Propane

Incident management

Key Points

Fire

- Extremely flammable
- Reacts with oxidising agents such as nitrates and perchlorates that may increase the risk of fire or explosion
- Emits acrid smoke and irritating fumes of carbon dioxide, carbon monoxide when heated to decomposition
- In the event of a fire involving propane, fine water spray and normal fire kit with breathing apparatus

Health

- Toxic by inhalation and dermal exposure
- Inhalation causes euphoria, agitation, slurred speech, nausea, vomiting, flushing and headache. In severe cases respiratory depression, hypotension, myocardial infarction, cardiac dysrhythmias, seizures, coma and death may occur
- Skin contact with liquid propane may cause severe burns

Environment

- Avoid release into the environment
- Inform Environment Agency of substantial incidents

Prepared by CHAPD HQ, HPA
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Version 1

Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes[a]

UN		**1978**	Propane	
EAC		**2YE**	Use fine water spray. Wear normal fire kit in combination with breathing apparatus*. Danger that the substance can be violently or explosively reactive. Spillages and decontamination run-off should be prevented from entering drains and watercourses. There may be a public safety hazard outside the immediate area of the incident**.	
APP		**-**	-	
Hazards	**Class**	**2.1**	Flammable gases	
	Sub risks	**-**	-	
HIN		**23**	Flammable gas	

UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

*Normal fire fighting clothing i.e. fire kit (BS EN 469), gloves (BS EN 659) and boots (HO specification A29 and A30) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).
** People should stay indoors with windows and doors closed, ignition sources should be eliminated and ventilation stopped. Non-essential personnel should move at least 250 m away from the incident.

[a] Dangerous Goods Emergency Action Code List, The Stationery Office, 2009.

Chemical Hazard Information and Packaging for Supply Classification[a]

Classification	**F+**	Extremely flammable	
Risk phrases	**R12**	Extremely flammable	
Safety phrases	**S2**	Keep out of the reach of children	
	S9	Keep container in a well-ventilated place	
	S16	Keep away from sources of ignition - No smoking	

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)[b]*

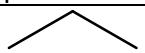
Hazard Class and Category	Flam. Gas 1		
	Press. Gas		
Hazard Statement	**H220**	Extremely flammable gas	
Signal word	DANGER		

* Implemented in the EU on 20 January 2009.

[a] Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.
http://ecb.jrc.ec.europa.eu/classification-labelling/clp/ (accessed 08/2010).

[b] Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of and Mixtures- Table 3.1.
http://ecb.jrc.ec.europa.eu/classification-labelling/clp/ (accessed 08/2010).

Physicochemical Properties

CAS number	74-98-6
Molecular weight	44.1
Empirical formula	C_3H_8
Common synonyms	Dimethylmethane, propyl hydride
State at room temperature	Colourless gas
Volatility	Vapour pressure = 760 mmHg at 25°C
Specific gravity	1.6 (air = 1), heavier than air.
Flammability	Flammable
Lower explosive limit	2.1%
Upper explosive limit	9.5%
Water solubility	Slightly soluble
Reactivity	Reacts with oxidising agents such as nitrates and perchlorates that may increase risk of fire or explosion.
Reaction or degradation products	Decomposes to emit acrid smoke and irritating fumes, produces carbon monoxide, carbon dioxide and water.
Odour	Odourless when pure, but may have a natural gas or faint petroleum-like odour.
Structure	

References [a,b,c]

[a] The Merck Index (14th Edition). Entry 7799: Propane, 2006.
[b] Propane (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 08/2009)
[c] International Chemical Safety Card (ICSC) entry for Propane. ISCS 0319. International Occupational Safety and Health Information Centre (CIS), 2005.

Threshold Toxicity Values

EXPOSURE VIA INHALATION		
ppm	**mg m^{-3}**	**SYMPTOMS**
< 1000	< 1830	Few effects
10,000 – 100,000	18,300 – 183,000	Dizziness
≥100,000	≥183,000	Vertigo

References [(a)]

[a] Propane (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 08/2009).

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values

	Listed value (ppm)	Calculated value (mg m^{-3})
ERPG-1*	Data not available	
ERPG-2**		
ERPG-3***		

* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour.
** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.
*** Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.

Interim Acute Exposure Guideline Levels (AEGLs)[(a)]

	ppm				
	10 min	**30 min**	**60 min**	**4 hr**	**8 hr**
AEGL-1[†]	10,000*	6,900*	5,500*	5,500*	5,500*
AEGL-2[††]	**	**	**	**	**
AEGL-3[†††]	***	***	***	***	***

Lower Explosive Limit (LEL) = 23,000 ppm
* = >10% LEL; ** = >50% LEL; *** = >100% LEL
AEGL 2 - 10 min/30 min/60 min/4 hr/8 hr = ** 17,000 ppm
AEGL 3 - 10 min/30 min/60 min/4 hr/8 hr = *** 33,000 ppm
For values denoted as * safety considerations against the hazard(s) of explosion(s) must be taken into account.
For values denoted as ** and *** extreme safety considerations against the hazard(s) of explosion(s) must be taken into account.

[†] The level of the chemical in air at or above which the general population could experience notable discomfort.
[††] The level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape.
[†††] The level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

[a] U.S. Environmental Protection Agency. Acute Exposure Guideline Levels, http://www.epa.gov/oppt/aegl/pubs/chemlist.htm (accessed 07/2009).

Exposure Standards, Guidelines or Regulations

Occupational Standards

WEL	LTEL (8 hour reference period): No guideline value specified
	STEL (15 min reference period): No guideline value specified

Public Health Guidelines

DRINKING WATER QUALITY GUIDELINE	No guideline value specified
AIR QUALITY GUIDELINE	No guideline value specified
SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES	No guideline value specified

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term exposure limit

Health Effects

Major Route of Exposure[a]

- Toxic by inhalation and dermal exposure.

Immediate Signs or Symptoms of Acute Exposure [a,b]

- Inhalation causes euphoria, agitation, slurred speech, nausea, vomiting, flushing and headache. Ataxia, dysarthria and progressive impairment of consciousness may develop. Respiratory depression, hypotension, myocardial infarction, cardiac dysrhythmias, seizures, coma and death may occur if exposure is prolonged or if inhaled concentrations are high.
- Liquid propane causes severe burns to the skin.

TOXBASE - http://www.toxbase.org
[a] TOXBASE: Propane, 2004.
[b] TOXBASE: Asphyxiant gases – features and management, 2008.

• Decontamination and First Aid

Important Notes

- Ambulance staff, paramedics and emergency department staff treating chemically-contaminated casualties should be equipped with Department of Health approved, gas-tight (Respirex) decontamination suits based on EN466:1995, EN12941:1998 and prEN943-1:2001, where appropriate.

Dermal Exposure

- Remove patient from exposure.
- The patient should remove all clothing and personal effects.
- Double-bag soiled clothing and place in a sealed container clearly labelled as a biohazard.
- Brush away any adherent solid particles and gently blot away any adherent liquid from the patient.
- Wash hair and all contaminated skin with copious amounts of water (preferably warm) and soap for at least 10-15 minutes. Decontaminate open wounds first and avoid contamination of unexposed skin.
- Pay special attention to skin folds, axillae, ears, fingernails, genital areas and feet.

Ocular Exposure

- Remove patient from exposure.
- Remove contact lenses if necessary and immediately irrigate the affected eye thoroughly with water or 0.9% saline for at least 10-15 minutes.
- Patients with corneal damage or those whose symptoms do not resolve rapidly should be referred for urgent ophthalmological assessment.

Inhalation[(a)]

- Remove patient from exposure.
- Ensure a clear airway and adequate ventilation.
- Give high flow oxygen to symptomatic patients.
- Monitor pulse, blood pressure and oxygen saturation. Patients who are asymptomatic at 4 hours post exposure and have a normal EEG are unlikely to develop further features of toxicity.
- Perform a 12 lead ECG in symptomatic patients.
- Apply other supportive measures as indicated by the patient's clinical condition.

Ingestion

- Ensure a clear airway and adequate ventilation.
- Give oxygen to symptomatic patients.
- Apply other supportive measures as indicated by the patient's condition.

This document will be reviewed not later than 3 years or sooner if substantive evidence becomes available.

TOXBASE - http://www.toxbase.org

[a] TOXBASE: Asphyxiant gases – features and management, 2008.