



# 1,2-dichloroethane

## Incident Management

### Key Points

#### Fire

- highly flammable
- reacts violently with alkali metals, ammonia, bases and strong oxidants
- emits toxic and corrosive fumes of phosgene and hydrogen chloride when heated to decomposition
- in the event of a fire involving 1,2-dichloroethane, use fine water spray and normal fire kit with breathing apparatus

#### Health



- major routes of exposure are inhalation, ingestion and dermal contact
- inhalation, ingestion and dermal absorption can cause systemic effects including initial excitement and headache, leading to drowsiness, ataxia and dysarthria
- coma and respiratory depression may occur in severe cases; cardiac arrhythmias and renal and hepatic effects may also occur
- ingestion also causes 'burning' in the mouth and throat, epigastric pain, nausea and vomiting
- irritating to the skin and eyes

#### Environment







- avoid release to the environment; inform the Environment Agency of substantial incidents

## Hazard Identification

### Standard (UK) dangerous goods emergency action codes

<b>UN</b>		1184	Ethylene dichloride	
<b>EAC</b>		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†	
<b>APP</b>		–	–	
<b>Hazards</b>	<b>Class</b>	3	Flammable liquid	
	<b>Sub-risks</b>	6.1	Toxic substance	
<b>HIN</b>		336	Highly flammable liquid, toxic	
<p>UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number</p> <p>* Normal firefighting clothing is appropriate, ie breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, firefighters' gloves conforming to BS EN 659 and firefighters' boots conforming to home office specification A29 or A30</p> <p>† 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</p> <p><b>Reference</b> Dangerous Goods Emergency Action Code List, National Chemical Emergency Centre (NCEC) Part of Ricardo-AEA. The Stationery Office, 2015.</p>				

**Classification, labelling and packaging (CLP)\***

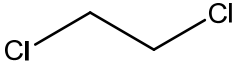
<b>Hazard class and category</b>	Flam. Liq. 2	Flammable liquid, category 2	
	Carc. 1B	Carcinogenicity, category 1B	
	Acute Tox. 4	Acute toxicity (oral), category 4	
	Eye Irrit. 2	Eye irritation, category 2	
	STOT SE 3	Specific target organ toxicity following single exposure, category 3	
	Skin Irrit. 2	Skin irritation, category 2	
<b>Hazard statement</b>	H225	Highly flammable liquid and vapour	
	H350	May cause cancer	
	H302	Harmful if swallowed	
	H319	Causes serious eye irritation	
	H335	May cause respiratory irritation	
	H315	Causes skin irritation	
<b>Signal words</b>	Danger		

\* Implemented in the EU on 20 January 2009

**Reference**

European Commission. Harmonised classification – Annexe VI to Regulation (EC) No. 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures. <http://echa.europa.eu/information-on-chemicals/cl-inventory-database> (accessed 07/2015).

## Physicochemical Properties

<b>CAS number</b>	107-06-2
<b>Molecular weight</b>	98.96
<b>Formula</b>	$\text{ClCH}_2\text{CH}_2\text{Cl}$ / $\text{C}_2\text{H}_4\text{Cl}_2$
<b>Common synonyms</b>	Dichloroethane, ethylene dichloride, ethane dichloride
<b>State at room temperature</b>	Colourless liquid. Turns dark on exposure to air, moisture and light
<b>Volatility</b>	78.9 mmHg at 25°C
<b>Specific gravity</b> <b>Vapour density</b>	1.2 (water = 1) 3.4 (air = 1)
<b>Flammability</b>	Highly flammable
<b>Lower explosive limit</b>	4.2%
<b>Upper explosive limit</b>	16%
<b>Water solubility</b>	Soluble in water, 8.69 g/L at 20°C
<b>Reactivity</b>	Reacts with alkali metals, powdered metals, ammonia, bases and strong oxidants to generate a fire and explosion hazard. Attacks many metals in the presence of water
<b>Reaction or degradation products</b>	Decomposes on heating and on burning, producing toxic and corrosive fumes including hydrogen chloride and phosgene. Mixtures with mercaptans form thioethers and generate heat, while mixtures with nitrides generate heat and ammonia forming toxic fumes
<b>Odour</b>	Chloroform-like odour
<b>Structure</b>	
<b>References</b>	<p>Ethylene Dichloride (HAZARTEXT™ Hazard Management). In Klasco RK (Ed): TOMES® System, Truven Healthcare Analytics Inc, Greenwood Village CO, US. RightAnswer.com Inc, Midland MI, US. <a href="http://www.rightanswerknowledge.com">http://www.rightanswerknowledge.com</a> (accessed 07/2015).</p> <p>Hazardous Substances Data Bank. 1,2-dichloroethane HSDB No. 65 (last revision date 24/06/2005). US National Library of Medicine: Bethesda MD. <a href="http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB">http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB</a> (accessed 07/2015)</p> <p>International Programme on Chemical Safety. International Chemical Safety Card entry for 1,2-dichloroethane. ICSC 0250, 2013. World Health Organization: Geneva.</p>

## Reported Effect Levels from Authoritative Sources

### Exposure by ingestion

mL	Signs and symptoms	Reference
20–50	Estimated lethal dose	a
mg/kg		
~570	Cardiovascular insufficiency, haemorrhage, liver necrosis and cirrhosis	b
g		
>10	Has resulted in death (in some cases due to cardiac arrhythmia)	a, c
<p>These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values</p> <p><b>References</b></p> <p>a International Programme on Chemical Safety. 1,2-dichloroethane. Environmental Health Criteria 176, 1995. World Health Organization: Geneva.</p> <p>b Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,2-dichloroethane, 2001. Atlanta, US.</p> <p>c WHO. Air Quality Guidelines, 2<sup>nd</sup> Edition, 2000. World Health Organization: Copenhagen.</p>		

## Published Emergency Response Guidelines

### Emergency response planning guideline (ERPG) values

	Listed value (ppm)	Calculated value (mg/m <sup>3</sup> )
ERPG-1*	50	202
ERPG-2 <sup>†</sup>	200	8,008
ERPG-3 <sup>‡</sup>	300	1,212
<p>* Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odour</p> <p><sup>†</sup> Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action</p> <p><sup>‡</sup> Maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects</p> <p><b>Reference</b>            American Industrial Hygiene Association (AIHA). 2015 Emergency Response Planning Guideline Values.  <a href="https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/2014%20ERPG%20Values.pdf">https://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines/Documents/2014%20ERPG%20Values.pdf</a>            (accessed 09/2015).</p>		

### Acute exposure guideline levels (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	Data not available				
AEGL-2 <sup>†</sup>					
AEGL-3 <sup>‡</sup>					
<p>* Level of the chemical in air at or above which the general population could experience notable discomfort</p> <p><sup>†</sup> 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</p> <p><sup>‡</sup> Level of the chemical in air at or above which the general population could experience life-threatening health effects or death</p>					

## Exposure Standards, Guidelines or Regulations

### Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>
<b>WEL</b>	5	21	Data not given	
<p>WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit</p> <p><b>Reference</b> Health and Safety Executive (HSE). EH40/2005 Workplace Exposure Limits, 2<sup>nd</sup> Edition, 2011.</p>				

### Public health guidelines

<b>Drinking water standard</b>	3 µg/L
<b>WHO guideline value</b>	30 µg/L
<b>Air quality guideline</b>	Guideline value not given
<b>Soil guideline values and health criteria values</b>	Guideline value not given
<p><b>Reference</b> WHO. Guidelines for Drinking-Water Quality, 4th Edition, 2011. World Health Organization: Geneva. The Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales) The Private Water Supplies Regulations 2009 and The Private Water Supplies Regulations (Wales) 2010</p>	



## Health Effects

### Major route of exposure

- inhalation, ingestion and dermal absorption

### Immediate signs or symptoms of acute exposure

Route	Signs and symptoms
<b>Inhalation</b>	Inhalation can cause irritation of the respiratory tract, and sudden death (due to cardiac arrhythmias) has been associated with misuse of hydrocarbons. Systemic features are common following inhalation and CNS depression is usually the first presenting feature
<b>Ingestion</b>	Ingestion may cause 'burning' in the mouth and throat, epigastric pain, nausea and vomiting. There is a risk of aspiration leading to chemical pneumonitis, particularly if vomiting occurs. Systemic features are possible
<b>Dermal</b>	Skin contact causes irritation, and may cause dermatitis due to its defatting action on the skin. Significant dermal exposure may lead to systemic toxicity
<b>Ocular</b>	May be irritating to the eyes; eye contact has caused injury to the corneal epithelium
<b>Systemic features</b>	Systemic effects include excitement, headache and dizziness leading to drowsiness, ataxia and dysarthria. Coma and respiratory depression may occur in severe cases. Cardiac arrhythmias may occur as a result of sensitisation of the heart to endogenous catecholamines. Hypoxia increases the risk of developing cardiac dysrhythmias  Chlorinated hydrocarbons can be nephrotoxic and hepatotoxic in large or chronic exposures
<b>References</b>	
TOXBASE. 1,2-Dichloroethane, 09/2016. <a href="http://www.toxbase.org">http://www.toxbase.org</a> (accessed 11/2016).	

## Decontamination at the Scene

### Summary

The approach used for decontamination at the scene will depend upon the incident, location of the casualties and the chemicals involved. Therefore, a risk assessment should be conducted to decide on the most appropriate method of decontamination.

Following disrobe, improvised dry decontamination should be considered for an incident involving 1,2-dichloroethane **unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.**

People who are processed through improvised decontamination should subsequently be moved to a safe location, triaged and subject to health and scientific advice. Based on the outcome of the assessment, they may require further decontamination

Emergency services and public health professionals can obtain further advice from Public Health England (Centre for Radiation, Chemical and Environmental Hazards) using the 24-hour chemical hotline number: 0344 892 0555.

### Disrobe

The disrobe process is highly effective at reducing exposure to HAZMAT/CBRN material when performed within 15 minutes of exposure.

**Therefore, disrobe must be considered the primary action following evacuation from a contaminated area.**

Where possible, disrobe at the scene should be conducted by the casualty themselves and should be systematic to avoid transferring any contamination from clothing to the skin. Consideration should be given to ensuring the welfare and dignity of casualties as far as possible.

### Improvised decontamination

Improvised decontamination is an immediate method of decontamination prior to the use of specialised resources. This should be performed on all contaminated casualties, unless medical advice is received to the contrary. Improvised dry decontamination should be considered for an incident involving chemicals **unless the agent appears to be corrosive or caustic.**

### Improvised dry decontamination

- any available dry absorbent material can be used such as kitchen towel, paper tissues (eg blue roll) and clean cloth
- exposed skin surfaces should be blotted and rubbed, starting with the face, head and neck and moving down and away from the body

- rubbing and blotting should not be too aggressive, or it could drive contamination further into the skin
- all waste material arising from decontamination should be left in situ, and ideally bagged, for disposal at a later stage

### Improvised wet decontamination

- water should only be used for decontamination where casualty signs and symptoms are consistent with exposure to caustic or corrosive substances such as acids or alkalis
- wet decontamination may be performed using any available source of water such as taps, showers, fixed installation hose-reels and sprinklers
- when using water, it is important to try and limit the duration of decontamination to between 45 and 90 seconds and, ideally, to use a washing aid such as cloth or sponge
- improvised decontamination should not involve overly aggressive methods to remove contamination as this could drive the contamination further into the skin
- where appropriate, seek professional advice on how to dispose of contaminated water and prevent run-off going into the water system

### Additional notes

- following improvised decontamination, remain cautious and observe for signs and symptoms in the decontaminated person and in unprotected staff
- if water is used to decontaminate casualties this may be contaminated, and therefore hazardous, and a potential source of further contamination spread
- all materials (paper tissues etc) used in this process may also be contaminated and, where possible, should not be used on new casualties
- the risk from hypothermia should be considered when disrobe and any form of wet decontamination is carried out
- people who are contaminated should not eat, drink or smoke before or during the decontamination process and should avoid touching their face
- consideration should be given to ensuring the welfare and dignity of casualties as far as possible. Immediately after decontamination the opportunity should be provided to dry and dress in clean robes/clothes

### Interim wet decontamination

Interim decontamination is the use of standard fire and rescue service (FRS) equipment to provide a planned and structured decontamination process prior to the availability of purpose-designed decontamination equipment.

## Decontamination at the scene references

National Ambulance Resilience Unit. Joint Emergency Services Interoperability Programme (JESIP). Initial operational response to a CBRN incident. Version 1.0, September 2013.

NHS England. Emergency Preparedness, Resilience and Response (EPRR). Chemical incidents: planning for the management of self-presenting patients in healthcare settings. April 2015.

## Clinical Decontamination and First Aid

Clinical decontamination is the process where trained healthcare professionals using purpose designed decontamination equipment treat contaminated persons individually.

Detailed information on clinical management can be found on TOXBASE – [www.toxbase.org](http://www.toxbase.org).

### Important notes

- secondary care staff should not need to wear protective equipment other than routine precautions against secondary contamination with vomit and body fluids
- carry out decontamination after resuscitation; resuscitate the patient according to standard guidelines

### Clinical decontamination following surface contamination

- carry out decontamination after resuscitation
- this should be performed in a well-ventilated area, preferably with its own ventilation system
- contaminated clothing should be removed, double-bagged, sealed and stored safely
- decontaminate open wounds first and avoid contamination of unexposed skin
- any particulate matter adherent to skin should be removed and the patient washed with copious amounts of water under low pressure for at least 10-15 minutes
- **the earlier irrigation begins, the greater the benefit**
- pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears

### Dermal exposure

- decontaminate (as above) the patient following surface contamination
- if features of systemic toxicity are present, manage as for ingestion/inhalation
- other supportive measures as indicated by the patient's clinical condition

### Ocular exposure

- remove contact lenses if present
- anaesthetise the eye with a topical local anaesthetic (eg oxybuprocaine, amethocaine or similar); however, **do not delay irrigation if local anaesthetic is not immediately available**
- immediately irrigate the affected eye thoroughly with 1,000 mL 0.9% saline (eg by an infusion bag with a giving set). A Morgan lens may be used if anaesthetic has been

given. Irrigate for 10–15 minutes irrespective of initial conjunctival pH. Aim for a final conjunctival pH of 7.5–8.0. The conjunctivae may be tested with indicator paper. Retest 20 minutes after irrigation and use further irrigation if necessary

- repeated instillation of local anaesthetics may reduce discomfort and help more thorough decontamination; however, prolonged use of concentrated local anaesthetics is damaging to the cornea
- patients with corneal damage, those who have been exposed to strong acids or alkalis and those whose symptoms do not resolve rapidly should be discussed **urgently** with an ophthalmologist
- other measures as indicated by the patient's clinical condition

## Inhalation

- maintain a clear airway and ensure adequate ventilation
- monitor vital signs, cardiac rhythm and measure blood sugar (BM)
- perform a 12 lead ECG in all patients who require assessment
- other supportive measures as indicated by the patient's clinical condition

## Ingestion

- maintain a clear airway and ensure adequate ventilation
- gastric decontamination after ingestion is contraindicated due to the increased risk of aspiration
- monitor vital signs, cardiac rhythm and measure blood sugar (BM)
- perform a 12 lead ECG in all patients who require assessment
- other supportive measures as indicated by the patient's clinical condition

## Clinical decontamination and first aid references

TOXBASE	<a href="http://www.toxbase.org">http://www.toxbase.org</a> (accessed 11/2016)
TOXBASE	1,2-dichloroethane, 09/2016
TOXBASE	Chlorinated hydrocarbons – features and management, 09/ 2016
TOXBASE	Chemical splashed or sprayed into the eyes, 02/2014

This document from the PHE Centre for Radiation, Chemical and Environmental Hazards reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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