



Electrical Engineer/Fitter

HAZARDS AND RISKS

Installation, maintenance, and repair of electrical wiring, equipment, and fixtures can involve tasks which generate dusts and fumes which are harmful when inhaled. Activities that might put electricians at risk of such hazardous exposures include soldering and brazing to connect wires to sockets and terminals, and drilling and riveting when assembling parts and installing or examining electrical fixtures and appliances such as fuse boxes and generators and electrical control systems.

Asbestos fibres

Engineers may come into contact with or disturb a number of asbestos containing materials (ACMs), particularly if working in buildings built before 2000. Asbestos is classified as a category 1 carcinogen and causes over 5000 work-related deaths each year in the UK. Inhalation of asbestos fibres can cause mesothelioma, asbestos-related lung cancer, asbestosis, and pleural thickening - all fatal or serious and incurable diseases that take many years to manifest.

Solder fumes

During soldering, the heating of flux containing rosin (or derivatives) produces fume, which if inhaled is one of the most significant causes of occupational asthma, an irreversible condition. The fumes can also act as an irritant to the upper respiratory tract.

Silica dust - respirable crystalline silica (RCS)

Silica is present in large amounts in most rocks, sand and clay, and in products such as bricks, concrete and mortar. Some of the dust created by drilling and riveting into these materials is fine enough to be breathed deeply into the lungs; this is called respirable crystalline silica (RCS) and exposure to RCS over many years or in extremely high doses can lead to serious lung diseases, including fibrosis, silicosis, chronic obstructive pulmonary disease (COPD) and lung cancer. These diseases cause permanent disability and early death: over 500 construction workers die every year from exposure to silica dust.

Wood dust

Dust from softwood, hardwood, and wood-based products such as MDF and chipboard can cause asthma which is a serious, debilitating, and sometimes life-limiting condition. Exposure comes from cutting and drilling wood and from settled dust that is later disturbed. Fine dust particles are most likely to damage the lungs. Some wood types are known to cause cancer. Wood dust exposure may also cause dermatitis. The dermatitis risk is high for softwoods.

CONTROL OPTIONS

Elimination/prevention

- Asbestos: The aim is to avoid exposure completely. Information on the presence of asbestos should come from the premises' asbestos management plan and asbestos register. For information on non-licensed work tasks involving asbestos and how to safely carry them out, refer to HSE's HSG210: Asbestos Essentials: www.hse.gov.uk/asbestos/essentials/index.htm [NNLW (Notifiable Non-Licensed Work) requires, in addition, for employers to notify the relevant enforcing authority (usually the HSE), designate areas where the work is being done, ensure medical examinations take place, and maintain health records.]
- Choose methods which eliminate/minimise the use of hazardous materials eg. use rosin-free or rosin reduced solder; use soldering irons at the lowest temperature possible.

Engineering controls

- Use industrial Class H HEPA vacuums for cleaning up ACMs. Any handling of ACM should be undertaken by persons competent to do so and with the appropriate RAMS in place for that task. <https://www.hse.gov.uk/pubns/guidance/em4.pdf>
- Use LEV, such as a back-draught partial enclosure and/or on-tool extraction, for soldering irons.

Safe working methods

- Minimise dust creation eg. avoid or limit drilling, particularly of silica containing materials if at all possible; wet working: damp down before work and during debris removal and cleaning; use vacuums or wet cleaning, avoid dry sweeping or use of compressed air to remove dust; use hand tools in place of power tools if feasible.
- Ensure good natural ventilation of work area.
- Working with asbestos materials should be undertaken with strict precautions in place. These are outlined under The Control of Asbestos Regulations and the HSE's asbestos essentials series. <https://www.hse.gov.uk/asbestos/essentials/#a1> <https://www.legislation.gov.uk/uksi/2012/632/contents/made>

PPE

- For non-licensed asbestos work, disposable overalls (type 5 (BS EN ISO 13982-1) and single-use disposable gloves should be worn and disposed of as asbestos waste. Non-laced boots are preferable to disposable overshoes. Use respiratory protective equipment (RPE) with an APF protection rating of 20+; disposable respirator (eg FFP3), half mask with P3 filter or semi-disposable with P3 filter are also suitable. <https://www.hse.gov.uk/pubns/guidance/em6.pdf>
- PPE such as RPE may be necessary whilst undertaking tasks involving wood dust, silica dust or solder fume. The PPE selection should be made in line with the risk assessment.

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.

Air monitoring in relation to asbestos should be decided and undertaken in accordance with The Control of Asbestos Regulation 19.

Also, see HSE leaflet G409, Exposure measurement: Air sampling. 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
Asbestos (all types)	0.1 fibres/ml (4 hr TWA) 0.6 fibres/ml (10 min TWA)	It is important to know whether the planned work is licensed*, Notifiable Non-Licensed Work (NNLW) or non-licensed. High risk from particular pipe ACMs - and tank lagging, sprayed insulation, wall boards and ceiling tiles, loose packing/insulation in heating equipment/loft spaces/under floors. All such work, as well as any at exposures above the control and short-term exposure limits, must be carried out by an HSE licensed contractor.
Construction dusts		These levels are not workplace exposure limit but the level at which the dust becomes defined as a 'hazardous substance' and so it subject to the COSHH regulations. This does not apply to substances listed in Table 3.2 of part 3 of Annex VI of the CLP Regulation, substances specified with an indication of danger e.g. very toxic, toxic, harmful, corrosive or irritant, or substances for which the HSE has an approved WEL.
Silica - RCS	0.1 mg/m ³ (8 hr TWA).	Different types of stone contain different amounts of silica, with sandstone (70-90% silica) and concrete (anything from 25-75% silica) typically containing the most. Granite, slate and brick (around 30% silica), and limestone and marble (about 2% silica) usually contain the least. Levels of dust exposure are affected by the frequency and duration of the work and are likely to be higher in poorly ventilated spaces. Dry working without extraction controls is likely to produce the highest levels of dust. Health risks to electricians are likely to be significant only if exposures are frequent or prolonged.
Wood dust	5 mg/m ³ (8 hr TWA) applies to both hardwood and softwood dusts.	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.
Rosin (colophony) based solder flux fume	0.15mg/m ³ (15 min TWA) 0.05mg/m ³ (8 hr TWA)	Manual soldering with a hand-held iron poses the greatest risk of fume exposure because the operator's head is likely to be near or actually in the fume which rises vertically. <i>Capable of causing occupational asthma.</i>

Further information

- Asbestos essentials: A task manual for building, maintenance and allied trades on how to safely carry out non-licensed work: www.hse.gov.uk/asbestos/essentials/index.htm
- Controlling health risks from rosin based solder fluxes: www.hse.gov.uk/pubns/indg249.pdf
- COSHH Essentials guidance sheet on how to control exposure to hazards in construction: www.hse.gov.uk/pubns/guidance/cnseries.htm
- COSHH Essentials: Health surveillance for those exposed to respirable crystalline silica (RCS): www.hse.gov.uk/pubns/guidance/g404.pdf
- Construction dust leaflet: www.hse.gov.uk/pubns/cis36.pdf
- Silica dust: www.hse.gov.uk/construction/healthrisks/cancer-and-construction/silica-dust.htm
- Wood dust: www.hse.gov.uk/woodworking/wooddust.htm
- Woodworking guidance: www.hse.gov.uk/coshh/essentials/direct-advice/woodworking.htm
- COSHH rosin guidance: www.coshh-tool.hse.gov.uk/assets/live/SR20.pdf