



UK Health
Security
Agency

Naphthalene

Incident management

This document provides information needed for response to a chemical incident, such as physicochemical properties, health effects and decontamination advice.

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Main points

General

Naphthalene is a semi-volatile white crystalline solid with an aromatic odour. It is combustible and has poor water solubility.

Flammable/combustible. May be ignited by friction, heat, sparks or flames.

It reacts with strong oxidisers which generates fire and explosion hazard.

Health

Inhalation and ingestion of naphthalene can lead to nausea, vomiting, abdominal pain, diarrhoea, headache, confusion, sweating, fever, tachycardia, tachypnoea, and agitation, leading to convulsions and coma.

Haemolysis and haemoglobinuria leading to acute renal failure may occur 3 to 5 days after exposure, particularly in patients with glucose-6-phosphate dehydrogenase deficiency.

Dermal exposure can cause skin irritation and possibly dermatitis.

Ocular exposure can lead to eye irritation.

Casualty decontamination at the scene

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


Environment

Inform the [Environment Agency](#) where appropriate and avoid release into the environment.

Spillages and decontamination run-off should be prevented from entering drains and watercourses.

Hazard identification

Table 1a. Standard (UK) dangerous goods emergency action codes for naphthalene crude or naphthalene, refined

UN		1334	Naphthalene, crude or refined	
EAC		1Z	Use coarse water spray. Wear normal fire kit in combination with breathing apparatus [note 1]. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface groundwaters.	
APP		-	-	
Hazards	Class	4.1	Flammable solids, self-reactive substances and solid desensitised explosives	
	Sub-risks	-	-	
HIN		40	Flammable solid, or self-reactive substance, or self-heating substance, or polymerising substance	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.


HIN = hazard identification number.

Note 1: Normal firefighting clothing is appropriate: self-contained open circuit positive pressure compressed air breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, fire fighters' gloves conforming to BS EN 659 and firefighters' footwear conforming to BS EN 15090 (Footwear for firefighters) type F3- Hazmat and structural firefighting or alternatively firefighters' boots conforming to Home Office Specification A29 (rubber boots) or A30 (leather boots). Leather footwear including those conforming to A30 may not provide adequate chemical resistance therefore caution should be exercised in the use of these boots.

References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. '[Dangerous Goods Emergency Action Code List](#)'. 2023 (viewed on 07 November 2024)

Table 1b. Standard (UK) dangerous goods emergency action codes for naphthalene, molten

UN		2304	Naphthalene, molten	
EAC		1Y	Use coarse water spray. Wear normal fire kit in combination with breathing apparatus [note 1]. Spillages, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters. Substance can be violently or explosively reactive.	
APP		-	-	
Hazards	Class	4.1	Flammable solids, self-reactive substances and solid desensitised explosives	
	Sub-risks	-	-	
HIN		44	Flammable solid, in the molten state at an elevated temperature	

Abbreviations

UN = United Nations number.

EAC = emergency action code.

APP = additional personal protection.





HIN = hazard identification number.

Note 1: Normal firefighting clothing is appropriate: self-contained open circuit positive pressure compressed air breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, fire fighters' gloves conforming to BS EN 659 and firefighters' footwear conforming to BS EN 15090 (Footwear for firefighters) type F3- Hazmat and structural firefighting or alternatively firefighters' boots conforming to Home Office Specification A29 (rubber boots) or A30 (leather boots). Leather footwear including those conforming to A30 may not provide adequate chemical resistance therefore caution should be exercised in the use of these boots.

References

National Chemical Emergency Centre (NCEC), part of Ricardo-AEA. '[Dangerous Goods Emergency Action Code List](#)'. 2023 (viewed on 07 November 2024)

Table 2. The GB classification, labelling and packaging (CLP) regulation for naphthalene

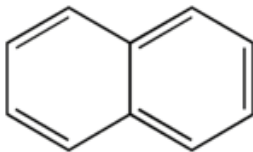
Hazard class and category	Carc. 2	Carcinogenicity, category 2	
	Acute Tox. 4	Acute toxicity (oral), category 4	
	Aquatic Acute 1	Acute hazard to the aquatic environment, category 1	
	Aquatic Chronic 1	Chronic hazard to the aquatic environment, category 1	
Hazard statement	H351	Suspected of causing cancer	
	H302	Harmful if swallowed	
	H400	Very toxic to aquatic life	
	H410	Very toxic to aquatic life with long lasting effects	
Signal words	WARNING		

References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed on 07 November 2024)

Physicochemical properties

Table 3. Physicochemical properties

CAS number	91-20-3
Molecular weight	128
Formula	C ₁₀ H ₈
Common synonyms	Napthene, naphthalin, albocarbon
State at room temperature	Solid, white powder
Volatility	Vapour pressure = 0.085 mmHg at 25°C
Specific gravity	Density = 1.16 at 20°C Relative vapour density = 4.42 (air = 1)
Flammability	Flammable/combustible. May be ignited by friction, heat, sparks or flames
Lower explosive limit	0.9%
Upper explosive limit	5.9%
Water solubility	Low, 31 mg/L at 25°C
Reactivity	Dust explosion possible if in powder or granular form, mixed with air. Will react with strong oxidisers, this generates fire and explosion hazard. On combustion forms irritating and toxic gases.
Odour	Aromatic odour
Structure	

References

World Health Organization. International Programme on Chemical Safety '[International Chemical Safety Card entry for Naphthalene](#)' ICSC 0667, 2015 (viewed on 07 November 2024)

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. '[PubChem Compound Summary for CID 931, Naphthalene](#)' (viewed on 07 November 2024)

Reported effect levels from authoritative sources

Table 4. Exposure by ingestion

g	Signs and symptoms	Reference
2	Lethal in children	a
5-15	Mean lethal dose in nonsensitive adults	a
6	Abdominal pain	b

These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values.

References

- a. World Health Organization (WHO). '[Naphthalene \(PIM 363\)](#)' 2000 (viewed 07 November 2024)
- b. Agency for Toxic Substances and Diseases Registry (ATSDR). '[Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene](#)' 2014 (viewed 07 November 2024)

Published emergency response guidelines

Table 5. Acute exposure guideline levels (AEGLs)

	Concentration (ppm)				
	10 minutes	30 minutes	60 minutes	4 hours	8 hours
AEGL-1 [note 1]	Data not available				
AEGL-2 [note 2]					
AEGL-3 [note 3]					

Note 1: Level of the chemical in air at or above which the general population could experience notable discomfort.

Note 2: 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.

Note 3: Level of the chemical in air at or above which the general population could experience life-threatening health effects or death.

Exposure standards, guidelines or regulations

Table 6. Occupational standards

	LTEL (8-hour reference period)		STEL (15-min reference period)	
	ppm	mg/m ³	ppm	mg/m ³
WEL	No guideline values specified			

Abbreviations

WEL = workplace exposure limit.

LTEL = long-term exposure limit.

STEL = short-term exposure limit.

Reference

Health and Safety Executive (HSE). '[EH40/2005 Workplace Exposure Limits Fourth Edition](#)' 2020 (viewed on 01 October 2024)

Table 7. Public health standards and guidelines

Drinking water standard	No guideline value specified
WHO guideline for drinking water quality	No guideline value specified
UK indoor air quality guideline	0.003 mg/m ³ (annual average concentration)
WHO indoor air quality guideline	0.01 mg/m ³ (annual average concentration)
WHO air quality guideline	No guideline value specified

Reference

World Health Organization Regional Office for Europe, Copenhagen World Health Organization Regional Publications. '[Guidelines for Indoor Air Quality: Selected Pollutants](#)' 2010 (viewed on 07 November 2024)

Public Health England. '[Indoor Air Quality Guidelines for selected Volatile Organic Compounds \(VOCs\) in the UK](#)' 2019 (viewed on 07 November 2024)

Health effects

The main toxic effect is intravascular haemolysis. Toxic by ingestion, inhalation and dermal exposure.

Table 8. Signs or symptoms of acute exposure

Route	Signs and symptoms
Inhalation/ Ingestion	<p>Nausea, vomiting, abdominal pain, diarrhoea, headache, confusion, sweating, fever, tachycardia, tachypnoea, and agitation, leading to convulsions and coma. Haemolysis and haemoglobinuria leading to acute kidney injury may occur after 3 to 5 days, particularly in patients with G6PD deficiency. Metabolic acidosis may occur.</p> <p>The urine may be dark brown or black in colour, due to haemoglobinuria and the presence of naphthalene metabolites. Methaemoglobinaemia may also occur.</p>
Eyes	Irritation and possible injury from particles in the eye.
Dermal	Irritation and possibly dermatitis in most cases, but prolonged contact particularly with concomitant use of baby oil has led to systemic features.

Reference

National Poisons Information Service (NPIS). TOXBASE '[Naphthalene](#)' 2020 (viewed on 07 November 2024)

Decontamination at the scene

Chemical specific advice

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 naphthalene 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 the UK Health Security Agency (UKHSA) Radiation, Chemicals, Climate and Environmental Hazards Directorate 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, disrobing should be conducted at the scene and by the casualty themselves. Disrobing should be systematic to prevent transfer of contaminant from clothing to skin. Clothing should not be pulled over the head if possible.

Clothing stuck to the casualty by the contaminant should not be forcefully removed, as this risks causing further harm.

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 or clothes.

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.

Unprotected first responders and members of the public should not approach casualties incapacitated by exposure to administer improvised decontamination, as they may be exposed to contaminants and become a casualty themselves.

Important note: Improvised decontamination should continue until a more structured intervention, such as an Interim Operational Response is conducted, or Specialist Operational Response are present.

Improvised dry decontamination

Improvised dry decontamination should be considered for an incident involving naphthalene unless casualties are demonstrating obvious signs of chemical burns or skin irritation.

Any available dry absorbent material can be used such as kitchen towel, paper tissues (for example blue roll) and clean cloth.

Exposed skin surfaces should be blotted first and then rubbed, starting with the face, head, and neck, and moving down and away from the body.

Blotting and rubbing should not be too aggressive, as it could drive contamination further into the skin.

Casualties should also blow their nose to remove contaminants from the nasal cavities.

All waste material arising from decontamination should be left in situ, and ideally bagged, for disposal at a later stage.

Improvised wet decontamination

Wet decontamination should be used if contamination with a caustic chemical substance is suspected.

Wet decontamination may be performed using copious amounts of water from any available source such as taps, showers, water bottles, fixed installation hose-reels and sprinklers to

gently rinse the affected skin. Other natural sources of water may be considered unless this creates greater risks to the individuals affected. Wet wipes or baby wipes may be used as an effective alternative.

Improvised decontamination should not involve overly aggressive methods to remove contamination as this could further damage affected tissues and 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 and so on) 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.

When vulnerable people are affected by a hazardous substance, they may need additional support to remove themselves, their clothing or the substance.

Casualties should remain in the area and should not leave to seek care at a hospital, as this presents a contamination risk. Further care will be administered on site by the appropriate emergency services.

Interim wet decontamination

Interim decontamination is the use of standard Fire and Rescue Service equipment to provide a planned and structured decontamination process prior to the availability of purpose-designed decontamination equipment.

Decontamination at the scene references

Home Office. [‘Initial operational response to a CBRN incident’](#) Version 2.0 2015 (viewed on 07 November 2024)

National Health Service England. [‘Emergency Preparedness, Resilience and Response \(EPRR\): Guidance for the initial management of self-presenters from incidents involving hazardous materials’](#) 2019 (viewed on 07 November 2024)

Joint Emergency Service Interoperability Programme. [‘Initial Operational Response \(IOR\) to Incidents Suspected to Involve Hazardous Substances or CBRN Materials’](#) 2024 (viewed on 07 November 2024)

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.

Important notes

Once body surface contaminants have been removed or if your patient was exposed by ingestion or inhalation, the risk that secondary care givers may become contaminated is very low. Secondary carers should wear standard hospital PPE as a precaution against secondary contamination from vomit and body fluids.

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.

For comprehensive clinical advice consult [TOXBASE](#) directly.

Clinical decontamination following surface contamination

Avoid contaminating yourself.

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 soap and copious amounts of water under low pressure for at least 10 to 15 minutes.

Pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears.

The earlier irrigation begins, the greater the benefit.

Dermal exposure

Decontaminate (as above) the patient following surface contamination.

For systemic toxicity manage as per inhalation/ingestion.

Carry out 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 (for example, oxybuprocaine, amethocaine or similar). However, do not delay irrigation if local anaesthetic is not immediately available.

Immediately irrigate the affected eye thoroughly with 1,000mL 0.9% saline or equivalent crystalloid (for example, by an infusion bag with a giving set) for a minimum of 10 to 15 minutes irrespective of initial conjunctival pH. A Morgan Lens may be used if anaesthetic has been given.

Aim for a final conjunctival pH of 7.0 to 8.0. The conjunctivae may be tested with indicator paper. Retest 20 minutes after irrigation and use further irrigation if necessary.

Any particles lodged in the conjunctival recesses should be removed.

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 supportive measures as indicated by the patient's clinical condition.

Ingestion and Inhalation

Maintain a clear airway and ensure adequate ventilation.

Gut decontamination (including activated charcoal) is unlikely to be of benefit.

The benefit of gastric decontamination is uncertain. See [TOXBASE](#) for further advice in this.

Monitor vital signs and check the capillary blood glucose.

Check and record pupil size.

Pulse oximetry is unreliable in the presence of methaemoglobinaemia.

Carry out other supportive measures as indicated by the patient's clinical condition.

For comprehensive advice on clinical first aid, clinicians should consult [TOXBASE](#) directly.

Clinical decontamination and first aid references

National Poisons Information Service (NPIS). TOXBASE '[Naphthalene](#)' 2020 (viewed on 07 November 2024)

National Poisons Information Service (NPIS). TOXBASE '[chemicals splashed or sprayed into the eyes - features and clinical management](#)' 2020 (viewed on 07 November 2024)

National Poisons Information Service (NPIS). TOXBASE '[Skin decontamination - irritants](#)' 2019 (viewed on 07 November 2024)

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

UKHSA is an executive agency, sponsored by the Department of Health and Social Care.

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