

Hazards during welding work

Guidance on safety instruction

Topic:

This safety instruction is intended to highlight the main hazards associated with welding work on metallic materials and to raise awareness of these hazards among employees. The term “welding work” is used below as a synonym for welding and related processes, such as soldering, metal spraying, and thermal cutting. It also includes ancillary work such as grinding that is directly related to the application of these processes.

Welding work always involves a risk of fire and explosion (Lesson 1). Therefore, extensive safety measures are usually required before work begins:

- Obtain a welding permit/approval certificate for work outside specified hot work areas.
- Take flying sparks into account: remove all fire loads as far as possible, protect stationary combustible components with a non-combustible, heat-insulating cover. Seal passages and connections to adjacent areas, e.g., grating platforms, cable ducts, pipe penetrations, joints, cracks, etc., with non-combustible materials.
- Cool heat-conducting parts, e.g., with water-wet cloths.
- Provide sufficient fire extinguishing equipment.
- Only use approved and tested gas cylinders, pressure regulators, and hose lines. Set up gas cylinders outside the danger zone and secure them against falling over. Do not use force when connecting and opening the cylinder valve.
- When working in confined spaces, assign an additional person to monitor the area.
- After work, check the work area and its surroundings for smoldering fires and, if necessary, assign a fire watch to monitor the area for up to 24 hours after the work.

Welding work releases hazardous substances consisting of particulate (welding fumes, soldering fumes) or gaseous hazardous substances (Lesson 2). The type and quantity of hazardous substances produced depends primarily on the welding process, the process parameters, and the materials used.



Depending on their harmful effects on health, smoke and gases can be classified as:

- substances that irritate the respiratory tract and lungs, e.g., iron oxides, aluminum oxidetoxic or toxic-irritant substances, e.g., fluorides, manganese oxides, zinc oxide, copper oxide, ozone, nitrous gases, aldehydes (when soldering with rosin-containing fluxes),
- carcinogenic substances, e.g., chromium(VI) compounds, nickel oxide, cadmium oxide, cobalt,
- substances toxic to reproduction, e.g., carbon monoxide, lead(II) oxide.

Where applicable, hazardous substances released from surface contaminants or coatings, such as pyrolysis products, must also be taken into account.

Protective measures to minimize emissions must be selected by the employer depending on the process and implemented by employees. Examples:

- Extract welding fumes, e.g., using burner-integrated extraction, extraction arm, extraction hood, or extraction table.
- Select a working position so that welding fumes do not enter the breathing zone.
- Wear respiratory protection depending on the composition of the welding fumes, e.g., fan-assisted or externally ventilated welding helmets, quarter, half, or full masks with suitable filters, or, for short periods of use, respiratory masks if necessary. The aspect of flame and heat resistance must also be taken into account.

If the extraction system, ventilation, or externally ventilated welding helmet fails, stop work immediately and leave the workplace.

Note: Welding fumes remain in the air for a long time. If the extraction system is unsuitable, incorrectly used, or missing, exposure lasts not only for the actual welding time, but possibly for the entire shift.

Shielding gases (e.g., argon, helium, or carbon dioxide) and cutting gases (e.g., nitrogen) can displace atmospheric oxygen in work areas, creating a risk of suffocation (Lesson 3). This is particularly true when working in confined spaces (which can include working in tents) and when working below ground level.

Other hazards associated with welding include burns and optical radiation (Lesson 4). The following personal protective equipment must be worn or measures taken in accordance with specifications:

- Safety goggles (for autogenous welders and welding assistants) or welding shields or hoods with radiation protection filters,
- protective gloves and safety shoes, with leather gaiters if necessary,
- cover skin as completely as possible with work clothing,
- avoid clothing fires by using flame-retardant work suits, prevent contamination by oils and greases,
- use a leather apron when working on hot parts,
- protect face and neck from UV rays with welding cream.

When selecting personal protective equipment, hazards posed by electric current and noise must also be taken into account. These hazards can be significantly increased when working in confined spaces and may require additional measures for special welding processes.

During welding work, not only the persons performing the work themselves but also other persons in the vicinity (so-called bystanders) are at risk (Lesson 5). The following measures must be taken to protect employees in adjacent work areas:

- Restrict or completely deny access to unauthorized persons.
- Separate the work area, e.g., with mats.
- Coordinate work with other trades to minimize the number of people affected.



Method:

This training tool is not to be used for E-learning. The set of slides is intended to assist managers for the personal instruction of employees and to start an open discussion on the topic of occupational safety.

Text and images included in the lessons provide information on which aspects are most important to the topic. Using this as a basis, discussions should be held on whether and where similar issues occur at the company in question, which specific technical and organisational measures are already in place, and which solutions could improve the situation. Safety instructions can thus be used not just to fulfil legal requirements but also as a tool for promoting ongoing improvement within the company.

Analysing thematically related events and “near misses” at the company (or other incidents known of from literature) can help the staff involved become aware of the relevance of the topic and thus encourage safety-conscious conduct for the long term. This may require further preparation and/or research.

The content of the safety courses is always focused on the staff involved. They therefore do not include information on measures to be undertaken by the employer.



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Lesson 1

Fire and explosion hazards

- Obtain a licence authorising welding work
- Remove / cover fire loads
- Cool heat-conducting parts
- Provide fire extinguishing equipment
- Only use approved and tested gas cylinders, pressure regulators and hose lines
- Organise a fire watch at least two hours after completion of work

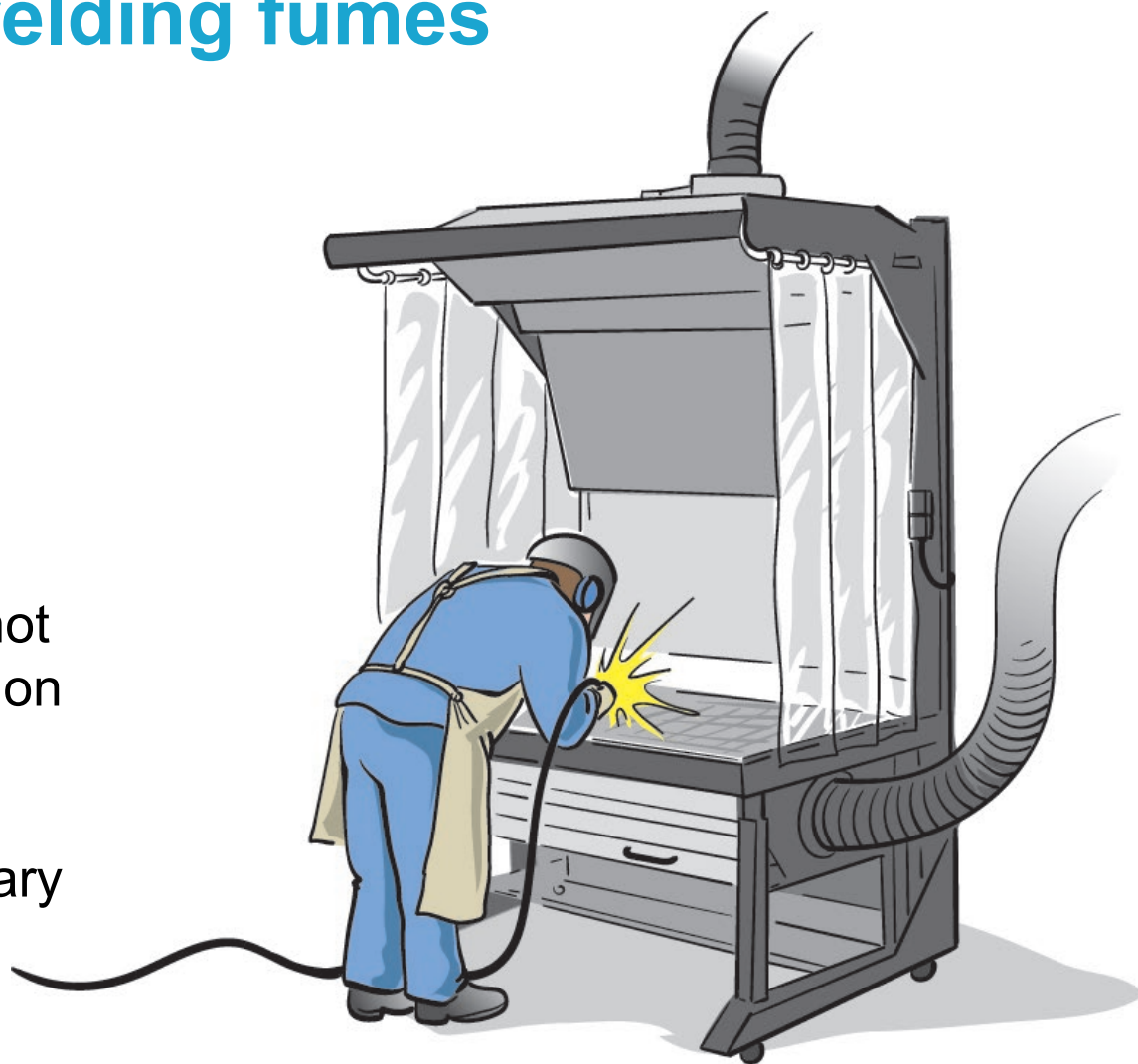




Lesson 2

Health hazards due to welding fumes

- Welding fumes can damage the respiratory tract and lungs, some are life-threatening, can cause cancer or damage the unborn child
- Extract welding fumes, position extraction device effectively, and do not recycle extracted air, even after filtration
- Use general ventilation in addition
- Wear respiratory protection if necessary





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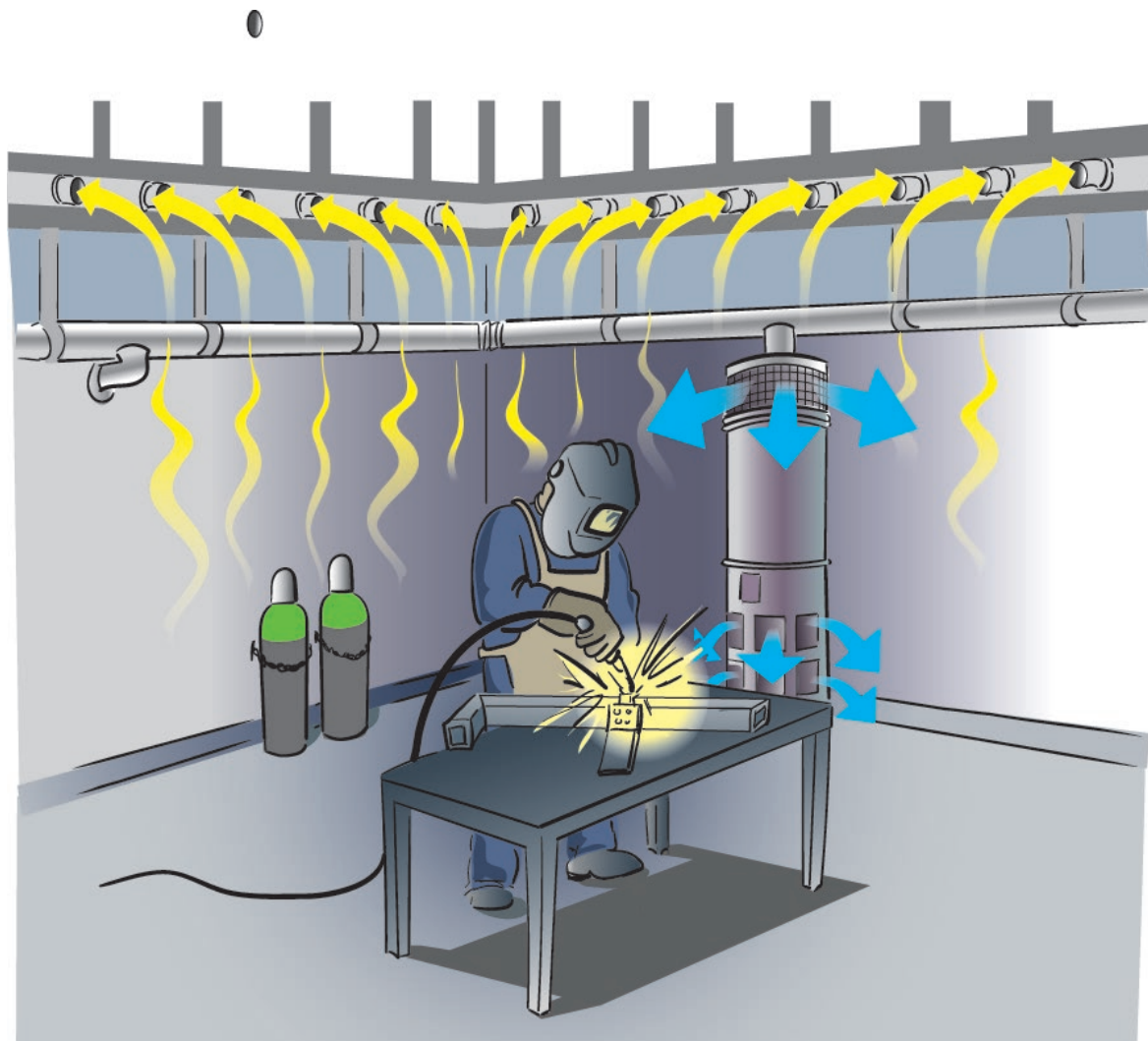
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Lesson 3

Suffocation hazard

- Risk of oxygen depletion in the atmosphere due to the use of gas-shielded welding processes
- Ensure adequate ventilation when using shielding or cutting gases, especially in confined spaces



Lektion 4

Hazard to eyes, skin and ears

- Welding work can damage skin and eyes due to welding spatter, UV radiation, hot surfaces or heat radiation
- Welding work can damage ears due to certain welding techniques, and to hammering, chiselling, grinding...
- Wear personal protective equipment, e.g.
 - Welding goggles
 - Hearing protection
 - Gloves
 - Protective footwear
 - Flame retardant clothing





Lesson 5

Also protect third parties

- Restrict / deny access to unauthorised persons
- Separate the work area, e.g. with mats, curtains and opaque screens
- Coordinate work with other trades

