

Material Safety Data for: Trichloroethylene

1. PRODUCT IDENTIFICATION

Name	1,1,2-trichloroethylene
Synonyms	trichloroethylene, acetylene trichloride, TCE and trade names
CAS#	79-01-6
Europe EC#	201-167-4
Product Uses	cleaning solvent for vapour degreasing

2. INGREDIENTS

	%	TWAEV / TLV mg/m ³	LD ₅₀ ORAL	(mg/kg) SKIN	LC ₅₀ ppm INHALATION
1,1,2-trichloroethylene	100%	10 / 55	2400	29,280	7175

3. (a) HAZARDS SUMMARY

Hazards, Quick Guide: irritating to skin and eyes, suspected carcinogen, suspected reproductive toxin

Canada – WHMIS

Key:

D IB, D 2A, D 2B

B 2 – Flash Point <38°C, B 3 – Flash Point >38°C & <93°C

D 1 – Immediately Toxic, D 2 – Chronic Toxicity

C – Oxidising Substance, E – Corrosive

U.S.A. – HMIS

Key:

Health – 3, Fire – 1, Reactivity – 0

0=minimal, 1=slight, 2=moderate, 3=serious, 4=severe

3. (b) HAZARDS – TOXICITY

Effects, Acute Exposure

Skin Contact	severely irritating if not removed promptly; chemical burns if contact is prolonged (>5 minutes)
Skin Absorption	slight – no systemic toxic effects by this route
Eye Contact	liquid severely irritating, may damage eyes; vapour irritates some above 160ppm, others at 350ppm
Inhalation	headache, dizziness, drowsiness, intoxication may occur at above 350ppm; irritating above 1000ppm; high concentrations can lead to unconsciousness & death, numbness & muscle weakness also
reported	
Ingestion	burning sensation in mouth & throat; headache, dizziness, drowsiness, intoxication & vomiting, followed by muscle weakness, plus possible delayed heart, kidney & liver damage

Effects, Chronic Exposure

General	prolonged or repeated exposure may cause skin cracking and dermatitis; neurological damage (headache, sleeplessness, mood change), plus blurred or tunnel vision may be seen; loss of sensation
in	hands and feet may occur
Sensitising	not a sensitiser
Carcinogen/Tumorigen	probable carcinogen – classified A2
Reproductive Effect	no known effect on humans or animals
Mutagen	mutagen in animal tests; not known to be a mutagen or teratogen in humans
Synergistic With	alcohol – prior exposure to trichloroethylene followed by alcohol consumption causes upper body flush, and called “degreasers flush”
LD ₅₀ (oral)	4920 & 5620mg/kg (rat), 2400mg/kg (mouse), >7330mg/kg (rabbit), >5865mg/kg (cat), 5680mg/kg (dog)
LD ₅₀ (skin)	29,280mg/kg (rabbit)
LC ₅₀ (inhalation)	7175, 7440, 8450, 40,920 & 48,730ppm (mouse), 7250 & 26,170ppm (rat)

NOTE: LD₅₀ & LC₅₀ test data vary widely between species & between independent tests on the same species. Relevance to human toxicity cannot be assumed.

Please ensure that this MSDS is given to, and explained to people using this product.

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4. FIRST AID

- SKIN: Wash with soap and plenty of water. Remove contaminated clothing and do not reuse until thoroughly cleaned or laundered.
- EYES: Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if there is irritation.
- INHALATION: Remove from contaminated area promptly. **CAUTION: Rescuer must not endanger himself!** If breathing stops, administer artificial respiration and seek medical aid promptly.
- INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.

5. PHYSICAL PROPERTIES

Odour & Appearance	clear, colourless, liquid with mild, sweet, <i>pleasant</i> ether odour
Odour Threshold	80ppm – 100ppm – <i>well above the TLV; hazardous below odour threshold!</i>
Vapour Pressure	60mmHg / 8kPa (20°C / 68°F)
Evaporation Rate (<i>Butyl Acetate = 1</i>)	4.5-4.9
Vapour Density (air = 1)	4.5
Boiling Point	87°C / 189°F
Freezing Point	-73°C / -99°F – <i>lower values are also given</i>
Specific Gravity	1.46 (20/20°C)
Water Solubility	1.1 grams/litre (20°C / 68°F)
- in other solvents	most organic solvents
Viscosity	0.57centipoise (20°C / 68°F)
pH	none – <i>does not yield hydrogen ions in solution</i>
Conversion Factor	1ppm = 5.36mg/m ³
Molecular Weight	131

6. FLAMMABILITY & FIRE FIGHTING

Flash Point	will not flash
Autoignition Temperature	420°C / 788°F
Flammable Limits	8% – 50% – <i>only burns in continuous contact with ignition source</i>
Combustion Products	hydrogen chloride & chlorine (<i>both corrosive</i>), phosgene (<i>highly toxic</i>)
Fire Fighting Precautions	as for substances sustaining fire; fire fighters must wear SCBA
Static Discharge	will accumulate a static charge, but cannot be ignited by a spark

NOTE: *Trichloroethylene may ignite in the presence of a welding torch – and may then produce highly hazardous vapours.*

7. STABILITY / REACTIVITY

Dangerously Reactive With	strong oxidising agents or reducing agents; reactive metals (eg: Na, K, Ca, Ba)
Also Reactive With	strong alkalis to produce explosive dichloroacetylene gas; copper reacts with any dichloroethylene present to form explosive acetylides; reactive with epoxides
Chemical Stability	unstabilised trichloroethylene may corrode aluminium, copper, zinc in presence of moisture stable; will not polymerize – except under x-ray or other radiation source, or in the presence of aluminium chloride
Decomposes in Presence of	iron, copper, zinc or aluminium at 250-600°C cause decomposition to phosgene; reactive metals cause decomposition to dichloroacetylene
Decomposition Products	apart from Hazardous Combustion Products – dichloroacetylene
Mechanical Impact	not sensitive

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8. PROTECTIVE EQUIPMENT / EXPOSURE CONTROL

TLV	10ppm / 55mg/m ³ (ACGIH); PEL – TWA: 50 / 270 (OSHA)
STEL	25ppm / 135mg/m ³ (ACGIH); PEL – STEL: 200 / 1075 (OSHA)
Ventilation	product should only be used in specially designed equipment (eg: vapour degreaser); mechanical ventilation should not be required so long as the equipment is working properly; using this product in open air and relying on mechanical ventilation is NOT ACCEPTABLE ; a respirator with organic vapour cartridge should be available for escape purposes, should vapour containment fail (<i>always store respirators in airtight containers [eg: "Tupperware"] to maintain cartridge "freshness"</i>)
Hands	"Viton" gloves – <i>other types also protect, always confirm suitability with supplier</i>
Eyes	safety glasses with side shields or chemical goggles – <i>always protect eyes!</i>
Clothing	impermeable (hands, above) apron, boots, long sleeves, if splashing is anticipated

9. HANDLING & STORAGE

Store in a cool environment, away from substances named in Part 7 (above).

Avoid breathing product vapour. Product should only be used in equipment designed for the purpose (eg: a vapour degreaser) Use with adequate ventilation. If dealing with a spill, and ventilation is impossible or impractical, wear a suitable respirator (see Part 8). **Never routinely wear a respirator for handling this product! Effective ventilation or engineering control of vapour is the ONLY acceptable way to protect people working with this product.**

If transferring product, or if there is any danger of contact, wear appropriate protective clothing.

Never cut, drill, weld or grind on or near this container. Avoid contact with skin and wash work clothes frequently. An eye bath and safety shower must be available near the workplace.

NOTE that, although the product is hard to ignite, fire can convert vapours into highly toxic, corrosive gases – Part 6, above.

10. SPILL PROCEDURES

Leak Precaution	dyke to control spillage; dyke must be able to contain the entire volume of a bulk storage tank
Handling Spill	ventilate contaminated area; recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep & pick up using plastic or aluminium shovel, & store in closed containers for recycling or disposal

11. DISPOSAL

Waste Disposal	do not flush to sewer , recycle solvent if possible, may be incinerated in approved facility with flue gas monitoring and scrubbing after mixing with a suitable flammable waste solvent
Containers	Drums should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use. Pails must be vented and thoroughly dried prior to crushing and recycling. IBCs (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years. Never cut, drill, weld or grind on or near this container, even if empty

12. ENVIRONMENTAL INFORMATION

Bioaccumulation	this product is metabolised & excreted (½-life ~40hr) and will not bioaccumulate
Biodegradation	this product degrades in aerobic sewage treatment facilities, but only in the presence of other carbon sources; much more slowly under anaerobic conditions
Abiotic Degradation	this product reacts with atmospheric hydroxyl (OH) radicals; estimated ½-life in air 5-7 days
Mobility in soil, water	this product has been shown to have moderate mobility in soil and the water column
Marine Toxicity	
LC ₅₀ (96 hr) Fish	28 & 63mg/litre/96hr (Jordanella floridae), 41mg/litre/96hr (Pimephelas promelas), 16mg/litre Limada limada), 52 & 99mg/litre (Cyprinodon variegatus), 45mg/litre (Lepomis macrochirus)
LC ₅₀ (48hr) Shrimp	58mg/litre/ (Daphnia cucullata), 2.2, 8, 21 & 42-97mg/litre (Daphnia magna) & others
EC ₅₀ (Algae)	450mg/litre (Scenedesmus subspicatus), 175mg/litre (Selenastrum capricornutum), 95 & 150mg/litre (Skeletonema costatum)
EC ₅₀ (Bacteria)	235mg/litre (Bacillus subtilis), >400mg/litre (Chilomonas paramecium), 975mg/litre (Photobacterium phosphoreum) & others

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13. TRANSPORT REGULATIONS

<i>Canada TDG</i>	PIN	UN-1710
<i>AND</i>	Shipping Name	trichloroethylene
<i>U.S.A. 49 CFR</i>	Class	6.1
	Packing Group	III
Marine Pollutant		not a marine pollutant

14. EMERGENCY INFORMATION

<i>Canada</i>	Call CANUTEC (collect)	(613) 996-6666
<i>U.S.A.</i>	Call CHEMTREC	(800) 424-9300

15. REGULATIONS

Canada DSL	on inventory
U.S.A. TSCA	on inventory
Europe EINECS	on inventory

Immediately Dangerous to Life or Health: NIOSH considers trichloroethylene to be a potential occupational carcinogen.

Allowable Tolerances: Tolerances are established for residues of trichloroethylene resulting from its use as a solvent in the manufacture of foods as follows: decaffeinated ground coffee 25 ppm; decaffeinated soluble (instant) coffee extract 10 ppm; and spice oleoresins 30 ppm (provided that if residues of other chlorinated solvents are also present, the total of all residues of such solvents in spice oleoresins shall not exceed 30 ppm).

OSHA Standards: Permissible Exposure Limit: Table Z-2 8-hr Time Weighted Avg: 100 ppm. Permissible Exposure Limit: Table Z-2 Acceptable Ceiling Concentration: 200 ppm. Permissible Exposure Limit: Table Z-2 Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift. Concentration: 300 ppm. Maximum Duration: 5 minutes in any 2 hours. Vacated 1989 OSHA PEL TWA 50 ppm (270 mg/cu m); STEL 200 ppm (1080 mg/cu m) is still enforced in some states.

NIOSH Recommendations: NIOSH considers trichloroethylene to be a potential occupational carcinogen. NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration. Recommended Exposure Limit: 60 Min Ceiling Value: 2 ppm. /During the usage of trichloroethylene as an anesthetic agent/ Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 25 ppm. /During exposures to trichloroethylene other than as an anesthetic agent/

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 50 ppm; 15min Short Term Exposure Limit (STEL) 100 ppm A5: Not suspected as a human carcinogen. Biological Exposure Index: Determinant: **Trichloroacetic acid** in urine; Sampling Time: end of shift at end of workweek; BEI: 80 mg/L. The determinant is nonspecific, since it is also observed after exposure to other chemicals. Biological Exposure Index: Determinant: **Trichloroethanol** (without hydrolysis) in blood; Sampling Time: end of shift at end of workweek; BEI: 2 mg/L. The determinant is nonspecific, since it is also observed after exposure to other chemicals. Biological Exposure Index: Determinant: **Trichloroethylene in blood**; Sampling Time: end of shift at end of workweek; The biological determinant is an indicator of exposure to the chemical, but the quantitative interpretation of the measurement is ambiguous. These determinants should be used as a screening test if a quantitative test is not practical, or as a confirmatory test if the quantitative test is not specific and the origin of the determinant is in question. Biological Exposure Index: Determinant: **Trichloroethylene in end-exhaled air**; Sampling Time: end of shift at end of workweek; The biological determinant is an indicator of exposure to the chemical, but the quantitative interpretation of the measurement is ambiguous. These determinants should be used as a screening test if a quantitative test is not practical, or as a confirmatory test if the quantitative test is not specific and the origin of the determinant is in question.

Atmospheric Standards: This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Trichloroethylene is produced, as an intermediate or a final product, by process units covered under this subpart. Listed as a hazardous air pollutant generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Trichloroethylene is included on this list.

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15. REGULATIONS (cont'd)

Federal Drinking Water Standards: EPA 5 ug/l

State Drinking Water Standards: Florida 3 ug/l, New Jersey 1 ug/l

State Drinking Water Guidelines: Arizona 3.2 ug/l, Connecticut 5 ug/l, Maine 32 ug/l, Minnesota 30 ug/l

Clean Water Act Requirements: Toxic pollutant designated pursuant to section 307(a)(1) of the Federal Water Pollution Control Act & is subject to effluent limitations. Trichloroethylene is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

CERCLA Reportable Quantities: Persons in charge of vessels or facilities are required to notify the National Response Center immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 100 lb or 45.4 kg. The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV, D.3.b).

RCRA Requirement: As stipulated in 40 CFR 261.33, when trichloroethylene, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes a waste, it must be managed according to Federal and/or State hazardous waste regulations. Also defined as a hazardous waste is any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR 261.5). A solid waste containing trichloroethylene may or may not become characterized as a hazardous waste when subjected to the Toxicity Characteristic Leaching Procedure listed in 40 CFR 261.24, and if so characterized, must be managed as a hazardous waste. When trichloroethylene is a spent solvent, it is classified as a hazardous waste from a nonspecific source, as stated in 40 CFR 261.31, and must be managed according to state and/or federal hazardous waste regulations.

FDA Requirements: Trichloroethylene is an indirect food additive for use as a component of adhesives. Tolerances are established for residues of trichloroethylene resulting from its use as a solvent in the manufacture of foods as follows: decaffeinated ground coffee 25 ppm; decaffeinated soluble (instant) coffee extract 10 ppm; and spice oleoresins 30 ppm (provided that if residues of other chlorinated solvents are also present, the total of all residues of such solvents in spice oleoresins shall not exceed 30 ppm).

16. PREPARATION INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577

Data from RTECS, Haz. Substance Data Base, Cheminfo, manufacturer data, and other source, as available

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