BREATHE FREELY Australia

Controlling Exposures to prevent occupational lung disease in the construction industry

Welder

HAZARDS AND RISKS

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) 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.

Exposure to tobacco smoke acts with welding fume to cause more damage to the lungs than would be the case with exposure to welding fume or smoking alone.

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.
- Use automated or self propelling weld profilers before parts are formed or have parts added that prevent their use; buy in raw materials with edge profiles already cut; make use of ceramic backing tiles and inert gas backing techniques; ensure surface coatings are removed prior to welding.
- Use a welding technique that makes less fume: use correct sized torch (avoid using a bigger torch than is needed); use short flames; avoid free-burning flames; minimise the distance between torch and work piece; for arc welding use the lowest current and voltage applicable, and lower cutting speed.

Engineering controls

- Control fume at source through local exhaust ventilation (LEV) or other engineering control equipment, or on-tool extraction where possible – containment/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.
- Use of turntables can enable welding in a position where fume rises away from the face.

Working methods

- 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.

PPE

- Powered respirators, 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.

Health protection

- Welders are strongly advised not to smoke!

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 risk assessment, as a periodic check on control effectiveness and to assess compliance with relevant WES, 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.

See reverse for Workplace Exposure Standards (WES)

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WORKPLACE EXPOSURE STANDARDS (WES) & EXPOSURE LEVELS

Agent or substance	Control/Exposure Limit	Exposure Levels
Welding fume Welding fume components	5 mg/m^3 (8 hr TWA) **Iron oxide fume** (as Fe): 5 mg/m^3 (8 hr TWA), **Chromium** (VI): 0.05 mg/m3 (8 hr TWA) **Manganese fume** 1 mg/m^3 (8 hr TWA) 3 mg/m3 (15 min STEL) **Chromium** (III): 0.5 mg/m^3 (8 hr TWA) WESs are in place for many other individual metals used in filler wires. Refer to SDS for the metals present and to *Safe Work Australia website for exposure limits, http://hcis.safeworkaustralia.gov.au/* **Nitrogen dioxide** (NO_2): 3 ppm (8 hr TWA), 5 ppm (15 min STEL) **Ozone:** 0.2 mg/m3 or 0.1ppm (Peak limitation)	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').

Further HSE information

- HSE COSHH essentials for welding, hot work and allied processes: *www.hse.gov.uk/pubns/guidance/wlseries.htm*
- HSE Fume facts: *www.hse.gov.uk/welding/fume-facts.htm*
- HSE Welding fume – reducing the risk: *www.hse.gov.uk/welding/fume-welding.htm*