

Technical Newsletter from  
**ADOR WELDING LIMITED**  
Formerly Advani - Oerlikon Ltd.

**SAFETY AT THE WORK PLACE**

**Part 1: Electrical shock and electro-magnetic field hazards.**

**Preamble:**

Safety at the work place is important for all personnel. Companies devise safety measures as per regulations and as per laid down standards. In a fabrication shop floor, it is very important to ensure the welder's safety from electrical shocks (in case of arc welding) as well as physical and chemical hazards. We will detail these hazards in a 3 part series; some guidelines for safety from electrical hazards are detailed in this article.

**Introduction:**

The main potential welding-related hazards encountered frequently by welders include electricity, radiation, heat, flames, fire, explosion, noise, welding fumes, fuel gases, inert gases, gas mixtures and solvents. The arc welding process requires a live electrical circuit. This means that all arc welders using hand held equipment may be at risk of electric shock and electrical burns. To work safely, it is essential that hazards are recognized and identified, risk is assessed and control measures are put in place.



**Electrical Hazards:**

The main electrical hazard to guard against is electric shock or electrocution. Touching electrical equipment or components, including the electrode and the work-piece, can result in serious burn injury or, more seriously, electric shock. The electric shock hazard associated with arc welding may be divided into two categories

• Primary Voltage Shock (i.e., 230, 460 volts); and  
• Secondary Voltage Shock (i.e., 20-100 volts).

The **primary voltage shock** is very hazardous because it is at much greater voltage than the welding equipment secondary voltage. Operator can receive a shock from the primary (input) voltage if he touches a lead inside the equipment with the power to the welding equipment while his body or hand is on the welding equipment case or other grounded metal. **Electric shock can kill** by direct action on the body. It can also cause you to fall if working at height. Electricity can cause burns if sufficient current and voltage passes through the body. High voltage machinery and cables are particularly dangerous sources.

A **secondary voltage shock** occurs when welder touch a part of the electrode holder on the electrode cable and at the same time another part of his body is touching the metal upon which he is welding (work). The voltage at the electrode is highest when there is no welding (open circuit voltage).

Electrical hazards are frequently not obvious and caution is essential when working with electric welding equipment and machinery.

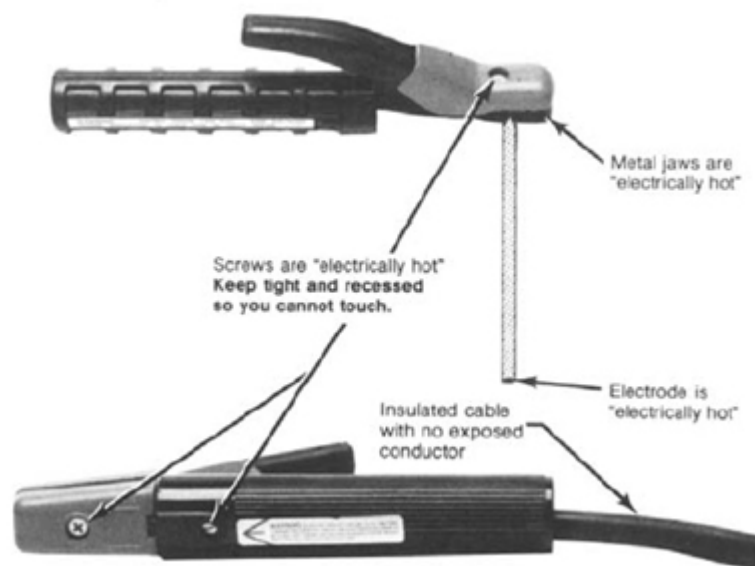
**Understanding the Risk of Electrical Hazard:**

Following steps may be followed to understand the potential risk of an electrical related incident:

- If the welding power sources is of correct rating for the job and they have been properly installed by qualified electricians and maintained in good condition, in this case the risk of an electrical incident will be low. If equipment is faulty or badly damaged, you may consider the risk too high.
- Welding equipment should have all side panels in place and secured; all terminals, connections and live components should be properly protected. If panels are missing or live components are exposed, then there is a high risk of electric shock by contact with an exposed live component.
- The current-carrying capacity of cables, interconnectors, terminals, etc., should be high enough to carry the maximum operating current otherwise it may overheat, giving an increased risk of burns or a fire.
- There should be a separate earthing conductor, unless the equipment requires only a welding return cable. Lack of an earthing conductor can give an increased risk of electric shock.
- All welding cables, electrode holders, welding torches and guns, wire feed units, etc., should be in good condition and properly insulated. Any piece of equipment that is damaged or unsafe gives a potentially high risk of electric shock.
- There should be an easily accessible means of switching off the welding power source at the mains, in the event of an emergency. If there is no means of switching it off at the mains and a fault occurs, it may not be possible to isolate an electrical problem, giving an increased risk of electric shock, burn or fire.
- Working in wet, damp or humid conditions increases the risk of electric shock, as moisture increases the electrical conductivity of the body.
- Working in a confined space gives an increased risk of electric shock as conditions are cramped and often damp or humid, and contact with equipment may be unavoidable.
- Working on a fabrication that constitutes part of the electric circuit (as in shipbuilding) gives a potentially high risk of electric shock, since an electrical fault could result in the fabrication becoming a live conductor.

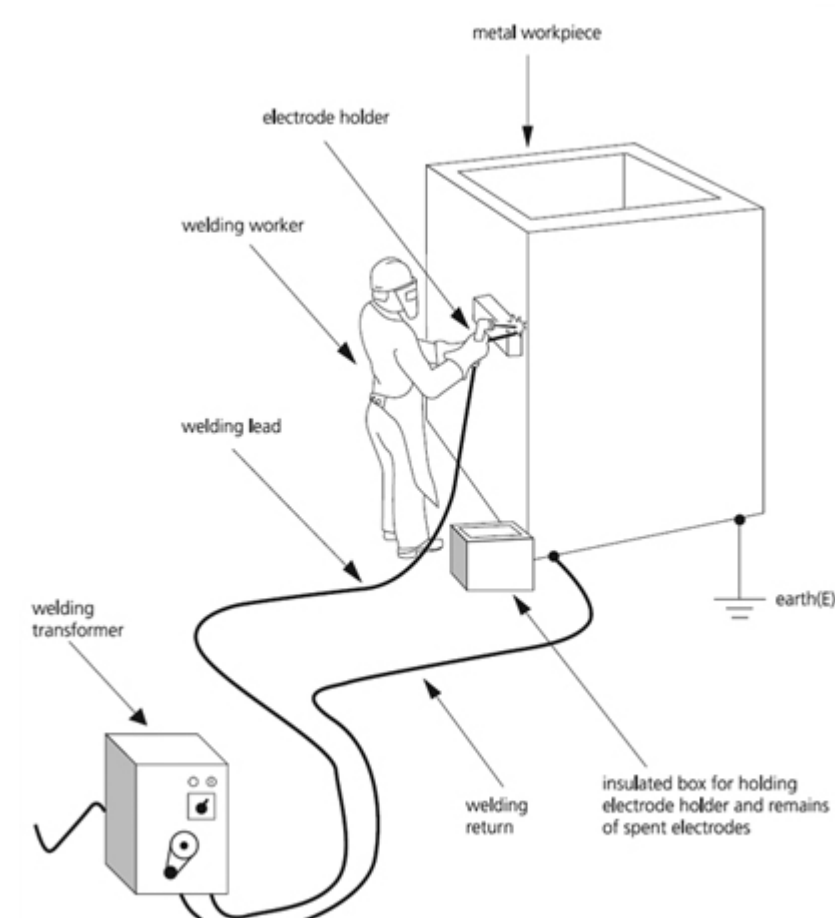
**Steps to Control Electrical Hazards:**

- Ensuring that electrical equipment is installed properly, is in accordance with regulations, and is maintained in good condition are the normal control measures taken to prevent electrical incidents. Welders should never remove panels from welding power sources and should always get a qualified electrician to investigate faults in electrical equipment.
- Using VRD (Voltage reducing device) for MMA welding machine reduces the risk of electric shock. They are particularly recommended when welding is taking place in confined spaces or other high-risk situations, such as wet environments, when the result of a shock could be particularly serious.



- The Enclosure of equipment must be grounded so that if a problem develops inside the welding equipment a fuse will blow, disconnecting the power and letting you know that repair is required. Never ignore a blown fuse because it is a warning that something is wrong.
- Fully insulated electrode holders are also available, to reduce the risk of electric shock.
- Wearing dry leather gloves, insulated footwear and other appropriate protective clothing is a practical risk control measure that can be taken by individual welders to reduce the risk of electric shock.

Following figure shows safe working arrangement for manual arc welding operation.



**Hazard due to Magnetic Fields:**

Anything that is powered by electricity, when it is operating and current is flowing, is a source of an electro-magnetic field (EMF). In industry, all electrical equipment including arc and resistance welding machines and leads, induction furnaces, electric cranes, even photocopiers, word processors and VDUs are sources of very small magnetic fields. In welding, strong magnetic fields can be produced close to the power source and the current-carrying cables, and these cables are often close to or touching the welder's body. However, the main hazards are that these magnetic fields can affect the functioning of some heart pacemakers, perhaps causing the heart to stop or slow down and this may induce fainting. A worker will not be aware of electro-magnetic field hazard unless a heart pacemaker behaves irregularly. Exposure to EMF fields in welding may have other health effects which are now not known.

**Identifying the potential risks of Electro-magnetic fields:**

Identifying the potential risk from magnetic fields becomes extremely important if you are fitted with a heart pacemaker. In most cases, the following steps will be necessary to carry out a risk assessment:

1. Company sites where strong magnetic fields are present should have safety warning notices regarding risk to heart pacemakers on prominent display. Entering such areas presents a high risk of exposure to magnetic fields
2. To welders and others who do not have heart pacemakers, magnetic fields present a very low risk of causing harm.

**Reducing the effect of Electro-magnetic field hazard:**

- Welders using electric welding processes can reduce exposure to magnetic fields by keeping welding cables together and to one side of them. Hence route the electrode and work cables together • Secure them with tape when possible.
- Never coil the electrode lead around your body. The further the magnetic field is from the body, the weaker it will be. Hence do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side (as shown in the figure for safe working arrangement, above).
- Connect the work cable to the work piece as close as possible to the area being welded
- Welders fitted with pacemakers can reduce exposure by using other welding processes, like oxy-fuel gas welding, that do not require electricity and do not, therefore, generate strong magnetic fields.

**Conclusion:**

Handling Arc welding equipment is safe when sufficient measures are taken to protect the welder from potential hazards. Following tips of safe practices will reduce risk of welders to electricity related hazards:

- Use of welding equipment conforming to the appropriate international (like IEC) standards.
- Installing the welding equipment by a suitably qualified person and as recommended by manufacturer.
- Ensuring the insulation on the welding and current return leads undamaged and the conductor is thick enough to carry the current safely.
- Ensure that all connectors are clean, undamaged and correctly rated for the current required.
- Don't use welding equipment with damaged insulation on the welding cables, plugs, clamps or torch/electrode holder.
- Use the appropriate personal protective equipment for the task.

Finally, it is the welder's responsibility for daily checks of equipment and for reporting defects.

If you want an assessment of risk for potential electricity related hazards to be carried out or you need advice on protecting your personnel from work place hazards, please contact us at [cmo@adorians.com](mailto:cmo@adorians.com) or visit our website [www.adorwelding.com](http://www.adorwelding.com)



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