Mines Safety Bulletin No. 154

Subject: Managing long-term exposure to carcinogenic welding fumes

Date: 24 August 2018

Background

In March 2017, the International Agency for Research on Cancer (IARC) reclassified welding fumes from “possibly carcinogenic” to “carcinogenic to humans”. Metalworkers are now considered at risk of long-term illness from prolonged exposure to welding fumes.

Workers who are regularly exposed to welding fumes have an increased incidence of lung cancer and pneumonia related to lifelong cumulative exposure. There is also mounting evidence that exposure to welding fumes increase the risk of welders developing kidney cancer.

In Australia, the occupational exposure standard for welding fumes (time-weighted average concentration when measured inside a welder’s helmet) is:

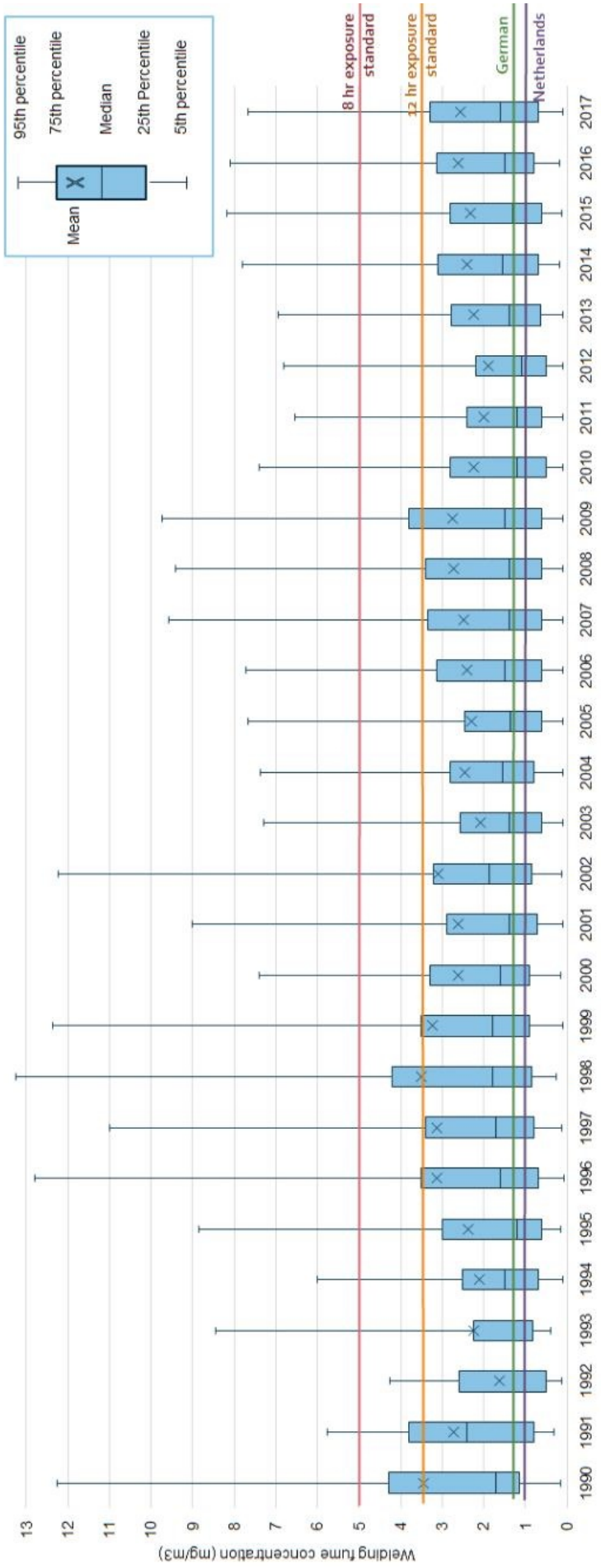
- 5 mg/m^3 (for an 8-hour workday)
- 3.5 mg/m^3 (for a 12-hour workday).

Exposure standards vary throughout the world. European occupational exposure standards are generally more precautionary (1.25 mg/m^3 in Germany and 1 mg/m^3 in the Netherlands, for an 8-hour workday).

The current Australian exposure standard was set considering short term illness (metal fume fever) as the primary consequence of welding fume exposure. However, the reclassification of welding fumes as a known carcinogen validates concerns related to long-term cumulative exposures, with potential for cancers occurring decades after the workplace exposures.

About 12 per cent of the welding fume samples submitted to the the Department over the last year exceeded the Australian exposure standard. This level of exceedence has been relatively consistent over the past 25 years (refer graph).

The Australian workplace exposure standard for welding fumes is currently being reviewed by Safe Work Australia to ensure it protects workers exposed to welding fumes against health effects.



Annual welding fume exposures as reported to the Department since 1990.

Summary of hazard

Inhaled welding fumes are associated with chronic inflammation and weakened immune function that may increase the body's vulnerability to infections or tumours.

Metal fumes associated with welding that pose long-term health risks include:

- nickel, chromium and cadmium – known carcinogens
- manganese – can cause manganism (a Parkinsonian neurological condition)
- aluminium and heavy metals, such as lead – linked to neurological diseases
- molybdenum trioxide and indium tin oxide – classified as Group 2B carcinogens ("possibly carcinogenic to humans").

Contributory factors

The airborne hazards associated with welding vary depending on the working environment, type of metal and flux, and the chemical nature of paints or cleaners on weld surfaces. Exposure of workers to welding fumes is significantly increased when:

- there is inadequate local exhaust ventilation to draw the fumes away from the breathing zone of the worker
- there is no, or inadequate, personal protective equipment (PPE) used to protect the worker from particulates and gases produced during welding
- welders remove the helmet shield prior to complete dispersion of the fume cloud.

Actions required

The following actions are recommended to minimise workers' risk of exposure to welding fumes.

Employers should:

- inform workers of the risks associated with welding activities
- reduce exposure to welding fumes as far as practicable by using engineering controls such as local exhaust ventilation
- provide welders with appropriate respirators and train them in the use and maintenance of these respirators, in accordance with AS/NZS 1715 *Selection, use and maintenance of respiratory protective equipment*
- when welding is conducted over extended periods of time, provide supplied air or powered respirators (with appropriate particulate and gas filters installed) in addition to protective clothing and a UV filtering helmet.
- confirm that workers are following workplace health and safety policies and procedures, and using PPE provided.

Further information

- Department of Mines, Industry Regulation and Safety, Safety publications, www.dmirs.wa.gov.au/ResourcesSafety

  Guidance about welding and other hot work (web page)

Guidance about dusts and other airborne contaminants (web page)

- Standards Australia, https://www.standards.org.au

  AS/NZS 1715 *Selection, use and maintenance of respiratory protective equipment*

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