



Acetone

Incident Management

Key Points

Fire

- highly flammable
- forms explosive peroxides on contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxide
- in the event of a fire, use alcohol-resistant foam or fine water spray and normal fire kit with breathing apparatus

Health


- major routes of exposure are inhalation and ingestion, it is poorly absorbed by the skin
- toxicity from dermal exposure may occur if exposure is extensive or prolonged
- inhalation causes irritation at high concentrations and systemic effects may develop
- ingestion causes nausea, vomiting, haematemesis, inflammation and systemic features
- dermal exposure causes irritation with erythema, drying and dermatitis
- ocular exposure to liquid acetone may cause irritation and transient epithelial injury
- systemic effects include headache, sedation, ataxia, lethargy, slurred speech, nausea, vomiting, hypothermia, convulsions, cerebral oedema, coma and respiratory depression

Environment




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

Hazard Identification

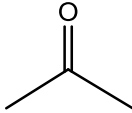
Standard (UK) dangerous goods emergency action codes

UN		1090	Acetone	
EAC		•2YE	Alcohol-resistant foam but, if not available, fine water spray can be used. 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	3	Flammable liquid	
	Sub-risks	–	–	
HIN		33	Highly flammable liquid (flash-point below 23°C)	
<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 EN137 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>Reference</p> <p>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)*

Hazard class and category	Flam. Liq. 2	Flammable liquid, category 2	
	Eye Irrit. 2	Eye irritation, category 2A	
	STOT SE 3	Specific target organ toxicity following single exposure, category 3	
Hazard statement	H225	Highly flammable liquid and vapour	
	H319	Causes serious eye irritation	
	H336	May cause drowsiness or dizziness	
Supplemental Hazard Statement	EUH066	Repeated exposure may cause skin dryness or cracking	
Signal words	DANGER		
<p>* Implemented in the EU on 20 January 2009</p> <p>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 05/2015).</p>			

Physicochemical Properties

CAS number	67-64-1
Molecular weight	58.08
Formula	C ₃ H ₆ O
Common synonyms	2-propanone, dimethylformaldehyde, dimethyl ketone, propanone
State at room temperature	Clear colourless liquid
Volatility	Vapour pressure = 231 mmHg at 25°C
Specific gravity	0.78 at 20°C
Flammability	Highly flammable
Lower explosive limit	2.2%
Upper explosive limit	13%
Water solubility	Miscible
Reactivity	Can react vigorously on contact with oxidising materials, causing explosion danger
Reaction or degradation products	Contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxides generates explosive peroxides. Reacts with chloroform and bromoform under basic conditions to generate fire and explosion hazard.
Odour	Characteristic 'fruity' odour
Structure	
References The Merck Index (14th Edition). Entry 66: Acetone, 2006. International Programme on Chemical Safety (IPCS). International Chemical Safety Card (ICSC) entry for Acetone. ICSC 0087, 2009. World Health Organization: Geneva. Hazardous Substances Data Bank [Internet]. Bethesda (MD): National Library of Medicine (US); (Last Revision Date 11/10/2007). Acetone; Hazardous Substances Databank Number: 41. http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB (accessed 05/2015).	

Reported Effect Levels from Authoritative Sources

Exposure by ingestion

mL/kg	Signs and symptoms	Reference
2–3	Potential toxic dose for children	a
<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>Reference</p> <p>a TOXBASE, Acetone, 2010. http://www.toxbase.org (accessed 05/2015).</p>		

Exposure by inhalation

ppm	mg/m ³	Duration	Signs and symptoms	Reference
≤2,000	≤4,750	Not given	No gross toxic effects or minor transient effects – irritation of the eyes, nose and throat	a
>12,000	>2,500	~ 4 hours	Vomiting and fainting	a
<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>Reference</p> <p>a International Programme on Chemical Safety (IPCS). Environmental Health Criteria (EHC) 207, 1998. World Health Organization: Geneva.</p>				

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 [‡]		
<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>[†] 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>[‡] 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>		

Acute exposure guideline levels (AEGLs)

	ppm				
	10 min	30 min	60 min	4 hours	8 hours
AEGL-1*	200	200	200	200	200
AEGL-2 [†]	9,300 ⁽¹⁾	4,900 ⁽¹⁾	3,200 ⁽¹⁾	1,400	950
AEGL-3 [‡]	⁽²⁾	8,600 ⁽¹⁾	5,700 ⁽¹⁾	2,500	1,700
<p>* Level of the chemical in air at or above which the general population could experience notable discomfort</p> <p>[†] 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>[‡] Level of the chemical in air at or above which the general population could experience life-threatening health effects or death</p> <p>Notes (1) and (2): lower explosive limit (LEL) = 26,000 ppm (1) = >10% LEL; (2) = >50% LEL (1) safety considerations against the hazard(s) of explosion(s) must be taken into account (2) extreme safety considerations against the hazard(s) of explosion(s) must be taken into account. Individual value is 16,000 ppm Level of distinct odour awareness = 160 ppm</p> <p>Reference US Environmental Protection Agency. Acute Exposure Guideline Levels. http://www.epa.gov/oppt/aegl/pubs/chemlist.htm (accessed 06/2015).</p>					

Exposure Standards, Guidelines or Regulations

Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m ³	ppm	mg/m ³
WEL	500	1,210	1,500	3,620
WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit				
Reference				
EH40/2005 Workplace Exposure Limits (second edition, published 2011).				

Public health guidelines

Drinking water standard	Data not available
Air quality guideline	Data not available
Soil guideline values and health criteria values	Data not available

Health Effects

Major route of exposure

- inhalation and ingestion; poorly absorbed by the skin

Immediate signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation	May cause respiratory irritation and chest tightness at high concentration. Systemic features may also develop
Ingestion	May cause nausea, vomiting, haematemesis and inflammation of the oral mucosa. Systemic features may also develop
Dermal	May cause irritation with erythema, drying and dermatitis. If contact is extensive or prolonged, systemic features may also develop
Ocular	Liquid acetone may cause irritation and transient epithelial injury; high vapour concentrations are irritating to the eyes. Prolonged contact with acetone liquid has caused permanent corneal damage
Systemic	Headache, sedation, ataxia, lethargy, slurred speech, nausea, vomiting, convulsions, cerebral oedema, coma, hypothermia and respiratory depression. An odour of acetone is often detected on the breath as some is exhaled unchanged. Central nervous system depression may be prolonged due to the long elimination half-life of acetone. Tachycardia and hypotension may develop. Hyperglycaemia, ketosis and metabolic acidosis may occur. Hepatic and renal toxicity may rarely occur
References	
TOXBASE. Acetone, 2016. http://www.toxbase.org (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 acetone **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 people individually.

Detailed information on clinical management can be found on TOXBASE – www.toxbase.org.

Important note

- if the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves. The area should be well ventilated
- carry out decontamination after resuscitation; resuscitate the patient according to standard guidelines

Clinical decontamination following surface contamination

- carry out decontamination in a well-ventilated area, preferably with its own ventilation system
- the patient should remove soiled clothing and wash him/herself if possible
- put soiled clothing in a sealed container to prevent escape of volatile substances
- wash hair and all contaminated skin with liberal amounts of water (preferably warm) and soap
- pay special attention to skin folds, fingernails and ears

Dermal exposure

- decontaminate (as above) the patient following surface contamination
- systemic toxicity would not be expected unless exposure has been extensive or prolonged. In such cases follow the management guidance for ingestion of acetone
- other supportive measures as indicated by the patient's clinical condition

Ocular exposure

- if symptomatic, immediately irrigate the affected eye thoroughly
- for patients at home, use lukewarm tap water, trickled into the eye or in a small cup held over the eye socket; an eye dropper is an alternative
- if symptoms persist seek medical assistance
- in hospital immediately irrigate the affected eye thoroughly with 0.9% saline 1000 mL (for example via an infusion bag with a giving set). A Morgan Lens may be used if anaesthetic has been given. Irrigate for 10-15 minutes

- refer for ophthalmological assessment if there is doubt regarding the management of corneal damage
- other supportive measures as indicated by the patient's clinical condition

Inhalation/Ingestion

- maintain a clear airway and ensure adequate ventilation
- give oxygen if required
- monitor vital signs and measure blood sugar (BM)
- other supportive measures as indicated by the patient's clinical condition

Clinical decontamination and first aid references

TOXBASE	http://www.toxbase.org (accessed 11/2016)
TOXBASE	Acetone, 05/2016
TOXBASE	Acetone – features and management, 05/2016
TOXBASE	Eye irritants, 01/2016

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