BREATHE FREELY

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) (which can also form hexavalent chromium while 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.

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. Pneumococcal infections are more likely to occur for people who have low resistance to infections due to longstanding illnesses e.g occupational lung disease.

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

- Minimize 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

- Respiratory protective equipment (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 selected in accordance with CSA Z94.4-11 *Selection, Use and Care of Respirators.*

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 an exposure risk assessment, as a periodic check on control effectiveness and to assess compliance with relevant occupational exposure limits, or where there has been a failure in a control (for example if a worker reports respiratory symptoms).

A qualified occupational hygienist or occupational hygiene technologist can ensure exposure monitoring it is carried out in a way that provides meaningful and helpful results.

Examples of good control practices for welding fume

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