

Material Safety Data for: Perchloroethylene

1. PRODUCT IDENTIFICATION

Name	1,1,2,2-tetrachloroethylene
Synonyms	tetrachloroethylene, perchloroethylene, "perc", many brand names
CAS#	127-18-4
Europe EC#	204-825-9
Product Uses	solvent, parts cleaning prior to painting or plating

2. INGREDIENTS

	%	TWAEV / TLV mg/m ³	LD ₅₀ ORAL	(mg/kg) SKIN	LC ₅₀ ppm INHALATION
1,1,2,2-tetrachloroethylene	100%	25 - 170	2630	3230	2700

3. (a) HAZARDS SUMMARY

Hazards, Quick Guide: highly irritating to skin and eyes, probable human carcinogen

Canada – WHMIS

Key:

D 1B, D 2A

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 – 0, Reactivity – 0

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

3. (b) HAZARDS – TOXICITY

Effects, Acute Exposure

Skin Contact	severely irritating within minutes, redness, possible blistering
Skin Absorption	slight; no toxic effects likely by this route
Eye Contact	mildly irritating; vapour irritating above ~250ppm
Inhalation	irritating above 100ppm; 100ppm or over causes dizziness, drowsiness, headache, nausea
Ingestion	over 600ppm causes incoordination, possible unconsciousness dizziness, drowsiness, intoxication, headache, nausea – not a route of industrial exposure

Effects, Chronic Exposure

General	prolonged skin exposure unlikely due to severe acute effect – if there is repeated exposure, dry, red skin and dermatitis is likely; mood changes, persistent nausea, fatigue & other neurological effects; based on animal testing, may damage liver & kidneys;
Sensitising	not a sensitiser in humans or animals
Carcinogen/Tumorigen	A2 – probably carcinogenic in humans; A3 – experimental animal carcinogen
Reproductive Effect	no known effect in humans or animals
Mutagen	no known effect on humans or animals
Synergistic With	not known
LD ₅₀ (oral)	2630mg/kg (rat), 6400 & 8100mg/kg (mouse), >4000mg/kg (dog & cat),
LD ₅₀ (skin)	>3230mg/kg (rabbit)
LC ₅₀ (inhalation)	4100 & 4620ppm (rat), 2700, 4860 & 5200ppm (mouse)€

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

(Perchloroethylene, cont'd)

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 pleasant ether odour
Odour Threshold	~50ppm – <i>odour is inadequate warning of the presence of toxic amounts of perchloroethane</i>
Vapour Pressure	14mmHg / 1.9kPa (20°C / 68°F)
Evaporation Rate (<i>Butyl Acetate = 1</i>)	1.5
Vapour Density (air = 1)	5.8
Boiling Range	121°C / 250°F
Freezing Point	-22°C / -8.5°F
Specific Gravity	1.62 (20/20°C)
Water Solubility	150 milligrams per litre (25°C / 77°F)
Also soluble in	most organic solvents
Viscosity	0.9 centipoise (20°C / 68°F)
pH	none – <i>(does not liberate hydrogen ions when dissolved)</i>
Conversion Factor	1ppm = 7.4mg/m ³
Molecular Weight	166grams per mole

6. FLAMMABILITY & FIRE FIGHTING

Flash Point	not combustible
Autoignition Temperature	not combustible
Flammable Limits	not combustible
Combustion Products	carbon monoxide, chlorine, phosgene, hydrogen chloride & other toxic gases
Fire Fighting Precautions	as for materials sustaining fire; toxic combustion products; fire fighters must wear SCBA
Static Charge Accumulation	cannot accumulate a static charge on agitation or pumping

7. STABILITY / REACTIVITY

Dangerously Reactive With	may explode in presence of granular barium and reactive metals like lithium, sodium, calcium; strong acids
Also Reactive With	strong oxidisers; produces explosive compounds with strong alkalis; attacks some plastics; may corrode aluminum, zinc, and cast iron unless inhibitors are present
Stability	stable; will not polymerize
Decomposes in Presence of	moisture causes gradual hydrolysis; with activated carbon at 700°C decomposes
Decomposition Products	apart from Combustion Products – hexachloroethane and hexachlorobenzene
Sensitive to Mechanical Impact	no

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8. PROTECTIVE EQUIPMENT / EXPOSURE CONTROL

ACGIH TLV	25ppm / 170mg/m ³	STEL	100ppm / 685mg/m ³
OSHA PEL	100ppm / 670mg/m ³	STEL	200ppm / 1340mg/m ³
Ventilation* respirator	mechanical ventilation may be required to maintain airborne titre below regulated limits; an “escape” with “fresh” organic vapour cartridge should be available for workers in area should vapour containment fail; <i>Store respirators & cartridges in airtight containers (“Tupperware”, “ZipLock”) to maintain “freshness”.</i>		
Hands	“Viton” gloves recommended – <i>other types may also protect; consult supplier to confirm suitability</i>		
Eyes	safety glasses with side shields – <i>always protect the eyes</i>		
Clothing	wear impermeable (above) apron, boots, & long sleeves if there is any danger of splashing,		
* <i>See Part 9</i>			

9. HANDLING & STORAGE

Store away from open flame and substances listed in Part 7. Stable to 500°C / 930°F. Always ensure that containers, whether empty or full, or part full, are tightly sealed unless in use.

Avoid breathing product vapour. ***This product should only be used in a sealed apparatus to keep vapour out of the workplace.*** If dealing with a spill, and ventilation is impossible or impractical, wear a suitable respirator with a *completely fresh cartridge, and discard after one use.* ***Do not smoke around this product. The heat of the cigarette converts tetrachloroethylene into toxic phosgene and hydrogen chloride!***

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

NOTE: A respirator must not be relied on to protect a worker from this product! The odour threshold and TLV are the same. Before you are aware of the substance, it has already reached a harmful concentration! Use respirators – fitted with a fresh cartridge – for emergency only!

10. SPILL PROCEDURES

Leak Precaution dyke to control spillage and prevent environmental contamination
 Handling Spill ventilate contaminated area; recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep, 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 at high temperature in approved facility (gas fired flame initially with less than stoichiometric air:fuel ratio and excess air injection later), ***flue gas monitoring and scrubbing is essential***

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

(Perchloroethylene, cont'd)

12. ENVIRONMENTAL INFORMATION

Bioaccumulation	not a bioaccumulator; biological half-life is 6 days
Biodegradation	degrades slowly in the presence or absence of oxygen; ½-life under aerobic conditions is 180 days & 98 days under anaerobic conditions; more rapid biodegradation in well acclimated sewage facilities
Abiotic Degradation	reacts with atmospheric hydroxyl radicals; its estimated half-life in air is 96 days; high stratospheric photolysis (high UV intensity) is rapid – 6 days for 50-90% destruction
Mobility in soil, water	this product is sparingly water soluble and move moderately readily in soil and water

12. ENVIRONMENTAL INFORMATION, cont'd

Aquatic Toxicity	
LC ₅₀ (Fish, 96hr)	5mg/litre (Limada limada, Oncorhynchus mykiss & Salmo gairdneri), 13.4-23.8mg/litre (Pimephelas promelas), 130mg/litre (Leuciscus idus), 29-52mg/litre (Cyprinodon variegatus), 13mg/litre (Lepomis macrochirus)
EC ₅₀ (Crustacea, 48hr)	3.2mg/litre (Daphnia magna)
EC ₅₀ (Algae)	10.5mg/litre (Phaeodactylum tricornutum), 500mg/litre (Skeletonema costatum)
EC ₅₀ (Bacteria)	112mg/litre (Nitrosomas sp), 100mg/litre (Tetrahymena pyriformis), & others

13. TRANSPORT REGULATIONS

Canada TDG	PIN	UN-1897
AND	Shipping Name	tetrachloroethylene
U.S.A. 49 CFR	Class	6.1
	Packing Group	III
Marine Pollutant		P

14. EMERGENCY INFORMATION

Canada	Call CANUTEC (collect)	(613) 996-6666
U.S.A.	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 has recommended that tetrachloroethylene be treated as a potential human carcinogen.

Acceptable Daily Intakes: Suggested No-Adverse-Response Level (SNARL): In light of the lack of definitive information regarding the quantity of tetrachloroethylene that must be ingested to depress psychophysiological function, it seems appropriate that calculations for a SNARL be based upon quantities of the chemical that are required to produce tissue injury. ... the 0.3 ml/kg (0.49 g/kg) dose appears to be a reasonable "minimum toxic dose" from which to calculate a 24-hr SNARL for contamination of drinking water, assuming that the sole source of tetrachloroethylene during this period will be from 2 l/day of drinking water consumed by a 70 kg human. A safety factor of 100 is applied: 490 mg/kg times 70 kg/100 times 2 l= 172 mg/l. The above considerations ignore the possibility that tetrachloroethylene may be carcinogenic. ... a 7-day standard for drinking water contamination, which was obtained by dividing the 24-hr standard by 7 (172 mg/l/7 days= 24.5 mg/l), should protect against adverse effects by the chemical.

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(Perchloroethylene, cont'd)

page 5

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 3 hours. Vacated 1989 OSHA PEL TWA 25 ppm (170 mg/cu m) is still enforced in some states.

NIOSH Recommendations: NIOSH recommends that tetrachloroethylene be regulated as a potential human carcinogen. NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concn. Minimize workplace exposure concentrations; limit number of workers exposed.

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 25 ppm; 15 min Short Term Exposure Limit (STEL): 100 ppm, A3: Confirmed animal carcinogen with unknown relevance to humans.

Biological Exposure Index (BEI): Determinant: Tetrachloroethylene in end-exhaled air; Sampling Time: Prior to last shift of workweek; BEI: 5 ppm.

Determinant: Tetrachloroethylene in blood; Sampling Time: Prior to last shift of workweek; BEI: 0.5 mg/L.

Determinant: Trichloroacetic acid in urine; Sampling Time: End of shift at end of workweek; BEI: 3.5 mg/L.

The determinant is nonspecific, since it is also observed after exposure to other chemicals. 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. 2008 Notice of Intended Changes: These substances, with their corresponding indices, comprise those for which (1) a BEI is proposed for the first time, (2) a change in the Adopted index is proposed, (3) retention as an NIC is proposed, or (4) withdrawal of the Documentation and adopted BEI is proposed. In each case, the proposals should be considered trial indices during the period they are on the NIC. These proposals were ratified by the ACGIH Board of Directors and will remain on the NIC for approximately one year following this ratification. If the Committee neither finds nor receives any substantive data that change its scientific opinion regarding an NIC BEI, the Committee may then approve its recommendation to the ACGIH Board of Directors for adoption. If the Committee finds or receives substantive data that change its scientific opinion regarding an NIC BEI, the Committee may change its recommendation to the ACGIH Board of Directors for the matter to be either retained on or withdrawn from the NIC. Chemical: Tetrachloroethylene; Determinant: Tetrachloroethylene in end-exhaled air; Sampling Time: prior to shift; BEI: 3 ppm; Notation: None. 2008 Notice of Intended Changes: These substances, with their corresponding indices, comprise those for which (1) a BEI is proposed for the first time, (2) a change in the Adopted index is proposed, (3) retention as an NIC is proposed, or (4) withdrawal of the Documentation and adopted BEI is proposed. In each case, the proposals should be considered trial indices during the period they are on the NIC. These proposals were ratified by the ACGIH Board of Directors and will remain on the NIC for approximately one year following this ratification. If the Committee neither finds nor receives any substantive data that change its scientific opinion regarding an NIC BEI, the Committee may then approve its recommendation to the ACGIH Board of Directors for adoption. If the Committee finds or receives substantive data that change its scientific opinion regarding an NIC BEI, the Committee may change its recommendation to the ACGIH Board of Directors for the matter to be either retained on or withdrawn from the NIC. Chemical: Tetrachloroethylene; Determinant: Tetrachloroethylene in blood; Sampling Time: prior to shift; BEI: 0.5 mg/L; Notation: None.

Atmospheric Standards: Listed as a hazardous air pollutant (HAP) 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. Tetrachloroethylene is included on this list.

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 0.67 ug/l, Connecticut 5 ug/l, Maine 7 ug/l, Minnesota 7 ug/l, Washington 4 ug/l

Clean Water Act Requirements: Toxic pollutant designated pursuant to section 307(a)(1) of the Federal Water Pollution Control Act and is subject to effluent limitations.

TSCA Requirements: Pursuant to section 8(d) of TSCA, EPA promulgated a model Health and Safety Data Reporting Rule. The section 8(d) model rule requires manufacturers, importers, and processors of listed chemical substances and mixtures to submit to EPA copies and lists of unpublished health and safety studies. Tetrachloroethylene is included on this list.

RCRA Requirements: A solid waste containing tetrachloroethylene 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 tetrachloroethylene is a spent halogenated 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.

16. PREPARATION INFORMATION

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

With data from RTECS, Haz. Substance Data Base, Cheminfo (CCOHS), IUCOLID Datasheets (European Chem. Substance Info. System), & others, as available

Preparation Date: **May 2004** Revision Date: **May 2007, May 2010**

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