

The Delivery hub health, safety and environment
Raising the bar 33
Occupational cancer

Contents

Objective	3
Background	3
Definitions	4
Topics	4
Dust	4
Shiftwork	4
Diesel fumes	4
Asbestos	5
Solar radiation	6
Smoking	7
Radon	8
Welding fumes	9
Additional information	11

Objective

The purpose of this guidance is to set minimum and desirable requirements to help delivery partners and contractors prevent ill health from occupational cancer.

Background

The institute of occupational safety and health report that cancer caused by work claims 666,000 lives a year worldwide, this equates to one death every 47 seconds.

Cancer can be caused by a variety of harmful substances, some are widely publicised, for example asbestos, whilst others may be less obvious – stone dust, coal tar, pitches, diesel fumes, solar radiation, metalworking fluids, mineral oils, pesticides, varnishes, paint spraying or some forms of MDF. Recent research shows that even particular circumstances at work can cause cancer – for example, several studies suggest a link between breast cancer and women who do certain types of shiftwork for many years. The following table provides examples of some occupational cancers and UK deaths in 2005

Occupational Carcinogen	UK deaths in 2005
Asbestos	3909
Respirable Crystalline Silica	789
Diesel Exhaust	652
Certain types of shiftwork	552
Mineral Oils	563
Workplace Tobacco Smoke	249
Radon	184
Welding Fumes	152

The World Health Organisation classifies the cancer-causing potential of various substances into four groups, depending on the evidence available in both humans and other animals:

- Group 1 is used when a substance causes cancer in humans
- Group 2A is used when a substance ‘probably’ causes cancer in humans
- Group 2B is used when a substance ‘possibly’ causes cancer in humans
- Group 3 is used when a substance is not classifiable in terms of its cancer-causing properties in humans because the evidence is inadequate
- Group 4 is used when a substance is ‘probably not’ a cause of cancer in humans.

It is important to recognise that the above groups do not factor in exposure levels and exposure is correlated to the likelihood of harm. In 2012 diesel fumes were moved from group 2A to group 1, this prompted alarmist headlines in some newspapers, but it should be recognised that other group 1 substances include sunlight, tobacco smoke and Chinese salted fish, it is excessive exposure that will lead to ill health.

Activity risk assessments must identify the need for health surveillance for at risk groups in order to check that control measures are sufficient. If health surveillance shows deterioration in health, then an immediate review of the controls will be required

Definitions

Occupational cancer: The term 'occupational cancer' is used to describe all cancers contracted following exposure to a cancer-causing agent (carcinogen) at work.

Topics:

1. Dust

Dust is addressed in Raising the Bar 18 which provides further detail on silica dust, non-silica dust and wood dust.

2. Shiftwork/fatigue

Refer to interim advice note 189/190 for guidance on managing fatigue.

3. Diesel fumes

Diesel engine exhaust emissions are a mixture of gases, vapours, liquid aerosols and substances made up of particles. They contain the products of combustion including: carbon (soot); nitrogen; water; carbon monoxide; aldehydes; oxides of nitrogen; oxides of sulphur and polycyclic aromatic hydrocarbons.

The carbon particle or soot content varies from 60% to 80% depending on the fuel used and the type of engine. Most of the contaminants are adsorbed onto the soot. Petrol engines produce more carbon monoxide but much less soot than diesel engines.

You may be exposed to diesel fumes if you work where diesel operated heavy vehicles are being used, or where motor vehicles are generating diesel fumes such as when coming into and out of car parks or when passing toll booths.

You may also be exposed to diesel fumes if you are working in tunnels or on construction sites where diesel operated stationary power sources are being used.

The International Agency for Research on Cancer, part of WHO, compared the risks from diesel fumes to those from passive smoking, and estimated that people regularly exposed to diesel fumes at work are about 40 per cent more likely to develop lung cancer.

In June 2012 the International Agency for Research on Cancer (IARC), which is part of the World Health Organisation (WHO) classified diesel engine exhaust as carcinogenic to humans (Group 1) based on sufficient evidence that exposure is associated with an increased risk for lung cancer. Exposure to DEEEs is also associated with irritation of the eyes and the respiratory tract. Prolonged exposure, in particular to any blue or black smoke, could lead to coughing, increased sputum production and breathlessness.

No workplace exposure Limit (WEL) has been set for DEEEs as a whole because there is insufficient data to establish a clear, reliable threshold for all potential health effects. Exposure to CO₂, CO and elemental carbon are all recognised markers of DEEE and a comparisons to these WELs / recognised limits can be made.

Minimum requirements

Between tasks, e.g. waiting for materials, operators often rest in vehicles and welfare units. In higher emission areas e.g. peak times between 07:00- 08:00 and again between 16:00-17:00 and where vehicles have been fitted with cabs, the doors and windows should remain shut and the air handling system used to ventilate and control the temperature. Vehicle cab filtration systems, providing they are properly maintained and fitted with suitable particulate filters, have been proven to adequately protect the operator.

Where 'air quality barriers' / noise barriers are installed, consider locating welfare and rest areas behind these structures as some reports show up to 34% reductions in pm10 levels 10 metres behind the barrier (effectiveness can drop over these distances).

For civils plant, use lower emission or more fuel-efficient engines where possible, e.g. higher engine injection pressures to reduce particulates, fitting exhaust gas recirculation systems to reduce gaseous oxide emissions, the use of cleaner fuels such as low sulphur diesel fuels is also recommended.

Vehicles should not be left running / idle when not in use – this should be enforced through toolbox talks and supervisor observations.

4. Asbestos

Asbestos can be found in any building built before the year 2000 (houses, factories, offices, schools, hospitals etc). Asbestos can also be found in many places including drainage ducts, bridge bearings and buried in the ground.

Minimum requirements

Duty holders must take reasonable steps to:

- Find out if there are materials containing asbestos in non-domestic premises, and if so, its amount, where it is and what condition it is in.
- Presume materials contain asbestos unless there is strong evidence that they do not, make and keep up-to-date a record of the location and condition of the asbestos- containing materials - or materials which are presumed to contain asbestos.
- Assess the risk of anyone being exposed to fibres from the materials identified
- Prepare a plan that sets out in detail how the risks from these materials will be managed
- Take the necessary steps to put the plan into action periodically review and monitor the plan and the arrangements to act on it so that the plan remains relevant and up-to-date provide information on the location and condition of the materials to anyone who is liable to work on or disturb them.

Close liaison is required between parties, for example between a major project with a maintenance area to ensure that asbestos plans are shared before works commence, updated to reflect any changes resulting from the works and returned to the maintainer at the end of the major project.

Depots should ensure that asbestos management plans are kept up to date and asbestos containing material should be labelled to prevent accidental damage that may release fibres.

5. Solar radiation

Minimum requirements

Minimum PPE requirements for Highways contracts mean that long sleeves and trousers should always be considered as a minimum requirement. During hot weather regular breaks, adequate drinking water and salt intake must also be available and undertaken as appropriate.

When working during the summer months, employers are to provide sunscreen for use by their employees of at least factor 15 protection. Sunscreen should be reapplied regularly in accordance with the manufacturer's instructions.

Sun-screen is not a substitute for the covering of the body by work-clothes to the company standard, it offers additional protection.

Desirable

Sites should also consider:

- Providing central sun-screen stations where employees can obtain the cream.
- Holding tool box talks on the use of the cream, its limitations and simple tests to be carried out by the individual to ensure that no allergic reaction will take place, such as a small application to the back of the hand, for example.
- Utilising skin cancer discs (right) or similar images to promote awareness of different types of skin lesions.



6. Smoking

Smoking is not permitted in any Highways England building or shared vehicle. This includes temporary buildings and welfare facilities.

Since October 2015 it has been illegal for retailers to sell e-cigarettes or e-liquids to someone under 18 and for adults to try to buy tobacco products or e-cigarettes for someone under 18.

Minimum requirements

1. Display 'no smoking' signs in all workplaces and vehicles.
2. Make sure people don't smoke in enclosed work premises or shared work vehicles that more than one person uses e.g.

- Buses
- Vans or goods vehicles used by more than one driver
- Company cars used by more than one employee

This includes e-cigarettes.

Legally a worker can smoke in a company car provided for their sole use if their employer agrees, however this should be discouraged as this could be a distraction from driving.

It should be noted that it is illegal to smoke in a vehicle containing anyone under the age of 18 at any time (in or out of work).

3. Designated smoking areas must be equipped with a suitable receptacle for cigarette butts in order to reduce the fire risk and maintain a tidy workplace.
4. Designated smoking areas must be shown on the fire plan and be located

away from sensitive receptors (e.g. fuel storage, COSHH storage, workplace doors/windows).

Desirable requirements

1. In order to encourage people to stop smoking, separate smoking shelters should be provided for users of e-cigarettes to those smoking tobacco.
2. Smoking shelters should be screened from view of the travelling public (but not be enclosed) as the image of road workers smoking does not enhance the road user experience or the image of Highways England.
3. Employers should offer advice to the employees on where to seek advice to aid giving up smoking.

What's in a cigarette?



7. Radon

Radon is a naturally occurring radioactive gas (Radon 222), which emits ionising radiation. You cannot see, hear, feel or taste it.

It comes from the minute amounts of uranium that occur naturally in all rocks and soils. The gas disperses outdoors so levels are generally very low. However it can build up to significant concentrations in closed structures with low air changes or in below ground enclosures.

Radon is present in all parts of the UK. However, some areas, known as Radon Affected Areas may have significantly higher levels due to specific geological conditions i.e. granite areas. Some of the highest radon levels have been found in the southwest, but levels well above average have been found in some other parts of the UK. Radon affected areas are defined as those with greater than 1% of homes above the domestic Action Level of 200 Becquerel's per cubic metre.

Prolonged exposure to particularly high levels of radon may increase the risk of developing lung cancer.

Public Health England (PHE) provides information on radiation protection and advisory services for the UK. It provides radon measurement services for government departments, local councils, other organisations, and private householders. Most homes in the UK have fairly low radon levels, with an average of about 20 Becquerel's per cubic metre. Where domestic buildings are being constructed, PHE has advised that indoor radon levels above the Action Level of 200 Becquerel's per cubic metre should be reduced.

The Ionising Radiation Regulation 1999 (IRR99) application threshold is 400 Bq/m³ averaged over any 24 hour period and applies to exposures at work and in workplaces.

Minimum Requirements

If work is to be undertaken underground or involves deep excavations, the risks from radon gas exposure must be assessed. A map of radon hotspots can be viewed at <http://www.ukradon.org/>.

If new buildings or structures are to be located within such hotspots an estimate of the levels of radon concentration must be made, prior to construction. Where levels are higher than the action level of 200 Becquerel's per cubic metre, then a suitable system for removal of the gas (e.g. extracted sump or similar) must be installed at ground level and within basements. (Full details of the requirements are available on the Public Health England website and in the BRE's report BR 211 (radon. guidance on protective measures for new buildings.)

Where there is a potential for members of the workforce to be exposed to significant levels of radon, i.e. above the IRR99 action level of 400 Bq/m³ averaged over any 24 hour period, then the requirements of the IRR99 will need to be satisfied to help ensure the health and safety of workers and an RPA should be consulted.

Where possible radon levels will be reduced below the IRR99 threshold by the installation of suitable mitigation e.g. improving ventilation and venting of work areas. Where mitigation cannot be relied upon to reduce levels, doses to employees may have to be managed by limiting the duration of any exposure; this will involve ongoing monitoring of radon levels and exposure times.

8. Welding Fumes

The fume given off by welding and hot cutting processes is a varying mixture of airborne gases and very fine particles which if inhaled can cause ill health.

HSE estimate that breathing metal fume at work leads to 40-50 welders each year being hospitalised. Pneumonia kills about 2 welders each year.

Gases that may be present in welding and cutting fume are:

- nitrous oxide (NO_x),
- carbon dioxide (CO₂),
- carbon monoxide (CO)
- shielding gas (eg Argon, helium) and
- ozone (O₃)

The visible part of the fume cloud is mainly particles of metal, metal oxide and flux (if used)

The exact level of risk from the fume will depend on 3 factors:

1. How toxic the fume is
2. How concentrated the fume is
3. How long you are breathing the fume

For arc welding, the visible fume comes mostly from the filler wire when it's exposed to the electric arc. The amount of hazardous substances in the filler wire should be included in the product information that is printed on the original packaging. Many of the common metals used in filler wires are harmful and several have Workplace Exposure Limits (WEL).

Cadmium and beryllium are rarely found, but are particularly toxic. Chromium, nickel, vanadium, manganese and iron all have WEL's. See [Table 1 of EH40](#) for a complete list. Generally the smaller the number for the WEL the more toxic the substance is. The toxic constituents of fume can be affected by the choice of welding process.

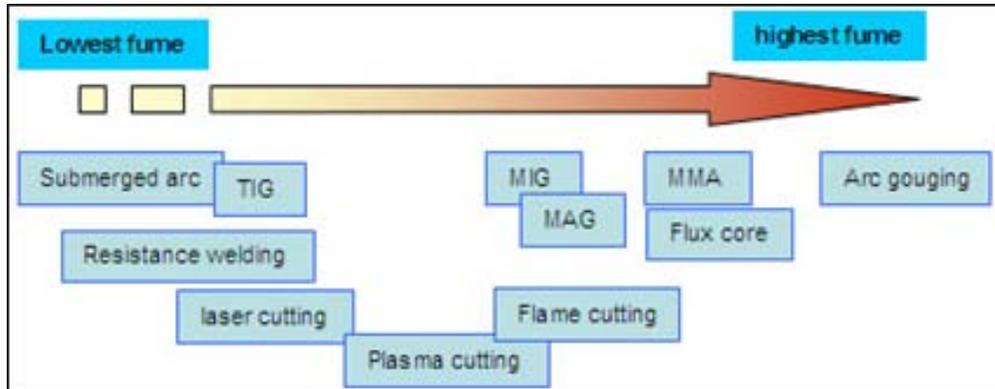
Minimum requirements

Conduct a risk assessment to identify how fumes can be minimised, consider the following:

- can the job be designed so there is less hot work (welding, gouging, manual flame/plasma cutting)?
- can the manufacturing sequence or techniques be modified so there is less hot work?
- can you use a welding technique that makes fewer fumes?
- reduce the time the welder is forced to breathe the fume arising directly from the torch
- how can fumes be extracted from the work front?
- what personal protective equipment is required and how to we ensure that it is correctly used?
- what health surveillance is required?

Local, exhaust ventilation and/or an air fed welding mask should be in place for all welding activities.

Types of welding and quantity of fume.



Further information is available at:

<http://www.hse.gov.uk/welding/fume-welding.htm>

Additional information

1. Diesel engine emissions
<http://www.hse.gov.uk/pubns/indg286.pdf>
2. An occupational air monitoring survey for manchester smart motorways.
Rhys sherman, consultant – alcumus sypol ltd
3. No time to lose campaign
<http://www.notimetolose.org.uk/>
4. Exhaust fumes as carcinogen <http://www.nhs.uk/news/2012/06june/Pages/who-classes-diesel-vehicle-exhaust-fumes-as-carcinogen.aspx>
5. Smoking at work
<https://www.gov.uk/smoking-at-work-the-law>
6. Smoking in cars
<https://www.gov.uk/government/news/smoking-in-cars-with-children-banned-from-today>
7. Radon hotspots
<http://www.ukradon.org/>
8. HSE guidance on welding
<http://www.hse.gov.uk/welding/fume-welding.htm>
9. HSE 'health in paving, road & highways supply chain' project <http://webcommunities.hse.gov.uk/connect.ti/kerbcutting.community/groupHome>

HSE risk matrix hazard & exposure identifier table
http://www.highwayssafetyhub.com/uploads/5/1/2/9/51294565/risk_matrix_-_health_hazard_and_exposure_identifier_table_-_r_ellis_-_ve....docx
10. Breath freely
<http://www.breathefreely.org.uk/>
11. Automated cutting of concrete barrier as a good practice case study.
Number 0377_
<http://www.highwayssafetyhub.com/hs-toolkit-good-practice-examples.html>
12. HSE HSG 256 managing shiftwork
<http://www.hse.gov.uk/pubns/priced/hsg256.pdf>

If you need help accessing this or any other Highways England information, please call **0300 123 5000** and we will help you.

© Crown copyright 2016

You may re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence:

visit www.nationalarchives.gov.uk/doc/open-government-licence/

write to the **Information Policy Team, The National Archives, Kew, London TW9 4DU**,

or email psi@nationalarchives.gsi.gov.uk.

This document is also available on our website at www.gov.uk/highways

If you have any enquiries about this publication email info@highwaysengland.co.uk or call **0300 123 5000***.

Highways England creative job number s160360

*Calls to 03 numbers cost no more than a national rate call to an 01 or 02 number and must count towards any inclusive minutes in the same way as 01 and 02 calls.

These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone. Calls may be recorded or monitored.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ

Highways England Company Limited registered in England and Wales number 09346363