

# Phosgene

## Incident management

### Key Points

#### **Fire**

- Non-combustible
- Toxic vapours emitted
- In the event of a fire involving phosgene, use fine water spray and liquid-tight protective clothing with breathing apparatus

#### **Health**


- Toxicity due to inhalation, skin and ocular exposure
- Very toxic and corrosive
- There may be a delay of several hours between inhalation exposure and onset of signs and symptoms
- Inhalation causes nose and throat irritation and coughing. At higher concentrations breathlessness, nausea and vomiting may occur
- Dermal exposure causes skin irritation and burns
- Ocular irritation causes irritation, lacrimation and corneal perforation

#### **Environment**

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

## Hazard Identification

### Standard (UK) Dangerous Goods Emergency Action Codes<sup>(a)</sup>

<b>UN</b>		<b>1076</b>	Phosgene	
<b>EAC</b>		<b>2XE</b>	Use 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. There may be a public safety hazard outside the immediate area of the incident**.	
<b>APP</b>		<b>B</b>	Gas-tight chemical protective suit with breathing apparatus***.	
<b>Hazards</b>	<b>Class</b>	<b>2.3</b>	Toxic gas	
	<b>Sub risks</b>	<b>8</b>	Corrosive substance	
<b>HIN</b>		<b>268</b>	Toxic gas, corrosive	

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 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.

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

<sup>a</sup> Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2004.

*Chemical Hazard Information and Packaging for Supply Classification<sup>(a)</sup>*

*Phosgene*

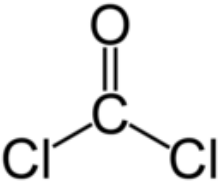
<b>Classification</b>	<b>T+</b>	Very toxic	
	<b>C</b>	Corrosive	
<b>Risk phrases</b>	<b>R26</b>	Very toxic by inhalation	
	<b>R34</b>	Causes burns	
<b>Safety phrases</b>	<b>S(1/2)</b>	Keep locked up and out of the reach of children	
	<b>S9</b>	Keep container in a well ventilated place	
	<b>S26</b>	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice	
	<b>S36/37/39</b>	Wear suitable protective clothing, gloves and eye/face protection	
	<b>S45</b>	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)	

*Specific concentration limits*

<b>Concentration</b>	<b>Classification</b>
<b>C ≥ 5 %</b>	T+; R26-34
<b>1 % ≤ C &lt; 2 %</b>	T+; R26-36/37/38
<b>0.5 % ≤ C &lt; 1 %</b>	T; R23-36/37/38
<b>0.2 % ≤ C &lt; 0.5 %</b>	T; R23
<b>0.02 % ≤ C &lt; 0.2 %</b>	Xn; R20

<sup>a</sup> European Chemicals Bureau, Classification and Labelling, Annex I of Directive 67/548/EEC; <http://ecb.jrc.it/classification-labelling/> (accessed 2/2007).

## Physicochemical Properties

<b>CAS number</b>	75-44-5
<b>Molecular weight</b>	99
<b>Empirical formula</b>	CCl <sub>2</sub> O
<b>Common synonyms</b>	Carbonic dichloride; Carbonyl chloride; Chloroformyl chloride
<b>State at room temperature</b>	Gas
<b>Volatility</b>	Vapour pressure = 1,215 mm Hg at 20 °C
<b>Specific gravity</b>	1.4 at 0 °C (water = 1)
<b>Vapour density</b>	3.5 at 20 °C (air = 1)
<b>Flammability</b>	Non flammable
<b>Lower explosive limit</b>	Data not available
<b>Upper explosive limit</b>	Data not available
<b>Water solubility</b>	Slightly soluble
<b>Reactivity</b>	May react violently with water, ammonia and primary amines
<b>Reaction or degradation products</b>	Reacts with water to form hydrochloric acid and carbon dioxide. Carbon monoxide and chlorine also produced
<b>Odour</b>	Freshly mown or musty hay odour
<b>Structure</b>	

References<sup>(a,b,c)</sup>

<sup>a</sup> WHO / UN / ILO International Programme on Chemical Safety: International Chemical Safety Card (ICSC) 0007: Phosgene, 2002.

<sup>b</sup> The Dictionary of Substances and their Effects. Ed. S Gangolli. Second Edition, Volume 6, 1999.

<sup>c</sup> The Merck Index (14<sup>th</sup> Edition), Entry 7335: Phosgene, 2006

### Threshold Toxicity Values

EXPOSURE VIA INHALATION		
ppm	mg m <sup>-3</sup>	SIGNS AND SYMPTOMS
3 – 5	12 – 20	Irritation of eyes, throat and upper respiratory system
62	251	Fatal (30 minute exposure)
500	2022	Fatal (1 minute)

Reference<sup>(a)</sup>

<sup>a</sup> Phosgene (MEDITEXT® Medical Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2007).

## Published Emergency Response Guidelines

### Emergency Response Planning Guideline (ERPG) Values<sup>(a)</sup>

	Listed value (ppm)	Calculated value (mg m <sup>-3</sup> )
<b>ERPG-1*</b>	-	-
<b>ERPG-2**</b>	0.2	1
<b>ERPG-3***</b>	1	4

\* 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.

### Acute Exposure Guideline Levels (AEGLs)<sup>(b)</sup>

	ppm				
	10 min	30 min	60 min	4 hr	8 hr
<b>AEGL-1<sup>†</sup></b>	-	-	-	-	-
<b>AEGL-2<sup>††</sup></b>	0.60	0.60	0.30	0.08	0.04
<b>AEGL-3<sup>†††</sup></b>	3.6	1.5	0.75	0.20	0.09

<sup>†</sup> The level of the chemical in air at or above which the general population could experience notable discomfort.

<sup>††</sup> 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.

<sup>†††</sup> The level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

<sup>a</sup> American Industrial Hygiene Association (AIHA). Emergency Response Planning Guideline Values and Workplace Environmental Exposure Level Guides Handbook, Fairfax, VA, 2005.

<sup>b</sup> U.S. Environmental Protection Agency. Acute Exposure Guideline Levels, <http://www.epa.gov/oppt/aegl/pubs/chemlist.htm> (accessed 02/2007).

## Exposure Standards, Guidelines or Regulations

### Occupational standards

<b>WEL<sup>(a)</sup></b>	LTEL(8 hour reference period): 0.02 ppm (0.08 mg m <sup>-3</sup> )
	STEL(15 min reference period): 0.06 ppm (0.24 mg m <sup>-3</sup> )

### Public health guidelines

<b>DRINKING WATER QUALITY GUIDELINE<sup>(b)</sup></b>	Formation of hydrochloric acid should not exceed pH minimum = 6.5 or maximum of 250 mg L <sup>-1</sup> chloride ions
<b>AIR QUALITY GUIDELINE</b>	No guideline value specified
<b>SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES</b>	No guideline value specified

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term Exposure Standards, Guidelines or Regulations

<sup>a</sup> Health & Safety Executive. EH40/2005 Workplace Exposure Limits 2005. The Stationery Office, London, 2005.

<sup>b</sup> Interim Guidance on the Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales). Drinking Water Inspectorate, September 2003.

## Health Effects

### *Major route of exposure<sup>(a)</sup>*

- Due to its gaseous nature, inhalation and ocular exposure are most likely.
- Dermal features usually only occur from splashes of liquefied material.
- Ingestion is unlikely.

### *Immediate signs or symptoms of acute exposure<sup>(a)</sup>*

- Inhalation of 3 ppm causes nose, throat irritation and 4.8 ppm causes coughing. Higher concentrations (>30 ppm) cause pain in the chest and breathlessness; nausea and vomiting may occur.
- Dermal exposure to 3 ppm causes skin irritation and splashes from liquefied material may cause burns.
- Ocular exposure causes irritation at 3 ppm and may also cause lacrimation. Splashes from liquefied material may cause corneal opacification, conjunctival adhesions and perforation.

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TOXBASE - <http://www.toxbase.org>

<sup>a</sup> TOXBASE: Phosgene, 2001.

## 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.
- Phosgene is a volatile substance and secondary contamination is unlikely to occur.

### Dermal exposure<sup>(a)</sup>

- 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<sup>(b)</sup>

- 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<sup>(c)</sup>

- Remove patient from exposure.
- Ensure a clear airway and adequate ventilation.
- Apply other measures according to the patient's clinical condition.
- Give oxygen to symptomatic patients.
- Exposed individuals should be assessed at hospital irrespective of the presence or severity of symptoms.

### Ingestion<sup>(c)</sup>

- Not applicable.

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TOXBASE - <http://www.toxbase.org>

<sup>a</sup> TOXBASE: Skin decontamination – corrosives, 2002.

<sup>b</sup> TOXBASE: Chemicals splashed or sprayed into the eyes, 2007.

<sup>c</sup> TOXBASE: Phosgene, 2001.

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