

Lead

Incident management

Key Points

Fire

- Reacts with hot concentrated nitric acid, boiling hydrochloric or sulphuric acid
- May cause explosions on contact with hydrogen peroxide or sodium, potassium or magnesium and their salts
- In the event of a fire involving lead, use fine water spray and normal fire kit with breathing apparatus

Health


- Toxicity most frequently results from ingestion or inhalation and rarely from dermal or ocular exposure
- Reproductive toxin and Harmful
- Exposure may cause metallic taste, abdominal pain, anorexia, diarrhoea with black stools (if acute massive exposure), constipation and vomiting, headaches, irritability, fatigue, insomnia, depression, peripheral neuropathy (predominantly motor), wrist drop and arthropathy

Environment

- Dangerous for the environment
- Inform Environment Agency of substantial release incidents

Hazard Identification

Standard (UK) Dangerous Goods Emergency Action Codes^(a)

UN		2291	Lead compound, soluble, n.o.s.	
EAC		2Z	Use fine water spray. Wear normal fire kit in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses.	
APP		-		
Hazards	Class	6.1	Toxic substance	
	Sub risks	-		
HIN		60	Toxic or slightly toxic substance	





UN – United Nations number; EAC – Emergency Action Code; APP – Additional Personal Protection; HIN - Hazard Identification Number

* Normal fire fighting clothing i.e. fire kit (BS EN 469), gloves (BS EN 659) and boots (HO specification A29 and A30) in combination with self-contained open circuit positive pressure compressed air breathing apparatus (BS EN 137).

^a Dangerous Goods Emergency Action Code List, HM Fire Service Inspectorate, Publications Section, The Stationery Office, 2009.

Chemical Hazard Information and Packaging for Supply Classification^(a)

Lead compounds^(b)

Classification	Repr cat 1	Category 1 reproductive toxin (developmental toxin)	
	Repr cat 3	Category 3 reproductive toxin (fertility)	
	Xn	Harmful	
	N	Dangerous for the environment	
Risk phrases	R61	May cause harm to the unborn child	
	R20/22	Harmful by inhalation and if swallowed	
	R33	Danger of cumulative effects	
	R62	Possible risk of impaired fertility	
	R50/53	Very toxic to aquatic organisms, may cause long-term adverse health effects in the aquatic environment	
Safety phrases	S53	Avoid exposure, obtain special instructions before use	
	S45	In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)	
	S60	This material and its container must be disposed of as hazardous waste	
	S61	Avoid release into the environment. Refer to special instructions/safety data sheet	

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.

<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

^b Lead compounds with the exception of lead alkyls, lead diazide, lead azide, lead chromate, lead di(acetate) trilead bis(orthophosphate), lead acetate, lead (II) methane sulphonate, lead sulfochromate yellow, lead chromate molybdate, lead hydrogen arsenate and lead 2,4,6-trinitro-m-phenylene dioxide.






Specific concentration limits^(a)

Concentration	Classification
C ≥ 2.5 %	Repr. Cat. 3; R62
C ≥ 1 %	Xn; R20/22
C ≥ 0.5 %	R33

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.2.
<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

Globally Harmonised System of Classification and Labelling of Chemicals (GHS)^(a)

Lead compounds^(b)

Hazard Class and Category	Repr. 1A	Reproductive toxicity, category 1A	
	Acute Tox. 4	Acute toxicity (oral, dermal, inhalation), category 4	
	STOT RE 2	Specific target organ toxicity following single exposure, category 2	
	Aquatic Acute 1	Acute hazards to the aquatic environment, category 1	
	Aquatic Chronic 1	Chronic hazards to the aquatic environment, category 1	
Hazard Statement	H360Df	May damage the unborn child. Suspected of damaging fertility	
	H332	Harmful if inhaled	
	H302	Harmful if swallowed	
	H373	May cause damage to organs through prolonged or repeated exposure	
	H400	Very toxic to aquatic life	
	H410	Very toxic to aquatic life with long lasting effects	
Signal Words	DANGER		

Implemented in the EU on 20 January 2009.

^a Annex VI to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures- Table 3.1.

<http://esis.jrc.ec.europa.eu/index.php?PGM=cla> (accessed 11/2011)

^b Lead compounds with the exception of lead alkyls, lead diazide, lead azide, lead chromate, lead di(acetate) trilead bis(orthophosphate), lead acetate, lead (II) methane sulphonate, lead sulfochromate yellow, lead chromate molybdate, lead hydrogen arsenate and lead 2,4,6-trinitro-m-phenylene dioxide.

Specific concentration limits

Concentration	Hazard Class and Category	Hazard Statement	
C ≥ 2.5 %	Repr. 2	H361f	Suspected of damaging fertility or the unborn child
C ≥ 0.5 %	STOT RE 2	H373	May cause damage to organs through prolonged or repeated exposure

Physicochemical Properties

CAS number	7439-92-1
Atomic weight	207
Chemical symbol	Pb
Common synonyms	-
State at room temperature	Solid
Volatility	Non-volatile at 20 °C
Specific gravity	11.3 at 20 °C (water = 1)
Flammability	Data not available
Lower explosive limit	Not applicable
Upper explosive limit	Not applicable
Water solubility	Insoluble in water, slightly soluble in alcohol.
Reactivity	Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric or sulphuric acid. Attacked by pure water, but not tap water and weak organic acids
Reaction or degradation products	May cause explosions on contact with hydrogen peroxide or sodium, potassium or magnesium and their salts
Odour	Odourless

References^(a,b,c)

^a The Merck Index (14th Edition). Entry 5396: Lead, 2006.

^b Lead (HAZARDTEXT® Hazard Management). In: Klasco RK (Ed): TOMES® System. Thomson Micromedex, Greenwood Village, Colorado (accessed 02/2010).

^c The Dictionary of Substances and their Effects. Ed. S Gangolli. Second Edition, Volume 5, 1999.

Threshold Toxicity Values

Blood lead conc. ($\mu\text{g dl}^{-1}$)	SIGNS AND SYMPTOMS	
	ADULTS	CHILDREN
10		Hearing impairment
10-15		Cognitive impairment
30	Decreased nerve conduction velocity	Reduced haemoglobin levels
40 - 60	GI disturbances: nausea, vomiting, anorexia, constipation, abdominal cramps, weight loss, reduced haemoglobin levels, cognition impairment	
40 - 120	Malaise, forgetfulness, irritability, lethargy, headache, fatigue, impotence, decreased libdo, dizziness, weakness and paraesthesia	
60 - 100		GI disturbances: abdominal pain, constipation, nausea, vomiting, anorexia, weight loss, frank anaemia
80	Frank anaemia	Signs and symptoms of lead encephalopathy: irritability, poor attention span, headache, memory loss, tremor, ataxia, convulsions, drowsiness, malaise, coma, seizures, death
100-120	Signs and symptoms of lead encephalopathy: irritability, poor attention span, headache, memory loss, tremor, ataxia, convulsions, drowsiness, malaise, coma, seizures, death	

Reference^(a,b)

^a Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead, 1999 (accessed 01/2011).

^b Air Quality Guidelines for Europe. World Health Organization Regional Office for Europe, Copenhagen WHO Regional Publications, European Series, No. 91, Second Edition, 2000 (accessed 01/2011).

Published Emergency Response Guidelines

Emergency Response Planning Guideline (ERPG) Values

	Calculated value (ppm)	Listed value (mg m ⁻³)
ERPG-1*	Data not available	
ERPG-2**		
ERPG-3***		

* 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 (AEGs)

	ppm				
	10 min	30 min	60 min	4 hr	8 hr
AEGL-1[†]	Data not available				
AEGL-2^{††}					
AEGL-3^{†††}					

[†] The level of the chemical in air at or above which the general population could experience notable discomfort.

^{††} 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.

^{†††} The 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

Occupational standards

WEL	LTEL (8 hour reference period): No guideline value specified
	STEL (15 min reference period): No guideline value specified
ACTION LEVEL IN BLOOD^(a)	25 $\mu\text{g dL}^{-1}$ (woman capable of having children)
	40 $\mu\text{g dL}^{-1}$ (a young person under 19)
	50 $\mu\text{g dL}^{-1}$ (general employees)

Public health guidelines

DRINKING WATER QUALITY GUIDELINE^(b)	25 $\mu\text{g L}^{-1}$ from 25 th December 2003 until 24 th December 2013. 10 $\mu\text{g L}^{-1}$ on and after 25 th December 2013
AIR QUALITY GUIDELINE^(c)	0.5 $\mu\text{g m}^{-3}$
SOIL GUIDELINE VALUE AND HEALTH CRITERIA VALUES	No guideline values specified

WEL – Workplace exposure limit; LTEL - Long-term exposure limit; STEL – Short-term exposure limit

^a The Control of Lead at Work Regulations, 2002. The Stationery Office, 2002 (accessed 01/2011).

^b The Water Supply (Water Quality) Regulations 2000 (England) and the Water Supply (Water Quality) Regulations 2001 (Wales) (accessed 01/2011)..

^c Air Quality Guidelines for Europe. World Health Organization Regional Office for Europe, Copenhagen WHO Regional Publications, European Series, No. 91, Second Edition, 2000.

Health Effects

Major route of exposure^(a)

- Toxicity most frequently results from ingestion or inhalation and rarely from dermal or ocular exposure.

Immediate signs or symptoms of acute exposure^(a)

- Metallic taste, abdominal pain, anorexia, diarrhoea with black stools (if acute massive exposure), constipation and vomiting may occur. Exposure may also cause headaches, irritability, fatigue, insomnia, depression, peripheral neuropathy (predominantly motor), wrist drop and arthropathy. Proximal renal tubular dysfunction with aminoaciduria, glycosuria, phosphaturia and renal tubular acidosis.
- Encephalopathy with headache, confusion, drowsiness, coma and seizures secondary to cerebral oedema may occur. Lead encephalopathy is more common in children.

TOXBASE - <http://www.toxbase.org> (accessed 01/2011)

^a TOXBASE: Lead, 03/2010.

Decontamination and First Aid

Important Notes.

- Ambulance staff, paramedics and emergency department staff treating chemically-contaminated casualties should be equipped with the 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.

Dermal exposure^(a)

- 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 chemical hazard.
- Brush away any adherent solid particles 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^(a)

- 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^(a)

- Remove patient from exposure.
- Ensure a clear airway and adequate ventilation.
- Give oxygen to symptomatic patients.
- Apply other measures as indicated by the patient's clinical condition.

Ingestion^(a)

- Ensure a clear airway and adequate ventilation.
- Apply other supportive measures as indicated by the patient's clinical condition.

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

TOXBASE - <http://www.toxbase.org> (accessed 01/2011)

^a TOXBASE: Lead, 03/2010.