact: Avoid direct contact. Wear chemical protective clothing if necessary. Quickly take off contaminated clothing, shoes and leather goods (e.g., watchbands, belts). Immediately flush with gently flowing water for 15-20 minutes. Get medical attention immediately. Thoroughly clean clothing, shoes and leather goods before reuse or dispose of safely. Double bag, seal, label, and leave contaminated clothing, shoes, and leather goods at the scene for safe disposal.

Eye Contact: Avoid direct contact. Wear chemical protective gloves if necessary. Immediately flush the contaminated eye(s) with gently flowing water for 15-20 minutes, occasionally lifting the upper and lower eyelids. If a contact lens is present, DO NOT delay flushing or attempt to remove the lens. Get medical attention immediately.

Ingestion: Have the victim rinse mouth with water. Get medical attention immediately.

First Aid Comments: Some of the first aid procedures recommended here require advanced first aid training. If exposed or concerned, see a medical professional for advice. All first aid procedures should be periodically reviewed by a medical professional familiar with the chemical and its conditions of use in the workplace.

What are fire hazards and extinguishing media for trichloroethylene?

Flammable Properties: Can ignite if strongly heated and/or exposed to a high energy ignition source (e.g., a welding arc).

Suitable Extinguishing Media: Use an extinguishing agent suitable for the surrounding fire. If trichloroethylene is burning use: carbon dioxide, dry chemical powder, appropriate foam, water spray or fog.

Specific Hazards Arising from the Chemical: Vapour may accumulate in hazardous amounts in low-lying areas, especially inside confined spaces, resulting in a toxicity hazard. Closed containers may rupture violently when heated, releasing contents. In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide; corrosive hydrogen chloride; corrosive chlorine; corrosive phosgene; toxic halogenated compounds; and other chemicals.

What are the stability and reactivity hazards of trichloroethylene?

- **Chemical Stability:** Stable if inhibited. Slowly decomposes in the air. Sunlight, heat, air or oxygen, and moisture accelerate this reaction.
 - **Conditions to Avoid:** Open flames, sparks, static discharge, heat and other ignition sources. High energy sources, e.g. welding arcs. Sunlight. Water, moisture or humidity. Depletion of stabilizers.
 - **Incompatible Materials:** Increased risk of fire and explosion on contact with: alkali metals (e.g., sodium or potassium), strong bases (e.g., sodium hydroxide), strong oxidizing agents (e.g., perchloric acid), epoxides (e.g., ethylene oxide). Not corrosive to: carbon steel. Corrosive to aluminum and alloys (unspecified) when unstabilized, heated or in the presence of water.
 - **Hazardous Decomposition Products:** None known.
 - **Possibility of Hazardous Reactions:** None known.
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What are unintentional release measures for trichloroethylene?

Personal Precautions: Keep unnecessary and unprotected personnel out of the spill area. Use personal protective equipment as required. Ventilate area. Do not touch damaged containers or spilled products unless wearing appropriate protective equipment. Increase ventilation to the area or move the leaking container to a well-ventilated and secure area. Eliminate ignition sources.

Methods for Containment and Clean-up: Do not touch spilled material. Stop or reduce leaks if safe to do so. Dike and recover contaminated water for appropriate disposal. Place used absorbent into suitable, covered, labelled containers for disposal. Flush spill area. Contaminated absorbent poses the same hazard as the spilled product.

What handling and storage practices should be used when working with trichloroethylene?

Handling: Before handling, it is important that all engineering controls are operating and that protective equipment requirements and personal hygiene measures are being followed. Only trained personnel should work with this product. In the event of a spill or leak, immediately put on an escape-type respirator and exit the area. Immediately report leaks, spills, or failures of the safety equipment (e.g., ventilation system). Prevent uncontrolled release of the product. Prevent unintentional contact with incompatible chemicals. Do not use near welding operations or other high-energy sources. Keep containers tightly closed when not in use or empty. Never reuse empty containers, even if they appear to be clean.

Storage: Store in an area that is: cool, dry, well-ventilated, out of direct sunlight and away from heat and ignition sources, separate from incompatible materials, an approved, fire-resistant area. Keep the amount in storage to a minimum. Store in the original, labelled, a shipping container. Label the container with the date received, date opened and disposal date. Use a first-in, first-out inventory system. Empty containers may contain hazardous residue. Store separately. Keep closed. Avoid bulk storage indoors.

What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for trichloroethylene?

ACGIH® TLV® - TWA: 10 ppm A2 BEI®

ACGIH® TLV® - STEL [C]: 25 ppm A2

Exposure Guideline Comments: TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. A2 = Suspected human carcinogen. BEI® = Biological Exposure Index.

Adapted from: 2022 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH).

NOTE: In many (but not all) Canadian jurisdictions, the exposure limits are similar to the ACGIH® TLVs®. Since legislation varies by jurisdiction, contact your local jurisdiction for exact details. A list is available in the OSH Answers on [Canadian Governmental Occupational Health & Safety Departments](#).

A list of acts and regulations that cover [exposure limits to chemical and biological agents](#) is available on our website. Please note that while you can see the list of legislation for free, you will need a subscription to view the actual documentation.

What are the engineering controls for trichloroethylene?

Engineering Controls: It may be necessary to use stringent control measures such as process enclosure to prevent product release into the workplace. Use a ventilation system separate from other exhaust ventilation systems. Filter the contaminated air before it is directly exhausted to the outside. Provide eyewash and safety shower if contact or splash hazard exists.

What Personal Protective Equipment (PPE) is needed when working with trichloroethylene?

Eye/Face Protection: Wear chemical safety goggles. A face shield (with safety goggles) may also be necessary.

Skin Protection: Wear chemical protective clothing e.g. gloves, aprons, boots. [Suitable materials](#) include: Viton®, Silver Shield® - PE/EVAL/PE, ChemMAX® 4 Plus, Frontline® 500, AlphaTec® (02-100, EVO, VPS), Tychem® (5000, 6000, 6000 FR, 9000, Responder® CSM, 10000, 10000 FR), Zytron® (300, 500).

Not recommended: butyl rubber, natural rubber, neoprene rubber, polyvinylchloride – PVC, Kemblok®, Saranex®, Chemprotex® 300, AlphaTec® 4000.

Respiratory Protection:

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode; or Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

APF = Assigned Protection Factor

Recommendations apply only to National Institute for Occupational Safety and Health (NIOSH) approved respirators. Refer to the [NIOSH Pocket Guide to Chemical Hazards](#) for more information.

NOTE: NIOSH has classified this substance as a potential occupational carcinogen, according to specific NIOSH criteria. This classification is reflected in these recommendations for respiratory protection, which specify that only the most reliable and protective respirators be worn at any detectable concentration. The requirements in Canadian jurisdictions may vary.

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