



## Controlling Exposures to prevent occupational lung disease in the construction industry

# Road Worker

### HAZARDS AND RISKS

There are a number of significant respiratory health hazards linked to road construction, in particular, work associated with cutting/drilling/breaking paving blocks, kerbs, flags, concrete and rock; laying and repair of asphalt; and any work carried out adjacent to diesel-emitting generators and site vehicles.

#### Silica dust

Silica occurs in many types of stone and concrete. It will be released as a dust during drilling and cutting processes. Inhaling fine silica dust (respirable crystalline silica or RCS) can lead to serious lung diseases, including fibrosis, silicosis, chronic obstructive pulmonary disease (COPD) and lung cancer. Over 500 construction workers die every year from exposure to silica dust.

#### Bitumen/asphalt fumes

Bitumen (aka asphalt) is commonly used for road surfacing. Hot bitumen work releases fumes containing polyaromatic hydrocarbons (PAHs)/particulate, which, when inhaled, can cause irritation of the respiratory tract, eyes and skin, burns, and possibly lung cancer.

#### Diesel engine exhaust emissions (DEEEs)

DEEEs contain a complex mix of gaseous components (eg. nitrogen dioxide, carbon monoxide) and various particulates. Exposure to these substances is more likely when working near to the emissions sources, such as generators and site vehicles like excavators, planers and lorries. When inhaled, DEEEs have been linked to a long term increased risk of lung cancer, as well as a definite risk of respiratory tract irritation causing symptoms such as coughing, breathlessness, rhinitis and wheezing.

### CONTROL OPTIONS

#### Elimination/prevention

##### Silica dust

- Buy in ready cut materials where possible.
- **DEEEs**
  - Use alternative fuels for equipment where possible. For example, substituting diesel fuel with a safer fuel or alternative technology where practicable, eg compressed natural gas, battery powered vehicles or equipment.

##### Bitumen/asphalt fumes

- Do not exceed the recommended operating temperature for the asphalt mix whilst road laying, as this may cause excessive fumes.

#### Engineering controls

##### Silica dust

- Use power tools with integrated or "on-tool" dust extraction.
- Use water suppression where possible.

##### DEEEs

- Use diesel exhaust gas 'after-treatment' systems such as catalytic converters.
- Provide mechanical ventilation to prevent accumulation of emissions.

#### Safe working methods

- Implement job rotation for all tasks to limit one person's exposure.

##### Silica dust

- Reduce dust generation: use non-electrical saws with water suppression; use block splitters rather than cut off saws; minimise the number of cuts/breaks.

##### Bitumen/asphalt fumes

- Keep workers and others not directly involved in the task as far away from the source of the fumes as possible.

##### DEEEs

- Keep workers away from exhausts.
- Choose vehicles with low level exhausts if possible.
- Locate generators / plant in open areas and clear of confined spaces or provide mechanical ventilation to prevent accumulation of emissions.
- Keep engine idling and revving to a minimum.

#### PPE

##### Silica dust

- RPE should be compatible with any other PPE. Wearers of tight fitting RPE must be face fit tested to ensure the RPE affords each individual the anticipated level of protection.
- RPE selection should be made in line with the risk assessment and with advice from the supplier sought if needed.
- Typically, for road laying activities, this may require either FFP3 rated disposable respiratory protective equipment (RPE) or a reusable half mask RPE with P3 filters with minimum APF20 protection rating.

### MANAGING THE RISK

**Training & communication, supervision, maintenance & testing of controls and air monitoring\*** are all vital aspects of managing the risk, in addition to health surveillance which can be a requirement in certain circumstances.

See our introductory [Respiratory Health Hazards in Construction Fact Sheet Series: Overview](#) for more information about what things to consider and implement.

#### Air monitoring\*

Air monitoring is a specialist activity. It may be needed as part of a COSHH assessment, as a periodic check on control effectiveness and to assess compliance with relevant WELs, or where there has been a failure in a control (for example if a worker reports respiratory symptoms). A qualified Occupational Hygienist can ensure it is carried out in a way that provides meaningful and helpful results.

The decision to undertake exposure monitoring should be made in accordance with HSE's monitoring strategies outlined in HSG173. In some situation, qualitative or semi-quantitative methods may be suitable. See also COSHH regulation 10 ACOP which details when exposure monitoring is necessary or unnecessary.

Also, see HSE leaflet G409, Exposure measurement: Air sampling. [www.hse.gov.uk/pubns/guidance/g409.pdf](http://www.hse.gov.uk/pubns/guidance/g409.pdf)



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## WORKPLACE EXPOSURE LIMITS (WELs) & EXPOSURE LEVELS

Agent or substance	Control/Exposure Limit	Exposure Levels
Silica - RCS	0.1 mg/m <sup>3</sup> (8 hr TWA)	<p>Different materials contain different amounts of silica, eg; concrete can comprise between 25-75%. Dry working in confined spaces will produce the highest exposure levels.</p> <p>All Party Parliamentary Group for Respiratory Health (which is an informal, cross-party group formed by MPs and Members of the House of Lords) published a report named "Silica- the next asbestos". This recommends that the WEL for RCS is reduced to 0.05 mg.m-3 as this would be in line with the recommended exposure standard from the Scientific Committee on Occupational Exposure Limits proposed in 2003.</p>
Asphalt/petroleum fumes (benzene solubles) (PAHs)	<p>Asphalt, petroleum fumes: 5 mg/m<sup>3</sup> (8hr TWA) WEL: 10 mg/m<sup>3</sup> (15min STEL), based on gravimetric analysis.</p> <p>Note: an ACGIH TLV for asphalt fume (as the solvent extractable fraction) is 0.5 mg/m<sup>3</sup> (8hr TWA).</p>	<p>There is no current WEL for total PAHs although occupational exposure limits are available for some PAHs. Biological monitoring may be carried out for PAHs; guidance value: 4 µmol 1-hydroxypyrene/mol creatinine in urine.</p> <p>Typical airborne levels of benzene solubles to which road workers are exposed have been shown to be 1.3mg/m3 over an 8 hour shift.</p>
Diesel engine exhaust emissions (DEEEs)	<p>An overall WEL is not set of DEEE. Although the European Commission is considering 0.05 mg/m<sup>3</sup> for elemental carbon which represents the particulate fraction or 'soot' component of DEEE (which is thought to link to the ill-health effects due to PAH absorption onto the soot). The WEL for gaseous components are as follows; carbon monoxide 20 ppm (8hr TWA) and 100 ppm 15min STEL, nitrogen monoxide 2 ppm (8hr TWA), nitrogen dioxide 0.5 ppm (8hr TWA) and 1 ppm 15min STEL.</p>	<p>Concentrations of respirable particulates from bitumen fumes and DEEEs during road construction work over an 8 hour shift have shown to be typically 1.5mg/m<sup>3</sup>.</p>

### Further HSE information

- COSHH Essentials guidance sheet on how to control exposure to hazards in construction: [www.hse.gov.uk/pubns/guidance/cnseries.htm](http://www.hse.gov.uk/pubns/guidance/cnseries.htm)
- Silica dust: [www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm](http://www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm)
- Controlling construction dust with on-tool extraction: [www.hse.gov.uk/pubns/cis69.pdf](http://www.hse.gov.uk/pubns/cis69.pdf)
- Construction dust: Cutting paving blocks kerbs and flags: [www.hse.gov.uk/construction/healthrisks/hazardous-substances/cutting-paving-blocks-kerbs-and-flags.htm](http://www.hse.gov.uk/construction/healthrisks/hazardous-substances/cutting-paving-blocks-kerbs-and-flags.htm)
- COSHH Essentials: Health surveillance for those exposed to respirable crystalline silica (RCS): [www.hse.gov.uk/pubns/guidance/g404.pdf](http://www.hse.gov.uk/pubns/guidance/g404.pdf)
- Control of diesel engine exhaust emissions in the workplace: [www.hse.gov.uk/pubns/priced/hsg187.pdf](http://www.hse.gov.uk/pubns/priced/hsg187.pdf)