



UK Health  
Security  
Agency

# Trichloroethylene

## Incident management

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

Thank you for visiting the compendium of chemical hazards. Please take our [short survey](#) to help us make improvements.

# Contents

Main points.....	3
General.....	3
Health.....	3
Casualty decontamination at the scene.....	3
Environment.....	3
Hazard identification.....	4
Physicochemical properties.....	6
Reported effect levels from authoritative sources.....	7
Published emergency response guidelines.....	8
Exposure standards, guidelines or regulations.....	9
Health effects.....	11
Decontamination at the scene.....	12
Chemical specific advice.....	12
Disrobe.....	12
Improvised decontamination.....	13
Improvised dry decontamination.....	13
Improvised wet decontamination.....	13
Additional notes.....	14
Interim wet decontamination.....	14
Decontamination at the scene references.....	15
Clinical decontamination and first aid.....	16
Important notes.....	16
Clinical decontamination following surface contamination.....	16
Dermal exposure.....	17
Ocular exposure.....	17
Ingestion, Inhalation and Systemic toxicity.....	17
Clinical decontamination and first aid references.....	18
About the UK Health Security Agency.....	19

## Main points

### General

Trichloroethylene is a clear, colourless, volatile liquid at room temperature. It is non-flammable, and has a sweet odour.

Trichloroethylene reacts violently with finely divided metals generating a fire and explosion hazard. It decomposes on contact with hot surfaces or flames, producing fumes of phosgene and hydrogen chloride. Trichloroethylene is slowly decomposed by light in the presence of moisture producing hydrochloric acid.

### Health

Systemic toxicity may occur by all routes of exposure to trichloroethylene.

Inhalation can cause irritation of the respiratory tract, and sudden death.

Ingestion may cause burning sensation and pain throughout GI tract, nausea and vomiting; there is a risk of aspiration leading to chemical pneumonitis, particularly if vomiting occurs.

Dermal exposure can cause skin irritation and dermatitis.

Features of systemic toxicity include excitement, headache and dizziness leading to drowsiness, ataxia and dysarthria. CNS depression with coma and respiratory depression in severe cases. Cardiac arrhythmias may occur.

Eye exposure may cause irritation and has caused injury to the corneal epithelium.

### Casualty decontamination at the scene

Following disrobe, improvised dry decontamination should be considered for an incident involving trichloroethylene 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, contaminated fire and decontamination run-off should be prevented from entering drains and surface and groundwaters.

## Hazard identification

**Table 1. Standard (UK) dangerous goods emergency action codes for trichloroethylene**

<b>UN</b>		1710	Trichloroethylene	
<b>EAC</b>		2Z	Use fine 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.	
<b>APP</b>		–	–	
<b>Hazards</b>	<b>Class</b>	6.1	Toxic substances	
	<b>Sub-risks</b>	–	–	
<b>HIN</b>		60	Toxic or slightly toxic 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 28 October 2024)

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

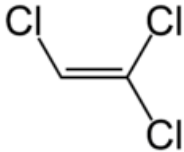
<b>Hazard class and category</b>	Carc. 1B	Carcinogenicity, category 1B	
	Muta. 2	Germ cell mutagen, category 2	
	Eye Irrit. 2	Eye irritation, category 2	
	Skin Irrit. 2	Skin corrosion/irritation, category 2	
	STOT SE 3	Specific target organ toxicity single exposure, category 3	
	Aquatic Chronic 3	Chronic hazard to the aquatic environment, category 3	
<b>Hazard statement</b>	H350	May cause cancer	
	H341	Suspected of causing genetic defects	
	H319	Causes serious eye irritation	
	H315	Causes skin irritation	
	H336	May cause drowsiness or dizziness	
	H412	Harmful to aquatic life with long lasting effects	
<b>Signal words</b>	DANGER		

### References

The Health and Safety Executive (HSE). '[GB CLP Regulation](#)' (viewed on 28 October 2024).

## Physicochemical properties

Table 3. Physicochemical properties

<b>CAS number</b>	79-01-6
<b>Molecular weight</b>	131.4
<b>Formula</b>	C <sub>2</sub> HCl <sub>3</sub>
<b>Common synonyms</b>	Trichloroethylene, trichloroethene, ethene, trichloro-, Petzinol
<b>State at room temperature</b>	Liquid
<b>Volatility</b>	Vapour pressure = 69 mm Hg at 25°C
<b>Specific gravity</b>	(Water = 1) 1.5 (Air = 1) 4.5
<b>Flammability</b>	Non-flammable
<b>Lower explosive limit</b>	7.9%
<b>Upper explosive limit</b>	100%
<b>Water solubility</b>	Slightly soluble in water
<b>Reactivity</b>	<p>Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of phosgene and hydrogen chloride.</p> <p>Decomposes on contact with strong alkali. This produces dichloroacetylene. This increases fire hazard.</p> <p>Reacts violently with finely divided metals. This generates fire and explosion hazard.</p> <p>Slowly decomposed by light in the presence of moisture. This produces corrosive hydrochloric acid.</p>
<b>Odour</b>	Sweet odour
<b>Structure</b>	

### References

World Health Organization. International Programme on Chemical Safety '[International chemical safety card for trichloroethylene](#)'. ICSC 0081, 2013. (viewed on 28 October 2024)

PubChem. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information. '[PubChem Compound Summary for CID 6575, Trichloroethylene](#)' (viewed on 28 October 2024)

## Reported effect levels from authoritative sources

**Table 4. Exposure by ingestion**

Concentration (g/kg bw)	Signs and symptoms	Ref
7	Death	a

**Table 5. Exposure by inhalation**

Concentration (mg/m <sup>3</sup> )	ppm	Signs and symptoms	Ref
270-540	50-100	Headache, lethargy, drowsiness, dulled senses, dizziness, sleepiness (especially at the end of the workshift) nausea, and vomiting (at narcotic doses)	a
600-1000	110-185	Effects on the CNS, including damage affecting the optic and trigeminal nerves	b
5300	1000	Decreased depth perception and motor skills (2 hour exposure)	c
16,000	3000	Unconsciousness (1 hour exposure)	c
27,000	5000	Light anaesthesia, eye irritation, pain and superficial corneal damage	a
108,000	20,000	Deep anaesthesia, eye irritation, pain and superficial corneal damage	a

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. International Programme on Chemical Safety (IPCS). [Trichloroethylene – Environmental Health Criteria 50](#) 1985 (viewed on 28 October 2024)

b. World Health Organization (WHO). [WHO guidelines for indoor air quality: selected pollutants](#) 2010 (viewed on 28 October 2024)

c. Agency for Toxic Substances and Disease Registry (ATSDR). [Toxicological profile for Trichloroethylene \(TCE\)](#). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service 2019 (viewed on 28 October 2024)

## Published emergency response guidelines

**Table 6. Interim acute exposure guideline levels (AEGLs)**

	Concentration (ppm)				
	10 minutes	30 minutes	60 minutes	4 hours	8 hours
<b>AEGL-1</b> [note 1]	260	180	130	84	77
<b>AEGL-2</b> [note 2]	960	620	450	270	240
<b>AEGL-3</b> [note 3]	6100	6100	3800	1500	970

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.

### Reference

US Environmental Protection Agency (EPA). '[Acute Exposure Guideline Levels](#)' (viewed on 28 October 2024)



## Exposure standards, guidelines or regulations

**Table 7. 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>	100	550	150	820

### 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 28 October 2024)

**Table 8. Public health standards and guidelines**

<b>UK drinking water standard</b>	10 µg/L (cumulative total concentration of both trichloroethylene and tetrachloroethylene)
<b>WHO guideline for drinking water quality</b>	8 µg/L
<b>UK Indoor air quality guideline</b>	No safe level of exposure can be recommended. Based on continuous exposure to 1 µg/m <sup>3</sup> from birth to age 70, the estimated lifetime unit risk of kidney cancer (adjusted for other cancers) is 4.8 x 10 <sup>-6</sup> . The concentrations of airborne trichloroethylene associated with an excess lifetime cancer risk of 1/10 000, 1/100 000 and 1/1 000 000 are 21, 2.1 and 0.21 µg/m <sup>3</sup> , respectively.
<b>WHO indoor and outdoor air quality guideline</b>	No safe level can be recommended as available evidence indicates trichloroethylene is genotoxic and carcinogenic. Unit risk estimate of 4.3 x 10 <sup>-7</sup> per µg/m <sup>3</sup> The concentrations of airborne tetrachloroethylene associated with an excess lifetime cancer risk of 1:10 000, 1:100,000 and 1:1,000,000 are respectively 230, 23 and 2.3 µg/m <sup>3</sup>

## Reference

[The Private Water Supplies \(England\) Regulations 2016](#) and [The Private Water Supplies \(Wales\) Regulations 2017](#) (viewed on 28 October 2024)

[The Water Supply \(Water Quality\) Regulations 2018](#) (Water, England and Wales) (viewed on 28 October 2024)

World Health Organization. '[Guidelines for Drinking-water Quality, 4th Edition Incorporating First and Second Addendum](#)' 2022 (viewed on 28 October 2024)

World Health Organization Regional Office for Europe, Copenhagen World Health Organization Regional Publications. '[Guidelines for Indoor Air Quality: Selected Pollutants](#)' 2010 (viewed on 28 October 2024)

Public Health England. '[Indoor Air Quality Guidelines for selected Volatile Organic Compounds \(VOCs\) in the UK](#)' 2019 (viewed on 28 October 2024)

World Health Organization Regional Office for Europe. '[Air Quality Guidelines for Europe, European Series, No. 91, 2nd Edition](#)' 2000 (viewed on 28 October 2024)

## Health effects

Trichloroethylene is rapidly absorbed by inhalation and from the gastrointestinal tract. Prolonged skin contact may also cause toxicity.

**Table 9. Signs or symptoms of acute exposure**

Route	Signs and symptoms
<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>Inhalation</b>	Inhalation can cause irritation of the respiratory tract. Sudden death (due to cardiac arrhythmias) has been associated with abuse of hydrocarbons. Systemic features are common following inhalation and CNS depression is usually the first presenting feature.
<b>Systemic features</b>	Chlorinated hydrocarbons predominantly cause CNS depression. Symptoms 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>Dermal</b>	May cause skin irritation, and may cause dermatitis due to its defatting action on the skin. Significant dermal exposure with certain chlorinated hydrocarbons may lead to systemic toxicity.
<b>Ocular</b>	May be irritating to the eyes; contact with eyes has caused injury to the corneal epithelium.

### Reference

National Poisons Information Service (NPIS). TOXBASE '[Trichloroethylene](#)' 2020 (viewed on 28 October 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 trichloroethylene 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 carried out, or Specialist Operational Response are present.

## Improvised dry decontamination

Improvised dry decontamination should be considered for an incident involving trichloroethylene 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 28 October 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 28 October 2024)

Joint Emergency Service Interoperability Programme. '[Initial Operational Response IOR to Incidents Suspected to Involve Hazardous Substances or CBRN Materials](#)' 2024 (viewed on 28 October 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

Carry out decontamination after resuscitation.

This should be performed in a well-ventilated area, preferably with its own ventilation system.

Avoid contaminating yourself with this product and wash any exposed area.

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.

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.

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

## Ingestion, Inhalation and Systemic toxicity

Maintain a clear airway and ensure adequate ventilation.

Gastric decontamination after ingestion is contraindicated due to the increased risk of aspiration.

Monitor vital signs and cardiac rhythm, check the capillary blood glucose.

Check and record pupil size.

Perform a 12-lead ECG in all patients who require assessment.

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

## Clinical decontamination and first aid references

National Poisons Information Service (NPIS). TOXBASE '[Trichloroethylene](#)' 2020 (viewed on 28 October 2024)

National Poisons Information Service (NPIS). TOXBASE '[chemicals splashed or sprayed into the eyes - features and clinical management](#)' 2020 (viewed on 28 October 2024)

National Poisons Information Service (NPIS). TOXBASE '[skin decontamination - irritants](#)' 2019 (viewed on 28 October 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](#).

This document from the UKHSA Radiation, Chemicals, Climate and Environmental Hazards Directorate reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

© Crown copyright 2024

First published: July 2014

Full document update: June 2021

Full document update: October 2024

For queries relating to this document, please contact [chemcompendium@ukhsa.gov.uk](mailto:chemcompendium@ukhsa.gov.uk) or [enquiries@ukhsa.gov.uk](mailto:enquiries@ukhsa.gov.uk)

Publishing reference: GOV-17548



You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v3.0. To view this licence, visit [OGL](#). Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.



UKHSA supports the Sustainable Development Goals

