

Welding

Welding - Electrical Safety

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What should I know about electrical welding?

Follow electrical safety procedures to prevent electrical hazards. Contact with the electrically live parts of a welding circuit can be fatal.

Electricity used in welding is available as:

- single phase, 120 Volts (V) or 240 V; and
- triple phase 575 V in Canada and 480 V in the USA.

Never connect an American triple phase power supply directly to a Canadian triple phase voltage input. You will destroy the transformer and possibly injure yourself.

Make sure that the maximum rating of the welding current matches with the welding electrode in use.

Power Supplies

All power supplies must meet the guidelines set by CSA standard C22.1-21 Canadian Electrical Code, 25th edition, 2021 (in Canada) or ANSI/NFPA 70 (2023) National Electrical Code (in the USA), or by your local electrical utility or other appropriate body.

What are common electrical hazards?

Electric Shock

The human body conducts electricity. Even low currents may cause severe health effects. Spasms, burns, muscle paralysis, or death can result depending on the amount of the current flowing through the body, the route it takes, and the duration of exposure.

The extent of the shock received can be determined by the worker's resistance to the electrical shock, and this can be further influenced by moisture levels, with workers showing less resistance to electrical shocks, in hot, moist working conditions.

The National Institute for Occupational Safety and Health (NIOSH) reports that standard voltages produce currents passing through a human body in the milliamper (mA) range (1,000 mA=1 Amp). Estimated effects of 60 Hz AC currents which pass through the chest are shown in Table 1.

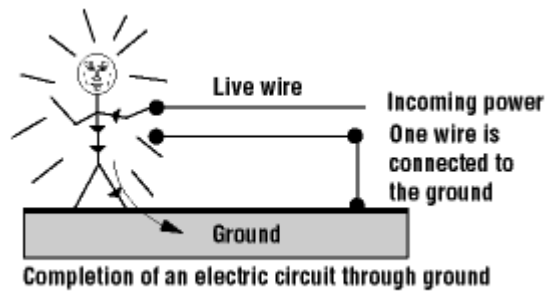
	Estimated Effects of 60 Hz AC Currents
1 mA	Barely perceptible
16 mA	Maximum current an average person can grasp and “let go”
20 mA	Paralysis of respiratory muscles
100 mA	Ventricular fibrillation threshold
2 Amps	Cardiac standstill and internal organ damage
15/20 Amps	Common fuse or breaker opens circuit*

*Contact with 20 milliamps of current can be fatal. As a frame of reference, a common household circuit breaker may be rated at 15, 20, or 30 amps.

Source: National Institute for Occupational Safety and Health (1998). [Worker deaths by electrocution: a summary of NIOSH surveillance and investigative findings](#)

Completion of Circuit through the Body

- If a person touches a live conductor, current may flow through the body to the ground and cause a shock.
- A person may get an electric shock hazard if, incidentally the hands or other parts of the body create a bridge between the welding supply (e.g., the live welding electrode) and the welding return (e.g., workpiece) of the welding circuit or equipment.
- Increased electrical contact with the ground increases the risk of shock.
- Small shocks could surprise you and cause you to slip and fall, possibly from a high place.



What precautions should I take to prevent an electrical shock?

- Make sure all cables are in good condition with no bare insulation or frayed wires to minimize the extent of live parts.
- When changing the welding electrode, there is a danger of shock equal to the no-load voltage output of the welding machine. The shock can be lethal under certain conditions (such as the welding current path, amount of electric current passing through the body, and working conditions (e.g., hot, moist)).
- Be careful to not touch the body, especially the face or neck, when repositioning the electrode.
- Protect cables from vehicular traffic or other hazards so the cables are not damaged, cut, or pinched.
- Make sure that the rod holder is insulated.
- Do not replace the welding electrode with a bare hand, or with a wet welding glove.
- Always keep the hands and the body dry during a welding operation.
- Avoid standing in water, on wet surfaces, or working with wet hands or wearing sweaty garments.
- Do not dip energized (hot) electrode holders in water.
- Avoid direct contact with the live parts of welding equipment and the workpiece.
- Ground the work or metal to be welded to a good electrical ground. Always insulate yourself from the work and ground.
- Wear proper protective equipment, such as rubber boots and rubber pads, if performing arc welding in wet or high humidity conditions. Wear rubber gloves under the welding gloves.
- If the welding operation must be done on steel or other conductive material, use an insulating mat under the operator.
- Place the welding transformer in a close vicinity. In case of an incident, the transformer can be switched off quickly to cut off the power source.

- Turn off the welding transformer during breaks or when not in use. Detach the remaining welding electrode on the electrode holder before leaving the welding area.
 - Do not hold or move the welding electrode holder and the welding return cable simultaneously when moving from one working position to another if the power source to the welding equipment has not been cut.
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What should I do in case of electric shock?

- Call for medical help immediately.
 - DO NOT touch the victim with your "bare hands" until he or she is away from the live electrical source.
 - Turn off the power at the fuse box or circuit breaker panel if an appliance or electrical equipment is the electrical source or, if you can do it safely, turn off the appliance or electrical equipment and unplug it. Just turning off the equipment is not sufficient.
 - If the electricity cannot be turned off and the victim is still in contact with the electrical source, decide if you must move the victim or push the wire away from the victim (call for emergency help if the wire is a high-voltage power line).
 - If you must move a victim away from a live contact, you should insulate yourself. Wear dry gloves or cover your hands with a cloth and stand on dry insulating material like cardboard, wood, or clothes. Ensure you have good footing and will not slip or fall when trying to move the victim.
 - Use a dry piece of wood, broom or other dry, insulating object or material to move the wire or power source away from the victim or push the victim off the live electrical source.
 - Do not move the victim if there is a possibility of neck or spinal injuries (from a fall, for example) unless it is absolutely necessary.
 - Give artificial respiration if the victim is not breathing.
 - Give cardiopulmonary resuscitation (CPR) if the victim's heart has stopped (only if you are trained in CPR).
 - Cover burns with a sterile dressing. There may be a burn where the power source touched the victim and in the area where the electricity left the body (to ground). On the surface electrical burns may not look serious but deeper in the tissue the burn can be severe.
 - Get medical assistance. Keep the victim comfortable, warm and at rest, and monitor breathing.
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