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Experts in Safety

EXPERT GUIDE

Welding Fume

An update following the HSE safety alert and the change in enforcement expectations.



Health and Safety Executive (HSE) Alert 2019



Arco is the UK and Ireland's leading safety company; our core purpose is to keep people safe at work.

We distribute a world-class range of over 170,000 branded and own brand products, including personal protective equipment, workwear, safety footwear, gloves, workplace safety and hygiene products.

Arco Professional Safety Services offer training, consultancy, rescue and site services and are market leader in working at height and confined space services.

As Experts in Safety, we help ensure workers go home safe every night. Our product and technical specialists advise on product selection and our sector specialists understand the hazards and issues of your industry.

We make it easy for you to keep your people safe. With a dedicated team in our customer engagement centre and a national network of retail stores you have access to the equipment you need, when you need it. Plus, our Support Solutions can assist you with eCommerce, bespoke garments, logistical help and more.

Arco is committed to providing safety equipment that is genuine and compliant with relevant standards and regulations. We have a five-step product assurance process supported by an independently accredited testing laboratory. Additionally, we are a member of the BSIF Registered Safety Suppliers Scheme.

Founded in 1884 and with traditional family values at the heart of the business, we pride ourselves on our ethical trading. In 2007 Arco was the first distributor in our industry to become a member of the Ethical Trading Initiative (ETI) and in 2010 we became a member of Sedex, the Supplier Ethical Data Exchange. We are dedicated to our Corporate Social Responsibility programme and demonstrate this by supporting local communities and charities donating in excess of 1% of pre-tax profits annually.



All welding fume (including mild steel) reclassified as carcinogenic.

Health and Safety Executive – Safety Alert

In February 2019, the Health and Safety Executive released a safety alert¹ in response to new scientific evidence from the International Agency for Research on Cancer that exposure to welding fume (including mild steel) can cause lung cancer and possibly kidney cancer.

Health and Safety Executive - Safety Alert	
Department Name:	All HSE
Bulletin No:	STSU1 - 2019
Issue Date:	February 2019
Target Audience:	All workers, employers, self-employed, contractors and any others who undertake welding activities, including mild steel, in any industry.
Key Issues:	<ul style="list-style-type: none"> • There is new scientific evidence that exposure to all welding fume, including mild steel welding fume, can cause lung cancer. • There is also limited evidence linked to kidney cancer. • There is a change in HSE enforcement expectations in relation to the control of exposure of welding fume, including that from mild steel welding. • All businesses undertaking welding activities should ensure effective engineering controls are provided and correctly used to control fume arising from those welding activities. • Where engineering controls are not adequate to control all fume exposure, adequate and suitable respiratory protective equipment (RPE) is also required to control risk from the residual fume.

Five key things that you need to know about the change in HSE enforcement expectations in relation to the control of exposure to welding fume:

- 1. Welding fume was reclassified** from “possibly carcinogenic in humans” (Group 2B) to “carcinogenic in humans” (Group 1).²
- 2. Exposure to all welding fume, including mild steel can cause lung cancer** and there is limited evidence linking it to kidney cancer.
- 3. Suitable engineering controls (typically Local Exhaust Ventilation (LEV)) need to be provided** and correctly used to control welding fume regardless of the duration – general ventilation does not achieve the necessary control and there is no known level of safe exposure.
- 4. Adequate and suitable respiratory protective equipment (RPE) should be provided to control the visual residual fume risk** where LEV does not adequately control exposure indoors. Appropriate RPE should also be provided for welding outdoors.
- 5. Risk assessments need to reflect the change** in the expected control measures and the increased risk posed by welding fume.

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1. http://www.hse.gov.uk/safetybulletins/mild-steel-welding-fume.htm?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term
 2. [https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045\(17\)30255-3/fulltext](https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(17)30255-3/fulltext)

Potential Hazards Associated with Welding Fume



Hierarchy of Control



Welders and others need to be aware that they may be exposed to numerous hazards associated with welding and cutting processes. These include welding fume, fuel gases, inert gases, gas mixtures and solvents.

Welding processes generate welding fume; this consists of particulate fumes, i.e. those which you can see, and gaseous fumes, which you generally can't see, but can sometimes smell.

Potential Effects

The potential affect to a person of exposure to welding fume depends mainly on the

- amount of fume produced
- the pollutants in the fume produced
- the worker's exposure to the fume - i.e. time exposed
- the concentration of fumes that a worker is exposed to

Effects may be worsened if an individual has a particular sensitivity (e.g. asthma).

Pollutants

The commonly encountered pollutants in fumes and gases thought to carry the highest risk factors include:

- ozone
- chromium particularly in its hexavalent state (Cr6+)
- nickel (potential carcinogen)
- cadmium
- lead

Health Effects

The health effects of exposure to fume can include:

Short-term health effects including:

- Irritation of the throat and lungs including dryness of the throat, tickling, coughing or a tight chest
- Metal fume fever
- Temporary reduced lung function e.g. where breathing is easier when not working

Long-term health effects including:

- Cancer including lung and potentially kidney
- Occupational asthma
- Pneumonia
- Bronchitis
- Emphysema

There are many different measures that can be implemented to control exposure to welding fume in the workplace.

Using the hierarchy of control, we have developed a list of measures in order of priority, each option should be considered starting at the top.

Not all options will be feasible, and, in most cases, more than one measure will be needed.

Measures



Source: <http://www.breathefreely.org.uk/hierarchy-of-control.html>

British Occupational Society – Breathe Freely Campaign

You can read more about the hazards from welding in the BOHS Breathe Freely Campaign. See <http://www.bohs.org/wp-content/uploads/2017/07/BF-II-Brochure-May-2017.pdf>



Elimination and Substitution



Risk Assessment

A risk assessment is required to evaluate the risks to a worker from inhaling welding fume. It is used to recommend the elimination of the risk or to substitute the welding technique or consumables. It should consider several factors which would influence how much fume is produced.

Factors could include:

- the welding process that you use
- the location where the welding is taking place
- the welding conditions
- the length of time that the welder will be creating fume
- the fume control equipment currently available.
- the consumables or filler wire that are being used
- the coatings, platings or contamination that are on surfaces being welded or cut

These factors influence how much fume is produced, what pollutants the fume contains, how much fume the welder breathes in and how long the welder is exposed to the fume.

Best Practice

1. Research the base materials and the consumables used.

These would include any coatings such as paint, plating, galvanisation, degreased materials. Consumables that generate fume containing chromium, nickel, zinc, manganese, barium or fluorides give a potentially higher risk of health damage. It is always best to weld onto a clean base metal to reduce toxic fumes. Consult relevant Material Safety Data Sheets (MSDS) to find out what is in consumable and what fume is likely to be produced during welding.

2. Understand the task that you are undertaking.

For detailed advice about the specific task that you are undertaking the HSE COSHH Essentials welding guidance offers useful guidance on task specific COSHH for welding, cutting and allied tasks.

More detailed information can be found about the following tasks:

Welding

- Gas and oxy-gas welding or brazing
- Manual metal arc (MMA) (stick) welding
- Metal inert gas (MIG) and active gas (MAG) welding
- Tungsten inert gas (TIG) welding
- Flux-cored arc (FCA) and metal cored arc (MCA) welding
- Resistance (spot) welding (hand-held)

Cutting Etc

- Gas and oxy-gas cutting
- Plasma cutting (hand held)
- Plasma cutting (fixed)
- Arc-air gouging

Allied Jobs

- Soldering – hand held, rosin-cored solders.
- Surface preparation – pressure blasting (small items)
- Surface preparation – pressure blasting (medium items)
- Surface preparation – pressure blasting (large items)
- Weld cleaning with pickling paste

Find out more at:

<http://www.hse.gov.uk/welding/guidance/index.htm>

3. Measure the extent of the exposure

The location of the welding and the conditions in which it is to take place will influence the risk of inhalation of fume and this should be carefully considered. Welding in confined spaces for example can greatly increase the risk factor, it should not be assumed that welding outside would carry a low risk factor as appropriate RPE is now a requirement.

The precise hazard of exposure to welding fume is not usually apparent, therefore sampling and analysis is the only way to detect what is in the fume and how much is in the welder's breathing zone. Levels of fume exposure will need to be measured by air monitoring and measurement.

Arco Professional Safety Services

Arco Professional Safety Services can provide a range of occupational hygiene services to help identify health hazards and appropriate control measures in the working environment.

Risk Assessments

We can visit your site and:

- Conduct a risk assessment
- Identify who is at risk
- Measure the exposure levels
- Provide a detailed outline of how the risks need to be controlled and maintained.

Air Monitoring

Air Monitoring and measurement will help assess the risk to health from welding fume and confirm that current control measures are working.

Arco Professional Safety Services can assess the short and long-term effects on health arising from exposure to hazards and help ensure that your business is meeting its legislative requirements in terms of ensuring 'adequate control' measures to protect people

For more information on site surveys, risk assessments and workplace monitoring

contact Arco Professional Safety Services

tel: 01482 611769 or

email: info@arcoservices.co.uk.



Where it is not possible to eliminate or substitute the hazard, control measures should be introduced with the objective of keeping the particulate and gaseous fume levels as low as possible. General ventilation is no longer considered to be adequate as offering the necessary control, the most appropriate engineering control is fume extraction using Local Exhaust Ventilation (LEV).

Examples where fume extraction is normally needed

The HSE advises that extraction is usually required in the instances below:

- Moderate to high volume MIG/MAG production welding, small or medium sized parts, welding on a bench; or in a screened off area. Welding on carbon (mild) steels and aluminium.
- High volume production welding using TIG on stainless steels or aluminium.
- Welding of stainless steels using MIG, MAG, Flux cored or MMA (stick welding).
- Arc air gouging.
- Welding or hot cutting galvanised materials (zinc plated).
- Welding or hot cutting materials containing cadmium or painted with lead or chromate paints.
- Automated cutting (e.g. flame or plasma).
- Automated multi-head resistance welding machines.

Find out more at:

<http://www.hse.gov.uk/welding/fume-extraction-rpe.htm>

Local Exhaust Ventilation (LEV)

LEV is an engineering control system which reduces exposures to airborne contaminants such as welding fumes in a workplace by extracting them away from the point of emission. The aim is to capture and remove the airborne contaminant before it enters the breathing space of the worker.

Flexible Extraction Arm

These systems have a round or oval inlet at the end of a flexible arm which can be moved over the welding position. The purpose is to draw the welding fume into the capture hood. Suitable filters should be fitted to the units which recirculate the filtered air back into the workplace.

- 3217825 Nederman FilterCart Original 240v
- 3217826 Nederman FilterCart Original 110v
- 3217827 Nederman FilterCart Replacement HEPA Filter

On-torch Extraction

Only suitable for MIG and MAG welding torches. Extract is very close to the source, so can be very effective at controlling the fume. An advantage is that extraction will normally be at the optimum position.

- 3217940 Nederman Fume Eliminator 120v
- 3217941 Nederman Fume Eliminator 230v
- 3217942 Nederman Fume Replacement Metal Filter

If a more comprehensive or bespoke filter system is required, please contact our Hose Department tel: 01482 383288 or email: hose.support@arco.co.uk

LEV maintenance and testing

LEV systems need to be used correctly, maintained and tested and managed properly to ensure they are effective. Examination and testing of LEV is required at least every 14 months via a statutory 'thorough examination and test' (TExT).

For more information on LEV inspection, testing and maintenance contact Arco Professional Safety Services tel: 01482 611769 or email: info@arcoservices.co.uk

British Occupational Hygiene Society – Welding Fume Control Selector Tool

This tool provides guidance on welding fume control for common welding tasks. A panel of experts from industry, consultancies, academia and the HSE formed a working group to create this web-tool to inform managers and supervisors of welders about the best welding fume controls available to protect health.

See the tool at:

<http://www.breathefreely.org.uk/wst/>



Personal Protective Equipment



LEV should look to remove all welding fumes, where there is obvious visual residual fume or where additional protection is needed further controls in the form of personal Respiratory Protective Equipment (RPE) such as respirators, air-fed helmets, welding hoods, etc., will be required.

Respiratory Protective Equipment (RPE)

Supplied Air

- **Headtop:** 1C3800 Sundstrom SR 592 Powered Welding Shield or 1C5700 Sundstrom SR 584/580 Headtop
- **Regulator:** 1A4000 Sundstrom SR 507 Airline Regulator Unit
- **Hose:** 160190 Sundstrom SR 359 Airline Hose
- **Filter Unit:** 160800 Sundstrom SR 99-1 Compressed Air Filter Unit

Powered Air

If supplied air is not practical, move to a powered option

- **Unit:** 1C8500 Sundstrom SR 500 Welding Fan Unit (Standard Battery)
- **Headtop:** 1C3800 Sundstrom SR 592 Powered Welding Shield OR 1C5700 Sundstrom SR 584/580 Headtop
- **P3 Filter:** 1C6600 Sundstrom SR 510 P3 Particulate Filter
- **Gas Filter:** 1C6700 Sundstrom SR 518 A2 Gas Filters

Reusable Respirators

Half Mask

- **Half Mask with P3 Filter:** 168600 Sundstrom SR 100 Half Mask Respirator with 1C6600 Sundstrom SR 510 P3 Particulate Filter **OR**
- **Half Mask with P3 Filter:** 110500 3M 6500 Series Reusable Half Face Mask with 114100 3M 6038 P3HF Encapsulated Filter (this fits under a welding shield slightly more easily than the Sundstrom SR 100)

PLEASE NOTE: The guidance states that the minimum requirement is an APF of 20 so if you want to add a Gas filter to a Half Mask this would reduce the APF to 10 and therefore wouldn't be suitable. You should instead select a Full Face Mask.

Full Face Mask

- **Full Face Mask with P3 Filter and Gas Filter:** 164600 Sundstrom SR 200 PC Full Face Mask with Polycarbonate Visor with 1C6600 Sundstrom SR 510 P3 Particulate Filter and 165400 Sundstrom SR 217 A1 Gas Filter **OR**
- **Full Face Mask with P3 Filter:** 111400 3M 6000 Series Reusable Full Face Mask with 114100 3M 6038 P3HF Encapsulated Filter

For people who are not welding but are in the vicinity we would suggest a P3 welding disposable respirator

P3 Welding Disposable Respirator

- 1A2240 10 AlphaFlow Moulded FFP3V Welding Respirator AMF3CV

RPE Technical Advice

Our Respiratory Protection Technical Specialist can visit your site to advise on the potential risks and hazards and suggest appropriate RPE. If RPE is required, our expert can assist with product demonstrations, product trials, training and advice on Face Fit Testing. They can provide ongoing support to help ensure your RPE is working effectively. This can include kit inspections, advice on equipment maintenance and maintenance training.

For technical advice and ongoing support for Respiratory Protective Equipment contact our Technical Specialist ashley.elson@arco.co.uk.

RPE Programme

Face Fit Testing

All wearers of tight fitting or close-fitting face pieces require a face fit test for each mask that they wear. Ideally face fit testing should be carried out at mask selection stage, so employers can ensure the correct mask models and sizes can be purchased.

In support of the recent HSE INDG479, the BSIF Fit2Fit companion that provides complementary practical guidance, recommends a suitable interval for repeat fit testing of two years. However, in some situation, more frequent testing may be appropriate.

Arco Professional Safety Services Fit2Fit accredited mobile respiratory protection team covers the UK, Ireland and offshore and can conduct qualitative and quantitative face fit testing.

Respiratory Training

RPE should be chosen with the specific task, individual and workplace in mind, and all wearers must be trained to use the equipment correctly.

Arco Professional Safety Services offers individually-structured training courses to ensure that your employees understand how RPE works, how to fit and use their specific RPE and aftercare, cleaning and storage.

RPE Servicing and Maintenance

RPE equipment needs to be maintained correctly and in a fit state for use. Legislation requires that you maintain your RPE according to specific standards.

Arco Professional Safety Services help you comply with these requirements by providing services including inspection, maintenance and repair and monthly air purity analysis tests for breathing airline systems.

For advice on Respiratory Training, Maintenance or Face Fit Testing contact Arco Professional Safety Services tel: 01482 611769 or email: services@arcoservices.co.uk.

Useful Resources

THE RPE Selector Tool

Employers are responsible for selecting the right RPE for their task, substance, work environment and the wearer. The RPE Selector Tool will help you find the right RPE to protect you and your employees, by answering a few questions about your work area, the wearer, the hazardous substance and the task for which RPE is needed. This tool will help you find the right RPE for your workers.

The tool was jointly developed by the Health and Safety Executive, NHS Health Scotland and Healthy Working Lives (HWL) based on HSE's RPE guidance HSG53.

www.healthyworkinglives.scot/resources/rpe-selector-tool

The Health and Safety Executive (HSE)

More detailed advice is available on the HSE welding web pages.

www.hse.gov.uk/welding

The British Occupational Hygiene Society

The BOHS Breathe Freely manufacturing hub offers comprehensive information on welding hazards, controls and management of workplace health risks. It holds a wealth of resources with tool box talks, selector tools and fact sheets.

<http://www.breathefreely.org.uk/breathefreelymanufacturing.html>

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