



Campus Safety and Emergency Operations
Office of Environmental Health and Safety

Walter J. Pinchbeck
128 A Facilities Drive
Pembroke, NC 28372

910-521-6792 Phone
910-775-4772 Phone
safety@uncp.edu
uncp.edu/safety

Hot Work Safety Program (Welding, Cutting and Brazing)

Prepared by:
Campus Safety and Emergency Operations
Office of Environmental Health and Safety

Walter J. Pinchbeck
128 A Facilities Drive
Pembroke, NC 28372

910-521-6792 Phone
910-775-4772 Phone
safety@uncp.edu
uncp.edu/safety

Table of Contents

Contents

INTRODUCTION	3
RESPONSIBILITIES.....	3
DEFINITIONS.....	4
SPECIALIZED HOT WORK PRECAUTIONS.....	6
PERSONAL PROTECTIVE EQUIPMENT.....	7
VENTILATION.....	8
POST HOT-WORK ACTIVITES	9
TRAINING	9
RECORDKEEPING.....	9
Appendix A – Hot Work Permit.....	10
Appendix B – Hot Work Warning Sign	11

Resources

[NC DOL: Welding and Cutting](#)

[OSHA 1910.252: \(Welding, Cutting, and Brazing\)](#)

INTRODUCTION

The following Hot Work Program provides written procedures to help prevent the outbreak of fire, fire alarm activations, and smoke/odor migration in buildings resulting from work involving open flames, producing heat or sparks. This includes, but is not limited to brazing, cutting, grinding, torch soldering, thawing pipes, and torch applied roofing and welding.

This procedure applies to hot work done at The University of North Carolina at Pembroke (UNCP) by UNCP employees. Contractors working in occupied UNCP buildings must have their own written Hot Work Program or follow the guidance in this program and submit copies of completed Hot Work Permits to UNCP Environmental Health and Safety Office (EH&S).

Contractors working at UNCP construction sites (new buildings or unoccupied renovation sites) are required to have their own written Hot Work Program; completed Hot Work Permits on construction sites are not required to be submitted to UNCP EH&S.

RESPONSIBILITIES

Environmental Health & Safety

- Is responsible for maintaining the written Hot Work Program;
- Is responsible for providing and maintaining Hot Work Permits to UNCP employees when notified of hot work activities. Additionally, EH&S staff conducts hot work permit inspections and approvals prior to hot work being done; and
- EH&S accepts completed Hot Work Permits from contractors performing hot work activities in occupied UNCP buildings. EH&S will provide assistance to contractors upon request.

Supervisors/Project Managers

- Ensure employees conducting hot work have received proper training and are provided appropriate equipment and personal protective equipment to complete the job safely;
- Be capable of identifying hazards when hot work is anticipated;
- Ensure Hot Work Permits are completed and submitted to EH&S for approval; and
- Ensure hired contractors have their own Hot Work Program or follow the guidance in this program and provide EH&S with completed permits.

Authorized Employees

Authorized employees are those who have received appropriate training and possess adequate knowledge to safely conduct hot work and are responsible for the following:

- Ensure the safe handling of cutting or welding equipment and safe use during the process;
- Identify combustible materials and hazardous areas present or likely to be present in the work area;
- Protect combustible materials from ignition by moving the hot work to a location free from dangerous combustibles; or, if not feasible, moving combustibles to a safe location or

- provide shielding to prevent ignition;
- Ensure hot work operations do not interfere with other operations in the area;
- Notify EH&S of all planned hot work and ensure appropriate hot work permits are complete prior to work;
- Ensure appropriate fire protection and extinguishing equipment are properly located at the site;
- Ensure a fire watch is present, when required;
- Ensure smoke/fire detection devices have been adequately addressed; and
- Ensure HVAC precautions have been adequately addressed.

Contractors

- Contractors are hired by the university to either make renovations or repairs to existing occupied facilities or to build or renovate unoccupied university facilities;
- All contractors hired to conduct hot work at The University of North Carolina at Pembroke shall have their own written hot work program that fulfills all regulatory requirements or follow the guidance in this program;
- Contractors working in occupied UNCP buildings shall notify EH&S that hot work is being conducted and provide copies of all hot work permits prior to commencing work; and
- Contractors working on new construction or renovating unoccupied university facilities shall follow their own hot work policies and procedures, which shall fulfill all regulatory requirements.

DEFINITIONS

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.

Cutting/Grinding: Any process which produces sparks capable of igniting combustible or flammable materials and transmits heat to the work material from a hot gas.

Designated Area: A permanent location designed for or approved for hot work operations to be performed regularly.

Fire Watch: Trained personnel who are in attendance during the entire hot work operation and are immediately available to extinguish a fire or take other effective action if needed.

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.

Hot Work Permit: A document issued for the purpose of authorizing a specified activity.

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 pressing, hammering, etc.

PRE-HOT WORK ACTIVITIES

All hot work activities are required to have a Hot Work Permit, unless the welding, cutting or brazing operations are being conducted in an area/shop designed to facilitate safe hot work operations.

If possible, move hot work activities to a safe area free from all combustible materials and fire hazards.

If hot work activities cannot be relocated to a safe area, the following precautions must be taken, in addition to acquiring the proper Hot Work Permit, to ensure fire, and other hazards, are addressed prior to hot work commencing:

- Hot work permits are posted at the entrance to the work site to inform personnel of the hot work operations taking place;
- Smoke detectors and sprinkler systems have been addressed by the Facilities Operations staff;
- Heating, Ventilation and Air Conditioning (HVAC) have been addressed by Facilities Operations staff;
- Ducts that might carry sparks to a distant combustible material must be suitably protected or disengaged;
- Welding and cutting equipment is in proper working order; and
- First aid supplies are readily available.
- Precautions have been taken to protect the area within 35 feet of the hot work area:
 - Floors are swept clean of dust and combustibles;
 - Combustible floors are wetted or covered with damp sand, metal or other suitable shields;
 - No combustible materials or flammable liquids are present;
 - Combustible surfaces are protected with covers, guards or metal shields;
 - Combustible materials in adjacent rooms are moved away from walls;
 - All wall and floor openings are covered, blocked or shielded; and
 - Grated floors (i.e. catwalks) are protected to ensure collection of sparks during work.
- Precautions within 50 feet of the hot work area:
 - Relocate or protect explosive material, compressed gas cylinders or stored fuel.
- A fire watch is established and assigned to a properly trained individual.

Fire Watch

During and after hot work activities, the work area must be monitored to ensure hot work does not result in a fire.

- Personnel assigned to fire watch responsibilities must be trained in the contents of the Hot Work Program and fire extinguisher use and limitations;
- Fire watch must be conducted during and at least 30 minutes following the hot work activity;
- Appropriate fire extinguishing equipment must be readily available during fire watch; and

- Fire watch personnel must have the ability to sound the fire alarm and alert the responding Fire Department in the event of a fire.

Prior to commencement of hot work, an EH&S representative will inspect the work area and confirm the aforementioned precautions have been taken to prevent fire in accordance with NFPA 51B. It is the responsibility of the person conducting the hot work, or their supervisor, to notify EH&S of the scheduled work in a timely manner to ensure EH&S has sufficient time to respond to the request.

Prohibited Areas

Cutting or welding shall not be permitted in the following situations:

- In unauthorized areas, such as occupied office space;
- In sprinklered buildings, while such protection is impaired;
- In the presence of explosive atmospheres or potential for explosive atmospheres;
- In areas near the storage of large quantities of exposed readily ignitable materials; and
- In areas not approved by EH&S through the hot work permitting process.

SPECIALIZED HOT WORK PRECAUTIONS

Pipes:

- Prior to cutting or welding on pipes, the operator must ensure the pipes are purged and empty; and
- Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.

Containers:

- No welding, cutting or other hot work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned to ensure no flammable materials or vapors are present;
- Pipes connected to containers must be disconnected prior to hot work; and
- All hollow spaces, cavities, or containers must be vented during the hot work to permit the escape of air and gases. Purging with inert gas is recommended.

Confined Space:

If hot work activities are to take place in a confined space the operator must be trained under and follow all components of the Confined Space Entry Program.

Prior to hot work in a confined space the following precautions must be addressed:

- Ensure a confined space entry permit is completed;
- Ensure all openings/covers are open and secured from closing;
- Test atmosphere within the confined space for oxygen, explosives, and toxins;

- Isolate lines and maintain vents open and valves leak-free;
- Lockout/tagout all systems not required during hot work;
- Provide a means for readily turning off power, gas and other supplies from outside the confined space;
- Protect or remove any hazardous materials which may become hazardous when exposed to hot work; and
- Ventilation within the confined space must be supplied to ensure fumes and gases do not exceed exposure limits and oxygen limits remain within an acceptable range.
 - If ventilation is not possible, the operators must be provided airline respirators or a self-contained breathing apparatus to ensure safe respirable air at all times. Respiratory protection users must have medical clearance and be included in the University Respiratory Protection Program.
- Gas cylinders and welding machines must be left outside the confined space and secured to prevent movement during hot work operations;
- Where an operator must enter a confined space through a manhole or other small opening, means must be provided to quickly remove (rescue) the operator in an emergency (i.e. lifeline); and
- When breaks in hot work occur (lunch or overnight) all valves must be turned off and hoses and connections must be disconnected at the power source.

PERSONAL PROTECTIVE EQUIPMENT

Operators performing hot work, and any personnel assigned to the hot work project as assistants must be provided appropriate personal protective equipment (PPE).

Eye Protection: Suitable eye protection must be provided and worn by operators and assistants during all hot work operations.

- PPE used for eye protection such as goggles, helmets and hand shields must meet minimum ANSI standards; and
- Table 1 provides recommendations for selection of the proper shade numbers for eye protection based on the type of hot work being done.

Protective clothing: Heat resistant clothing must be provided and worn by operators during hot work operations.

- Other PPE including head, hand and foot protection shall be provided based on the hazard evaluation of the work area and work to be completed; and
- Screens shall be utilized to provide protection to the worker as well as others not involved in the hot work.

Table 1:

Welding Operation	Shade Number
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
Shielded metal-arc welding (5/16, 3/8-inch electrodes)	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3-4
Light cutting (up to 1-inch)	3-4
Medium cutting (1-6-inches)	4-5
Heavy cutting (6-inches and over)	5-6
Light gas welding (up to 1/8-inch)	4-5
Medium gas welding (1/8 to 1/2-inch)	5-6
Heavy gas welding (1/2-inch and over)	6-8

VENTILATION

Ventilation must be adequate during general welding and cutting hot work operations.

Mechanical ventilation must be provided when welding or cutting operations take place:

- In a space less than 10,000 cubic feet per welder;
- In a room having a ceiling height of less than 16 feet;
- In a confined space; and
- In a space containing partitions, balconies or other structural barriers, which may significantly obstruct ventilation.

Ventilation should be provided at a rate of 2,000 cubic feet per minute (CFM) per welder unless local exhaust hoods, booths, or supplied breathing air is provided in the work area.

Natural ventilation will be considered sufficient where the restrictions in Mechanical ventilation of this plan are not present.

Cutting or welding operations involving hazardous materials must be pre-approved and reviewed by EH&S prior to work.

POST HOT-WORK ACTIVITIES

Upon completion of hot work operations, the fire watch personnel must remain on site for at least 30 minutes to ensure fire hazards are mitigated.

Upon completion of the fire watch, the attendant must sign the hot work permit indicating the hot work is complete.

As a precautionary measure, it is recommended the hot work area be inspected again at the end of the shift to ensure fire hazards or potential fires are properly handled.

TRAINING

Supervisors must ensure all hot work operators, fire watch personnel and assistants receive training relating to hot work operations.

Training shall cover all aspects of the hot work program including:

- Pre-hot work operations;
- Completion of hot work permits;
- Personal protective equipment;
- Ventilation; and
- Post-hot work operations

RECORDKEEPING

Hot work permit

- A copy of the hot work permit must be maintained by the shop performing the hot work operations and EH&S.

Training records

- Training records are maintained by the employing department in the employees employment file. Records for training provided by EH&S will be maintained by EH&S but should also be kept in the employment file.

Appendix A – Hot Work Permit



HOT WORK PERMIT

STOP!

Avoid hot work or seek an alternative/safer method, if possible.

This *Hot Work Permit* is required for any temporary operation involving open flames or producing heat and/or sparks. This includes, but is not limited to: brazing, cutting, grinding, soldering, torch-applied roofing and welding.

HOT WORK BY			Y	NA	
<input type="checkbox"/> Employee:			<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/> Contractor: _____			<input type="checkbox"/>	<input type="checkbox"/>	
DATE	JOB NO.		<input type="checkbox"/>	<input type="checkbox"/>	
LOCATION/BUILDING AND FLOOR			<input type="checkbox"/>	<input type="checkbox"/>	
IDENTIFY OBJECT/SPECIFIC LOCATION			<input type="checkbox"/>	<input type="checkbox"/>	
NATURE OF JOB			<input type="checkbox"/>	<input type="checkbox"/>	
NAME (PRINT) AND SIGNATURE OF PERSON PERFORMING WORK			<input type="checkbox"/>	<input type="checkbox"/>	
Supervisor Approval: I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for work.			<input type="checkbox"/>	<input type="checkbox"/>	
NAME (PRINT) AND SIGNATURE OF OPERATIONS SUPERVISOR			<input type="checkbox"/>	<input type="checkbox"/>	
TIME STARTED	a.m.	p.m.	<input type="checkbox"/>	<input type="checkbox"/>	
TIME FINISHED	a.m.	p.m.	<input type="checkbox"/>	<input type="checkbox"/>	
PERMIT EXPIRES	DATE	TIME	<input type="checkbox"/>	<input type="checkbox"/>	
		a.m.	<input type="checkbox"/>	<input type="checkbox"/>	
		p.m.	<input type="checkbox"/>	<input type="checkbox"/>	
Fire watch signoff: work area and all adjacent areas to which sparks and heat might have spread were inspected during the watch period and were found fire safe.			<input type="checkbox"/>	<input type="checkbox"/>	
Signed:					
EH&S Approval: I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for work.					
Signed:					

Required Precautions Checklist

Fire suppression sprinklers, fire hoses or fire extinguishers are available.

Hot work equipment is operable and in good repair.

Smoke / fire detectors in the immediate area of the hot work have been temporarily disabled until the hot work is complete.

Building occupants have been protected or isolated from the hot work area.

Drums, barrels and tanks have been cleaned and purged of flammables and toxics, all tank feeds are closed, and the tank is vented.

Requirements within 35 feet

Area within 35 feet of the work area has been properly swept to remove any combustible debris.

Flammable and ignitable materials and debris have been moved at least 35 feet from the hot work area or covered and protected with fire resistant materials.

Cracks or holes in floors, walls and ceilings (including ductwork) are covered or plugged.

Combustible floors covered with fire-resistive material.

Requirements within 50 feet

Explosives, compressed gas cylinders or stored fuel have been moved at least 50 feet from the hot work area or have been protected from the hot work.

Work on walls or Ceilings

Construction is noncombustible and has no combustible covering or insulation.

Areas adjacent to walls being worked on are checked for combustibles and any combustibles are either removed or protected.

Fire watch/hot work area

Fire watch will be provided during and for thirty (30) minutes after work, including any break activity.

Fire watch is supplied with suitable extinguishers, and where practical, a charged small hose.

Fire watch is trained in use of equipment and in sounding alarm.

Fire watch may be required in adjoining areas, above and below.

Upon completion of the fire watch, the attendant must sign the hot work permit indicating the hot work is complete.

As a precautionary measure, it is recommended the hot work area be inspected again at the end of the shift to ensure fire hazards or potential fires are properly handled.

Other precautions taken:

Appendix B – Hot Work Warning Sign



WARNING!

HOT WORK IN PROGRESS

Watch for fire!

In case of emergency:

Call: 910.521.6235
 Campus police
 Or
 911

WARNING!

Think smart before you start.



**ENVIRONMENTAL HEALTH
AND SAFETY**

UNIVERSITY OF NORTH CAROLINA PEBBROKE