



**3M** Science.  
Applied to Life.™

# 2020 welding fume update: The current state of play

A closer look at a 2019 study on welding fume and lung cancer, from an Australian and New Zealand perspective

 **Speedglas**™

## 2019: A meta-analysis of welding fumes and lung cancer

The results of a meta-analysis on exposure to welding fume and risk of lung cancer were published in April 2019. This statistical analysis reviewed

over **35 studies** conducted from 1954 to 2017 and included over **16 million participants** from all around the world.

### The conclusions of this 2019 study:

- Exposure to welding fume increases the risk of lung cancer.
- Welders present, on average, a **43% increased risk of lung cancer** when compared with those who have never welded or been exposed to welding fume.
- This increased risk of lung cancer is regardless of the type of steel welded, the welding process and independent of exposure to smoking.
- Increased risks persist regardless of time period or occupational setting.
- The risk increases with years of employment as a welder.

2019 Honaryar MK, Lunn RM, Luce D, et al. Occup Environ Med<sup>1</sup>

## How does this study change what we already know about welding fume?

In 2017 the International Agency for Research on Cancer (IARC) reclassified welding fume from 'possibly carcinogenic to humans', as was its position from 1989, to 'carcinogenic to humans'. The reclassification of welding fume by the IARC was qualitative in nature and was the result of a systematic review of all available literature published on the subject. The recent Honaryar statistical analysis published in 2019, instead quantifies the risk of lung cancer, and explores exposure and effect

associations through a quantitative and statistical analysis.

The two studies, qualitative and quantitative, taken together send a clear and important message to welders and those who employ welders in Australia and New Zealand. Recognising welding fume as carcinogenic and the increased lung cancer risk faced by welders should encourage the welding industry to introduce or reassess control measures to better protect their workers.

## How workplace exposure standards work in Australia and New Zealand

The exposure standards in Australia and New Zealand 'do not identify a dividing line between a healthy or unhealthy working environment'<sup>2</sup>. 'Therefore, exposure standards should not be considered as representing an acceptable level of exposure to workers. They establish a statutory maximum upper limit'<sup>2</sup>. All safety professionals should therefore keep up to date with studies such

as these and also stay informed about the exposure standard changes in different countries that are considered relevant. Alerts issued or lowering of an occupational exposure limit (OEL) in another jurisdiction can be the trigger to install an internal OEL used in a company to give the exposed workers the protection they deserve.

## What can I do as an employer of welders?

The employer 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. The employer can achieve this by introducing engineering or administrative controls such as extract ventilation and the use of personal protective equipment (PPE) such as welding powered air purifying respirators (PAPR).

Based on the reclassification of welding fume and this recent 2019 meta-analysis, all employers of welders should consider reviewing their risk assessments for welding activities and revise where necessary their control measures to protect those undertaking welding activities.

'You must ensure that air monitoring is carried out to determine the airborne concentration of a substance or mixture at the workplace to which an exposure standard applies if:

- you are not certain on reasonable grounds whether or not the airborne concentration of the substance or mixture at the workplace exceeds the relevant exposure standard, or
- monitoring is necessary to determine whether there is a risk to health<sup>3</sup>.

For expert guidance on air monitoring in Australia and New Zealand, please contact the Australian

Institute of Occupational Hygienists or the New Zealand Occupational Hygiene Society, as appropriate.

Under both the Australian Work, Health and Safety Laws and the New Zealand Health and Safety at Work Regulations, a person who directs the carrying out of work (eg. employer) at a workplace must provide PPE to workers carrying out work unless the personal protective equipment has been provided by another person conducting a business or undertaking, like a labour hire company.

As an employer, once you have selected the appropriate PPE, 'you must provide the worker with information, training and instruction in the proper use and wearing of that PPE<sup>3</sup>. Proper guidance should be given on the storage of equipment and care and maintenance guidelines should be clear and adhered to.

For help on selecting suitable respiratory protection for your specific welding application, or training and instruction on the proper use, fitting, or care and maintenance of your welding PPE, please contact AWS.



## What can I do as a welder?

The key is to remember that the risk is real but keeping yourself safe is simple. There is a risk associated with scuba diving and you wouldn't dream of doing it without the proper safety equipment. The same is true with welding. If the proper precautions are taken and followed, welding can be a safe occupation.

When selecting suitable PPE, the employer, where reasonable, should consult with the welders. A welder's knowledge, experience and personal preferences improve the overall decision-making process.

As someone who is directly affected by welding hazards, welders are entitled to take part in the consultation process and selection of suitable PPE. Personal preferences are the key to user acceptance – so look for gear that you feel comfortable wearing. As a welder you should aim to educate yourself on the risks, understand the appropriate PPE available and look to involve yourself in the consultation process and ultimate selection of suitable PPE.



## What respiratory PPE should be worn by welders?

'In most cases, PPE must be worn by workers when welding to supplement higher levels of controls such as ventilation systems or administrative controls'<sup>3</sup>. In the 2017 Occupational Cancer Risk Series on Welding released by the Cancer Council they advised that welders should 'wear either air supplied or air purifying respiratory protection'<sup>4</sup> and use 'a full face welding helmet, with a UV filtered lens'<sup>4</sup> as well as suitable clothing, welding gloves and welding boots.

The Health and Safety Executive (HSE), is the government body responsible for the

encouragement, regulation and enforcement of workplace health, safety and welfare, and for research into occupational risks in Great Britain. In February 2019, HSE released a health bulletin regarding the reclassification of welding fume. With immediate effect, they stipulated that there is no known level of safe exposure to welding fume and current control methods such as general ventilation, will not be deemed acceptable. They declared that where controls are not adequate or not present that appropriate and effective respiratory protective equipment is to be provided and used.

# Respiratory protection for welders

Respirators are rated by Australian Standard AS/ NZS 1715:2012 with a Required Minimum Protection Factor (RMPF). This indicates, if properly worn, the level to which the respirator protects the wearer from the surrounding pollutants. Powered Air Purifying Respirators, correctly worn, have a RMPF of 50 meaning that they supply breathing air a minimum 50 times cleaner than the welder would otherwise be breathing unprotected. Supplied air respirators provide the welder with a RMPF of 100+. This means that these systems deliver air to the welder that is at least 100 times cleaner than the air in the surrounding environment. To put this into

perspective, disposable and reusable half-face style respirators have a RMPF of 10 if properly fitted and worn. Therefore, powered air respirators provide 5 times the level of protection compared to a half-face respirator and supplied air respirators provide 10 times that of disposable and reusable half-face respirators.

The chart below gives a basic guideline to the type of respiratory protection that could be worn based on welding material, process and ventilation. This chart is only provided as an example and as a basic guideline. It should not be used as the only means of selecting a respirator.

**P** = Powered air respirator with particle filter (P).

**P** + **A** = Particle and gas filtration via powered air respirator with both a high efficiency particulate filter (P) and an A1 gas filter installed.

**S** = Supplied air via regulator and filtration unit.

Material to be welded	Welding method	Ventilation conditions of your working environment				Classified as IDLH
		Good environment, with forced ventilation	Limited ventilation	Restricted space - <small>Note: Not suitable for Confined Spaces as defined by AS2885.</small>		
Aluminium	MIG 	<b>P</b>	<b>P</b> / <b>P</b> + <b>A</b>	<b>S</b>	Powered and supplied air respirators must never be used in atmospheres Immediately Dangerous to Life or Health (IDLH). Always consult your Safety Engineer or Occupational Hygienist.	
	TIG 	<b>P</b>	<b>P</b> / <b>P</b> + <b>A</b>	<b>S</b>		
	MMA (stick) 	<b>P</b>	<b>P</b> / <b>P</b> + <b>A</b>	<b>S</b>		
Stainless steel	MIG 	<b>P</b>	<b>P</b> / <b>P</b> + <b>A</b>	<b>S</b>		
	TIG 	<b>P</b>	<b>P</b> / <b>P</b> + <b>A</b>	<b>S</b>		
	MMA (stick) 	<b>P</b>	<b>P</b> / <b>P</b> + <b>A</b>	<b>S</b>		
	PLASMA (Welding and Cutting)	<b>P</b>	<b>P</b> + <b>A</b> / <b>S</b>	<b>S</b>		
Steel not coated or painted	MIG/MAG 	<b>P</b>	<b>P</b>	<b>S</b>		
	STICK WELDING 	<b>P</b>	<b>P</b>	<b>S</b>		
	PLASMA (Welding and Cutting)	<b>P</b>	<b>P</b> / <b>S</b>	<b>S</b>		
Steel painted (lead based paints)	MIG/MAG 	<b>P</b>	<b>P</b>	<b>S</b>		
	MMA (stick) 	<b>P</b>	<b>P</b>	<b>S</b>		
	PLASMA (Welding and Cutting)	<b>P</b>	<b>P</b> / <b>S</b>	<b>S</b>		
Steel galvanised	MIG/MAG 	<b>P</b>	<b>P</b>	<b>S</b>		
	MMA (stick) 	<b>P</b>	<b>P</b>	<b>S</b>		
	PLASMA (Welding and Cutting)	<b>P</b>	<b>P</b> / <b>S</b>	<b>S</b>		
Steel coated with 2-component paints or insulated with 2-part polyurethanes (risk of isocyanates)	MIG/MAG 	<b>P</b>	<b>S</b>	<b>S</b>		
	MMA (stick) 	<b>P</b>	<b>S</b>	<b>S</b>		
	PLASMA (Welding and Cutting)	<b>P</b>	<b>S</b>	<b>S</b>		
Material cleaned with trichloroethylene	MIG 	<b>S</b>	<b>S</b>	<b>S</b>		
	TIG 	<b>S</b>	<b>S</b>	<b>S</b>		
	MMA (stick) 	<b>S</b>	<b>S</b>	<b>S</b>		
	PLASMA (Welding and Cutting)	<b>S</b>	<b>S</b>	<b>S</b>		

## The positive side-effect of welders' PAPR respiratory protection

When you consider that a welding fume particle that is 0.5 µm in size can take 2 days to reach the floor when released from a height of 1.5 metres you begin to understand how long welding fume can remain suspended in the air. You also begin to understand that if you weld using a PAPR and you lift the auto-darkening welding helmet to view your workpiece or complete non-welding tasks, then you have just broken your positive pressure respiratory seal and allowed particles still suspended in the air to enter your breathing zone, compromising your respiratory protection.

With integrated flip-up visor welding helmets with powered air respiratory protection, welders can have completely clear and uninhibited views of their workpiece and surroundings while maintaining their positive pressure seal and desired level of respiratory protection at all times. The powered air

respirator goes where you go allowing you to move around your workplace with perfect vision and uninterrupted respiratory protection.

A recent study out of the US found that 'foreign body eye injuries decreased over 70% year-on-year' in areas that implemented the PAPRs with integrated flip-up auto-darkening welding helmets (please contact AWS for information on this study). Worker compensation claims decreased markedly while employee morale increased substantially. This is an often overlooked positive side-effect of using flip-up welding helmet PAPR systems. By keeping the welding helmet on and in the safe position at all times, the welder has the added benefit of continuous high impact eye and face protection (if the equipment in use is compliant with Australian and New Zealand standards).



An example of a flip-up auto-darkening welding helmet with high impact grinding visor including powered air respiratory protection.

## What's happening in Australia and New Zealand?

The world has shifted to more of a health and safety focus—the result of court cases and research.

A large number of Australian and New Zealand companies are now completely changing their stance on welders' PPE. The 2017 reclassification of welding fume as carcinogenic prompted many to re-think and challenge what was historically considered

'normal'. The 2019 statistical analysis concluding that welders have a '43% increased risk of lung cancer'<sup>1</sup> regardless of the type of steel welded, the welding process or time period is of serious public health relevance and should promote change to better protect welders in Australia, New Zealand and around the world.

### Key take-aways

- Welding fume is classified as 'carcinogenic to humans'.
- Welders have a 43% increased risk of lung cancer.
- Exposure standards should not be considered as representing an acceptable level of exposure to workers. They establish a statutory maximum upper limit.
- If the employer or welders have any doubt that an exposure standard is being exceeded, air monitoring will be necessary.
- The employer must provide the PPE to workers.
- Welders should be involved in the selection of suitable PPE.
- Powered air and supplied air respirators are rated to provide 5-10 times the level of protection of a properly fitted disposable or reusable respirator. They can also have other positive side-effects when used within a business.
- Welders must be provided with information, training and instruction in the proper use, wearing and care & maintenance of PPE.

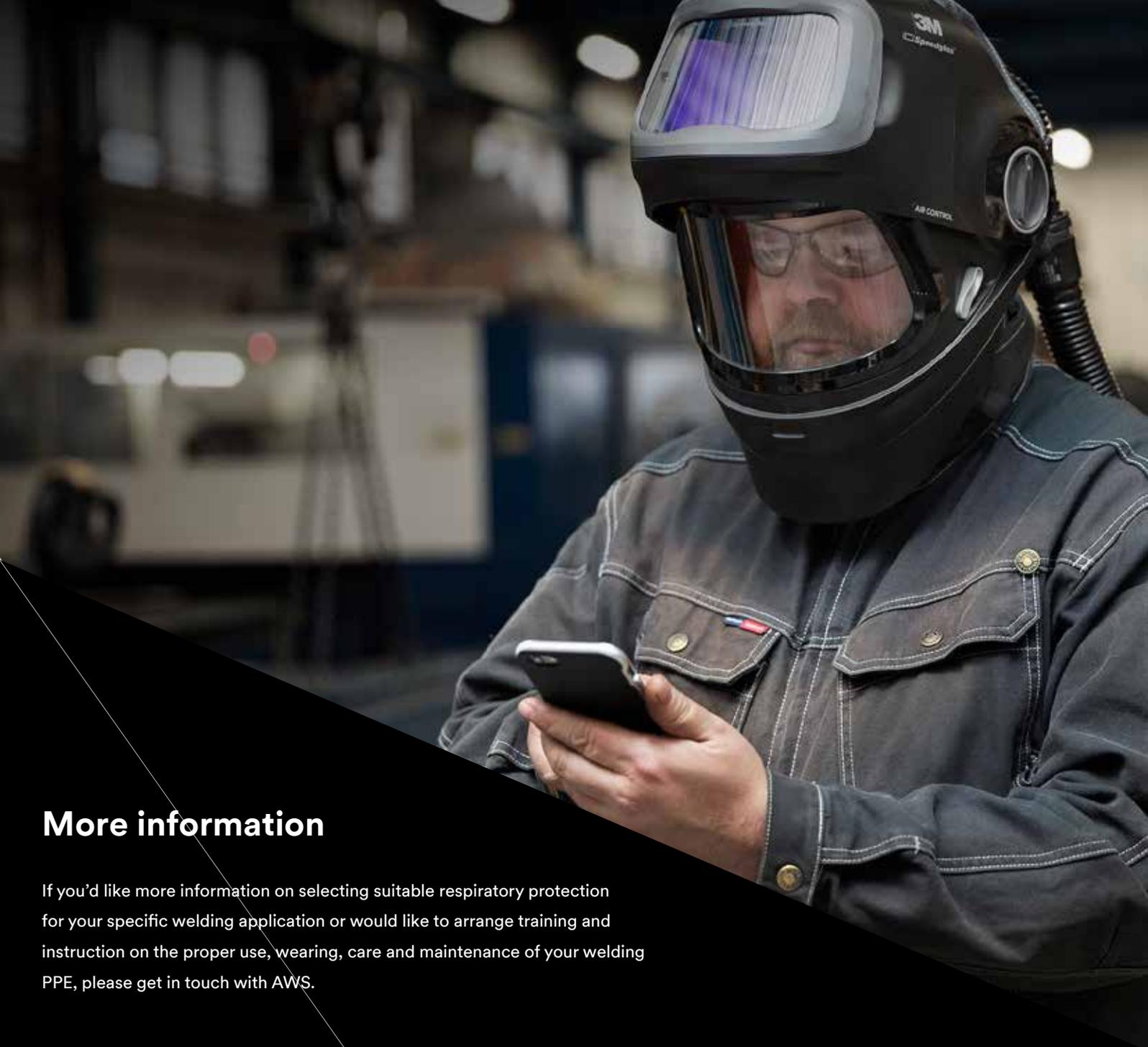
### Where to from here?

For a summary of this information in a professional presentation format please contact AWS. This information can be used to raise welding safety awareness in your business regardless of whether you are a welder, safety professional or employer of welders.

For further information on the dangers of welding fume and a strategic approach that can help to reduce exposure please visit and explore our

resources on this subject – <https://www.awsi.com.au/welding-fume-and-welders-respiratory-protection>.

If you'd like more information on selecting suitable respiratory protection for your specific welding application or would like to arrange training and instruction on the proper use, wearing, care and maintenance of your welding PPE, please get in touch with AWS – [www.awsi.com.au](http://www.awsi.com.au)



## More information

If you'd like more information on selecting suitable respiratory protection for your specific welding application or would like to arrange training and instruction on the proper use, wearing, care and maintenance of your welding PPE, please get in touch with AWS.

### References

1. Honaryar MK, Lunn RM, Luce D, et al. Occup Environ Med. Welding Fume and lung cancer: a meta-analysis of case-control and cohort studies, April 2019
2. Guidance on the interpretation of workplace exposure standards for airborne contaminants, Safe Work Australia, April 2013
3. Welding processes code of practice, Safe Work Australia, May 2018
4. Occupational Cancer Risk Series, Cancer Council, 2016

Authorised Wholesaler



**Speedglas™**  
Welding Safety



Australian Welding Supplies Pty Limited  
St Leonards Corporate Centre  
Unit 13, 39 Herbert Street St Leonards NSW 2065 Australia  
PO Box 912 Artarmon NSW 1570 Australia  
T: (02) 9439 0111 • F: (02) 9439 0100  
E: sales@awsi.com.au  
W: www.awsi.com.au  
Facebook: www.facebook.com/awsspeedglas