

Methanol

Incident management

Key Points

Fire

- Flammable; burns with a non-luminous, bluish flame.
- Methanol forms an explosive mixture with air due to its low flash point
- In the event of a fire involving methanol, use alcohol resistant foam or fine water spray and liquid-tight chemical protective suit with breathing apparatus

Health


- Ingestion, inhalation and skin absorption are the main routes of exposure
- Toxic
- Exposure causes headache, confusion, vertigo, ataxia, drowsiness, nausea, vomiting and abdominal pain. Convulsions and coma are seen in severe toxicity
- May be directly irritating to the eyes causing an immediate stinging and burning sensation with lacrimation, as well as blurred vision with the appearance of a 'snow field' and photophobia

Environment

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

Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes^(a)

UN		1230	Methanol	
EAC		•2WE	Use alcohol resistant foam but, if not available, fine water spray. Wear liquid-tight chemical protective clothing in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses. Substance can be violently or explosively reactive. There may be a public safety hazard outside the immediate area of the incident**.	
APP		A(fl)	Gas-tight chemical protective suit with breathing apparatus***	
Hazards	Class	3	Flammable liquid	
	Sub risks	6.1	Toxic substance	
HIN		336	Highly flammable liquid, toxic	

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



* Liquid-tight chemical protective clothing (BS 8428) in combination self-containing 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.

*** Gas-tight chemical protective clothing conforming to BS EN 943 part 2 in combination with self-contained open circuit positive pressure compressed air breathing apparatus to BS EN 137.

^a Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2009.

Chemical Hazard Information and Packaging for Supply Classification^(a)

Classification	F	Highly flammable	
	T	Toxic	
Risk phrases	R11	Highly flammable	
	R23/24/25	Toxic by inhalation, in contact with skin and if swallowed	
	R39/23/24/25	Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed	
Safety phrases	S1/2	Keep locked up and out of reach of children	
	S7	Keep container tightly closed	
	S16	Keep away from sources of ignition – No smoking	
	S36/37	Wear suitable protective clothing and gloves	
	S45	In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)	




Specific concentration limits

Concentration	Classification
C ≥ 20 %	T; R23/24/25
3 % ≤ C < 20 %	Xn; R20/21/22
C ≥ 10 %	T; R39/23/24/25
3 % ≤ C < 10 %	Xn; R68/20/21/22

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.

<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)^(a)

Hazard Class and Category	Flam. Liq. 2	Flammable liquid, category 2	
	Acute Tox. 3	Acute toxicity (oral, dermal, inhalation), category 3	
	STOT SE 1	Specific target organ toxicity following single exposure, category 1	
Hazard Statement	H225	Highly flammable liquid and vapour	
	H331	Toxic if inhaled	
	H311	Toxic in contact with skin	
	H301	Toxic if swallowed	
	H370	Causes damage to organs	
Signal Words	DANGER		

Implemented in the EU on 20 January 2009.

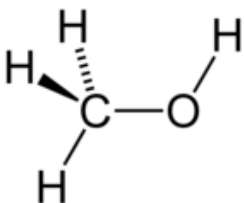
Specific concentration limits

Concentration	Hazard Class and Category	Hazard Statement	
C ≥ 10 %	STOT SE 1	H370	Causes damage to organs
3 % ≤ C < 10 %	STOT SE 2	H371	May cause damage to organs

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.1.

<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

Physicochemical Properties

CAS number	67-56-1
Molecular weight	32
Empirical formula	CH ₃ OH
Common synonyms	Methyl alcohol; Wood alcohol; Carbinol
State at room temperature	Liquid
Volatility	Vapour pressure = 100 mm Hg at 21.2 °C
Specific gravity	0.8 at 20 °C (water = 1); vapours are lighter than air at room temperature
Flammability	Flammable: burns with a non-luminous, bluish flame.
Lower explosive limit	6%
Upper explosive limit	36.5%
Water solubility	Fully soluble in water
Reactivity	Methanol forms an explosive mixture with air due to its low flash point. Methanol is incompatible with beryllium dihydride, metals (such as potassium and magnesium), oxidants (such as barium perchlorate, bromine, sodium hypochlorite, chlorine, and hydrogen peroxide), potassium tert-butoxide, carbon tetrachloride + metals (such as aluminum, magnesium, and zinc), and dichloromethane. Attacks some plastics, rubber, and coatings.
Reaction or degradation products	Data not available
Odour	Slight alcoholic odour
Structure	

References^(a,b,c)

^a Methanol (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2010).

^b The Merck Index (14th Edition). Entry 5957, 2006.

^c The Dictionary of Substances and their Effects. Ed. S Gangolli. Second Edition, Volume 5, 1999.

Threshold Toxicity Values

EXPOSURE VIA INHALATION		
ppm	mg m⁻³	SIGNS AND SYMPTOMS
300	393	Visual changes, headache; lung, thorax or respiration changes
65627	86000	Lacrimation, cough, changes of the lung, thorax, or respiration

Reference^(a)

^a Methanol (MEDITEXT® Medical Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2010).

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values^(a)

	Listed value (ppm)	Calculated value (mg m ⁻³)
ERPG-1*	200	262
ERPG-2**	1000	1310
ERPG-3***	5000	6552

* 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 (AEGs)^(b)

	ppm				
	10 min	30 min	60 min	4 hr	8 hr
AEGL-1[†]	670	670	530	340	270
AEGL-2^{††}	11000 [◇]	4000	2100	730	520
AEGL-3^{†††}	◇◇	14000 [◇]	7200 [◇]	2400	1600

[†] 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.

Lower explosion Limit (LEL) = 55000 ppm

◇ ≥ 10 % LEL; > 50 % LEL

◇◇ 3 – 10 min = 40000ppm

^a American Industrial Hygiene Association (AIHA). 2010 Emergency Response Planning Guideline Values and Workplace Environmental Exposure Level Guides Handbook, Fairfax, VA (accessed 01/2011).

^b U.S. Environmental Protection Agency. Acute Exposure Guideline Levels, <http://www.epa.gov/oppt/aegl/pubs/chemlist.htm> (accessed 01/2011)..

Exposure Standards, Guidelines or Regulations

Occupational standards

WEL^(a)	LTEL (8 hour reference period): 200 ppm (266 mg m ⁻³)
	STEL (15 min reference period): 250 ppm (333 mg m ⁻³)

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

^a List of approved workplace exposure limits (as consolidated with amendments October 2007). <http://www.hse.gov.uk/cosHH/table1.pdf> (An update to EH40/2005: Workplace Exposure Limits 2005. The Stationery Office, London) (accessed 01/2011).

Health Effects

Major routes of exposure^(a)

- Toxic by ingestion, inhalation and skin absorption.

Immediate signs or symptoms of acute exposure^(b,c)

- Methanol is an alcohol and will cause features of intoxication.
- Ingestion causes ataxia, drowsiness, dysarthria, nystagmus within 30 minutes, followed by a latent period of 12 – 24 hours before metabolic toxicity becomes apparent. Poor prognostic features include convulsions, coma, shock, persistent acidosis, bradycardia and renal failure.
- Central nervous system effects include headache, confusion and vertigo occur with mild to moderate toxicity. Convulsions and coma are seen in severe toxicity.
- Common gastrointestinal features include nausea, vomiting and abdominal pain. Acute pancreatitis can occur.
- Other common features include blurred vision, with the appearance of a "snow field", and photophobia. Optic disc and retinal oedema occur with diminished pupillary light response.
- A severe metabolic acidosis with an increased anion and osmolal gap is usually seen. Tachypnoea is common. Hyperglycaemia may occur. Renal failure may develop in severe cases.
- Eye exposure may cause eye irritation and immediate stinging and burning sensation with lacrimation.

TOXBASE - <http://www.toxbase.org> (accessed 01/2011)

^a TOXBASE: Methanol, 12/2009.

^b TOXBASE: Methanol – features and management, 07/2010.

^c TOXBASE: Eye irritants, 05/2002.

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.
- Decontamination should be performed using local protocols in designated areas such as a decontamination cubicle with adequate ventilation.
- Flammability warning: prevent exposure to all sources of ignition such as naked flames, electrical equipment, oxidising chemicals and the smoking of tobacco products.

Dermal exposure^(a,b)

- 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 chemical hazard.
- 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.
- Ensure clear airway and adequate ventilation, particularly if there is depression of conscious level.

Ocular exposure^(c)

- 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)

- Ensure a clear airway and adequate ventilation,
- Monitor pulse, blood pressure, respiratory rate, cardiac rhythm and urine output. Perform a 12 lead ECG.
- Apply other measures as indicated by the patient's clinical condition.

TOXBASE - <http://www.toxbase.org> (accessed 01/2011)

^a TOXBASE: Methanol 12/2009.

^b TOXBASE: Methanol – features and management, 07/2010.

^c TOXBASE: Eye irritants, 05/2002.

Ingestion^(a)

- Ensure a clear airway and adequate ventilation,
- Consider gastric aspiration if the patient presents within 1 hour of ingestion. Charcoal is of no use since it does not adsorb significant quantities of methanol.
- Monitor pulse, blood pressure, respiratory rate, cardiac rhythm and urine output. Perform a 12 lead ECG.
- For patients with methanol intoxication, early administration of [fomepizole](#) or [ethanol](#) will minimise the further metabolism of methanol and the development of clinical and metabolic complications. This means that treatment usually needs to be started before the diagnosis has been confirmed.
- Apply other measures as indicated by the patient's clinical condition.

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

^a TOXBASE: Methanol – features and management, 07/2010.