



# THE UNIVERSITY OF MAINE SAFETY AND ENVIRONMENTAL MANAGEMENT

## Welding, Cutting, and Brazing

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### General

This policy is intended to reduce and control fire, explosion, and thermal burn hazards associated with welding, cutting, and brazing operations, and must be used in conjunction with any other applicable University of Maine policies and programs.

This policy applies to all individuals engaged in welding, cutting, or brazing activities located on the University of Maine premises, and to those individuals performing off-site welding, cutting, and brazing activities as part their employment or course work at The University of Maine.

### Regulatory Guidance

Occupational Health and Safety (OSHA) 29 CFR 1910 Subpart Q

National Fire Protection Association (NFPA) 51B, Fire Prevention in Use of Cutting and Welding Processes, 1994.

American National Standards Institute (ANSI) F4.1-8

ANSI G7.1-1989, *Compressed Gas Association Commodity Specification for Air*

ANSI Z49.1, 87.1

### Requirements

Prior to welding, cutting, or brazing a personal protective equipment certification must be completed in accordance with the University of Maine *Personal Protective Equipment (PPE) Policy*.

Individuals performing welding, cutting, and brazing must be qualified to perform such work or be under the direct supervision of a qualified instructor in a lab/shop setting.

#### **The following general work practices apply to all operations:**

- Unless authorized by a *Hot Work Permit*, welding, cutting and brazing operations must be conducted in a designated welding area
- No welding, cutting or brazing is allowed in an area containing flammable liquids, gases, vapors or dust air mixtures.
- Before cutting, welding, or brazing is permitted, the area must be inspected by the Supervisor or Instructor responsible to ensure that it is fire safe.
- Floor, wall, and duct openings must be tightly covered prior to performing welding or cutting operations.
- Welding, cutting or brazing operations are not allowed in buildings that have automated fire protection systems when the systems are impaired,

without prior approval from the *Authority Having Jurisdiction* and after implementing appropriate temporary protective measures.

- Welding, cutting or brazing operations are prohibited near areas where large quantities of readily ignitable material(s) are stored.
- Protective measures must be implemented whenever heat generated by welding, cutting or brazing operations could be transmitted to combustible materials by conduction.
- Trip and slip hazards must be minimized by keeping tools, debris and other items cleaned-up and in their proper location(s) (Don't throw electrode or rod stubs on the floor.)
- Utilize approved fall protection to protect employees when they are working above 4 feet in elevation, or when working around dangerous equipment or machinery, into which they could fall.
- Inspect all welding, cutting and brazing equipment prior to each use.
- Special protection against electric shock must be provided, while arc welding or cutting in wet, damp, high humidity locations.
- Inspect and use welding, cutting or brazing equipment as directed by the manufacturer(s).
- All hollow spaces, cavities or containers must be vented to permit the escape of air or gases before preheating, cutting or welding (purging with inert gas is recommended).
- Welding, cutting or brazing is not permitted on used piping, drums, barrels or other containers, unless they have been thoroughly cleaned and the operations are approved using a *Hot Work Permit*.

### **Fire Watch:**

In addition to the permit requirements listed under general requirements, a Hot Work Permit and a Fire Watch must be instituted whenever:

- a) Welding, cutting or brazing operations are conducted outside a designated area.
- b) Combustible materials are located within a 35 foot radius of the welding, cutting or brazing operation; or appreciable combustible materials that could be easily ignited by sparks are located more than 35 feet away.
- c) Wall or floor openings within a 35 foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
- d) Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

The fire watch will be knowledgeable in the following areas:

- Fire Extinguisher Use and Emergency Procedures.
- Use and location of emergency equipment in the vicinity of the work.
- Fire prevention strategies as outlined by permits and work procedures.

- Hazards of chemicals used in the area, when applicable.

A fire watch must be maintained for at least ½ hour after the completion of the cutting or welding operation to detect and extinguish smoldering fires and must meet all of the following requirements:

- The fire watch must stay in the immediate vicinity of the work. The fire watch will coordinate his/her breaks and lunch with the people doing the work. The fire watch does not perform any independent operating function.
- A fire watch must have fire extinguishing equipment readily available and be trained in its use.
- A fire watch shall be familiar with facilities and procedures for sounding an alarm in the event of a fire.
- The fire watch must stay alert to all activities that could have any effect on the work and should be particularly alert to conditions that may have changed after the *Hot Work Permit* was issued (i.e., must be knowledgeable of, and assist in isolating of potential hazards, lay down plastic, fire blanket and hose down area when/where appropriate).
- The fire watch will verify that there is no ignition sources (smoldering materials, etc.) left anytime work is discontinued.
- The fire watch is required to shut down the work anytime a situation exists that could cause a fire or explosion.
- If a fire occurs, it will be the responsibility of the fire watch to initiate the appropriate fire fighting procedure within their level of training and equipment or stop work and activate alarm system.

If a fire watch has to leave the job for any reason, the job must be shut down or the fire watch must be relieved by another fire watch.

### **Welding of Toxic Material:**

- Local exhaust ventilation must be utilized when welding / cutting / brazing on any metal containing or coated with the following elements, or compounds in order to keep exposures below safe level;
  - Lead
  - Fluorine
  - Zinc (galvanized metal)
  - Beryllium (use an airline respirator also)
  - Cadmium
  - Mercury
- Adequate mechanical ventilation must be utilized when oxygen-acetylene welding on stainless steel containing materials.

In addition to using adequate mechanical ventilation, air monitoring must be performed to assess potential exposure(s) and help determine system

requirements and PPE requirements if the user cannot verify ventilation system meets specified ventilation requirements.

### **Welding in Confined Spaces:**

- All welding, cutting, and brazing operations carried in a confined space (relatively small or restricted spaces such as pipes, tanks, boilers, pressure vessels, small compartment of a ships etc. – as defined in 29 CFR 1910.252) must be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency.
- Ventilation systems must protect not only the welder, but also the helpers and other personnel in the immediate vicinity.
- All breathing air being supplied to the welder(s) shall be “D grade breathing air” as outlined in ANSI G7.1-1989, *Compressed Gas Association Commodity Specification for Air*.
- Compressed gas cylinders shall not be taken into confined spaces and must be located as far as practical from the opening of the confined space.
- If welding, cutting, or brazing inside a confined space is interrupted (e.g., due to work breaks), special precautions should be instituted. Disconnect power to arc welding or cutting units and remove electrode from holder. Turn off torch valves and shut off the gas supply to gas welding / cutting / brazing units at a point outside the space. Remove torch and hose from the space, if possible.

Any welding, cutting, or brazing operations performed in a confined space that contains any other hazards (other than those atmospheric hazards listed above) must also comply with *The University of Maine Confined Space Program*.

### **Responsibilities**

The **Chairperson or Director** is responsible for ensuring that employees permitted to weld, cut, or braze as part of their employment or coursework receive appropriate training.

**Supervisors and Instructors** are responsible for:

- ensuring that welding operators comply with requirements of this policy;
- the safe operation of welding, cutting, and brazing equipment;
- inspecting and maintain all welding, cutting, and brazing equipment;
- ensuring all individuals who weld, cut or braze are qualified to do so;
- inspecting the area where the welding, cutting, or brazing is to be performed to ensure that it is a fire safe area;
- ensuring that designated areas meet all regulatory requirements;
- authorizing hot work permits and assigning a fire watch, when required; and
- conducting Personal Protective Equipment Assessment(s).

**Employee and Student Operators** are responsible for:

- following all established safe procedures,

- utilization of the proper protective clothing and equipment, and
- notifying the Supervisor or Instructor of any hazards that arise.

**Definitions**

***Fire Watch*** – An individual, or group of individuals, who have access to fire extinguishers (and have been trained in their use), and who have been assigned to watch the welding / cutting / brazing area for ignition of combustible material(s).

***Hot Work Permit System*** – A system utilized to conduct a formal review of welding, cutting or brazing activities and issuance of permits to inform individuals involved with welding / cutting / brazing of materials of the required safety procedures. The hot work permit must be issued by a supervisor.

**For Additional Information**

Contact your Department Safety Coordinator or the Department of Safety and Environmental Management at 207/581-4055.

UMaine Hot work permit – MF10101

**Document History**

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