
Welding, Cutting and Brazing Safety Guidelines

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Welding, Cutting and Brazing Safety Guidelines

I. Purpose

The purpose of the University of Northern Colorado's Welding, Cutting and Brazing (WC&B) program is to protect faculty, staff, students and visitors from hazards associated with activities that requires the use of equipment involving open flames, sparks and heat that pose fire and other health hazards. This program establishes minimum requirements for performing work during such activities in a safe and cautious manner.

II. Responsibilities

The appropriate department shall be responsible for following in accordance with this guideline.

A. Environment, Health & Safety (EHS) Department shall:

- Review and approve, in coordination with the AVP Facilities Management the designated areas approved for welding and cutting activities.

- Maintain a list of designated areas.

- Inspect designated areas to be sure that conditions have not become unsafe for welding and/or cutting annually.

- Provide training for fire watches.

- Suspend welding and cutting work if conditions become unsafe for the work being performed.

III. Hazard Identification and Prevention

Welding, cutting, and similar processes produce molten metal, sparks, slag, and hot work surfaces that

Hot work is never permitted in certain types of locations where safe conditions do not exist and cannot be created. Hot work is allowed in *two* types of locations, Designated and Controlled. Refer to the UNC Hot Work program for further details regarding requirements and restrictions.

C. Approved Fire-Resistant Materials For Welding, Cutting & Brazing

Welding Blanket: A heat-resistant fabric designed to be placed in the vicinity of a hot work operation. Intended for use in horizontal applications with light to moderate exposures such as that resulting from chipping, grinding, heat treating, sand blasting, and light horizontal welding. Designed to protect machinery and prevent ignition of combustibles such as wood that are located adjacent to the underside of the blanket. They are made from different materials such as fiberglass, Silica, and other fire-resistant materials.

Welding Pads: A heat-resistant fabric designed to be placed directly under a hot work operation such as welding or cutting. Welding pads are intended for use horizontal applications with severe exposures such as that resulting from molten

ground or wear properly designed and approved rubber-soled boots in good condition.

If utilizing long lengths of cable, suspend them overhead whenever possible.

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C. Eye and Face Protection:

Welding, cutting, and brazing processes present various hazards to the welder's eyes and face: the intense heat from arc rays and welding sparks can cause burns to the skin and eyes, during electric welding and welding processes. Personal Protective Equipment for the eyes and face is very important for both the welder and other personnel working near welding operations. Filter lens shall be in accordance with ANSI Z87.1.

Helmets with filter lenses and cover lenses shall be used by operators and nearby personnel when viewing the arc. A darker shade is necessary because the presence of the gas increases the reflective intensity of the arc.

Appendix A is a guide for the selection of the proper shade number for welding and cutting eye protection. These recommendations may be varied to suit the individual's needs to protect against infrared and ultraviolet light

Welding helmets with filter lenses are intended to protect users from arc rays and from weld sparks and spatter which impinge directly against the helmet. They are not intended to protect against slag chips, grinding fragments, wire wheel bristles, and similar hazards. Spectacles with side shields or impact safety goggles, combined with the use of a face shield is required for protection against these hazards.

V. Health Protection / Ventilation Requirements

The heat caused by welding, cutting or brazing creates fumes and gases (fume plume). Fumes contain respiratory particles. Gases include the shielding gas, and combustion products. The heat from the arc or flame causes the fume plume to rise. Over exposure to welding fumes and gases can cause dizziness, illness, and even unconsciousness and death. The following measures and precautions are to be instituted to protect employee health.

Ventilation is used to control overexposures to the fumes and gases during welding and cutting will keep the fumes and gases from the welder's breathing zone. Adequate ventilation shall be provided for all welding and cutting and related operations and shall be enough ventilation such that personnel exposures to hazardous concentrations of

A. Natural Ventilation

Natural ventilation is the movement of air through a workplace by natural forces. Roof vents, open doors and windows provide natural ventilation. The size and layout of the area/building can affect the amount of airflow in the welding area. Natural ventilation can be acceptable for welding operations if the contaminants are kept below the allowable limits.

Natural ventilation is considered sufficient for welding or cutting operations where the following restrictions are not present.

In a space of less than 10,000 cubic feet (284 m³) per welder.

In a room having a ceiling height of less than 16 feet (5 m).

In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.

B. Mechanical Ventilation

Mechanical ventilation is the movement of air through a workplace by a mechanical device such as a fan. Mechanical ventilation is reliable. It can be more effective than natural ventilation. An example is a local exhaust ventilation system that includes a capture device, ducting, hood, and a fan. The capture devices remove fumes and gases at their source. Some systems filter the airflow before exhausting it. Fixed or moveable capture devices are placed near or around the work. They can keep contaminants below allowable limits. When using mechanical ventilation remember to:

per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3 inch (7.6 cm) wide flanged suction opening are shown in the following table:

Minimum air Duct - Welding zone flow		
Distance from arc	Cubic feet/Minute	Duct Size
4 to 6 inches from arc or torch	150	3
6 to 8 inches from arc or torch	275	3 1/2
8 to 10 inches from arc or torch	425	4 1/2
10 to 12 inches from arc or torch	600	5 1/2

2. Fixed enclosure (Booths). A fixed enclosure with a top and not less than two sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet (30 m) per minute.

Ventilation in confined spaces

All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All replacement air shall be clean and reparable. Because of its flammable properties, Oxygen shall never be used for ventilation.

VI. Operational Safety

The following sections are general safety prec sa 0 1 157.22 625.9Tm0 g0 1 303.53 388.9Tm g0 G[Gp

Before lighting the torch for the first time each day, hoses shall be purged individually.

Hoses shall not be purged into confined spaces or near ignition sources.

Hoses shall be purged after a cylinder change.

Torches shall be lit by a friction lighter or other approved device, not by any form of flame.

Whenever work is suspended, Torch valves shall be closed, and the gas supply shut off.

Hose connections shall be clamped or otherwise securely fastened in a manner that will

With stand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 PSI.

Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall be repaired or replaced.

B. Electric Arc Welding

This section contains safety precautions specific to the operat

Care shall be taken in applying arc welding equipment to ensure that the ampere rating chosen is adequate to handle the job. Welding machines shall not be operated above the ampere ratings and corresponding rated duty cycles as specified by the manufacturer and shall not be used for applications other than those specified by the manufacturer.

When using alternating current (AC) or direct current (DC) arc welding machines, the welding operator shall take special care to prevent electrical shock. The manufacturer shall be consulted, and a hazard assessment shall be performed before unusual service conditions are encountered. Unusual service conditions may exist, and in such circumstances, machines shall be especially designed to safely meet the requirements of the service. Most important among these conditions are:

- Exposure to unusually corrosive fumes.
- Exposure to steam or excessive humidity.
- Exposure to excessive oil vapor.
- Exposure to flammable gases.
- Exposure to abnormal vibration or shock.
- Exposure to excessive dust.
- Exposure to weather.

Note: Water or perspiration may cause electrically hazardous conditions. Electrical shock may be prevented by performing a hazard assessment before work, relocating work to a safe location, avoiding contact with live electrical parts, and lastly by use of personal protective equipment the use of nonconductive gloves, clothing, and shoes.

VII. Training and Record Keeping

It is the responsibility of each department to ensure that their employees receive the

UNC Welding, Cutting, & Brazing Safety Guidelines Appendix A: Filter Shade Selection for Types of Welding

Operation	Electrode Size (mm)	Arc Current (A)	Min Shade	Suggested Shade
Shielded Metal	< 2.5 mm	< 60	7	*
Arc Welding	2.5 - 4mm	60 - 160	8	10
	4 - 6.4mm	160 - 250	10	12
	> 6.4mm	250 - 550	11	14
Gas Metal Welding and Flux Cored Arc		< 60	7	*
		60 - 160	10	11
		160 - 250	10	12
		250 - 500	10	14
Gas Tungsten Arc Welding		< 50	8	10
		50 - 150	8	12
Air Carbon Arc Cutting		150 - 500	10	14
		< 500	10	12
		500 - 1000	11	14
Torch Brazing				3 or 4
Torch Soldering				2
Carbon Arc Welding				14
				4 or 5
				5 or 6
				6 or 8

