

**1. Product and Company Identification**

<b>Product identifier</b>	<b>Tetrahydrofuran</b>
<b>Version #</b>	01
<b>Issue date</b>	08-22-2014
<b>Chemical name</b>	Tetrahydrofuran
<b>Chemical description</b>	Saturated cyclic aliphatic ether
<b>CAS #</b>	109-99-9
<b>MSDS Number</b>	COM219
<b>Product use</b>	Professional use only
<b>Synonym(s)</b>	BUTYLENE OXIDE * THF
<b>Manufacturer information</b>	Refer to supplier
<b>Supplier</b>	Comet Chemical 3463 Thomas Street Innisfill, ON L9S 3W4 CA Information (M-F 8:00-5:00): 705-436-5580 24 Hour Number (Newalta): 800-567-7455

**2. Hazards Identification**

<b>Emergency overview</b>	Clear, colorless liquid. Ether-like odor.  DANGER!  EXTREMELY FLAMMABLE LIQUID AND VAPOR. Vapors may cause a flash fire or ignite explosively. May form explosive peroxides. Causes serious eye irritation. May cause mild skin irritation. May cause respiratory irritation. Harmful if swallowed. May cause central nervous system effects. Prolonged or repeated overexposure may cause liver and kidney effects.
<b>Potential health effects</b>	
<b>Routes of exposure</b>	Inhalation. Ingestion. Skin contact. Eye contact.
<b>Eyes</b>	Can cause severe eye irritation.
<b>Skin</b>	Direct skin contact may cause slight or mild, transient irritation. Skin absorption: May be absorbed through the skin, however there are no reports of harmful effects following occupational exposure.
<b>Inhalation</b>	May cause irritation of respiratory tract. High concentrations may cause central nervous system depression.
<b>Ingestion</b>	May cause irritation of the gastrointestinal tract. May cause central nervous system effects.
<b>Target organs</b>	Central nervous system. Eyes. Kidneys. Liver. Lungs. Respiratory system.
<b>Chronic effects</b>	Prolonged or repeated overexposure may cause liver and kidney effects.
<b>Most important symptoms/effects, acute and delayed</b>	Causes serious eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Direct skin contact may cause slight or mild, transient irritation. Symptoms may include redness, edema, drying, defatting and cracking of the skin. May cause respiratory irritation. Symptoms may include upper respiratory irritation, coughing, and breathing difficulties. Inhalation of extremely high concentrations may cause dizziness, disorientation, incoordination, narcosis, nausea or narcotic effects. Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Symptoms of overexposure can include shortness of breath, drowsiness, headaches, confusion, decreased coordination, visual disturbances and vomiting, and are reversible if exposure is stopped.
<b>Potential environmental effects</b>	See ECOLOGICAL INFORMATION, Section 12.

**3. Composition / Information on Ingredients**

<b>Components</b>	<b>CAS #</b>	<b>Percent</b>
Tetrahydrofuran	109-99-9	100

## 4. First Aid Measures

### First aid procedures

#### Inhalation

Move to fresh air. If breathing is difficult, give oxygen. If breathing stops, provide artificial respiration. Call a POISON CENTER or doctor/physician if you feel unwell.

#### Skin contact

Take off immediately all contaminated clothing. Wash off immediately with plenty of water for at least 15 minutes. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

#### Eye contact

Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

#### Ingestion

Rinse mouth. Do not induce vomiting. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical advice/attention if you feel unwell.

### Notes to physician

Treat symptomatically. This product is a CNS depressant.

### General advice

If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

## 5. Fire Fighting Measures

### Flammable properties

Flammable by WHMIS criteria. Extremely flammable liquid and vapor. Vapors are heavier than air and may spread along floors. Vapors may travel considerable distance to a source of ignition and flash back. Closed containers may rupture if exposed to excess heat or flame due to a build-up of internal pressure. Prolonged (12 months) exposure to air and heat, and/or prolonged storage can produce explosive peroxides.

### Extinguishing media

#### Suitable extinguishing media

Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO<sub>2</sub>).

#### Unsuitable extinguishing media

Do not use water jet as an extinguisher, as this will spread the fire.

### Protection of firefighters

#### Specific hazards arising from the chemical

Vapors may form explosive mixtures with air. Material will float and may ignite on surface of water. Fire may produce irritating, corrosive and/or toxic gases. To reduce potential for static discharge, use proper bonding and grounding procedures. If sufficient charge is accumulated, ignition of flammable mixtures can occur.

#### Protective equipment for firefighters

Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

### Fire fighting equipment/instructions

Firefighters should wear full protective gear. Evacuate area and fight fire from a safe distance. Remove all sources of ignition. Containers should be cooled with water to prevent vapor pressure build up. Move containers from fire area if you can do so without risk. Prevent fire extinguishing water from contaminating surface water or the ground water system.

### Specific methods

Cool containers exposed to flames with water until well after the fire is out.

### Explosion data

#### Sensitivity to static discharge

May be sensitive to static discharge. Static charges generated by emptying package in or near flammable vapor may cause flash fire.

#### Sensitivity to mechanical impact

Not expected to be sensitive to mechanical impact.

### Hazardous combustion products

Carbon oxides. Peroxides.

## 6. Accidental Release Measures

### Personal precautions

Ventilate the contaminated area. Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. For personal protection, see section 8 of the MSDS. Avoid inhalation of vapors or mists. Use appropriate containment to avoid environmental contamination. Local authorities should be advised if significant spillages cannot be contained.

### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not contaminate water.

## Methods and materials for containment and cleaning up

Ventilate the contaminated area. Eliminate all sources of ignition. Wear appropriate protective equipment and clothing during clean-up. Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Take precautionary measures against static discharge. Use only non-sparking tools. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. For waste disposal, see section 13 of the MSDS. Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

## Other information

Clean up in accordance with all applicable regulations.

## 7. Handling and Storage

### Handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Vapors may form explosive mixtures with air. Use only in area provided with appropriate exhaust ventilation. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. These alone may be insufficient to remove static electricity. Avoid breathing mist or vapor. When using, do not eat, drink or smoke. Wash hands after handling and before eating. Avoid release to the environment.

For additional information on equipment bonding and grounding, refer to the Canadian Electrical Code in Canada, (CSA C22.1), or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity" or National Fire Protection Association (NFPA) 70, "National Electrical Code".

### Storage

Store locked up. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store away from incompatible materials (see Section 10 of the MSDS). Store in tightly closed original container in a dry, cool and well-ventilated place. Keep away from food, drink and animal feedingstuffs.

Prolonged (12 months) exposure to air and heat, and/or prolonged storage can produce explosive peroxides.

## 8. Exposure Controls / Personal Protection

### Occupational exposure limits

#### US. ACGIH Threshold Limit Values

Material	Type	Value
Tetrahydrofuran (CAS 109-99-9)	STEL	100 ppm
	TWA	50 ppm

#### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
Tetrahydrofuran (CAS 109-99-9)	PEL	590 mg/m3
		200 ppm

### Biological limit values

#### ACGIH Biological Exposure Indices

Material	Value	Determinant	Specimen	Sampling Time
Tetrahydrofuran (CAS 109-99-9)	2 mg/l	Tetrahydrofuran	Urine	*

\* - For sampling details, please see the source document.

### Exposure guidelines

#### Canada - Alberta OELs: Skin designation

Tetrahydrofuran (CAS 109-99-9) Can be absorbed through the skin.

#### Canada - British Columbia OELs: Skin designation

Tetrahydrofuran (CAS 109-99-9) Can be absorbed through the skin.

#### Canada - Manitoba OELs: Skin designation

Tetrahydrofuran (CAS 109-99-9) Can be absorbed through the skin.

**Canada - Ontario OELs: Skin designation**

Tetrahydrofuran (CAS 109-99-9)

Can be absorbed through the skin.

**Canada - Saskatchewan OELs: Skin designation**

Tetrahydrofuran (CAS 109-99-9)

Can be absorbed through the skin.

**US ACGIH Threshold Limit Values: Skin designation**

Tetrahydrofuran (CAS 109-99-9)

Can be absorbed through the skin.

**Engineering controls**

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

**Personal protective equipment****Eye/face protection**

Wear chemical goggles. Face shield is recommended.

Eye wash facilities and emergency shower must be available when handling this product.

**Skin protection**

Use of an impervious apron is recommended. Wear suitable protective clothing as protection against splashing or contamination.

**Respiratory protection**

Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Advice should be sought from respiratory protection specialists.

**Hand protection**

Wear appropriate chemical resistant gloves. Advice should be sought from glove suppliers.

**9. Physical & Chemical Properties****Appearance**

Clear, colorless liquid with ether-like odor.

**Physical state**

Liquid.

**Form**

Liquid. Transparent liquid.

**Color**

Clear colorless or nearly colorless

**Odor**

Ethereal odour.

**Odor threshold**

3.5 ppm

**pH**

7 (aqueous solution)

**Vapor pressure**

132 mm Hg at 20 °C

**Vapor density**

2.5

**Boiling point**

150.8 °F (66 °C)

**Melting point/Freezing point**

-163.3 °F (-108.5 °C)

**Solubility (water)**

Soluble

**Specific gravity**

0.89 at 20 °C

**Relative density**

Not available.

**Flash point**

1.4 °F (-17.0 °C) Closed Cup

**Flammability limits in air, upper, % by volume**

11.8

**Flammability limits in air, lower, % by volume**

1.8

**Auto-ignition temperature**

609.8 °F (321 °C)

**Evaporation rate**

&gt; 1

**Partition coefficient (n-octanol/water)**

0.5

**Molecular weight**

72.11 g/mol

**Molecular formula**C<sub>4</sub>H<sub>8</sub>O**Other data****Density**0.89 g/cm<sup>3</sup>**Dynamic viscosity**

456 mPa.s

**Dynamic viscosity temp**

77 °F (25 °C)

**Explosive limit**

Not explosive

**Explosive properties**

During long-term storage, uninhibited THF may form peroxides in the presence of air. Exposure to light can accelerate peroxide formation. THF containing peroxides may explode when the peroxides are concentrated by evaporation or distillation.

**Flammability (solid, gas)**

Not applicable.

**Oxidizing properties** No oxidizing properties.  
**Solubility (other)** Soluble in all proportions in alcohols, ketones, esters, ethers and hydrocarbons.

## 10. Chemical Stability & Reactivity Information

**Reactivity** The product is stable and non-reactive under normal conditions of use, storage and transport. During long-term storage, uninhibited THF may form peroxides in the presence of air. Exposure to light can accelerate peroxide formation. THF containing peroxides may explode when the peroxides are concentrated by evaporation or distillation.

**Chemical stability** Stable at normal conditions. Prolonged (12 months) exposure to air and heat, and/or prolonged storage can produce explosive peroxides.

**Conditions to avoid** Avoid temperatures exceeding the flash point. Contact with incompatible materials. Do not use in areas without adequate ventilation.

**Incompatible materials** Strong oxidizing agents. Alkalies. Bromine.

**Hazardous decomposition products** Refer to hazardous combustion products in Section 5. The following may be released during a fire: Carbon oxides. Peroxides.

**Possibility of hazardous reactions** Hazardous polymerization does not occur.

## 11. Toxicological Information

### Toxicological data

Product	Species	Test Results
Tetrahydrofuran (CAS 109-99-9)		
<b>Acute</b>		
<i>Dermal</i>		
LD50	Rat	> 2000 mg/kg
<i>Inhalation</i>		
LC50	Rat	18000 ppm, 4 hours 53.67 mg/l, 4 hours
<i>Oral</i>		
LD50	Rat	1650 mg/kg

**Acute effects** This product is not classified as an acute toxicity hazard. See data for individual ingredient acute toxicity data.

**Sensitization** Not expected to be a skin or respiratory sensitizer.

**Chronic effects** Prolonged or repeated overexposure may cause liver and kidney effects.

**Carcinogenicity** This product is not considered to be a carcinogen by IARC, NTP or OSHA.

### ACGIH Carcinogens

Tetrahydrofuran (CAS 109-99-9) A3 Confirmed animal carcinogen with unknown relevance to humans.

**Skin corrosion/irritation** May cause mild skin irritation. Prolonged contact, such as when trapped against the skin under clothing or jewelry, may be more irritating.

**Serious eye damage/irritation** Causes serious eye irritation.

**Mutagenicity** No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Reproductive effects** This product is not expected to cause reproductive or developmental effects.

**Teratogenicity** This product is not expected to be a teratogen.

**Most important symptoms/effects, acute and delayed** Causes serious eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Direct skin contact may cause slight or mild, transient irritation. Symptoms may include redness, edema, drying, defatting and cracking of the skin. May cause respiratory irritation. Symptoms may include upper respiratory irritation, coughing, and breathing difficulties. Inhalation of extremely high concentrations may cause dizziness, disorientation, incoordination, narcosis, nausea or narcotic effects. Harmful if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Symptoms of overexposure can include shortness of breath, drowsiness, headaches, confusion, decreased coordination, visual disturbances and vomiting, and are reversible if exposure is stopped.

**Epidemiology** No epidemiological data is available for this product.

**Synergistic materials** None known.

## 12. Ecological Information

### Ecotoxicological data

Product	Species	Test Results
Tetrahydrofuran (CAS 109-99-9)		
<b>Aquatic</b>		
<i>Acute</i>		
Crustacea	EC50	Water flea ( <i>Daphnia magna</i> ) 10.27 mg/l, 48 hours
Fish	LC50	Fathead minnow ( <i>Pimephales promelas</i> ) 2160 mg/l, 96 hours
<b>Ecotoxicity</b>	Harmful to aquatic life.	
<b>Environmental effects</b>	Harmful to aquatic organisms.	
<b>Aquatic toxicity</b>	The product should not be allowed to enter drains, water courses or the soil.	
<b>Persistence and degradability</b>	Readily biodegradable.	
<b>Bioaccumulation / accumulation</b>	No accumulation in living organisms is expected due to high solubility and dissociation properties.	
<b>Partition coefficient</b>	0.45	
<b>Mobility in environmental media</b>	This product is miscible in water.	

## 13. Disposal Considerations

<b>Disposal instructions</b>	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Dispose in accordance with all applicable regulations.
<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
<b>Contaminated packaging</b>	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

## 14. Transport Information

### TDG

<b>UN number</b>	UN2056
<b>UN proper shipping name</b>	TETRAHYDROFURAN
<b>Transport hazard class(es)</b>	
<b>Class</b>	3
<b>Subsidiary risk</b>	-
<b>Packing group</b>	II
<b>Environmental hazards</b>	Not available.
<b>Special precautions for user</b>	Read safety instructions, MSDS and emergency procedures before handling.

### IATA

<b>UN number</b>	UN2056
<b>UN proper shipping name</b>	TETRAHYDROFURAN
<b>Transport hazard class(es)</b>	
<b>Class</b>	3
<b>Subsidiary risk</b>	-
<b>Packing group</b>	II
<b>Environmental hazards</b>	No.
<b>ERG Code</b>	3H
<b>Special precautions for user</b>	Read safety instructions, MSDS and emergency procedures before handling.
<b>Other information</b>	
<b>Passenger and cargo aircraft</b>	Allowed.
<b>Cargo aircraft only</b>	Allowed.

### IMDG

<b>UN number</b>	UN2056
<b>UN proper shipping name</b>	TETRAHYDROFURAN

**Transport hazard class(es)**

**Class** 3  
**Subsidiary risk** -  
**Packing group** II

**Environmental hazards**

**Marine pollutant** No.  
**EmS** F-E, S-D

**Special precautions for user** Read safety instructions, MSDS and emergency procedures before handling.

IATA; IMDG; TDG

**15. Regulatory Information****Canadian regulations**

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

**WHMIS status**

Controlled

**WHMIS classification**

B2 - Flammable Liquids  
 D2B - Other Toxic Effects-TOXIC

**WHMIS labeling****International Inventories**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

**16. Other Information****HMIS® ratings**

Health: 2\*  
 Flammability: 3  
 Physical hazard: 1

**NFPA ratings**

Health: 2  
 Flammability: 3  
 Instability: 1

**Disclaimer**

Prepared by: ICC The Compliance Center Inc. 1-888-442-9628  
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**Disclaimer**

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**Bibliography**

Canadian Centre for Occupational Health and Safety, CCIInfoWeb Databases, 2014 (Chempendium, RTECs, HSDB, INCHEM)  
European Chemicals Bureau, Existing Chemicals Work Area, EINECS Information System, 2014. Material Safety Data Sheet from manufacturer.  
OECD - The Global Portal to Information on Chemical Substances - eChemPortal, 2014.

**Legend to abbreviations and acronyms used in the SDS**

ACGIH: American Conference of Governmental Industrial Hygienists  
CAS: Chemical Abstract Services  
CEPA: Canadian Environmental Protection Act  
CPR: Controlled Products Regulation  
CSA: Canadian Standards Association  
DSL: Domestic Substance List  
HMIS: Hazardous Materials Identification System  
HPA: Hazardous Protection Act  
HSDB: Hazardous Substance Data Bank  
IARC: International Agency for Research on Cancer  
IATA: International Air Transport Association  
ICAO: International Civil Aviation Organisation  
IMDG: International Maritime Dangerous Goods  
LC: Lethal Concentration  
LD: Lethal Dose  
MSDS: Material Safety Data Sheet  
NFPA: National Fire Protection Association  
NOEC: No observable effect concentration  
NTP: National Toxicology Program  
OECD: Organisation for Economic Co operation and Development  
OEL: National occupational exposure limits  
OSHA: Occupational Safety and Health Administration  
PPE: Personal Protective Equipment  
RCRA: Resource Conservation and Recovery Act  
RTECS: Registry of Toxic Effects of Chemical Substances  
STEL: Short Term Exposure Limit  
TDG: Canadian Transportation of Dangerous Goods Act & Regulations  
TWA: Time Weighted Average  
WEL: Workplace Exposure Limit  
WHMIS: Workplace Hazardous Materials Identification System