

Welding fume - Reducing the risk

This page expands on the basic 'what you need to do' guidance contained in the welders, managers pages. Here you will find more detailed information on issues that may help you reduce the amount of fume you generate and working practices that can help reduce the risk to the welder. For information on local exhaust ventilation (LEV) see welding – do I need fume extraction also the [LEV website](#)^[1] which has plenty of further information.


There are some links to other areas of the HSE website and some selected external websites. We have attempted to direct you to external websites that provide good quality information however HSE is not responsible for web content on these external websites. Information found on external linked websites may not be sufficient for you to comply with the law. Opinions found on these sites are not necessarily those of HSE.

Fume and gases from welding and cutting

Minimise fume

Can the job be designed so there is less hot work (welding, gouging, manual flame/plasma cutting)?


There are numerous options, the following are just a selection. Some, or all of them may not be applicable to your particular job:

- CAD/3D design techniques allow complex items to be designed and manufactured with more accuracy. Combined with CNC cutting, it is possible to design and automate raw materials cutting so that there is less minimal grinding and gap filling when complex parts are fitted together later in the fabrication process.
- Simpler solutions include use of cold jointing techniques. There are numerous mechanical fasteners (bolts, rivets etc). Adhesive technologies have progressed in recent years. Bonded metal structures are used in some new cars. More novel techniques such as friction stir welding can be used for certain applications. There may be other risks associated with friction stir welding but produces little or no fume.
 - [Friction stir welding - TWI website](#) ^[2]
- Could the job be redesigned to use thinner gauge material? Thinner gauge material will generally need fewer weld passes or, for sheet metalwork, lower power requirements on the welding set. Less power = less fume.

- **Highest fume**

Manual arc welding processes

TIG produces the least fume although it does produce significant amounts of ozone and nitrous oxide both of which are irritant gases. MIG and MAG generally produce quite a lot more fume. MMA (stick) welding and flux cored tend to produce the most fume. If you can automate the arc welding process then submerged arc welding, 'hot wire' TIG or perhaps electron beam welding may be practical and cost effective.

For further information on welding and jointing techniques and their characteristics see the TWI [Job knowledge sheets](#) ^[3].

Resistance welding

Resistance welding generally produces less fume than manual arc welding processes. One example of replacing manual arc welding with resistance welding techniques is the fixing of fairing aids in ship building. These can be fixed using stud welded bolts rather than arc welding the bracket directly to the hull. There is less fume produced when welding the item and less grinding to remove it afterwards.

Are your welders using the optimum set up?

Excessive currents and long duty cycles tend to generate excess fume and can affect weld quality. Optimise your shielding gas so you get the best production speed and lowest fume emissions. All the major welding gas suppliers produce shielding gases which allow welders to lay down welds faster, produce better quality finishes and reduce fume at the same time. Ask your gas supplier which is the optimum shield gas mix for your application.

- [Further information on the best welding set up - TWI website](#) ^[4]

Useful FAQ's and you can register, free, and get access to their technical helpdesk.

Reduce the time the welder is forced to breathe the fume arising directly from the torch

- Minimise the work carried out in enclosed or confined spaces.
- Can you make it easier for the welder to work with their head out of the fume cloud. It's not always possible but planning the welding sequence differently could allow the welder to work in a position where they are not directly breathing in the fume cloud.
- Generally a welder working in a crouching position will be more likely to have fume passing their nose and mouth than a person standing while they weld. A seated welder will tend to have the least fume round their face.

- Is it practical to use turn tables or other devices to manipulate the work piece so the welder can weld in a position where the fume rises away from their face? However if you do chose to move the fabrication around makes sure it's lifted and supported properly. Accidents involving the unintended movement of heavy objects is one of the biggest causes of fatal accidents in manufacturing industries.
- In larger scale fabrications where you are creating internal voids or rooms, can you organize the welding sequence to reduce the 'internal' welds. Consider where the fume will go when welding in tight internal corners. Small bore high flow fume extractors can help remove fume when welding in tight corners and the reduced size still allows the welder to see what they are doing.

Further information

The COSHH Essentials welding guidance offer useful guidance.

- [Task Specific COSHH guidance for welding cutting and allied jobs](#)^[5]

A useful online selector tool has been developed by the Scottish Centre for Healthy Working Lives

- [Online RPE selector tool used for welding](#)^[6]

Link URLs in this page

1. LEV website
<http://www.hse.gov.uk/lev/index.htm>
2. Friction stir welding - TWI website
<http://www.twi.co.uk/content/fswintro.html>
3. Job knowledge sheets
<http://www.twi.co.uk/technical-knowledge/job-knowledge/>
4. Further information on the best welding set up - TWI website
<http://www.twi.co.uk/services/technical-information/>
5. Task Specific COSHH guidance for welding cutting and allied jobs
<http://www.hse.gov.uk/welding/guidance/index.htm>
6. Online RPE selector tool used for welding
<http://www.hse.gov.uk/welding/links.htm>

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