

Appendix B – Specific hazardous substances

Asbestos

Asbestos attracts particular attention because it has had such a devastating effect for so many people.

There are three common types

1. White (chrysotile),
2. Brown (amosite)
3. Blue (crocidolite)

People working directly with asbestos are clearly at risk, but the main problem is that it has had many applications in the past, and this leads to exposure to others for many years after. Typical uses included:

- Pipe lagging;
- Ceiling tiles;
- Roof and wall sheeting (asbestos cement);
- Coatings sprayed on to steel structures to provide fire insulation;
- Thermal insulation in lofts and walls;
- Gaskets.

Illnesses caused by asbestos inhalation include

- Pneumoconiosis;
- Asthma;
- Asbestosis;
- Mesothelioma;
- Lung cancer.

Asbestos is covered by the Control of Asbestos at Work Regulations 2006. They create a duty on employers if workers are likely to come into contact with asbestos based materials or if there is asbestos based material in the workplace.

A suitable and sufficient assessment of the presence and type of asbestos is required prior to commencement of work. Where there is doubt it should be assumed that asbestos is present and that all the applicable provisions of the regulations apply. Anyone likely to be exposed to asbestos at work requires training. Where asbestos is found in the workplace a decision needs to be made about whether it needs to be removed or made safe whilst leaving it in position (i.e. encapsulated). Most activities involving asbestos must be performed by companies licensed to do so, although there are some exceptions, the most notable

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being work with textured decorative coatings such as Artex, although precautions are still required.

There are two Approved Codes of Practice

- L143 “Work with materials containing asbestos” - Gives an in-depth look at the Regulations
- L127 “The management of asbestos in non-domestic premises” - Deals with how to manage asbestos.

Lead

Lead is a toxic metal. Exposure is usually via inhalation of fumes, vapour or dust. Symptoms of exposure include headaches, tiredness, irritability, constipation, nausea, stomach pains, anaemia and weight loss. Prolonged exposure can cause damage to kidneys, nervous system and brain.

Unborn children are a particular concern, so any woman of child bearing age must take particular care if exposure is possible. Tests of concentration in blood can pick up exposure.

Reference – ‘Lead and you’ available free at
<http://www.hse.gov.uk/pubns/indg305.pdf>

Mercury

Is a metal, but is liquid at room temperature. It has an appreciable vapour pressure at room temperature meaning mercury vapour is released and so can be inhaled. Mercury can be absorbed through the skin.

Mercury has a number of unusual properties which mean it has a variety of uses including:

- A cathode in electrolysis of brine to create chlorine
- Temperature measurement devices
- Electrical switch gear
- Light bulbs
- As amalgam for dental uses
- Manufacture of many compounds.

Possible symptoms from an acute exposure include severe nausea, vomiting, abdominal pain, bloody diarrhoea, kidney damage and death.

Potential symptoms from a chronic exposure include inflammation of the mouth and gums, excessive salivation, loosening of the teeth, kidney damage, muscle tremors, jerky gait, spasms of the extremities, personality changes, depression, irritability and nervousness.

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Reference – ‘Mercury and its inorganic divalent compounds in air’ available free at <http://www.hse.gov.uk/pubns/mdhs/pdfs/mdhs16-2.pdf>

Ammonia

Ammonia is a colourless gas with pungent odour. It occurs naturally but is manufactured in large quantities for industrial uses including as a refrigerant, in cleaning solutions and for making fertilizers.

Ammonia is toxic, corrosive (to skin, eyes and lungs), flammable and exposure to high concentration can affect the immune system. Exposure can be fatal. Also, it is often stored and used at very cold temperatures, which in itself is a hazard.

Chlorine

The chlorine element occurs naturally in great abundance in a great number of different compounds. It is used to disinfect water and the manufacture of many substances including plastics and pharmaceuticals.

Chlorine is a very toxic gas that at very low concentrations can cause eye, nose and throat irritation; and at modest concentrations (30 ppm) can cause severe breathing difficulties.

Benzene

Benzene occurs naturally in crude oil, and so people working in associated industries may be exposed (including small concentrations in petrol).

Harm can be caused by inhalation of vapour, contact with skin or ingestion. Symptoms include headache, tiredness, nausea and dizziness; and unconsciousness if high concentration. Over longer term, serious blood disorders such as anaemia and leukaemia (form of cancer) can occur.

Reference – ‘Benzene and you’ available free at <http://www.hse.gov.uk/pubns/indg329.pdf>

Silica

Silica is a naturally occurring compound that can be found in sand, stone (notably sandstone and granite), clay, shale and slate.

Silica dust is hazardous if inhaled. This can lead to silicosis, which is scarring of the lung tissue that causes breathing difficulties. Short exposure to high concentration can cause death within months and longer term exposure to lower concentrations can cause premature death. There is also some concern that silica may be carcinogenic.

Reference – ‘Construction Information Sheet 36 - Silica’ available free at <http://www.hse.gov.uk/pubns/cis36.pdf>

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Carbon Dioxide (CO₂)

Carbon dioxide is a naturally occurring gas and found in the earth's atmosphere. It is widely used as a refrigerant, for carbonating drinks and in fire extinguishers. It commonly occurs as a by-product of natural and industrial processes.

High concentrations of carbon dioxide in air cause oxygen deficiency with the risk of unconsciousness or death. The problem is that there is no visible or odour warning of its presence. Also, it is often present at very low temperatures as liquid or solid, which is in itself hazardous.

Carbon Monoxide (CO)

Carbon monoxide is the product of incomplete combustion of carbon-containing compounds. It is a significant fuel in its own right (i.e. will burn in air) and has many industrial uses in the manufacture of bulk chemicals.

Carbon monoxide is toxic. It is colourless and odourless gas and when it is inhaled it prevents the blood from carrying oxygen cells to tissues and organs. As well the risks from its use in industry, it can occur readily in domestic circumstances, especially from poorly installed and maintained gas boilers used to heat water and for central heating.

Detergents

Detergents are useful for cleaning because they help dissolve oils and fats. Unfortunately the human skin relies on oils and fats to function properly and so exposure to detergents can lead to skin drying with the possibility of dermatitis developing.

Solvents

Solvents have many uses in industry, including surface cleaning, degreasing and laundry. Also, they are used as carriers for other materials (e.g. paint).

The potential effects of exposure to solvents include irritation of the skin, eyes and lungs, headache, nausea, dizziness and light-headedness. Repeated or prolonged skin contact can cause dermatitis.

Inhaling solvents can have a hallucinogenic effect, which can lead to accidents.

Solvents are usually volatile (evaporate at low temperatures) and can be highly flammable.

Trichloroethylene

Trichloroethylene is used in a large number of workplaces, particularly as a powerful solvent for surface degreasing for the cleaning of metal parts. It is classed as a category 2 carcinogen, which means it 'may cause cancer.'

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Category 1 and 2 carcinogens are subject to specific requirements under COSHH. Employers must first consider whether it is reasonably practicable to prevent exposure to a carcinogen by using an alternative substance or process and, if not, whether it is reasonably practicable to enclose the process totally.

Reference – ‘Surface cleaning: Solvent update including the reclassification of trichloroethylene’ available free at <http://www.hse.gov.uk/pubns/eis34.pdf>

Isocyanates

Organic isocyanates exist as liquids or solids at room temperature and are soluble in aromatic hydrocarbons, nitrobenzene, acetone, ethers and esters. They are highly reactive compounds, and react exothermally with water, alcohols and amines. Examples include toluene (used in the production of flexible elastomers and polyurethane foams), and 4,4'-methylenebis (phenyl isocyanate) used to make rigid foams and is employed in the foundry industry as a core binder.

Isocyanates are found in some printing inks, paints and adhesives. The critical health effect associated with isocyanates is respiratory sensitisation. In higher doses, isocyanates can cause irritation to the eyes, skin and respiratory system. After periods of exposure, the worker may become responsive to extremely low concentrations. The inhalation of isocyanates has been associated with a range of complaints, including coughing, wheezing, chest discomfort, acute oedema and interstitial pulmonary fibrosis, as well as covert decrement of lung function.

Reference – ‘Organic isocyanates in air’ available free at <http://www.hse.gov.uk/pubns/mdhs/pdfs/mdhs25-3.pdf>

Acids and alkalis

Acids and alkalis are corrosive materials with multiple uses, including cleaning products.

Acids include hydrochloric acid (HCl), hydrofluoric acid (HF), phosphoric acid (H₃PO₄), nitric acid (HNO₃) and sulphuric acid (H₂SO₄)

Alkalis include sodium hydroxide (NaOH - caustic soda) and potassium hydroxide (KOH - caustic potash)

They can cause serious ill health mainly by:

1. Skin contact - causing burns which are often slow to heal;
2. Inhaling fumes or mist given off by concentrated solutions or when substances are being sprayed.

Reference – ‘Chemical cleaners’ available free at <http://www.hse.gov.uk/pubns/cis24.pdf>

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Legionnaires disease

Causes illness with symptoms similar to pneumonia, and can be fatal for old, young and ill people. It is caused by the legionella bacteria present in airborne droplets that are then inhaled. Air conditioning systems and cooling towers are common source of problem. It is controlled by managing water temperatures so that bacteria do not survive and breed, testing for presence of bacteria and chemical dosing.

Leptospirosis

Caused by leptospira bacterium.

Symptoms similar to flu (fever, chills, muscular aches and pains). More rarely Weils disease may occur which has symptoms of bruising of the skin, anaemia, sore eyes, nose bleeds and jaundice; and can cause organ failure and death.

Rats and cattle can carry the bacteria and it is present in their urine. It typically enters the human body via through cuts and scratches. People susceptible include canal, sewer, farm and abattoir workers; and vets. Immunisation is available. People at risk need to be informed about covering cuts and scratches and washing after potential exposure.

Hepatitis B and HIV

Both Hepatitis B and HIV are blood-borne infections. Hepatitis B causes severe jaundice and HIV causes failure of immune system.

Both are contracted through blood and bodily fluids. Controlling risks involves preventing puncture wounds, keeping instruments clean and sterile, and wearing protective gloves, masks etc. People most at risk are health and emergency services personnel.

Dermatitis

Occupational dermatitis occurs when skin comes into contact with certain substances at work, often following repeated contact. Symptoms of the condition include redness, itching, scaling and blistering of the skin.

A number of different types of substance can cause dermatitis including water, soaps and detergents, solvents, some foodstuffs, nickel, rubber and other chemicals.

Reference – ‘Occupational dermatitis in the catering and food industries’ available free at <http://www.hse.gov.uk/pubns/fis17.pdf>

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Asthma

Asthma causes shortness of breath, which can be accompanied by wheezing, coughing and chest tightness. It occurs when the linings of airways in the lungs become swollen and inflamed so that air is not able to flow through so easily. It is a condition that some people have without any apparent cause, but can be caused or triggered by exposure to substances at work.

Occupational asthma is an allergic reaction that can occur when some people are exposed to substances known as 'respiratory sensitisers.' These include flour and wood dust, chromium and cobalt compounds. It can result in lungs becoming hypersensitive so that asthma starts to be triggered at low levels of exposure.

Work-related asthma is a different condition where people already with asthma (possibly since childhood) have attacks triggered by substances they encounter at work. These substances include chlorine, general dust, and even cold air can act as a trigger.

HSE have a website dedicated to asthma at <http://www.hse.gov.uk/asthma/>

Carcinogens

There are many substances classified as carcinogens. There are different scales of concern.

Carcinogens of concern

- Polycyclic aromatic hydrocarbons
- Ferrous foundry particulate
- Wood dust
- Rubber fume/rubber process dust
- Sulphuric acid mist
- Aromatic amines (in particular MbOCA and MDA)
- TGIC
- Beryllium and compounds
- Nickel and compounds
- Hexavalent chromium and compounds

Carcinogens of possible concern

- Refractory ceramic fibres and special purpose fibres
- Leather dust in footwear manufacture
- Plastic processing fume (as product of de-polymerising of plastic)
- Dyestuffs Auramine manufacture, Magenta manufacture, and dyes based on certain diazo bases, dichlorobenzidine

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- Nitrosamines arising from processes
- Hydrazine and its salts
- Epichlorohydrin
- Dimethylsulphamoyl chloride,
- 1-methyl-3-nitro-1-nitrosoguanidine,
- Dimethylcarbamoylchloride,
- 1,3-propanesultone,
- 1,4-dichlorobut-2-ene,
- Ethyleneimine
- Dimethyl sulphate
- Chlorodimethylether and bis(chloromethyl)ether
- Styrene oxide

Carcinogens of low concern

- Diesel engine exhaust emissions (DEEE)
- Benzene
- Vinyl chloride monomer
- Trichloroethylene
- Arsenic
- Cadmium
- Ethylene oxide

Reference – ‘Disease Reduction Programme: Cancer Project’ available free at <http://www.hse.gov.uk/aboutus/hsc/iacs/acts/watch/091106/p7annex1.pdf>

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A note about the text

This is an excerpt from Health and Safety 2008 written by Andy Brazier, which covers all the key elements of health and safety as it stands as a discipline at the end of 2007. The book provides a quick reference, focussing on hazards in the workplace and practical controls of risk. The aim has been to present the health and safety processes so that, if these are understood, appropriate solutions to a very large range of health and safety issues can be developed. It provides links to freely available HSE guidance throughout.

The book has been arranged, to a large extent, around the syllabus of the NEBOSH National General Certificate (NGC). This is because the syllabus appears to provide a very comprehensive overview of all the key issues of health and safety. Also, by doing this it is hoped that the book will be a useful aid to people studying for the certificate, acting as a supplement to training material from course providers or to assist in self-study.

The draft text of the whole book is available at <http://healthandsafetycertificate.blogspot.com/>

If you would like a copy of the book or more information go to Andy's website at <http://www.andybrazier.co.uk/Health&safety/book.htm>