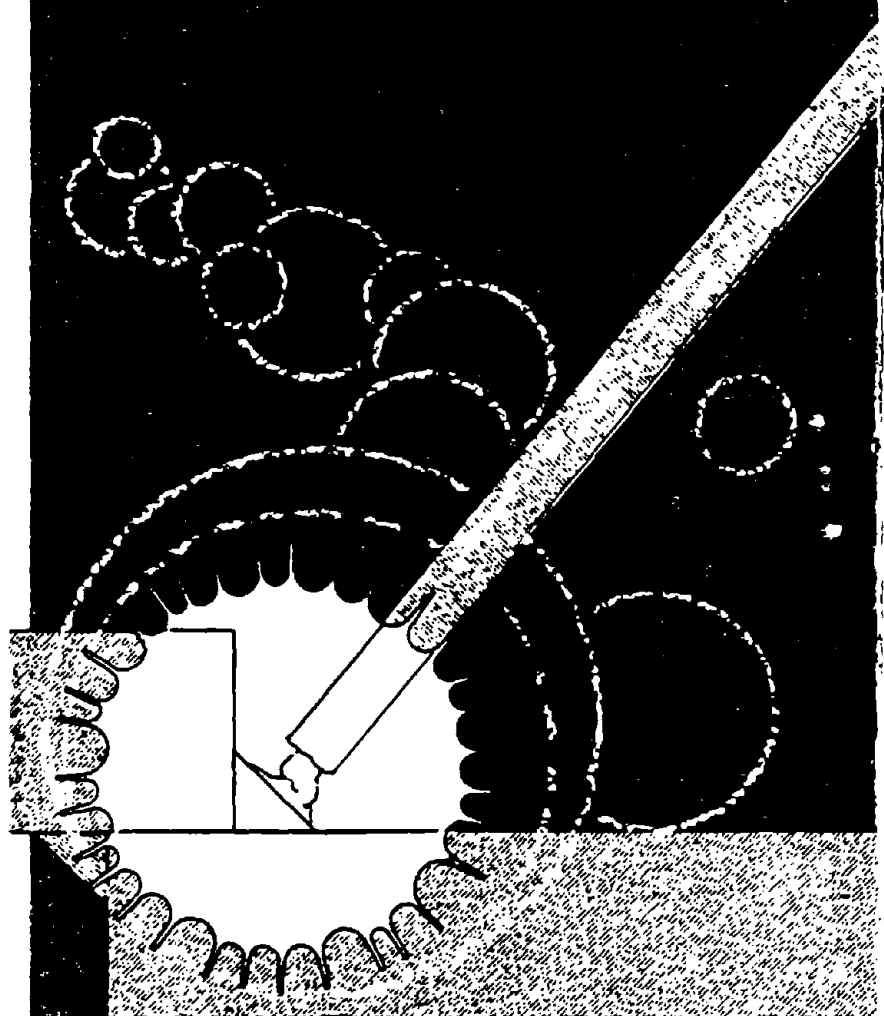


PB83 - 181909



WELDING SAFETY

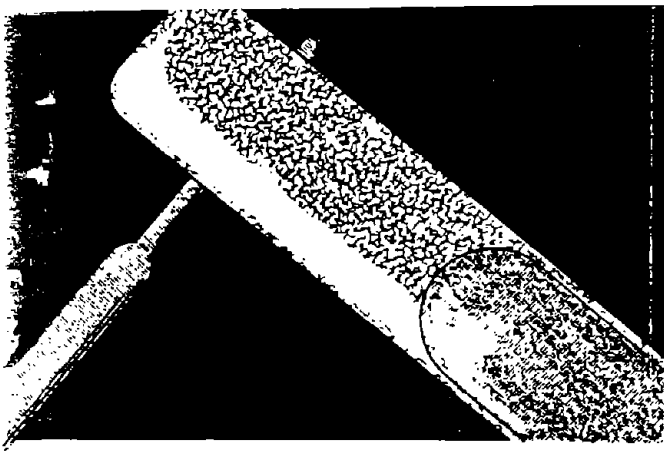


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<p>Certain hazards are common to most arc welding processes. Principally, these are damage to eyes and skin from infrared and ultraviolet radiation, from the molten metal and electric arc respectively, burns from contact with hot metal or sparks, adverse health effects from breathing metal fumes and gases, accidents from materials handling, and electrical shock.</p> <p>Interest has centered around the health and safety hazards of arc welding. With proper environmental controls and work procedures, the hazards may be eliminated.</p>				
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welding safety

The American Welding Society has identified over 80 different types of welding and allied processes in commercial use. Some of the more common types include: oxygen-acetylene, gas metal and gas tungsten arc welding (TIG), shielded-metal arc welding (MIG), resistance welding, and brazing. An industrial welding process may be done manually, or may be a completely automatic operation done by a welding machine.

Interest has centered around the health and safety hazards of arc welding. With proper environmental controls and work procedures, the hazards may be eliminated.

what the welding hazards are

Welding problems can vary with the method of welding employed, the location of work, the materials being welded, and the control measures employed.

Certain hazards are common to most arc welding processes. Principally, these are damage to eyes and skin from infrared and ultraviolet radiation, from the molten metal and electric arc respectively, burns from contact with hot metal or sparks,

adverse health effects from breathing metal fumes and gases, accidents from materials handling and electrical shock.

Eye exposure to ultraviolet radiation from the arc can result in a condition known as 'welder's flash' or 'arc eye' — an irritation with a sensation of sand in the eyes. These flash burns are very painful and repeated exposure may result in permanent eye injury. Overexposure to ultraviolet radiation may also cause severe skin burns. Infrared radiation from the molten metal produces a sensation of burning on the skin but is usually not of sufficient intensity to cause permanent skin damage.

The hazard potential from the fumes and gases generated by a welding operation depends upon the chemical composition of the materials being used, the concentrations of the chemicals in the worker's breathing zone, and the duration of exposure. The composition of the fume itself depends upon the various materials involved in the welding process. Air contaminants may arise from the various components of the welding rods, oxides of the metals and alloying elements being joined — ozone, carbon monoxide, and the oxides of nitrogen.

Ozone and the oxides of nitrogen are the principal toxic (poisonous) gases produced by the arc welding process. Ozone, an intensely irritating gas, is produced by the action of the electric arc through air. Toxic fumes are generated from welding on metals coated with or containing alloys of lead, zinc, cadmium, or beryllium. Some paints may also produce toxic fumes when heated with the welding torch.

Fumes from many metals including cadmium, copper, nickel, and zinc are capable of producing metal fume fever. The symptoms are similar to those of influenza and usually occur a few hours after exposure. The symptoms include a metallic taste in the mouth, dryness of the nose and throat, weakness, fatigue, muscular and joint pain, fever, chills, and nausea. These symptoms usually last less than 24 hours and a temporary immunity follows. As a result welders are more susceptible to this condition on Mondays or on workdays following a holiday than on other workdays.

Most welding is done with coated rods or electrodes. Welding rod coatings and cores contain various metal oxides, hydroxides, carbonates, silicates, fluorides and organic materials. Fluorides are significant because of their toxicity. They are contained in low hydrogen, stainless, and some hard surfacing electrodes; mild and low alloy tubular open arc wires; most non-ferrous electrodes and fluxes; and many brazing and soldering fluxes.

Some silver solders contain cadmium. Even a brief over-exposure to cadmium fumes can produce severe lung irritation, which may be fatal. The welding of metal alloys particularly those containing beryllium and its compounds, can also cause serious lung problems.

The avoidance of electric shock is largely within the control of the welder. Electric shocks experienced at welding voltages usually may not cause severe injury; however, under certain conditions they can be lethal. Even mild shocks can produce involuntary muscle contractions leading to injurious falls. The severity of the shock

is determined largely by the path of the current and the amount of current flowing through the body. This is determined by the voltage and the contact resistance of the area of skin involved. Wearing clothing which is damp from perspiration or working in wet conditions reduces skin contact resistance and thus increases the risk of electric shock.

controlling the hazards

Arc welding hazards can be controlled by using effective ventilation, by following safe working practices such as heeding safety labels, and by using respirators and personal protective equipment.

Proper application of local mechanical exhaust ventilation or general dilution ventilation will vary with the type of welding being performed. In open-air welding or in large, well-ventilated maintenance shops where welding is not done constantly, the hazards from airborne contaminants may not be significant except for the more toxic fumes such as cadmium, beryllium, lead, and zinc. For heavy or production welding indoors, local or general dilution ventilation must be provided. Specifically designed local exhaust ventilation and/or approved supplied-air respirators will usually be required for welding on or with materials containing fluorides, lead, cadmium, and beryllium, or other highly toxic materials and when welding in confined spaces such as tanks or boilers. Local exhaust ventilation should be located as near to the welding operation as possible for greater capture efficiency.

Welders helmets and goggles with proper filter plates and filter lenses must be worn during

arc welding to protect from harmful rays and from flying sparks and debris. All welders and welders' helpers should have adequate eyesight to avoid positioning themselves too close to the arc — thus increasing exposure to gases and fumes. The helpers or attendants and other workers in the adjacent area should also be provided with proper eye protection. Barrier curtains around the operation can provide protection for workers in adjacent areas during the welding process.

The appropriate protective clothing required for any welding operation varies with the size, nature, and location of work to be performed. Except when engaged in light work, all welders should wear flameproof gauntlet-style gloves. Flameproof aprons made of leather or other suitable material may also be desirable as protection against radiant heat and sparks. Woolen clothing is preferable to cotton because it is less susceptible to deterioration and helps to protect the welder from changes in temperature. Flameproof leather leggings, high boots, or other equivalent protection such as screens in front of the worker's legs should be used. Ear protection so as to prevent sparks from entering the ear should be used. Ear protection, to prevent noise exposure may also be needed for work in confined spaces, in arc gouging, chipping, or plasma torch applications.

management's responsibilities

Industrial management can help to prevent injuries to welders by informing them of the potential hazards and how to avoid them.

Welders should be instructed in the proper techniques so as to avoid breathing any portion of the fume column.

Each supervisor has a definite responsibility to keep the employees in his area informed, to post warning signs, and to enforce safe work practices.


Local or general exhaust ventilation must be provided to control excessive concentrations of air contaminants generated by the various types of welding processes.

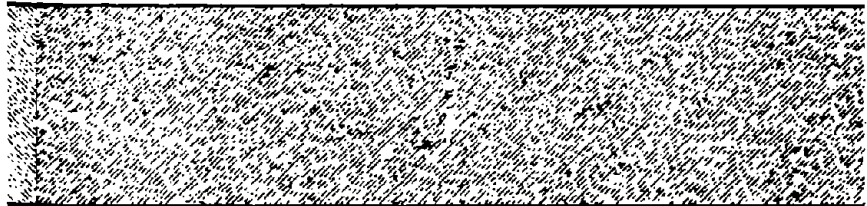
Welding operations, when possible, should be isolated from other industrial operations, particularly degreasing tanks or solvent cleaning operations. Good housekeeping practices should be maintained throughout welding work areas.

responsibilities of employees

Workers should maintain and operate their welding equipment so as to avoid undue risk to health and safety. The following general rules should also be observed:

- Follow the safety procedures required for each type of welding. Read and heed warning labels.
- Avoid electric shock by checking all connections, effectively grounding the workpiece and avoiding wet locations where possible.
- Check to see that equipment is in good condition before use.
- Be alert to possible fire hazards. Move the object to be welded to a safe area or remove flammable materials from the work area. Always keep a fire extinguisher nearby.
- Use all required protective equipment and clothing.
- Use appropriate exhaust ventilation systems and avoid breathing the fumes.

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- Never weld inside confined spaces without adequate ventilation or the use of supplied-air respirators.
 - Never weld in an area where degreasing or other cleaning operations using organic solvents are performed.
 - When working outdoors, weld upwind of the fumes and gases produced.
 - Cooperate with plant management in reporting defective equipment and hazardous working conditions.



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