



JULY 2021

Welding, Cutting, and Brazing (Hot Work) Program

UNC CHARLOTTE
9201 UNIVERSITY CITY BLVD. CHARLOTTE, NC 28223

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I. Purpose

The purpose of this program is to comply with Occupational Safety and Health Administration (OSHA) Welding, Cutting, & Brazing standard – 29 CFR 1910.252 and the National Fire Protection Association (NFPA) 51 B - Fire Prevention During Welding, Cutting, and Other Hot Work guidelines.

II. Scope

This program applies to all university employees who perform operations (welding, cutting and brazing) capable of producing a source of ignition.

III. Definitions

- A. Brazing and Soldering - Soldering and brazing use molten metal to join two pieces of metal. The metal added during both processes has a melting point lower than that of the workpiece, so only the added metal is melted, not the workpiece. Brazing produces a stronger joint than does soldering, and often is used to join metals other than steel, such as brass. Brazing can also be used to apply coatings to parts to reduce wear and protect against corrosion.
- B. Confined Space - A space that:
 - 1. Is large enough that an employee can bodily enter and perform assigned work; and
 - 2. Has limited means for entry or exit; and
 - 3. Is not designed for continuous employee occupancy.
- C. Cutters - Any tool that is used to remove some material from the work piece by means of shear deformation. Cutters use heat from an electric arc or stream of ionized or burning gasses to cut and trim metal objects to meet blueprint or work order specifications.
- D. Cutting / Grinding - Any process which produces sparks capable of igniting or flammable materials and transmits heat to the work material from a hot gas.
- E. Designated Hot Work Area - A permanent location designed for or approved for hot work operations to be performed regularly.
- F. Fire Watch – is a temporary measure intended to ensure continuous and systematic surveillance of a building, or portion of the building, by one or more qualified individuals for the purpose of identifying and controlling fire hazards, detecting early signs of fire, activating an alarm and notifying the fire department in the event of a fire.
- G. Hot Work – Any process that can be a source of ignition when flammable material is present or can be a fire hazard regardless of the presence of flammable material in the workplace. Common hot work processes are welding, soldering, cutting and brazing.

- H. Hot Work Area – The area exposed to sparks, hot slag, radiant heat, or convective heat as a result of the hot work.
- I. Hot Work Equipment – Electric or gas welding or cutting equipment use for hot work.
- J. Hot Work Operator - An individual designated to perform hot work.
- K. Hot Work Permit – A document issued for the purpose of authorizing a specified activity.
- L. Hot Work Program – A permitted program, carried out by approved facilities-designated personnel, allowing them to oversee and issue permits for hot work conducted by their personnel or at their facility.
- M. Hot Work Supervisor – Person that is responsible for the safe operations of hot work activity under their supervision.
- N. Permit Authorizing Individual (PAI) – Employee that is responsible for the safe operations of hot work operations under their supervision (project manager, construction manager, maintenance supervisor, etc.,) that issues, approves, and cancels the hot work permit.
- O. Torch –Applied Roof System – Bituminous roofing systems using membranes that are adhered by heating with a torch and melting asphalt back coating instead of mopping hot asphalt for adhesion.
- P. Welding – Joining together (metal pieces or parts) by heating the surfaces to the point of melting using a blowtorch, electric arc, or other means, and uniting them by pressure, hammering, etc.

IV. Responsibilities

A. Executive Leadership

The University of North Carolina at Charlotte has legal responsibility for compliance with the occupational safety and health standards.

B. Program Administrator

The Environmental Health and Safety Office (EHS) is responsible for:

1. Planning and recommending programs that adhere to all applicable federal, state, and local laws and regulations pertaining to environmental health and safety.
2. Assisting supervisors with implementing environmental health and safety programs in their areas.
3. Curtailing or stopping work that pose a clear and imminent danger to the health or safety of the University community.
4. Periodically reviewing the program and updating it as needed to ensure compliance with all applicable federal and state regulations.

C. Departmental Management

Management is responsible for:

1. Planning and developing budget requests for departmental safety programs.
2. Developing safety procedures, work practices, and safe working areas for all those under their supervision.
3. Supporting safety and health as a model to those they supervise.
4. Supplying appropriate equipment and training.
5. Enforcing environmental health and safety regulation by invoking disciplinary action or administrative sanction.

D. Employees

Every UNC Charlotte employee is responsible for conducting himself/herself in accordance with this program. All employees shall:

1. Adhere to all safety programs, procedures, and practices while performing his/her duties in a safe manner.
2. Notifying your immediate supervisor of unsafe working conditions, potential hazards, and accidents as soon as possible.

E. Contractors

Contractors and vendors are required to develop their Occupational Safety and Health Administration (OSHA) compliance program and adhere to compliance regulations. However, UNC Charlotte will ensure contractors are made aware of this permit system.

V. Designated Hot Work Areas

The Environmental Health and Safety (EHS) office conducts workplace hazard assessments to evaluate hot work hazards, identify safety precautions and assist supervisors with implementing program requirements. As a result, EHS has designated the following locations as Designated Hot Work Areas:

- Outside 35 feet away from flammables or combustibles
- Smith building room 128 welding area
- Motorsports Kulwicki building room 103 welding area
- Motorsports Research building room 124 welding area
- Rowe building room 114 welding area
- Storrs building room 140 welding area
- EPIC building room 1424 high bay welding area

These areas do not require a hot work permit prior to performing hot operations. However, the designated hot work area shall meet the following requirements during hot work operations:

- Non-combustible, fire-resistive construction, essentially free of combustibles and flammables
- The working surface for the use of the soldering and brazing activities should be of a non combustible

material (i.e. Laboratory bench top, Duraboard, tile, etc)

- Suitably segregated from adjacent areas
- Equipped with fire extinguisher(s)
- Equipped with a smoke detector and/or heat detectors
- Equipped with mechanical ventilation to control smoke and fumes

VI. Hot Work Permit

Before hot work operations begin in a non-designated location, a hot work permit must be submitted and a Permit Authorizing Individual (PAI) must authorize the hot work permit. The permit is to be submitted 48 hours prior to the start of the work (exceptions made on an emergency basis), is valid for 24 hours, and shall be accessible at the area of hot work for the duration of the operation. The hot work permit can be completed using the Hot Work Permit form (see Appendix A).

The PAI will provide the authorized hot work permit to the hot work operator. The hot work operator shall adhere to the hot work permit safety precautions prior to starting hot work. Where the hot work is accessible to persons other than the operation of the hot work equipment, conspicuous signs reading, "Caution Hot Work in Progress Stay Clear" shall be posted to warn others before they enter the hot work area. Periodic inspections will be performed to ensure compliance.

VII. Prohibited Hot Work Areas / Operations

Hot work shall not be permitted in the following areas until the conditions prohibiting hot work have been modified:

- In the presence of explosive atmospheres, or in situations where explosive atmospheres may develop inside contaminated, improperly prepared tanks or equipment which previously contained flammable liquids.
- In areas with an accumulation of combustible debris, dust, lint and oily deposits.
- In areas near the storage of exposed, readily ignitable materials such as combustibles.
- On a container, such as a barrel, drum or tank that contained materials that will emit toxic fumes when heated.
- In a confined space, until the space has been inspected and determined to be safe. Refer to Confined Space Program
- In cases when an entire building fire detection system is shut down.
- In buildings with sprinkling systems while such protection is impaired.
- Where floor and wall openings cannot be covered.
- Hot work shall not be attempted on:
 - A partition, wall, ceiling or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich-type panel construction.
 - Pipes or other metal that is in contact with combustible walls, partitions, ceilings or roofs shall not be done if the work is close enough to cause ignition by conduction.
 - Ducts and conveyor systems that might carry sparks to distant combustibles.

There are some activities that do not require a hot work permit. Examples of activities that do not require a hot work permit include:

- Bunsen burners in labs
- Fixed grinding wheels
- Electric soldering irons

If unsure whether an operation is considered hot work, please contact EHS or your supervisor.

VIII. Personal Protective Equipment (PPE)

Heat resistant clothing must be provided and worn by operators during hot work operations. Other PPE including head, eye, face, hand and foot protection shall be provided based on the equipment owner’s manual and/or specific job task hazard assessment. Individuals must contain any long hair under the PPE. Welding screens should be utilized to provide protection to the worker as well as others not involved in the hot work.

Eye Protection

Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Individuals who might be exposed to ultraviolet light (UV) generated by welding must wear eye protection with filter lenses specifically designated for the type of welding they are performing. The following table is a guide for the selection of the proper shade number. These recommendations may be varied to suit the individual’s needs.

Welding operation	Shade No.
Shielded metal arc welding – 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	10
Gas-shielded arc welding (nonferrous) - 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous) - 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	12
Shielded metal-arc welding: 3/16-, 7/32-, 1/4-inch electrodes	12
5/16 -, 3/8-inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1 / 2 inch and over	6 or 8

Soldering / Brazing - Prior to performing any non-UV-generating hot work such as soldering and brazing operations personnel must wear a clear full-face shield over prescription glasses or eye-goggles for eye and face protection. The prescription glasses or goggles must have the appropriate lens shade number in the table below based upon the type of soldering / brazing being performed.

Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4

Gloves

All hot work activities must be conducted wearing flame resistant and electrically non conductive gloves that allow adequate dexterity for manipulation of the welding equipment and controls in addition to weld-filler rods.

- A. Inspect clothing and gloves before every use for holes, damage, etc. These items must be in good repair with no holes or frayed seams and free from water or oil residue.
- B. Gloves must cover the cuff of long sleeve shirts, and fit snug around the forearm to the mid-forearm.

IX. Ventilation

Portable and/or mechanical ventilation capable of keeping the levels of fumes, dust and gases below the thresholds established in the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PELs).

X. Confined Spaces

The following precautions are in addition to the requirements of a confined space entry program and must be followed when performing hot work in a confined space:

- To prevent accidental contact, when arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine be disconnected from the power source.
- In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the gas supply to the torch positively shut off at some point outside the confined space area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practical, the torch and hose shall also be removed from the confined space.
- When welding or cutting is being performed in any confined space, the gas cylinders and welding machines shall be left on the outside. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.

XI. Compressed Gas Cylinders

- Cylinders containing oxygen, acetylene or any other fuel or gas must not be taken into confined spaces.
- Welding fuel-gas cylinders are placed with valve end up whenever they are in use or being stored.
- When in use, nothing is placed on top of an acetylene cylinder which may damage the safety device or interfere with the quick closing of the valve.
- Cylinders must be securely stored upright by two non-combustible chains or straps located at the top one-third and bottom one-third of the cylinder height. Chains and straps must be snug. Rope or string is not acceptable.

- Welding-gas cylinders must be separated by a distance of 20 feet, or by a non-combustible partition 60 inches high or taller having a fire-resistance rating of at least one-half hour.

XII. Fire Watch

A fire watch shall be maintained for at least 30 minutes after completion of hot work operations in order to detect and extinguish smoldering fires. The fire watcher shall have fire extinguishing equipment readily available and be trained in its use. The fire watcher shall be familiar with the facilities for sounding an alarm in the event of a fire.

XIII. Training

Employees supervising or performing hot work operations must be suitably qualified to safely operate equipment and follow all process instructions. All Permit Authorizing Individuals, Fire Watchers, Hot Work Operators, and their Supervisors are to receive hot work training. Additionally, employees performing fire watch operations shall receive fire extinguisher training.

Employees working with hazardous chemicals shall receive documented hazard communication training as outlined in the [UNCC Hazardous Communication Program](#).

XIV. Program Review

The written program will be reviewed periodically to ensure compliance.

XV. Recordkeeping

All program records will be maintained in accordance with the University's Records Retention policy and Occupational Safety and Health Administration (OSHA) requirements.

APPENDIX

HOT WORK PERMIT

UNC Charlotte Environmental Health and Safety Office (EHS)

Instructions:

Complete the general information and hot work information sections. Review the safety precautions sections and submit the form. A Permit Authorizing Individual (PAI) will contact you to authorize the permit. Note: Hot work operations shall not be started until the PAI authorizes the hot work permit.

General Information	
Name of Hot Work Operator Department/Contractor: _____	
Name of Hot Work Operator: _____	
Contact Information: _____	
Name of Hot Work Operator Supervisor: _____	
Contact Information: _____	
Name of Fire Watch _____	
Hot Work Information	
Type of Work _____	Description of Work: _____
Building Name: _____	Building Number: _____
Floor: _____	Specific Location: _____
Safety Precautions	
Appropriate arrangements have been made with the Facilities Management Fire Alarm Group to prevent the accidental activation of the fire detection and alarm systems.	
A responsible fire watcher has been assigned to watch for dangerous fire situations, as well as floors above and below and will remain on the job site for 30 minutes after completion of hot work.	
All equipment to be used is in good working condition, ventilation is adequate, and flameproof screen/ shields available.	
Appropriate fire extinguisher equipment is within 10 ft. of work area. (Note: Hot work operators must provide their own fire extinguisher.)	
Floor openings within 35 feet are tightly covered.	
Floors and surrounding area are clear of combustible materials within 35 feet of the hot work area.	
Materials that cannot be moved are protected with noncombustible material or cover.	
There are no flammable liquids, vapors, dusts, lint or equipment containing such materials in the area.	
If hot work is accessible to other people, please ensure CAUTION HOT WORK IN PROGRESS STAY CLEAR warning signs are posted in a visible location.	
If confined space entry or lock out tag out is required I will contact the Environmental Health and Safety office.	
I verify the information on this hot work permit is correct.	Submit
Permit Authorizing Individual (PAI) Information	
PAI Name: _____	Contact Information: _____
Permit Status: _____	Permit Issue Date: _____
Date Work to Begin: _____	Date Work to End: _____

*If for any reason, the permit cannot be fully completed or the precautions cannot be met, hot work is prohibited.
The permit must be accessible at the hot work area during hot work operations.*