

Construction

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Welding and cutting >

This information bulletin provides information on hazards associated with welding and cutting and guidance on the precautions, which should be taken to protect persons and property against them.

Introduction

Welding, cutting, grinding and other hot work are potentially dangerous activities that require the skills of a trained professional and a great deal of attention to safety. These professionals follow guidelines for safe welding practices, fire prevention and the utilisation of personal protective equipment.

Welding hazards pose an unusual combination of safety and health risks. By nature welding produces fumes and noise, emits radiation, involves electricity or gases and has the potential for burns, electrical shock, fire and explosions.

Welding is performed by the use of heat or pressure or both and with or without added metal. There are many types of welding including metal arc, atomic hydrogen, submerged arc, resistance butt, flash, spot, stitch, stud, and projection to name a few.

The following are general safety precautions to follow if working with or near a welding operation.

Hazards

Welding hazards include:

- Electric shock
- Radiation
- Manual handling
- Burns
- Noise
- Slips, trips and falls
- Fire and explosion
- Fumes and gases

The variables that influence exposure to these hazards can include:

- Variables in the welding process
- Effect of the work area (including weather)
- Effect of the operator

Electric shock

Manual metal arc welding and arc-air gouging are particularly hazardous because the electrode is changed frequently while the electrode holder is electrically live. There is a high risk that the welder can receive a shock by simultaneously touching the electrode and workpiece.

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An electrically hazardous environment is compounded in wet, damp or hot locations where moisture or perspiration considerably reduces the electrical resistance of the human body and the insulating properties of accessories.

Arc welding in the Northern Territory where the environment presents a hot humid climate for the majority of the year making it impossible to avoid accumulation of perspiration or condensation immediately creates an increased risk of an electric shock or electrocution. When arc welding is performed in wet conditions, or under condition of high humidity, special protection against electric shock must be supplied.

The high humidity should be considered a hazard when planning welding jobs and appropriate measures taken to minimise the risk of electric shock.

Areas of increased risk are in wet or humid conditions, confined spaces or when the welder is exposed to large areas of bare metal. For use in this type of environment, it is important to use a power source with an S mark, which means that the no-load voltage is below 48V rms AC or 113V peak DC. If the power source has a higher no-load voltage, a voltage reduction device should be used which will limit the voltage at the holder to approximately 25V.

Burns

Radiation burns - burns to the eyes or body due to large quantity of visible light, ultraviolet and infrared from the welding arc.

Body burns - burns due to weld spatter or hot or molten material, or due to burning of clothing.

Head to toe protection is needed to protect the welder's skin from hot metal, sparks and radiation. This includes welding helmets, caps, work boots, spats and flame-retardant clothing (long sleeved shirts, long pants and gloves).

Fire and explosion

Fire and explosion - due to arc, flame, sparks or spatter or electrical faults in combination with flammable materials, gases or liquids.

Before starting to weld, inspect the work surface. Look for flammable coatings or any unknown substances that would ignite when heated. Because of the extreme fire and explosion hazards inherent to welding on or around containers and piping that may have combustible materials, assign only experienced welders for such work.

Know the location of fire alarms and fire extinguishers. Check the pressure gauges for empty extinguishers. If there are no extinguishers in the area, have access to fire hoses, sand buckets, fire-resistant blankets or other fire-fighting equipment.

When welding within 10 metres of flammable materials, use a firewatcher. He or she can watch for landing sparks and, if needed, grab an extinguisher or sound an alarm. The welder and the firewatcher should wait for a half hour after all welding is finished to find and put out any smouldering fires.

Radiation

Can cause burns to the skin and eyes. Welding hoods and special welding goggles with UV filter lenses and side shields are designed to protect your eyes and face from UV exposure. Appropriate gloves and aprons must be used to protect exposed skin. Welding curtains may be used for the same purpose to protect others in the vicinity of the welding area. This equipment must be used faithfully for every welding job in order to prevent UV burns. Flash burns to the eyes are extremely painful and can cause permanent damage, including blindness.

Noise

Noise - welding environments are sufficiently noisy to be above the limit level (85dB(A)).

The best way to control noise is at the source, however, when such control is not possible, hearing protectors such as earmuffs or plugs must be worn.

Fumes and gases

Fumes - due to inhalation of harmful fumes and gases from the welding process.

Fumes are fine, solid particles, formed by the following general process:

- Metal and flux undergo rapid melting accompanied by limited vaporisation
- Vapours are oxidised
- Reaction takes place with flux constituents and other materials present
- Vapours condense and clump to produce fine particles of fume of complex composition

Gases may be produced in certain welding processes in the following way:

- Decomposition of flux or electrode coatings and base metal coatings such as paints and solvents
- Reaction produces of the shielding gases
- Oxidation of elements present in the arc or flame
- Photochemical reaction of atmospheric gases due to ultraviolet radiation from the arc or flame

There is an easy way to reduce the risk of hazardous fumes and gases, keep the head out of the fume plume. As obvious as this sounds, it is a common cause of fume and gas overexposure because the concentration of fumes and gases is greatest in the plume.

In addition, use mechanical ventilation or local exhaust at the arc to direct the fume plume away from the face. If this is not sufficient, use fixed or moveable exhaust hoods to draw the fume from the general area. Finally, it may be necessary to wear an approved respiratory device if sufficient ventilation cannot be provided.

As a rule of thumb, if the air is visibly clear and the welder is comfortable, the ventilation is probably adequate.

Manual handling

Manual handling – due to the use of heavy tools and equipments. Safe work practices should exist for all welding activities including handling and storage of compressed gas cylinders and oxy-acetylene or electric arc welding equipment.

Slips, trips and falls

Slips, trips and falls – due to arrangements of tools and power lines in different work environments.

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