



OSH Brief No. 6

Welding is the process of uniting pieces of material (usually metal) by heating and/or pressing them together. The hazards can be roughly divided into two categories:

1. The dangers of burns, damage to the eyes, electric shock and possibly explosion; and
2. Insidious hazard, with possibly both short and long-term health effects from fumes and gases. The latter problem is particularly acute with some types of welding such as argon arc (TIG), metal inert gas (MIG), electron beam, resistance, laser and plasma-arc.

Prevention of eye injuries, burns and explosions

The brilliant light given off by an electric arc contains a high proportion of ultraviolet radiation which may produce painful conjunctivitis (known as 'arc-eye' or 'eye-flash') after even momentary exposure. This can be prevented by using a shield or helmet fitted with the correct grade of filter, and by avoiding stray flashes from other adjacent arcs. Adequate screening is therefore essential to protect nearby workers.



Excessive exposure to ultraviolet radiation may also cause overheating and burning of the skin, so any exposed parts of the body should be protected. In addition, the high temperature created by the arc can cause deep burns if concentrated to one point on the skin. If welding is being carried out in the presence of flammable gases or liquids there is always the danger of explosion. All tanks and vessels containing flammable materials should be thoroughly purged before any welding or cutting takes place. There have been a number of examples in the Caribbean of welders/cutters being seriously injured or killed when working on old fuel drums.

Protective equipment

For all arc welding work, either a helmet or a hand-held face shield is essential for protection against radiation or molten metal. Leather gauntlet gloves with canvas or leather cuffs, must be worn to protect the hands from heat, spatter and radiation. Rubber gloves are unsuitable, but other substitute gloves may be used.

Welders need to wear aprons made of leather (or other suitable material) to protect both their bodies and clothing from heat and burns. An apron is also necessary where the operator is seated at a bench for welding. If the welder is wearing ordinary clothes and welding in certain positions, leather or heat resistant sleeves and leather spats, as well as an apron, may be required.



Poor example of PPE: The welder is using a bit of the visor's broken glass to protect his eyes.



An excellent example of a welder sitting down with full protection. He even has a heat resistant blanket to protect his lower body.

Screens and booths

All welding operations should be screened to protect others who are working nearby or they should be similarly protected. If the work is carried out at fixed benches or in welding shops, permanent screens should, where possible, be erected. Otherwise temporary screens should be used.

Noise Hazards

Certain specialized types of welding can create excessive noise levels. For example, in plasma-arc welding, the jet is ejected at very high speeds and can produce intense noise (up to 90 dB) particularly in the higher frequency bands. This is also the case with certain resistance welding machines. To protect workers' hearing from damage, hearing protection in the form of plugs or muffs should be worn.

Fumes and gases

Welding vapourizes metals and anything which is resting or coating the surface. This gives rise to fumes which are condensed fine particulate material. The numerous types of fumes and gases that are produced during welding depend on the composition of the metal being welded, including any surface coating, and the composition of the electrodes. Among the main gases produced are:

- carbon monoxide;
- carbon dioxide;
- nitrogen dioxide; and
- ozone.

Fumes which may be encountered include:

- zinc;
- iron;
- cobalt, nickel and manganese (where present in stainless and alloyed steels); and
- copper and lead (usually in the electrodes).

The short-term effects from exposure to welding fumes may vary from minor throat irritation, to catarrh, nipping of the eyes, slight cough, and possible so-called “metal fume fever” – a flu-like condition which lasts usually only about 24 hours – and is caused by exposure to finely divided particles in the air.

Welding fumes contain a wide variety of elements which are known, or are suspected, to have potential long- term toxic effects in human. It is important, therefore, that precautions should be taken to avoid exposure to these fumes and gases as far as possible. In the Caribbean it was common practice for welders to drink milk or even have a shot of rum to neutralize the metal fume and the taste of the metal in the mouth – this is only a myth and is not recommended as a preventive practice, as the chemical is already in the body.



Note the metal fumes in the breathing zone of this worker. There should be increased ventilation in the form of a fan blowing the fumes away or some kind of local exhaust ventilation (LEV). On no account should fumes be visible in the atmosphere near the immediate vicinity of the welding point, and steps should be taken to ensure that any visible fumes near the arc are rapidly dispersed.

Ventilation

Proper ventilation is the key to safe work while welding, and this is particularly important in confined spaces, such as large tanks. For most types of welding, high speed local exhaust ventilation (by exhaust fan, flexible ducting or elongated hood which remove the fumes at the point of the weld) is the most effective in making the job safe. There are a number of types of portable exhaust equipment available on the market, including a magnetic type that can be clipped to the job.

With some types of welding there are special problems because of the difficulty in detecting gases and because local exhaust ventilation cannot be used in many of these operations. In confined spaces for example, breathing apparatus of the airline type should be worn. This, of course, is a last line of defence and such protection should only be used as a temporary measure.

Gas bottles and trolleys

It is essential that gas bottles are stored and tethered safely. They should also be moved around the workplace on specialized trolleys for safety and correct manual handling.

