

DuPage County Environmental, Safety, Health & Property Loss Control Program

Plasma Arc Cutting Safety

Purpose: Provide basic safety practices to staff trained to use plasma arc cutting equipment.

Like a hot knife through butter, a plasma arc cutting machine slices through any electricity-conducting metal faster than traditional cutting methods, including saws, snips or oxy-acetylene torches. Although the technology has been available for more than 50 years, the introduction of small, portable (less than 50 lb.) and affordably-priced machines in the mid-1990s produced phenomenal growth in the use of plasma arc cutters.

Personnel Safety:

Arc rays produce intense visible and invisible (ultraviolet and infrared) light rays that can burn eyes and skin.

Preferably a welding curtain can be placed between job and other workers. If not then warn other workers not to look at arc and to stay away unless wearing the following PPE.

Wearers of Pacemakers or other implanted medical devices must stay away as Electric and Magnetic Fields can affect the devices.

- To protect your body from flying sparks and hot metal, always wear dry, oil free, undamaged, flame-resistant clothing and gloves. Clothing made from tightly woven material - such as leather, wool or heavy denim - works well.
- Be sure to wear long sleeved shirts and full length pants.
- Button shirt collars, cuffs and front pockets to prevent them from catching sparks.
- Do not keep matches or butane lighters in your pockets.
- Avoid wearing cuffed pants, as the cuffs may catch sparks.
- High-top leather shoes or boots provide the best foot protection.
- The intensely hot and powerful plasma arc can quickly cut through gloves and skin.
- To prevent injury, do not grip material near the cutting path.
- The pilot arc can cause burns, too, so keep away from the torch tip when pressing the trigger.
- When starting the arc, point the torch away from your body and toward the work piece.
- Protect face and eyes by wearing a full face shield with proper shade or filter lenses to protect eyes and face from arc rays and sparks.
- Under face shield safety glasses with side shields are to be worn as well.
- Use approved ear plugs or ear muffs if noise level is high.
- Turn off power source and disconnect input power before disassembling torch or changing torch parts.

Eye Protection needed for Plasma Arc Cutting	
Current level in Amperes	Minimum Shade Number
Below 20	#4
20-40	#5
40-60	#6
60-100	#8

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Fire Hazards:

Also see Hot Work Permit Policy.

The plasma cutting arc blows out hot metal and sparks, especially during the initial piercing of the metal. It also heats the work piece and cutting torch, all of which can cause fire and burns. To protect your eyes while plasma cutting, wear approved safety glasses with side shield. For increased protection, use a face shield or helmet in conjunction with safety glasses.

Since heat and sparks can ignite flammable materials, move all flammables at least 35 ft. away from the cutting area or protect them with flame-proof covers. Take extra care to close off small cracks and openings in partitions, as sparks can easily pass through them.

- Never plasma arc cut near flammable gases, vapors, liquids, dust or in locations where explosions are possible.
- Never cut on closed or pressurized containers, such as tanks or drums.
- Do not cut on containers that may have held combustibles or toxic or reactive materials unless they have been tested and declared safe by a qualified person.
- When cutting aluminum and it is touching water, free hydrogen gas (explosive), may collect under the work-piece. (see manufacturer's suggestions)

When cutting on a ceiling, floor, bulkhead or partition, remember that sparks and metal can ignite combustible materials on the hidden side.

Well Grounded:

Plasma arc cutting torches are typically designed with safety interlock systems that turn off the machine if operators loosen the shield cup or if the tip touches the electrode inside the nozzle. However, plasma arc cutting requires higher voltages than welding to start and maintain the arc - typically 110 to 400 VDC - and touching live electrical parts can cause fatal shocks or severe burns. Poor connections and bare spots on cables increase the possibility of electrical shock. Inspect these items daily and replace, not repair, any worn cables or broken connections.

Because water conducts electricity very well, avoid wet working conditions (even body perspiration can lower the body's resistance to electrical shock). Insulate yourself from work and ground by standing on a dry rubber mat or dry plywood sheet big enough to cover the full area of your contact with the work or ground. Be cautious, as both rubber and wood can ignite. If you can find a dry, non-flammable material to stand on (put between you and ground), use it.

When plasma arc cutting equipment is properly grounded according to the National Electrical Code (NFPA 70) and to OSHA standards, a voltage may safely exist between the electrode and the work, making the cut possible.

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Operators must routinely inspect for effective ground connections. Connect the work piece to a proper earth ground. Connect the frames of all electrically powered machines to a properly grounded disconnect switch, receptacle or other appropriate ground. Always double-check the installation and verify proper grounding. Never use chains, wire ropes, cranes, hoists and elevators as grounding connectors.

Clear the Air:

Cutting any metal produces fumes and gases, and breathing them can create health hazards. Keep your head out of the fumes and do not breathe them. (Hint: For a better view of the cutting arc, hold your head to the side of the torch. Don't peer directly over it). Work only in a confined space if it is well ventilated or while wearing an air-supplied respirator. ***(See Confined Space Public Works Policy)***

When cutting coated metals - such as galvanized steel, lead- or cadmium-plated steel - remove the coating from the cutting area if possible. These coatings, and any metal containing these elements, can give off toxic fumes when cut with a plasma arc (always read the Material Safety Data Sheets (MSDS) for all coatings, metals and consumables used in the process). When cutting coated metals, ventilate the cutting area and use an exhaust hood or suction system - positioned at the arc - to keep the breathing zone safe and clear of fumes. If necessary, wear an air-supplied respirator.

Gas Systems:

Plasma arc cutting systems use shop air and sometimes compressed gases, typically nitrogen. When using cylinders, securely chain them to a stationary, upright support or cart at all times. When moving or storing a cylinder, fasten the threaded protector cap to the top of the cylinder. This shields the valve system from impact damage.

- Immediately remove a faulty regulator from service for repair. Do not attempt to repair a faulty regulator. Instead, send it to the manufacturer's designated repair center where it will be repaired according to the manufacturer's specifications.
- Use only recommended ferrules or clamps designed to connect hoses to fittings.
- Never use ordinary wire or other substitutes.
- Always suspend the hose off the ground to keep it from being run over, stepped on or otherwise damaged.
- Avoid long runs or coil excess hose to prevent kinks and tangles.
- Examine all hose regularly for leaks, wear and loose connections.
- Replace leaky or worn hoses, or repair them by cutting out damaged area and properly splicing in a new section.
- Never splice hoses with tape; it cannot ensure a safe seal.

Manufacture: Plasma arc cutting can cut metal safely, but you must follow proper procedures to avoid accidents. Because this procedure does not cover all the safety issues that may exist at the job, always refer to the operator's manual for a thorough explanation.