

THE DANGERS OF WELDING FUMES

**LOWER LIMIT
LIVE LONGER**

A known carcinogen

Welding fumes can cause cancer in people exposed, with welders almost 50% more likely to get lung cancer than the general population.¹ As well as being linked to lung cancer, there is limited evidence linking it to kidney cancer.

The International Agency for Research on Cancer reclassified welding fumes to a Group 1 carcinogen (known to cause cancer in humans) in 2017.

Ultraviolet radiation from the welding arc is also a known carcinogen.

Safe Work Australia needs to lower the limit for welding fumes in the workplace to 1 mg/m³. A lower limit means longer, healthier lives for workers.

Exposure in the workplace

The workplace exposure standard for welding fumes (WES) is a general exposure standard that sets the limit of exposure to welding fumes a workplace can have. It's a critically important tool to keep workers safe, but the limit needs to be updated.

The current Australian WES is 5mg/m³. This means that the maximum average airborne concentration of total welding fumes in the breathing zone (which is inside a welder's helmet when worn) must not exceed 5 milligrams of substance per cubic metre of air.²

This level was set in the 1990s. Under the current WES, welders are still notionally "allowed" to breathe up to 11 grams of a known carcinogen every year.³ With welding fumes classified as carcinogenic, the WES is now outdated and must be established at the lower level of 1 mg/m³.

In Germany, welders have an exposure limit of 1.25 mg/m³. In the Netherlands it's 1 mg/m³. This means an Australian worker can potentially be exposed to four to five times the level of a known carcinogen as some workers overseas.

¹Loomis D, Dzhambov AM, Momen NC, Chartres N, Descatha A, Guha N, Kang SK, Modenese A, Morgan RL, Ahn S, Martinez-Silveira MS, Zhang S, Pega F. The effect of occupational exposure to welding fumes on trachea, bronchus and lung cancer: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. Environ Int. 2022 Dec;170:107565. doi: 10.1016/j.envint.2022.107565. Epub 2022 Oct 13. PMID: 36402034.

²Calculated over an 8-hour working day over a five-day working week.

³Based on the typical respiratory rate of 20 litres of air per minute or 2,300 m³ of air per year.

Health problems from welding fumes exposure

The very small particles formed when vaporised metal condenses in air during welding can cause short- and long-term illnesses. The components of welding fumes vary based on the type of welding being performed, the material used and any contaminants.

Exposure to welding fumes is associated with metal fume fever, asthma, lung cancer, welder's pneumoconiosis, melanoma of the eye, manganism (manganese poisoning), deafness (due to some fumes being toxic to the ear) and changes in the kidney due to cadmium.

Metal fume fever: Zinc oxide fumes, typically produced when welding galvanised steel, can cause an immediate flu-like illness called metal fume fever. Common symptoms include fever, chills, muscle aches, chest pain, non-productive cough, metallic taste in the mouth, headache and fatigue. As these symptoms are very similar to those caused by the flu or a cold, the diagnosis can sometimes be missed.

Symptoms usually develop within 48 hours of exposure, but the body develops a tolerance to the fumes with everyday exposure, so symptoms can improve throughout the work week. When a worker is re-exposed after a break, such as over the weekend, symptoms return. This is why it's sometimes called "Monday morning fever." Damage to the lungs can still occur without immediate symptoms.

Chronic lung conditions: Chronic lung conditions linked with welding fumes exposure are also linked with other exposures, like cigarette smoke, which is why doctors often miss the link to work. Welders are particularly prone to lung infection, which can lead to severe and sometimes fatal pneumonia. Asthma is also a common complaint for welders. Fumes released during stainless steel welding contain chromium trioxide (CrO₃) and nickel oxide, both of which cause asthma.

Chronic obstructive pulmonary disease: Chronic obstructive pulmonary disease (COPD) is a lung disease characterised by widespread damage to the airways and gas exchange parts of the lung that cannot be reversed by treatment. Chronic bronchitis is a related disease characterised by persistent inflammation of the airways in the lungs that can cause severe coughing. There is a significant overlap between the two diseases. COPD is caused by many combined exposures but has been found to be common in welders.

Lung cancer: Welders have an almost 50% higher risk of developing lung cancer. This is linked to exposure to fumes containing chromium VI, nickel, manganese and iron. Research is now suggesting that all metal fumes could be carcinogenic.

Who is responsible for safety in the workplace?

The employer/PCBU has the primary responsibility to ensure that welders, as far as reasonably practicable, are not exposed to health and safety risks whilst performing their job.

If it's not possible to eliminate the risk entirely, the employer must minimise the risk as far as reasonably practicable. Controls include ventilation and the use of personal protective equipment, such as air-fed respirators.

Under Australian health and safety legislation, employers/PCBUs must provide information, training and safe systems of work for tasks involving hazardous work or materials in the workplace.

Welders also have a responsibility to take reasonable care for their own health and safety. You should understand the hazards of the materials you are working with, referring to the relevant safety data sheets.

Remember: if you don't think it's safe, don't do it.

How to weld safely

- Your workplace should use local exhaust ventilation systems to remove fumes and gases from your breathing zone. Any fume extraction system inlet should be as close to the plume source as possible to remove the maximum amount of fumes and gases. The exhaust points must be filtered and kept away from workers.
- Use appropriate respiratory protection equipment such as powered or supplied air respirators.
- Your workplace's control monitoring system must include atmospheric and worker health monitoring.
- Welding surfaces should be as clean as practicable. Being coated in oil or grease can potentially increase the overall exposure to airborne concentrations of hazardous particles or vapours.
- Position yourself in respect of the fume source to avoid or reduce your exposure to welding fumes e.g. upwind if working in an open or outdoor environment or using natural draughts inside.
- Look at your consumable options to see if there are less-toxic alternatives or a welding type that produces less fumes.