

SUBJECT: Welding and Cutting

REGULATORY STANDARD: Occupational Safety and Health Act of 1970

DATE: May 2000

Introduction

Welding and cutting operations are sometimes performed on the Montana Tech campus. There are enough potentially serious hazards in welding and cutting that both novice and experienced welders should be reminded of them from time to time. Note that Montana Tech has a Hot Works Program that must be followed for all welding and cutting.

General Hazards

These are a few general hazards in welding and cutting

- Fire from sparks and spatter
- Explosion and fires from reaction with welding gases
- Asphyxiation
- Electric shock
- Inhaling toxic fumes and gases
- Eye injuries from heat rays

General Safety Procedures

- Look around at possible hazards before you start.
- Clear the floor of anything you could trip over
- Keep track of hoses and cables
- Use a safety harness and /or have a buddy watch out for you if you are working above ground level
- Follow Montana Tech's Hot Works Program

Fire and Explosion

Fire and explosion are two of the biggest risks when welding and cutting. Sparks can travel as far as 35 feet, and spatter can bounce on the floor or fall through openings. Here are a few ways to minimize the danger of fire or and explosion.

- Weld in separate areas with fire-resistant floors covered with fire-resistant shields.
- Use a combustible gas indicator to determine if there are flammable gases or vapors in the area.
- Before you start the job, remove anything from the area that could burn and cover anything that can't be moved with a fireproof blanket.
- Make sure area has adequate ventilation.
- Close or cover ducts that could carry sparks to other areas.

- Use shields and guards where possible around operations.
- Perform welding at least 35 feet from any combustible materials.
- Don't cut or weld a container unless you're sure it has been thoroughly cleaned of anything that could burn, explode, or create toxic vapors.
- Keep the area clear of trash or debris.
- Make sure a firewatcher has been assigned to the job.
- Make sure there is a working fire extinguisher nearby.

Extra Precautions for Gas Welding

Additional precautions are needed for **gas welding** to avoid risk of a fire or explosions.

- Read the MSDS for the gas you are using.
- Don't smoke.
- Keep cylinders away from sparks and splatters.
- Don't turn or run over gas hoses.
- Don't use the oxygen to blow dust away; this could create an explosive atmosphere.
- Use the proper lubricants, not grease or oil, on compressed oxygen cylinder connections.

Inhalation

Welding and cutting operations create hazardous fumes and gases. In addition to using respirators, you should keep these safety guidelines in mind to minimize inhalation of hazardous substances.

- Use ventilation.
- Use portable fans to create air currents that take fumes away from your face. The air currents should flow from left to right or from right to left in front of you.
- Don't get too close to an arc welder's arc.
- Leave the area immediately and get medical help if you feel sick.

Storage and Handling

Some welding accidents happen after the job is completed because of careless storage and handling. The basic precautions for arc and gas welders are listed below.

For arc welders

Arc welders are electric, so follow these basic electrical safety practices to prevent shock or electrocution.

- Use the correct cable sizes and be sure insulation is in good shape.
- Turn off power before touching electrical parts.
- Ground what you're welding with a separate electrical connection.
- Don't wear metal jewelry that could become a conductor, and don't weld in the rain where you will become a conductor.

For gas welders

You should know exactly what is in a cylinder before you handle it. Read all the labels and the material safety data sheet and follow these general safety guidelines.

- Keep cylinders upright and properly secured.
- Store cylinders in dry areas on a fireproof floor, away from flammable materials and heat sources.
- Check equipment and hoses regularly for leaks, and report any leaking cylinders immediately.
- Transport cylinders by strapping them to a cart or dolly. Never drop or roll a cylinder on its side.
- Use cylinders only in areas with proper ventilation, with nothing around that could burn or explode.
- Keep valves closed when cylinders are empty or not in use. When you need to open the valves, do so slowly.
- Light flames promptly according to manufacturer's instructions.
- Keep cylinders away from heat, sparks, molten metal, etc.
- Keep oxygen away from combustible materials and fuel gas cylinders, particularly acetylene. Except when being used, oxygen and acetylene must be stored at least 20 feet apart or with a 5-foot high firewall with a minimum 30-minute fire resistance rating in between the cylinders.

Protective Clothing

Protective clothing is a very important part of welding safety. You must wear the right protective clothing to keep from being burned or damaging your eyes. Eye and face protection is vital to safe welding. To prevent burns, heat radiation, or contact with flying pieces of hot metal, OSHA calls for the following:

- Gas welders are to wear impact and heat-resistant goggles or eye protection with the appropriate shading, and in many cases, nonflammable helmets.
- Arc welders are to wear helmets and eye protection with appropriate shading that resists, fire, impact, and electricity. See the Montana Tech Hot Works Program for guidance.

You should be aware that long-term exposure to the infrared or heat rays given off by welding can cause cataracts, and ultraviolet rays can burn your eyes and skin in a way that is similar to a bad sun burn. Use the proper eye protection for all types of welding.

Welding in some areas may require the use of a leather apron, leggings, and sleeves. Some welding jobs can be performed safely in street clothes if the following precautions are taken:

- Wear long sleeved shirts with collars and cuffs buttoned.
- Wear high shoes with pant legs over them to keep sparks out.
- Don't wear anything with cuffs or open pockets that could catch sparks.

- Wear clean clothes. Clothing soiled with grease or oil is more easily ignited than are clean clothes.
- Wear flame-resistant head covers and don't wear flammable preparations such as hairspray on your hair.

Arc Welders Protective Clothing

In addition to the general protective clothing for welding and cutting operations, arc welding requires the following extra clothing:

- Wear clothes made of materials heavy enough to protect against ultraviolet rays.
- Wear dry welder's gloves to protect against shock and electrocution.

Respirators

Respirators are used for some welding jobs for protection from inhaling fumes and gases. Special welding respirators are available. Make certain you are using the correct respirator and cartridges for the materials you will be welding. If you need a respirator, contact the Montana Tech Environmental Health and Safety Office at 494-4463. Anyone requiring a respirator must be included in the respiratory protection program, which includes having a medical evaluation, being fit-tested, and receiving the proper training.

Confined Space Safety Procedures

- See the Montana Tech Confined Space Entry Program and Hot Works Program for full details.
- Have an entry permit.
- Test the atmosphere for oxygen, toxic substances and explosive atmospheres before entering a confined space. Once inside the confined space, continue monitoring.
- Ventilate the space.
- Leave welding machines and gas cylinders outside.
- Wear protective equipment, including respirators.
- Turn off all equipment when you stop work.

Welding and cutting are potentially dangerous, but following Montana Tech's Hot Works program can reduce the risk substantially. By following the safe work practices for welding and cutting, there should be little risk to you or others in the area.