BREATHE FREELY

Controlling Exposures to prevent occupational lung disease in the construction industry

Steel Erector/Fabricator

HAZARDS AND RISKS

The biggest respiratory health risk to steel erectors/fabricators comes from inhaling welding fume. Numerous welding tasks are carried out on steel frames, columns, beams and girders that are used for assembling scaffolding, frameworks and other steel components of buildings and structures. There may also be a risk of disturbing asbestos in existing buildings.

Welding fume

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

Stainless steel fume is considered more harmful than mild steel fume as it contains chromium oxide (CrO3) (which can also form hexavalent chromium whilst welding) and nickel oxide, which are both asthmagens and carcinogens - although there is a higher risk of lung cancer for all welders. Flu-like symptoms of "metal fume fever" are caused by short-term exposure to high fume concentrations. Metal fume fever is a temporary effect, however, prolonged and repeated exposure to welding fume is associated with the neuro physiological and psychological effects of manganism (due to inhalation of manganese fume); respiratory irritation, bronchitis and possibly pulmonary oedema (due to inhalation of ozone and nitrous oxides); and chronic obstructive pulmonary disease (COPD) including emphysema.

Welders are known to be particularly susceptible to lung infections that can, in some cases, lead to pneumonia. Other health hazards include asphyxiation through using inert gases that reduce the amount of oxygen in enclosed spaces.

CONTROL OPTIONS

Elimination/prevention

- Design the job so there is less hot work, eg. through CAD/3D design techniques, cold jointing techniques, use of mechanical fasteners and newer adhesive technologies; use thinner gauge material; use MIG brazing which produces less fume than a full penetration weld.

Engineering controls

- Control fume at source through local exhaust ventilation (LEV) or other engineering control equipment, or on-tool extraction if possible –LEV is unlikely to be feasible for outside work.
- Enclosed spaces may also need general mechanical ventilation to remove fume and ensure oxygen levels are maintained.
- Portable extraction units should be used where possible when on-gun extraction isn't available – especially when working indoors. It's important to make sure that the extraction inlet is positioned as close as possible to the welding point.
- Small bore high flow fume extractors can help remove fume when welding in tight corners.

Safe working methods

- Use MIG/MAG techniques for stainless steel welding (fume tends to be less toxic).
- Where protective coatings are present, these must be dressed back in order to provide a clean welding area.
- Minimise the amount of work carried out in enclosed or confined spaces.
- Make it easier for the welder to work with their head out of the fume cloud: a welder in a crouching position will be more likely to have fume passing their nose and mouth than if standing while they weld, and a seated welder will tend to have the least fume round their face.
- Ensure good general ventilation wherever possible.

PPE

- Powered respiratory protective equipment (RPE), in conjunction with a welding visor and/or a purified air-powered helmet, should normally be worn in addition to other controls. There are various types available which offer different levels of protection. Particulate filter respirators do not remove gases such as oxides of nitrogen, and so are not suitable for this purpose.

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

Good control practice for welding fume

(as per HSE's *Welding Fume Control document WL3*)

Frequency and duration of welding	Type of welding	Good control practice
Sporadic low - intensity welding	Gas, MMA, FCA, MIG, MAG	LEV where reasonably practicable. Otherwise good general ventilation and RPE
Regular and/or high-intensity welding	Gas, MMA, FCA, MIG, MAG	LEV and consider supplementary RPE
Regular and/or high-intensity welding outdoors in the open air	Gas, MMA, FCA, MIG, MAG, TIG	RPE where LEV is not reasonably practicable
Sporadic low-intensity welding	TIG and resistance spot welding	Good general ventilation
Regular and/or high intensity welding	TIG and resistance spot welding	LEV

See reverse for Workplace Exposure Limits (WELs)

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WORKPLACE EXPOSURE LIMITS (WELs) & EXPOSURE LEVELS

Agent or substance	Control/Exposure Limit	Exposure Levels
Welding fume	There is no standard UK welding fume limit. In the Netherlands there has been a legal limit since 2010: 1mg/m^3 (8 hr TWA)	In the UK, the closest to a general welding fume WEL is the iron oxide fume limit and the worst case scenario (for stainless steel) is taken as the chromium limit. The levels of exposure and subsequent risks to health vary depending on what type of welding process is undertaken, the base metal, the composition of the filler rod (core) and flux, any surface contaminants, the work environment (for example, whether indoors or outdoors, or in an enclosed space or an area that is well ventilated) as well as the exposure time (or 'arcing time'). Chromium (VI) Compounds are capable of causing occupational asthma and cancer.
Welding fume components	**Iron oxide fume** (as Fe): 5 mg/m^3 (8 hr TWA), 10 mg/m^3 (15 min TWA) **Chromium** (VI) Compounds: 0.025 mg/m^3 (if process generated eg; fume from welding) WELs are in place for many other individual metals used in filler wires. Refer to SDS for the metals present and to HSE's Workplace Exposure Limits EH40/2005 for the limits: *www.hse.gov.uk/pubns/priced/eh40.pdf* **Carbon monoxide:** 20 ppm (8hr TWA), 100 ppm 15-min STEL **Nitrogen monoxide**: 2 ppm (8hr TWA) **Nitrogen dioxide:** 0.5 ppm (8hr TWA), 1 ppm 15-min STEL **Manganese and its inorganic compounds (as Mn)**: 0.2 mg/m3 (8 hr TWA) inhalable fraction, 0.05 mg/m3 (8 hr TWA) respirable fraction **Chromium (III)**: 0.5 mg/m^3 (8 hr TWA)	
Asbestos (all types)	0.1 fibres/ml (4 hr TWA) 0.6 fibres/ml (10 min TWA)	The aim should be to avoid any exposure.

Further information

- COSHH Essentials welding: : *www.hse.gov.uk/welding/guidance/index.htm*
- HSE Essentials Asbestos: *www.hse.gov.uk/asbestos/essentials/*