

Material Safety Data for: Cyclohexane

1. PRODUCT IDENTIFICATION

Name	cyclohexane
Synonyms	none in common use – eg: hexahydrobenzene, benzenehexahydride
CAS#	110-82-7
Europe EC#	203-806-2
Product Uses	solvent for oils, fats, waxes, resins; reagent

2. INGREDIENTS

	%	TWAEV / TLV mg/m ³	LD ₅₀ (mg/kg) ORAL	LD ₅₀ (mg/kg) SKIN	LC ₅₀ ppm INHALATION
Cyclohexane	100%	100 / 344	815 ¹	18,000 ²	20,300

1. See "NOTE" at the end of Part 3b. 2. See comment at the end of Part 3b

3. (a) HAZARDS SUMMARY

Hazards, Quick Guide: flammable liquid, heavy vapour may travel, distant ignition and flashback are possible; moderate irritant

Canada – WHMIS
Key:

B 2, D 2B (moderately irritating to skin)
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 – 1, Fire – 3, Reactivity – 0
0=minimal, 1=slight, 2=moderate, 3=serious, 4=severe

3. (b) HAZARDS – TOXICITY

Effects, Acute Exposure

Skin Contact	degreasing – irritating, but little to no effect on intermittent contact
Skin Absorption	yes, but very low toxicity by this route
Eye Contact	liquid slightly irritating; vapour irritating above 300ppm
Inhalation	irritating above 250ppm; generally low toxicity, high concentrations may cause headache, dizziness, drowsiness, intoxication
Ingestion	as for inhalation, plus nausea & (temporary) laxative effect

Effects, Chronic Exposure

General	prolonged exposure may cause dermatitis through degreasing action; suggestion of peripheral neuropathy on long exposure to high concentrations, but not expected in industrial use
Sensitising	not a sensitiser in humans or animals
Carcinogen/Tumorigen	not considered a tumorigen or a carcinogen in humans or animals
Reproductive Effect	no known effect in humans or animals
Mutagen	no known effect on humans or animals
Synergistic With	not known
LD ₅₀ (oral)	12,850mg/kg (rat), 815mg/kg (mouse) ¹ , 5500mg/kg (rabbit)
LD ₅₀ (skin)	>18,000mg/kg (rabbit) ²
LC ₅₀ (inhalation)	20,300ppm (mouse), 26,000 (rabbit)

1. Oral LD₅₀ test data vary widely between species. Relevance to human toxicity cannot be assumed. The 815mg/kg value appears unrealistic.

2. Given as >180,000mg/kg & as >18,000mg/kg in 2 sources. One may be a typo. Even the numerically lower value represents very low toxicity.

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 & plenty of water. Remove contaminated clothing & do not reuse until thoroughly 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 pleasant gasoline odour
Odour Threshold	10-750ppm – <i>huge range for detection makes the odour unreliable guide to hazard</i>
Vapour Pressure	77mmHg / 10.3kPa (20°C / 68°F)
Evaporation Rate (<i>Butyl Acetate = 1</i>)	5.6
Vapour Density (air = 1)	2.9
Boiling Range	81°C / 177°F
Freezing Point	6.6°C / 44°F
Specific Gravity	0.780 (20/20°C)
Water Solubility	5.5 milligrams per litre (20°C / 68°F)
Also soluble in	most organic solvents
Viscosity	1.0centipoise (20°C / 68°F)
pH	none – (<i>does not liberate hydrogen ions when dissolved</i>)
Conversion Factor	1ppm = 3.44g/m ³
Molecular Weight	84grams per mole

6. FLAMMABILITY & FIRE FIGHTING

Flash Point	-20°C / -4°F (closed cup); also -18°C / -1°F
Autoignition Temperature	245°C – 260°C / 473°F – 500°F
Flammable Limits	1.3% – 8%
Combustion Products	carbon monoxide, nitrogen oxides, smoke, part oxidised hydrocarbon fragments
Fire Fighting Precautions	foam, dry chemical, water fog, water spray only to cool & dilute, product floats on water - water jet spreads flames; fire fighters must wear SCBA
Static Charge Accumulation	readily accumulates static charge on agitation or pumping; <i>static discharge can cause ignition</i>

7. STABILITY / REACTIVITY

Dangerously Reactive With	strong oxidising agents; <i>liquid NO₂ added to hot cyclohexane causes explosions</i>
Also Reactive With	none known
Stability	stable; will not polymerize
Decomposes in Presence of	not known
Decomposition Products	none apart from Hazardous Combustion Products
Sensitive to Mechanical Impact	no

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8. PROTECTIVE EQUIPMENT / EXPOSURE CONTROL

ACGIH TLV	100ppm / 334mg/m ³
Ontario TWAEV	100ppm / 334mg/m ³
OSHA PEL	300ppm / 1050mg/m ³
STEL	not listed
Ventilation	product use in sealed equipment is preferred; mechanical ventilation (<i>explosion-proof</i>) may be required to control airborne titre to regulated limits depending on handling procedure; respirators with organic vapour cartridges must be available for "escape" purposes should ventilation fail; <i>store respirators in air-tight containers (eg: "Tupperware" or "ZipLock") to preserve cartridge "freshness"</i>
Hands	nitrile or "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	no special protective clothing required

9. HANDLING & STORAGE

Store in a cool, dry environment, away from sources of ignition, heat and oxidising agents. ***Always use non-sparking bronze or aluminium hand tools. All electrical and mechanical equipment (including lighting, switchgear and forklift trucks) used with or around this product must be explosion-proof.***

Always ground or electrically bond the source container, receiving container and transfer pump before transferring contents. Avoid splashing by ensuring that the product nozzle is below the surface in the receiving container.

Avoid breathing product vapour. Use with adequate ventilation. If dealing with a spill, and ventilation is impossible or impractical, wear a suitable respirator with an organic vapour cartridge.

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.

Cyclohexane has a mild, pleasant odour, which may not warn of hazard!

WHEN FILLING STORAGE TANKS WITH THIS PRODUCT, IN ADDITION TO NORMAL GROUNDING PROCEDURES, READ THE FOLLOWING:

This product may form an explosive mixture inside a bulk storage tank. Prior to filling a bulk storage tank with this product, consider ventilating the headspace with nitrogen. In addition, consider asking the supplier to put an anti-static additive in the product when you order. If the bulk tank has a floating product level indicator, this should be inspected regularly. The float MUST HAVE a firmly fixed ground wire connecting it to its support cable. This connection must be free of corrosion.

For more detail, consult NFPA 77, 2007: "Recommended Practice on Static Electricity"

10. SPILL PROCEDURES

Serious Fire Potential: blanket spill with foam as a precaution against accidental ignition. Take extreme care to avoid sparks – do not operate (turn on OR off) electrical appliances near spill, unless explosion proof.

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 & 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
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. <i>Never cut, drill, weld or grind on or near this container, even if empty</i>

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12. ENVIRONMENTAL INFORMATION

Bioaccumulation	theoretically, cyclohexane should be a moderate bioaccumulator, however rapid volatilisation & low water solubility & low specific gravity limit this
Biodegradation	biodegradation data for cyclohexane is highly variable; from 10% biodegradation in 10hr to highly resistant to biological attack; in one study, 45% biodegradation was seen in 8 days when cyclohexane was added to gasoline & observed
Abiotic Degradation	reacts with atmospheric hydroxyl radicals; estimated ½-life in air is 45hr
Mobility in soil, water	water insoluble & moves slowly in soil and water
Aquatic Toxicity	
LC ₅₀ (Fish, 96hr)	93-117mg/litre (Pimephales promelas), 42.3mg/litre (Carassius auratus & Lepomis macrochirus, 24hr),
	55mg/litre (Leuciscus idus, 48hr) & others
EC ₅₀ (Crustacea, 24hr)	7.3mg/litre (Artemia salina), 3.8mg/litre (Daphnia magna, 48hr), 135mg/litre (Daphnia magna, 96hr)
EC ₅₀ (Algæ)	38mg/litre (Chlamidomonas sp.), 32mg/litre (Chlorella vulgaris), >500mg/litre (Scenedesmus subspicatus)
EC ₅₀ (Bacteria)	97mg/litre (Nitrosomonas sp.), 200mg/litre (Photobacterium phosphoreum),

13. TRANSPORT REGULATIONS

<i>Canada TDG</i>	PIN	UN-1145
AND	Shipping Name	cyclohexane
<i>U.S.A. 49 CFR</i>	Class	3
	Packing Group	II
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

European Classification **R: 11, 65, 38, 67, 50-53** - Highly flammable. Harmful: may cause lung damage if swallowed. Irritating to the skin. Vapours may cause drowsiness and dizziness. Dangerous for the environment. Very toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

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15. REGULATIONS, cont'd

Immediately Dangerous to Life or Health: 1300 ppm

Allowable Tolerances: Cyclohexane is exempted from the requirement of a tolerance when used as a solvent, cosolvent in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

OSHA Standards: Permissible Exposure Limit: Table Z-1 8-Hr Time Weighted Avg: 300 ppm (1050 mg/cu m).

NIOSH Recommendations: Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 300 ppm (1050 mg/cu m).

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 100 ppm. Excursion Limit Recommendation: Excursions in worker exposure levels may exceed 3 times the TLV-TWA for no more than a total of 30 minutes during a work day, and under no circumstances should they exceed 5 times the TLV-TWA, provided that the TLV-TWA is not exceeded.

Atmospheric Standards: This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) 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. Cyclohexane is produced, as an intermediate or a final product, by process units covered under this subpart.

CERCLA Reportable Quantities: Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 1000 lb or 454 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).

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. Cyclohexane is included on this list. A testing consent order is in effect for cyclohexane for health effects testing and environmental release reports. FR citation: 11/18/94.

RCRA Requirements: As stipulated in 40 CFR 261.33, when cyclohexane, 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).

FIFRA Requirements: Cyclohexane is exempted from the requirement of a tolerance when used as a solvent, cosolvent in accordance with good agricultural practice as inert (or occasionally active) ingredients in pesticide formulations applied to growing crops only.

FDA Requirements: Cyclohexane is an indirect food additive for use only as a component of adhesives.

16. PREPARATION INFORMATION

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

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

*Preparation Date: **October 2003** Revision Date: **July 2006, November 2008, November 2011***

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