## 6. PREVENTIVE AND CORRECTIVE MEASURES

**PERSONAL PROTECTION:**

The selection of personal protective equipment varies, depending conditions of use.
In open systems where contact is likely, wear safety goggles, ch resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety goggles, lo and chemical-resistant gloves.
Where concentrations in air may exceed the occupational exposure given in Section 4 and where engineering, work practices or othe of exposure reduction are not adequate, approved respirators may necessary to prevent overexposure by inhalation.

**ENGINEERING CONTROLS:**

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled fumehood. Provide mechanical ventilation of confined spaces. Use explosion-proof ventilation equipment.

**HANDLING, STORAGE AND SHIPPING:**

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible ma
In keeping with good personal hygiene practices, wash hands thor after handling the material.
Store and load at normal (up to 38 deg C) temperature and at atm pressure.
Material will accumulate static charges which may cause a spark. charge build-up could become an ignition source. Use proper rel grounding procedures.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containe without commercial cleaning or reconditioning.

**LAND SPILL:**

Eliminate source of ignition. Keep public away. Prevent additi discharge of material, if possible to do so without hazard.
Vapours or dust may be harmful or fatal. Warn occupants of down areas.

Prevent spills from entering sewers, watercourses or low areas. spilled liquid with sand or earth. Do not use combustible mater as sawdust.
Recover by pumping (use an explosion proof motor or hand pump), using a suitable absorbent.
Consult an expert on disposal of recovered material. Ensure dis

compliance with government requirements and ensure conformity to disposal regulations. Notify the appropriate authorities immedi Take all additional action necessary to prevent and remedy the a effects of the spill.

**WATER SPILL:**

Eliminate all sources of ignition. Vapours or dust may be harmf or fatal. Warn occupants and shipping in downwind areas.
Consult an expert on disposal of recovered material. Ensure dis compliance with government requirements and ensure conformity to disposal regulations. Notify the appropriate authorities immedi Take all additional action necessary to prevent and remedy the a effects of the spill.

---

## 7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: -18 deg C COC ASTM D92

Autoignition: NA Flammable Limits: LEL: 0.6% UEL: 8.0%

**GENERAL HAZARDS:**

Extremely flammable; material will readily ignite at normal temp
Flammable Liquid; may release vapours that form flammable mixtur or above the flash point.
Decomposes; flammable/toxic gases will form at elevated temperat (thermal decomposition).
Toxic gases will form upon combustion.
Static Discharge; material may accumulate static charges which m a fire.

**FIRE FIGHTING:**

Use water spray to cool fire exposed surfaces and to protect per Shut off fuel to fire if possible to do so without hazard. If a spill has not ignited use water spray to disperse the vapours.
Either allow fire to burn out under controlled conditions or ext with foam or dry chemical. Try to cover liquid spills with foam Respiratory and eye protection required for fire fighting person Avoid spraying water directly into storage containers due to dan boilover.
A self-contained breathing apparatus (SCBA) should be used for a fires and any significant outdoor fires. For small outdoor fire may easily be extinguished with a portable fire extinguisher, us SCBA may not be required.

**HAZARDOUS COMBUSTION PRODUCTS:**

Smoke, carbon monoxide, carbon dioxide and traces of oxides of s

In addition, small amounts of nitrogen oxides will be formed.

## 8. REACTIVITY DATA

**STABILITY:**

This product is stable. Hazardous polymerization will not occ

**INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:**

Strong oxidizing agents. Use product with caution around heat, lights, static electricity and open flames.

**HAZARDOUS DECOMPOSITION:**

See: Hazardous Combustion Products

## 9. NOTES

All components of this product are listed on the U.S. TSCA inven

.

REVISION SUMMARY:
Since 31 May 2003, this MSDS has been revised in Section(s):
2

## 10. PREPARATION

Date Prepared: December 03, 2003
Prepared by: Lubricants & Specialties
IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

CAUTION: " The information contained herein relates only to this pr material and may not be valid when used in combination with any oth or material or in any process. If the product is not to be used fo or under conditions which are normal or reasonably foreseeable, thi information cannot be relied upon as complete or applicable. For gr

certainty, uses other than those described in Section 1 must be rev
with the supplier. The information contained herein is based on the
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the use of Imperial Oil customers and their employees and agents on
Any further distribution of this MSDS by Imperial Oil customers is
prohibited without the written consent of Imperial Oil."

**Call our toll-free customer service center at 1-800-567-ESSO (3776) for information or ques Sheets.**

## SECTION 1. CHEMICAL IDENTIFICATION

**CHEMINFO Record Number:** 59
**CCOHS Chemical Name:** Propane

**Synonyms:**
Dimethylmethane
Liquified petroleum gas
Propyl hydride

**Chemical Name French:** Propane
**Chemical Name Spanish:** Propano
Propano (gas)

| | |
|---|---|
| **CAS Registry Number:** | 74-98-6 |
| **UN/NA Number(s):** | 1075 1978 |
| **RTECS Number(s):** | TX2275000 |
| **Chemical Family:** | Saturated aliphatic hydrocarbon / alkane / n-alkane / propane isomer |
| **Molecular Formula:** | C3-H8 |
| **Structural Formula:** | CH3-CH2-CH3 |

**Status of Record:**
The CHEMINFO record for this chemical is complete. The full format provides a detailed evaluation of health, fire and reactivity hazards, as well as recommendations on topics such as handling and storage, personal protective equipment, accidental release and first aid.

## SECTION 2. DESCRIPTION

**Appearance and Odour:**
Colourless gas with a faint odour at high concentrations when pure; fuel grades contain trace amount of an odorous mercaptan.

**Odour Threshold:**
22,000 mg/m3, 36,000 mg/m3 (method not specified)

**Warning Properties:**
POOR - pure propane; GOOD - with added mercaptan odourant

**Composition/Purity:**
Contains trace amounts of ethane, propylene, isobutane, and n-butane.

**Uses and Occurrences:**
Household and industrial fuel; solvent; refrigerant; aerosol propellant; production of ethylene and other petrochemicals.

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**Uses and Occurrences:**
Household and industrial fuel; solvent; refrigerant; aerosol propellant; production of ethylene and other petrochemicals.

## SECTION 3. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW:

Colourless gas. Faint odour at high concentrations. Fuel grades contain mercaptans which have a disagreeable odour. EXTREMELY FLAMMABLE GAS. Gas is heavier than air and may spread long distances. Distant ignition and flashback are possible. COMPRESSED GAS. Simple asphyxiant. Gas may reduce oxygen available for breathing. Rapid evaporation of liquid from cylinder may cause frostbite.

### POTENTIAL HEALTH EFFECTS

#### Effects of Short-Term (Acute) Exposure

**Inhalation:**

At air concentrations below 1000 ppm propane is virtually non-toxic.(4) Brief exposures to 10,000 ppm cause no symptoms; 100,000 ppm can produce slight dizziness after a few minutes of exposure, but is not noticeably irritating to the nose and throat.(3)

Propane is a simple asphyxiant. High concentrations of propane can displace oxygen and cause asphyxiation. Oxygen content in the atmosphere must not be allowed to fall below 18%. Effects of oxygen deficiency are: 12-16% breathing and pulse rate increased, muscular co-ordination slightly disturbed; 10-14% emotional upset, abnormal fatigue, disturbed respiration; 6-10%: nausea and vomiting, collapse or loss of consciousness; below 6%: convulsive movements, possible respiratory collapse and death.(7)

**Skin Contact:**

The gas does not affect the skin.(4) Contact with liquified gas escaping from its high pressure cylinder may cause frostbite. Symptoms of mild frostbite include numbness, prickling and itching in the affected area. Symptoms of more severe frostbite include a burning sensation and stiffness of the affected area. The skin may become waxy white or yellow. Blistering, tissue death and gangrene may also develop in severe cases.
Close range contact with liquified propane gas may cause injury characteristic of a thermal burn with swelling, fluid accumulation and extreme redness. Tissue death and gangrene may also develop.(8)

**Eye Contact:**

The gas does not cause eye irritation. Contact with liquified gas escaping from its high pressure cylinder may cause freezing of the eye. Permanent eye damage or blindness could result.

**Ingestion:**

Not applicable to gases

#### Effects of Long-Term (Chronic) Exposure

No long-term effects have been reported from exposure to propane.

**Carcinogenicity:**

## SECTION 1. CHEMICAL IDENTIFICATION

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**Eye Contact:**

The gas does not cause eye irritation. Contact with liquified gas escaping from its high pressure cylinder may cause freezing of the eye. Permanent eye damage or blindness could result.

**Ingestion:**

Not applicable to gases

#### Effects of Long-Term (Chronic) Exposure

No long-term effects have been reported from exposure to propane.

**Carcinogenicity:**

No specific data. Probably not carcinogenic.

The International Agency for Research on Cancer (IARC) has not evaluated the carcinogenicity of this chemical.

The American Conference of Governmental Industrial Hygienists (ACGIH) has not assigned a carcinogenicity designation to this chemical.

The US National Toxicology Program (NTP) has not listed this chemical in its report on carcinogens.

**Teratogenicity and Embryotoxicity:**
No specific data. Probably has no teratogenic or embryotoxic effects.

**Reproductive Toxicity:**
No specific data. Probably has no reproductive effects.

**Mutagenicity:**
Not mutagenic in short-term bacterial tests.(3)

**Potential for Accumulation:**
None

## SECTION 4. FIRST AID MEASURES

**Inhalation:**
This product is flammable. Take proper precautions (e.g., remove any sources of ignition). Take proper precautions to ensure your own safety before attempting rescue, e.g., wear appropriate protective equipment, use the "buddy" system. Remove source of contamination or move victim to fresh air. If breathing has stopped, properly trained personnel should begin artificial respiration or cardiopulmonary resuscitation (CPR) immediately. Oxygen may be beneficial if administered by a person trained in its use, preferably on a physician's advice. Obtain medical attention immediately.

**Skin Contact:**
LIQUID: Quickly remove victim from source of contamination and briefly flush with lukewarm, gently flowing water until the chemical is removed. DO NOT attempt to rewarm the affected area on site. DO NOT rub area or apply dry heat. Gently remove clothing or jewelry that may restrict circulation. Carefully cut around clothing that sticks to the skin and remove the rest of the garment. Loosely cover the affected area with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Quickly transport victim to an emergency care facility. GAS: Not applicable. No effects expected.

**Eye Contact:**
LIQUID: Quickly remove victim from source of contamination. Immediately and briefly flush with lukewarm, gently flowing water until the chemical is removed. DO NOT attempt to rewarm. Cover both eyes with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Quickly transport victim to an emergency care facility. GAS: Not applicable. No effects expected.

**Ingestion:**

Ingestion is not an applicable route of exposure for gases.

**First Aid Comments:**

Provide general supportive measures (comfort, warmth, rest). Consult a doctor and/or the nearest Poison Control Centre for all exposures except minor instances of inhalation or skin contact. Some recommendations in the above sections may be considered medical acts in some jurisdictions. These recommendations should be reviewed with a doctor and appropriate delegation obtained, as required. All first aid procedures should be periodically reviewed by a doctor familiar with the material and its condition of use in the workplace.

## SECTION 5. FIRE FIGHTING MEASURES

**Flash Point:**

Flammable gas; -104.4 deg C (-155.9 deg F) (4)

**Lower Flammable (Explosive) Limit (LFL/LEL):**

2.2%

**Upper Flammable (Explosive) Limit (UFL/UEL):**

9.5% (5)

**Autoignition (Ignition) Temperature:**

450 deg C (842 deg F) (5)

**Sensitivity to Mechanical Impact:**

Probably not sensitive. Stable material.

**Sensitivity to Static Charge:**

Can accumulate electrostatic charge by flow or agitation due to its low electrical conductivity (50 pS/m).(7) Propane gas in the flammable range can be ignited readily by an electrostatic discharge of sufficient energy.

**Fire Hazard Summary:**

Extremely flammable gas. Can form explosive mixtures with air. Gas is slightly heavier than air and may travel a considerable distance to a source of ignition and flash back to a leak or open container. Can accumulate in confined spaces, resulting in an explosion or toxicity hazard. Compressed gas. Heat from a fire can cause a rapid buid-up of pressure inside cylinders, which may cause expolosive rupture.

**Extinguishing Media:**

Dry chemical, carbon dioxide, water spray, fog. Water may be ineffective because it will not cool propane below its flash point.

**Fire Fighting Instructions:**

Evacuate area and fight fire from a safe distance or protected location. Approach fire from upwind to avoid hazardous toxic decomposition products. For fires involving flammable gases, the best procedure is to stop the flow of gas before trying to extinguish the fire. To extinguish the

stop the flow of gas before trying to extinguish the fire. To extinguish the fire, while allowing continued flow of the gas, is extremely dangerous. The gas could form an explosive mixture with air and reignite, which may cause far more damage than if the original fire had been allowed to burn. In some cases, extinguishing the fire with carbon dioxide or dry chemical powder may be necessary to permit immediate access to valves to shut off the flow of gas. However, this must be done carefully. If it is not possible to stop the flow of gas and if there is no risk to the surrounding area, it is preferable to allow continued burning, while protecting exposed materials with water spray until the flow of gas can be stopped. Gas clouds may be controlled by water spray or fog. Isolate materials not yet involved in the fire and protect personnel. Heat from a fire can cause a rapid build-up of pressure inside cylinders, which may cause explosive rupture. Move cylinders from fire area if this can be done without risk. Keep fire-exposed cylinders or tanks cool by spraying with water to minimize the risk of rupture. No part of a cylinder should be subjected to a temperature higher than 52 deg C (approximately 125 deg F). For a massive fire in a large area, use unmanned hose holder or monitor nozzles; if this is not possible withdraw from fire area and allow fire to burn. Stay away from ends of tanks. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. After the fire has been extinguished, explosives atmospheres may linger. Before entering such an area, especially confined areas, check the atmosphere with an appropriate device. Propane, itself, is only slightly hazardous to health. However, it can displace oxygen, reducing the amount available for breathing. Firefighters may enter the area if positive pressure self-contained breathing apparatus (MSHA/NIOSH approved or equivalent) and full Bunker Gear is worn.

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) HAZARD IDENTIFICATION

| | |
|---|---|
| **NFPA - Health:** | 2 - Intense or continued (but not chronic) exposure could cause temporary incapacitation or possible residual injury. |
| **NFPA - Flammability:** | 4 - Will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or readily disperse in air and burn readily. |
| **NFPA - Instability:** | 0 - Normally stable, even under fire conditions, and not reactive with water. |

## SECTION 6. ACCIDENTAL RELEASE MEASURES

**Spill Precautions:**

Restrict access to area until completion of cleanup. Ensure cleanup is conducted by trained personnel only. Provide adequate personal protective equipment. Eliminate all ignition sources. Ventilate area. Notify government environmental agencies if release of material into the environment occurs.

**Clean-up:**

Stop leak if it can be done without risk. Use water spray to reduce vapours. Isolate area until gas has dispersed.

## SECTION 7. HANDLING AND STORAGE

**Handling:**

This material is a FLAMMABLE GAS. In some workplaces, it will be available as a compressed gas. Before handling, it is very important that engineering controls are operating and that protective equipment requirements are being followed. People working with this chemical should be properly trained regarding its hazards and its safe use.

Eliminate all ignition sources (e.g., sparks, open flames, hot surfaces). Keep away from heat and welding operations. During transfer operations, cylinders and vessels should be electrically grounded and bonded to prevent the build up of a static charge. Post NO SMOKING signs. It is very important to keep areas where this material is used clear of other materials which can burn. Prevent the release of gas into the workplace air.

Do not use with incompatible materials such as strong oxidizing agents (e.g., nitrates and perchlorates) which can increase risk of fire and explosion.

In large scale handling operations, use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems. Keep aisles and exits free of obstruction. Consider the installation of leak and fire detection equipment along with a suitable, automatic fire suppression system.

Use smallest, practical cylinder size in a well ventilated area separate from the storage area. Leave cylinder cap on cylinder until cylinder is secured and ready for use. Always secure cylinders to a wall, rack or other solid structure in an upright position. Do not handle cylinders with oily hands. Use the appropriate pressure regulator. Ensure equipment is compatible with cylinder pressure and contents. Follow supplier recommendations. Before connecting the cylinder for use, make sure that back feed from the system into the cylinder is prevented. Do not open cylinder if damaged. Never use excessive force when opening. Open cylinder valve slowly to prevent rapid decompression and damage to valve seat. Keep cylinder valves clean and free from contaminants (particularly oil and water). Make sure valves on gas cylinders are fully opened when gas is used. Open and shut valves at least once a day, while cylinder is in use, to avoid valve freezing. Make sure cylinders are labelled clearly. Avoid damaging cylinders. Move cylinders by hand truck or cart designed for that purpose. Do not drop cylinders or permit them to bang against each other. Do not lift cylinders by the cap or with a lifting magnet. Shut flow off at cylinder valve and not just at the regulator after use. Replace outlet caps or plugs and cylinder caps as soon as cylinder is disconnected from equipment. Keep empty cylinders under slightly positive pressure. Do not use cylinders as rollers or for any other purpose than to contain the gas as supplied. Regularly check cylinders for evidence of corrosion or leakage.

Follow handling precautions on Material Safety Data Sheet. Have suitable emergency equipment for fires, spills and leaks readily available. Practice good housekeeping. Maintain handling equipment. Comply with applicable regulations.

**Storage:**

Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Inspect all incoming containers before storing to ensure they are undamaged and properly labelled. Store in a cool, dry, well-ventilated area out of direct sunlight. Store away from incompatible materials, such as strong oxidizing agents (e.g. perchlorates). Consider leak detection and alarm equipment for storage area.

Avoid storage of cylinders for more than six months. Protect cylinders from corrosion by keeping surface of storage area dry. Always check cylinder valve for evidence of damage, rust or dirt which may inhibit operation before storage and use. Check that the cylinder was last tested within the required time. Always chain or otherwise

securely restrain cylinders in an upright position to a wall, rack or other solid structure when they are stored. Check compatibility with other materials including other compressed gases and separate at the appropriate distance. Store empty cylinders separate from full ones with valves shut off, cap secure and labelled EMPTY or "MT". Follow supplier/manufacturer recommendations on storage, quantity, temperature and other storage conditions. This material is heavier than air and at a colder temperature than air. Leaks can accumulate in low areas. Do not store below ground level.

Store away from all heat and ignition sources. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems. Store according to applicable regulations for flammable materials for storage tanks, containers, buildings, rooms, cabinets, allowable quantities and minimum separation distances. Keep quantity stored as small as possible. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Keep storage area clear of materials which can burn. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers).

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

NOTE: Exposure to this material can be controlled in many ways. The measures appropriate for a particular worksite depend on how this material is used and on the extent of exposure. This general information can be used to help develop specific control measures. Ensure that control systems are properly designed and maintained. Comply with occupational, environmental, fire, and other applicable regulations.

**Sampling and Analysis:**

Sampling should only be done by trained personnel using appropriate instrumentation and sampling strategy (location, timing, duration, frequency, and number of samples). Interpretation of the sampling results is related to these variables and the analytical method.

OSHA IN-HOUSE METHOD. OSHA CD-ROM (OSHA A95-1). US Dept. of Labour, December 1994. Partially validated. Collection on 2 carbosieve S-III sorbent tubes in series. Desorption with carbon disulphide (CS2). Analysis by gas chromatography using flame ionization detector (FID). For further details, contact OSHA Salt Lake Technical Centre at 801-487-0267.

NIOSH METHOD S87 - NIOSH Manual of Analytical Methods. 2nd ed. Vol. 2. Validated method. The propane vapour present in the atmosphere is measured directly by drawing the air into a combustible gas meter properly calibrated with propane. Estimated detection limit: 481 ppm.

DIRECT READING INSTRUMENTS: Methods of detection in commercially available devices which may be suitable: Infrared spectrometer, photoionization detector, gas chromatograph, thermal conductivity detector, flame ionization detectors, combustible gas meter.

COLORIMETRIC DETECTOR TUBES: Commercially available.

NOTE: Measure oxygen content of the workplace air, especially in confined spaces, because displacement of oxygen by high concentrations of propane.

**Engineering Controls:**

Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions, and process modification (e.g. substitution of a less hazardous material). Administrative controls and personal protective equipment may also be required.

Provide adequate local exhaust and dilution (general) ventilation to maintain airborne levels of propane safely below the lower explosive limit. Use a non- sparking, grounded ventilation system separate from other exhaust ventilation system. Exhaust directly to the outside taking necessary precautions for environmental protection. Supply sufficient air to replace air removed by exhaust ventilation systems.

**Personal Protective Equipment:**

If engineering controls and work practices are not effective in controlling exposure to propane, then wear suitable, approved respiratory protection. Have appropriate protective equipment available for use in emergencies such as spills or fire. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection. Refer to the CSA Standard Z94.4-93, "Selection, Use and Care of Respirators," available from the Canadian Standards Association, Rexdale, Ontario, M9W 1R3.

**Respiratory Protection Guidelines:**

NIOSH RECOMMENDATIONS FOR PROPANE CONCENTRATIONS IN AIR (2):

UP TO 2100 ppm: SAR; or full-facepiece SCBA.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

ESCAPE: Escape-type SCBA.

NOTE: The IDLH concentration for propane is 2100 ppm (10% of the Lower Explosive Limit).

NOTE: The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protective equipment, every effort should be made to exit immediately. Recommendations apply only to NIOSH approved respirators.
ABBREVIATIONS: SAR = supplied-air respirator; SCBA = self-contained breathing apparatus. IDLH = Immediately Dangerous to Life or Health.

**Eye/Face Protection:**

Chemical safety goggles and a face shield when handling liquid propane.

**Skin Protection:**

Insulated gloves suitable for low temperatures; long sleeves, trousers worn outside boots, or over shoes when handling liquid propane.

**Resistance of Materials for Protective Clothing:**

Guidelines for propane (10):
RECOMMENDED (resistance to breakthrough longer than 8 hours): Responder (TM).
RECOMMENDED (resistance to breakthrough longer than 4 hours): Teflon(TM).
Recommendations are valid for permeation rates reaching 0.1 ug/cm2/min or 1 mg/m2/min and over. Resistance of specific materials can vary from product to product. Breakthrough times are obtained under conditions of continuous contact, generally at room temperature. Evaluate resistance under conditions of use and maintain clothing carefully.

**Personal Hygiene:**

Have a safety shower and eyewash fountain readily available in the work area for emergency use when handling liquid propane. Any clothing which becomes wet with liquid propane should be removed immediately and not reworn until the propane has evaporated.

evaporated.

## EXPOSURE GUIDELINES

### THRESHOLD LIMIT VALUES (TLVs) / AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) / 2003

**Time-Weighted Average (TLV-TWA):** (2500 ppm)*
**TLV Basis - Critical Effect(s):** Asphyxiation

**TLV Proposed Changes:**
*NOTICE OF INTENDED CHANGE: The replacement of the adopted TLV with a TLV-TWA of 1000 ppm for aliphatic hydrocarbon gases (C1 - C4) is proposed.

**TLV Comments:**
NOTE: In many jurisdictions, exposure limits are similar to the ACGIH TLVs. Since the manner in which exposure limits are established, interpreted, and implemented can vary, obtain detailed information from the appropriate government agency in each jurisdiction.

### PERMISSIBLE EXPOSURE LIMITS (PELs) / FINAL RULE LIMITS / US OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

**Time-Weighted Average (PEL-TWA):** Not established

NOTE: The OSHA PEL Final Rule Limits are currently non-enforceable due to a court decision. The OSHA PEL Transitional Limits are now in force.

### PERMISSIBLE EXPOSURE LIMITS (PELs) / TRANSITIONAL LIMITS / US OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

**Time-Weighted Average (PEL-TWA):** 1000 ppm (1800 mg/m3)

**Transitional Limit PEL Comments:**
These Permissible Exposure Limits are taken from 29 CFR 1910.1000 Table Z - 1.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**Molecular Weight:** 44.10

**Conversion Factor:**
1 ppm = 1.80 mg/m3, 1 mg/m3 = 0.56 ppm

| | |
|---|---|
| **Melting Point:** | -190 deg C (-310 deg F) |
| **Boiling Point:** | -42.1 deg C (-43.7 deg F) |
| **Relative Density (Specific Gravity):** | 0.5 (water=1) (saturation pressure at 20 deg C) |
| **Solubility in Water:** | Slight (65 ml of gas per L of water) |

| | |
|---|---|
| **Solubility in Other Liquids:** | Soluble in ethanol, ether, chloroform; slightly soluble in acetone. |
| **Coefficient of Oil/Water Distribution (Partition Coefficient):** | Log P(oct) = 2.36 (3) |
| **pH Value:** | Not applicable |
| **Vapour Density:** | 1.55 (air=1) |
| **Vapour Pressure:** | 853 kPa (8.42 atm) at 21.1 deg C |
| **Saturation Vapour Concentration:** | Not applicable |
| **Evaporation Rate:** | Not applicable |
| **Critical Temperature:** | 96.8 deg C (206.3 deg F) |

**Other Physical Properties:**

CRITICAL PRESSURE: 4266 kPa (42.10 atm)

## SECTION 10. STABILITY AND REACTIVITY

**Stability:**

Stable

**Hazardous Polymerization:**

Does not occur

**Incompatibility - Materials to Avoid:**

STRONG OXIDIZING AGENTS (e.g. nitrates, perchlorates) - can increase the risk of fire and explosion.

**Hazardous Decomposition Products:**

None

**Conditions to Avoid:**

Static charge, sparks, open flames and other ignition sources

**Corrosivity to Metals:**

Not corrosive

## SECTION 11. TOXICOLOGICAL INFORMATION

No standard animal toxicity values are available.
SKIN CONTACT (Rabbit): Several formulations containing an isobutane - propane mixture were tested for skin irritation effects. All formulations contained less than 13% propane. All of the formulations containing propane caused only mild irritation.(4)

EFFECTS OF SHORT-TERM INHALATION: Guinea-pigs breathing 5.5% (55,000 ppm) propane by volume developed tremors after 5 minutes. Nausea, retching and stupefaction were observed when animals were exposed for 30-120 minutes. All the animals survived a 2-hour exposure and had no significant tissue damage.(3) A gas concentration of 89% did not cause anesthesia, but depressed the blood pressure of cats. Inhalation of 10% propane by mice and 15% by dogs causes weak cardiac sensitization. Presumably, all of these effects are reversible when exposure ceases.(1)

In primates, 10% propane (100,000 ppm) caused some changes in heart function. At

20% there was aggravation of these symptoms and respiratory depression.(1)

EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE: No toxicity or abnormalities were observed when monkeys were exposed to approximately 750 ppm for 90 days. Similar results were obtained in another study where monkeys were exposed to an aerosol spray containing 65% propane and isobutane.(3)

## SECTION 12. ECOLOGICAL INFORMATION

NOTE : Inclusion of Ecological Information on an MSDS is optional under the US Hazard Communication Standard and the Canadian Controlled Products Regulations (WHMIS). In other jurisdictions, inclusion of Ecological Information may be a requirement. For specific requirements, contact the relevant regulatory authorities in the jurisdiction where the MSDS is intended to be used.

The American National Standard for Hazardous Industrial Chemicals - Material Safety Data Sheets - Preparation (ANSI 2400.1-1998) provides advice on data that could be included in this section, as well as ecotoxicological tests and issues.

Databases in CCOHS's CD-ROM and Web collection which contain useful Ecological Information include CESARS, HSDB® (Hazardous Substances Data Bank) and CHRIS (Chemical Hazards Response Information System).

## SECTION 13. DISPOSAL CONSIDERATIONS

Allow gas to dissipate safely into the atmosphere or use as fuel.

## SECTION 14. TRANSPORT INFORMATION

### CANADIAN TRANSPORTATION OF DANGEROUS GOODS (TDG) SHIPPING INFORMATION

| | |
|---|---|
| **Shipping Name and Description:** | PROPANE |
| **UN Number:** | UN1978 |
| **Class:** | 2.1 |
| **Packing Group/Risk Group:** | --- |
| **Special Provisions:** | 29, 42 |
| **Passenger Carrying Road/Rail Limit:** | Forbidden |
| **Marine Pollutant:** | --- |
| **Shipping Name and Description:** | LIQUEFIED PETROLEUM GASES; or PETROLEU GASES, LIQUEFIED |
| **UN Number:** | UN1075 |
| **Class:** | 2.1 |
| **Packing Group/Risk Group:** | --- |
| **Special Provisions:** | --- |
| **Passenger Carrying Road/Rail Limit:** | Forbidden |
| **Marine Pollutant:** | Potential Marine Pollutant |

NOTE: This information incorporates the Transportation of Dangerous Goods Regulations SOR/2001-286, effective October 2003

Regulations SOR/2001-286, effective October 2003.

### US DEPARTMENT OF TRANSPORT (DOT) HAZARDOUS MATERIALS SHIPPING INFORMATION (49 CFR)

| | |
|---|---|
| **Shipping Name and Description:** | PROPANE see also PETROLEUM GASES, LIQUI |
| **Hazard Class or Division:** | 2.1 |
| **Identification Number:** | UN1978 |
| **Packing Group:** | --- |

NOTE: This information was taken from the US Code of Federal Regulations Title 49 - Transportation and is effective October 2003.

## SECTION 15. REGULATORY INFORMATION

### CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

**CCOHS WHMIS Classification:**

A - Compressed gas
B1 - Flammable combustible material - Flammable gas


**WHMIS Health Effects Criteria Met by this Chemical:**

Does not meet criteria

**Detailed WHMIS Classification According to Criteria:**

**Class A - Compressed Gas:**

Meets criteria.
Vapour pressure 8.5 atm at 20 deg C

**Class B - Flammable and Combustible Material:**

Meets criteria for "Flammable gas".
Lower Flammable Limit: 2.2%; Upper Flammable Limit: 9.5%

**Class C - Oxidizing Material:**

Does not meet criteria.

**Class D - Poisonous and Infectious Material. Division 1 - Immediate and Serious Toxic Effects:**

Does not meet criteria.

**Class D - Poisonous and Infectious Material. Division 2 - Other Toxic Effects:**

Does not meet criteria.
See detailed evaluation below

See detailed evaluation below.

**Chronic Health Effects:**
Does not meet criteria.
No toxic effects in 90-day study at 750 ppm.

**Carcinogenicity:**
Does not meet criteria. Not included in standard reference lists.

**Teratogenicity and Embryotoxicity:**
Insufficient information.
Probably does not meet criteria.

**Reproductive Toxicity:**
Insufficient information.
Probably does not meet criteria.

**Mutagenicity:**
Does not meet criteria.

**Respiratory Tract Sensitization:**
Does not meet criteria.
Not reported as a human respiratory sensitizer.

**Skin Irritation:**
Does not meet criteria.

**Eye Irritation:**
Does not meet criteria.

**Skin Sensitization:**
Does not meet criteria.

**Class E - Corrosive Material:**
Does not meet criteria.

**Class F - Dangerously Reactive Material:**
Does not meet criteria.

## US OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200)

**OSHA Hazard Communication Evaluation:**
Meets criteria for hazardous material, as defined by 29CFR 1910.1200.

## EUROPEAN UNION (EU) CLASSIFICATION AND LABELLING INFORMATION

**EU Classification:**
Extremely Flammable [Ft].(6)

**EU Risk Phrases:**
Extremely flammable. [R:12].

**EU Safety Phrases:**

Keep out of reach of children.* Keep container in a well ventilated place. Keep away from sources of ignition - no smoking. [S:(2-)*9-16].
*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.

## SECTION 16. OTHER INFORMATION

**Selected Bibliography:**

(1) Cavender, F. Aliphatic hydrocarbons. In: Patty's industrial hygiene and toxicology. 4th revised ed. Vol. 2B. Edited by G.D. Clayton, et al. John Wiley and Sons, Inc., 1994. p. 1221-1266
(2) NIOSH pocket guide to chemical hazards. NIOSH, June 1994. p. 262-263
(3) Patty, F.A., et al. Odour intensity and symptoms produced by commercial propane, butane, pentane, hexane and heptane vapor. R.I. 2979 (Dec. 1929). p. 1-10
(4) Final report of the safety assessment of isobutane, isopentane, n-butane and propane. Journal of the American College of Toxicology. Vol. 1, no. 4 (1982). p. 127-142
(5) Fire protection guide to hazardous materials. 13th ed. Edited by A.B. Spencer, et al. National Fire Protection Association, 2002. NFPA 325
(6) European Economic Community. Commission Directive 94/69/EC. December 19, 1994
(7) Nash Osbern, L. Simple Asphyxiants. In: Environmental and Occupational Medicine. 2nd ed. Edited by W.N. Rom. Little, Brown and Company, 1983. p. 285-288
(8) Matook, G.M. et al. Propane thermal injuries: case report and review of the literature. Journal of Trauma. Vol. 37, no. 2 (1994). p. 318-321
(9) Chemical safety sheets: working safely with hazardous chemicals. Kluwer Academic Publishers, 1991. p. 746
(10) Forsberg, K., et al. Quick selection guide to chemical protective clothing. 3rd ed. Van Nostrand Reinhold, 1997

Information on chemicals reviewed in the CHEMINFO database is drawn from a number of publicly available sources. A list of general references used to compile CHEMINFO records is available in the database Help.

**Review/Preparation Date: 1996-09-16**

**Revision Indicators:**

| | |
|---|---|
| TLV-TWA | 1997-10-01 |
| TLV comments | 1997-10-01 |
| Respiratory guidelines | 1997-12-01 |
| US transport | 1998-03-01 |
| Resistance of materials | 1998-06-01 |
| Bibliography | 1998-06-01 |
| TLV-TWA | 1998-06-01 |
| TLV comments | 1998-06-01 |
| TDG | 2002-05-27 |
| US transport | 2002-12-04 |
| Bibliography | 2003-04-11 |
| NFPA (health) | 2003-04-11 |
| TLV-TWA | 2003-05-23 |
| TLV proposed changes | 2003-05-23 |

| | |
|---|---|
| PEL transitional comments | 2003-10-30 |
| PEL-TWA transitional | 2003-10-30 |
| PEL-TWA final | 2003-10-30 |