



 **Speedglas™**

Welding Safety



Identifying respiratory hazards for welders

The right equipment for each job

It is the employer's responsibility to identify all welding hazards in their workplace, to explain those hazards and health effects to their welders, conduct a risk assessment and implement control measures to reduce risk and over exposures.

That protection plan needs to be specific and cover all variables that a welder may encounter. Those variables can include changes to base metals, electrodes, the amount of sparks or splatter generated, fume intensity, the location of the weld, ventilation limitations, and so on.

Your risk assessment and control measures will include guidance for welders how these variables impact the use of control measures such as local exhaust ventilation (LEV) and their selection of personal protective equipment (PPE) for specific welding applications.

Fortunately, the 3M™ Speedglas™ team has developed a wide range of PPE, so welders can select the right equipment for each job.

That means meeting several of the welder's protection needs – plus empowering welders to perform at their highest levels.



Identify the hazards

Make a list of all the hazards in your welding environment (arc radiation, sparks, fumes, noise, trip hazards, falling objects, etc).

Assess the risk levels

By evaluating every risk, you can prioritise their prevention. See more details in each section of this catalogue. If there are any doubts or ambiguities, always consult a professional health and safety engineer.

Apply controls

Work through the Hierarchy of Controls systematically to eliminate or substitute the hazard, use engineering controls to contain the hazard, administrative controls to change how people work and finally consider the use of PPE.

Select the right PPE

Now that you know the levels of protection needed for a specific application, you can select the right level of PPE to protect each vulnerability: eye, face, head, hearing, and respiratory system.

Within the appropriate level of protection, let welders choose on matters of personal preference regarding comfort, style, and ease of maintenance. For example, sweatbands can be in leather, fleecy cotton, or towelling. These personalised comfort choices help to maximise user acceptance of PPE.

Training, motivation and maintenance

For maximum benefit from any piece of PPE, it pays to focus on user acceptance and proper use. 3M can help:

- On-site training by 3M personnel or a visit from our Welding Safety Caravan (not available in all countries). We'll show you equipment options based on your needs.
- 3M eAcademy - the flexible way to discover and learn throughout your busy day:
www.3m.com/3M/en_US/3m-academy/log-in
- Other techniques, such as Toolbox Talks, educational posters for your facilities, online videos, etc.

What's happening to me as a welder?

What do increased clumsiness, ulcers, and flu symptoms have in common? They – and many more symptoms – might be caused by overexposure to welding fumes.

Potential immediate health effects of certain welding fumes

- Eye, nose and throat irritation
- Dizziness
- Nausea
- Headaches
- Metal fume fever - influenza like symptoms that can begin within 24 hours of exposure, are usually short lived with full recovery.
- Pneumonia

Potential long-term health effects of certain welding fumes

- Chronic obstructive pulmonary disease (COPD)
- Pneumoconiosis and pulmonary fibrosis
- Occupational Asthma
- Lung Cancer
- Certain fumes can lead to stomach ulcers, kidney damage, and nervous system damage.
- Larynx and urinary tract cancers.¹⁾
- Certain fumes can lead to stomach ulcers, kidney damage, and nervous system damage.¹⁾

FACTS:

HSE Estimates that breathing metal fume at work leads to:

40–50 welders

each year being hospitalised from all acute health effects from breathing welding fume.²⁾

Welding Fume was classified as a Group 1 Carcinogen by IARC (2017)

Welders run a 40% greater risk than other professional groups of being affected by lung cancer because of their working environment³⁾

Pneumonia kills

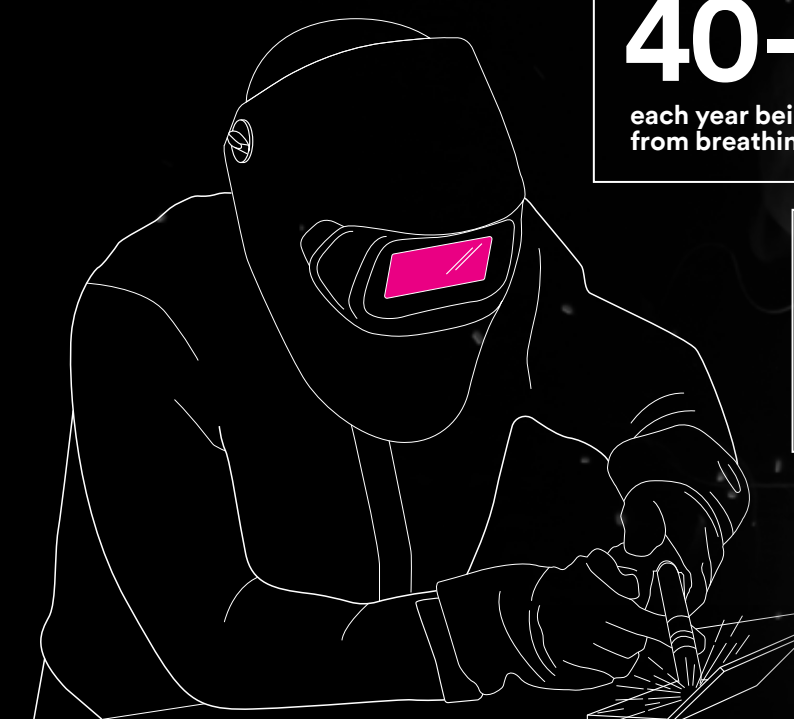
2 welders

each year in the UK²⁾

1) "Controlling Hazardous Fumes and Gases during Welding," OSHA Fact Sheet, U.S. Department of Labor, DSG FS-3647, March, 2013.

2) Source: <https://www.hse.gov.uk/welding/health-risks-welding.htm>

3) Welding, Molybdenum Trioxide, and Indium Tin Oxide IARC Monographs on the Evaluation of Carcinogenic Risks to Humans Volume 118

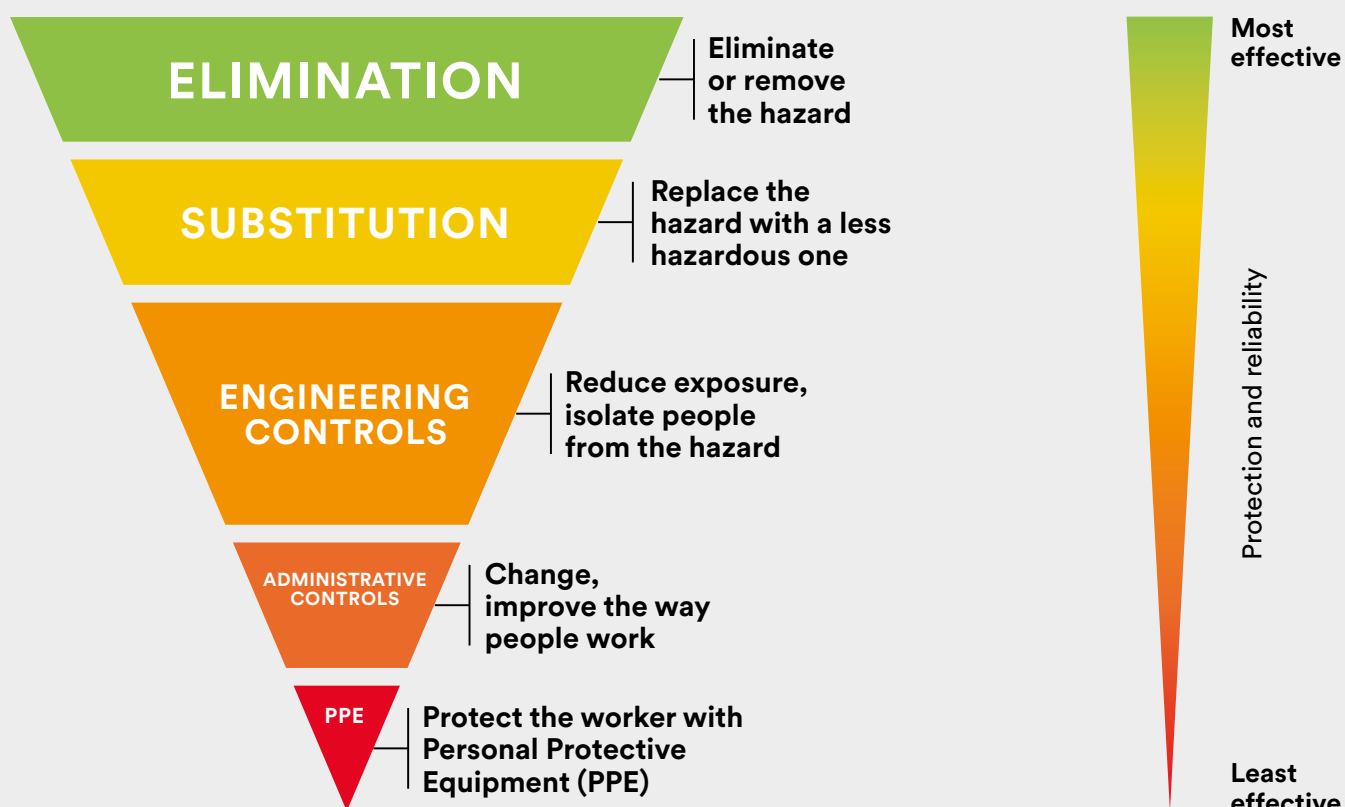




Apply Controls - Reducing welding fumes & exposure

Welding creates respirable and inhalable fumes. To address these hazards and risks, it is best practise to use the Hierarchy of Controls. The idea is that the highest priority items on the hierarchy not only do the most to reduce fumes and worker exposure, but that they also put the least burden of responsibility on the welder. However, welding fume control has its limitations:

Hierarchy of Controls



An overview of the Hierarchy of Controls

Elimination

This step focuses on eliminating, i.e. removing the hazard altogether. Ideally, prevention through early design using either a process or application that generates a hazard, or new construction projects designed to automatically eliminate hazards, for example windows that are self-cleaning or can be cleaned from the inside. While this step can be difficult to implement for existing processes, it is something to consider when upgrading and replacing process or equipment.

Substitution

This step looks at the materials used in the process and considers whether there's a suitable alternative that's safer – i.e. the alternative either does not pose a risk to health or is of a form that reduces potential exposure, such as using pellets or paste rather than powders to minimise airborne dust or the use of less volatile solvents.

Engineering controls

This step examines what engineering controls can be installed in existing processes, applications or facilities to reduce exposure to the hazard at source before it poses a risk to workers, such as inhalation or dermal exposure to hazardous substances, loud noise or guard rails to prevent workers accessing potentially dangerous areas such as balconies or roof parapets.

Local exhaust ventilation (LEV), when well-designed, maintained and used correctly can be very effective at reducing exposure to hazardous substances. LEV that are independent of worker interactions, i.e. systems that start automatically with the process and do not require actions by the worker, can offer greater reliability. Other engineering controls can include on-tool extraction to remove airborne hazards as close to the source as possible and dust suppression techniques such as water spraying during stone cutting.

Process isolation, the use of vibration dampening techniques and sound absorbing materials can all effectively reduce potential exposure of dangerous noise levels, reducing the reliance on the use of hearing protection.

Administrative controls

The last of the collective controls, before examining personal protective equipment, are administrative controls. While these offer collective controls they sometimes, as in the case of safety signage, require the individuals to abide by these control measures and some extent rely on the safety culture of the workforce. Job rotation and the introduction of PPE zones will reduce the time workers are exposed to hazardous substances. Other controls include safe handling of materials, worker training and general good housekeeping practices.

Personal protective equipment (PPE)

One of the benefits that applies to all the other steps in the hierarchy of control is that they will offer collective protection, i.e. protect more than just an individual worker. However, as very often is the case, personal protective equipment (PPE) may still be required in addition to the implementation of other controls. PPE, as the name implies, will only protect the wearer, and how much protection they will receive depends on many factors.

PPE such as respiratory protective equipment, hearing and eye protection and fall arrest harnesses are classified as the least effective and reliable control measures in the hierarchy. The effectiveness of PPE is reliant upon the employer having conducted a suitable and sufficient risk assessment*, and the correct selection of adequate and suitable PPE (using the results of the risk assessment), along with correct use, care and maintenance of the PPE (supported by training and supervision) – a process known as a PPE Programme. Without the implementation of an effective PPE programme there will always be the potential that PPE wearers may still be exposed to hazards.

An overview of metals, welding processes, and respirator protection selection

The following is a general outline to the type of 3M™ Respiratory Protection that may be appropriate for your welding applications.

The overview looks at the metals to be joined, welding processes, welding fume and ventilation conditions. It then lists the types of respiratory protection that your Industrial Hygienist may recommend as determined by their hazard assessments.



Classified as IDLH
 Powered and supplied air respirators must never be used in atmospheres Immediately Dangerous to Life or Health (IDLH). Always consult your Safety Engineer.

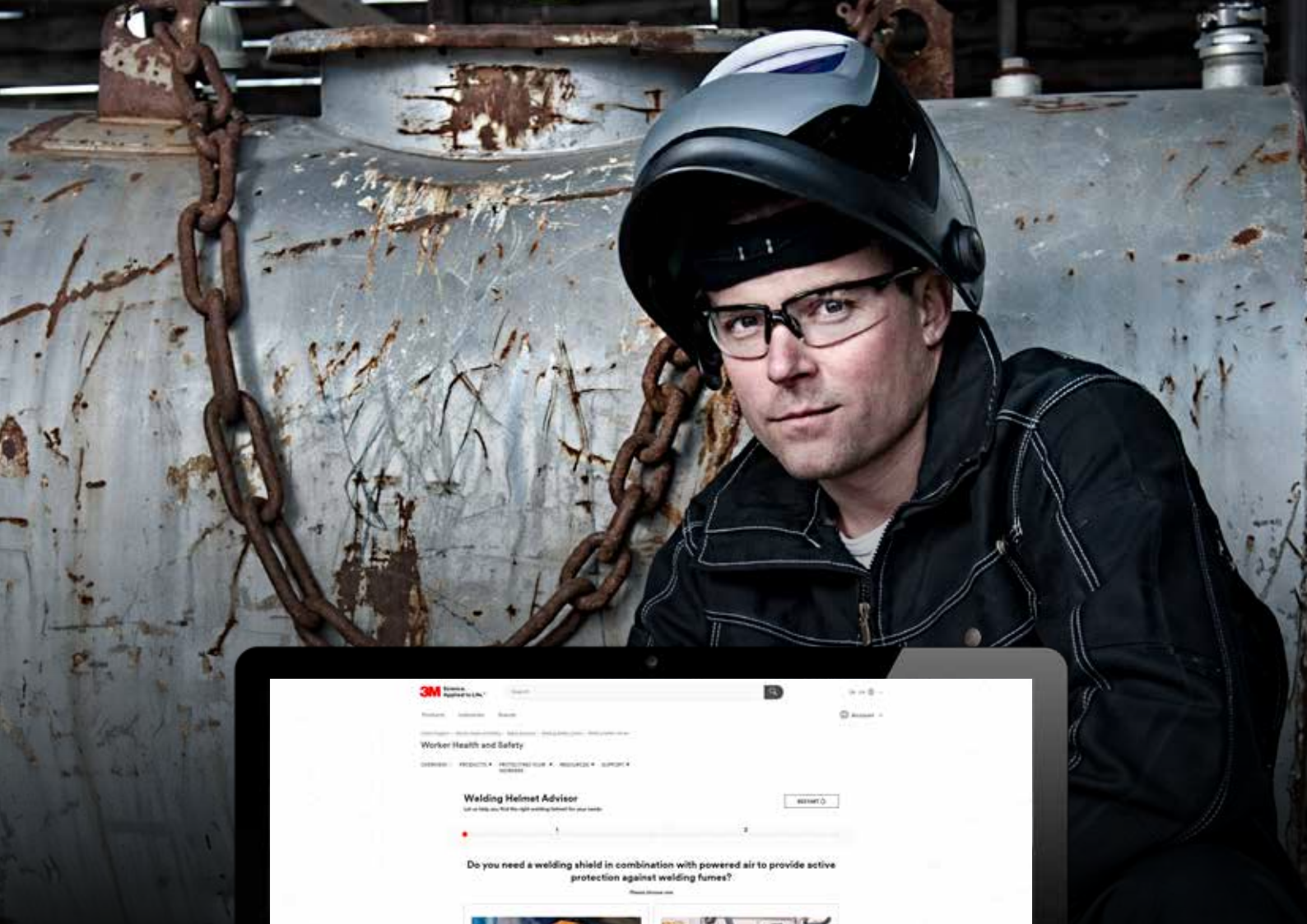
Particle filtration via disposable respirator, reusable respirator, or powered air respirator with a high efficiency particulate filter installed.

Particle and gas filtration via powered air respirator with both a high efficiency particulate gas and/or vapor filter installed.

Supplied air via regulator and filtration unit.

Material to be welded	Welding method	Low concentration of welding fumes (particles)	Higher concentration of welding fume (particles and gases)	Breathing air (oxygen above 19,5%) impacted by narrow space
Aluminium	MIG	Low	Higher	Impacted
	TIG	Low	Higher	Impacted
	MMA (stick) / FCAW	Low	Higher	Impacted
Stainless steel	MIG	Low	Higher	Impacted
	TIG	Low	Higher	Impacted
	MMA (stick) / FCAW	Low	Higher	Impacted
	PLASMA (Welding and Cutting)	Low	Higher	Impacted
Steel not coated or painted	MIG/MAG	Low	Higher	Impacted
	STICK WELDING	Low	Higher	Impacted
	PLASMA (Welding and Cutting)	Low	Higher	Impacted
Steel painted (lead based paints)	MIG/MAG	Low	Higher	Impacted
	MMA (stick) / FCAW	Low	Higher	Impacted
	PLASMA (Welding and Cutting)	Low	Higher	Impacted
Steel galvanised	MIG/MAG	Low	Higher	Impacted
	MMA (stick) / FCAW	Low	Higher	Impacted
	PLASMA (Welding and Cutting)	Low	Higher	Impacted
Steel coated with 2-component paints or insulated with 2-part polyurethanes (risk of isocyanates)	MIG/MAG	Low	Higher	Impacted
	MMA (stick) / FCAW	Low	Higher	Impacted
	PLASMA (Welding and Cutting)	Low	Higher	Impacted
Material cleaned with trichloroethylene	MIG	Low	Higher	Impacted
	TIG	Low	Higher	Impacted
	MMA (stick) / FCAW	Low	Higher	Impacted
	PLASMA (Welding and Cutting)	Low	Higher	Impacted

3M accepts no liability for the incorrect choice of respiratory protective equipment. This chart is only an outline. It is designed to help focus on the most appropriate respirators in the 3M range for particular applications. It should not be used as the only means of selecting a respirator. Details regarding performance and limitations are set out on the respirator packaging and user instructions.



Find the right welding protection for your needs with the 3M Welding Advisor



Scan the QR code or visit
go.3m.com/weldingadvisorGB

Do you, as a welder, know what's in your air?

Follow the path to protection

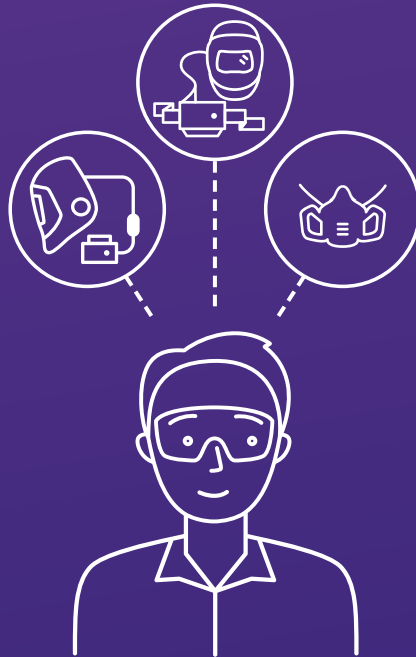


1. Detect

We believe welders deserve to feel safe and comfortable during their workday.

Clean air is critical to employee safety, but you won't know if you have appropriate protection without monitoring and understanding what's in your air.

Different welding methods and environments requires different levels of protection – let us help you on the path to safety



2. Select

Establishing a thorough respiratory protection program requires both selecting the correct respirators and a plan to change out your gas/vapor cartridges.

Selecting the welding PPE include various parameters such as protection, comfort and performance. Each situation and welding environment have their unique challenges

It doesn't matter how good your protective equipment is if nobody uses it. We make helmets that are comfortable, good-looking, and promote welders' performance.



3. Protect

Risk remains constant. You'll need a consistent program that can also adapt to new challenges, and we want to help you establish one.

We've developed tools and guidelines to help you maintain your equipment and make the most out of it.



3M Welding Centre of Excellence
SE-78521 Gagnef, Sweden

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www.3M.com

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