Environmental Health and Safety

Welding, Burning and Cutting Program
Pursuant to 29 CFR § 1910 Subpart Q and 29 CFR §1926 Subpart J

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Purpose and application

This program details the process required to obtain and complete a hot work permit to perform hot work – welding, burning, and cutting – activities at the Arizona State University. These procedures have been established to prevent accidental fires, loss of life, injury from exposure to sparks, heat, or flames, and/or property loss. The hazards associated with hot work can be reduced through the implementation of an effective control program.

The purpose of this program is to provide guidelines for open flame activities and to establish a permit process for these activities on campus. The intention of this program is to create a self-policing system of safe work practice verification.

The scope of this program covers all hot work activities performed by ASU employees and other employees who are under the supervision and direction of ASU employees. This includes Facilities Management, or FM, employees, individual department renovations, and construction personnel, and outside contractor personnel.

Introduction

Arizona State University’s academic and research laboratories along with other operations including Facilities Management and outside contractors are often involved in operations involving hot work, including welding, cutting, brazing or similar operations such as use of open torch during daily activities.

ASU’s Department of Environmental Health and Safety, or EHS is responsible for coordinating an effective Fire Safety Management program for university facilities. The primary objective is to ensure the safety of the ASU Community, protect human health and the environment, and ensure compliance with local, state, and federal regulations and all applicable university policies. Hot work, or HW, operations may create hazardous conditions and fire danger. To adequately address potential hazards, all personnel involved in HW operations must follow this guideline and adhere to the programs linked from this document. This will help ensure compliance with applicable codes and regulations, and promote a safe environment.

Overview of requirements

Fire protection and prevention

It is the responsibility of each employee supervisor to ensure that all employees involved in welding, cutting and all other HW activities adhere to all protection and prevention procedures.
1. Remove all other sources of ignition and combustible and flammable materials from the work area/hazard zone, defined as within 35 feet from the HW. If all fire hazards cannot be removed, then appropriate barriers or shielding such as welding blankets shall be provided to prevent sparks, slag, or heat from igniting the flammable and combustible materials. All use of flammable and combustible solvents must be stopped or moved a minimum of 35 feet away from all ignition sources.

2. A fire watch shall be provided during HW activities and shall continue for a minimum of 30 minutes after the conclusion of the operation. Individuals designated for the fire watch shall have fire-extinguishing equipment readily available and must be trained in use and capabilities of such equipment.

3. All HW must be performed under a permit unless the work occurs in a “Designated Hot Work Area” as identified in the ASU Welding Safety Program.

4. All contractors involved in HW must complete a Service Provider Acknowledgement Agreement and comply with its requirements. All contractors must obtain a Hot Work Permit from CPMG as described in CPMG’s Building Permit Process by completing an Application for Building Permit and checking the Hot Work Permit box.

5. Hot work associated with routine maintenance conducted by ASU Facilities Development and Management, or FDM, personnel shall be conducted as identified in the FDM Hot Work Permit Procedure

**Hot work area**
The area that will be exposed to sparks, hot slag, radiant or convective heat as a result of the HW must be inspected prior to starting work to ensure the following:

1. Proper safety precautions/measures are taken to prevent fire danger. Inspection must confirm the HW area is free of debris and that flammable liquids or vapors, lint, dust, or combustible materials/storage are not at risk of ignition from sparks or hot metal.

2. Openings or cracks in walls, floors, ducts or shafts must be tightly covered to prevent passage of sparks or slag.

3. A minimum of 2-A, 20BC fire extinguisher must be readily available – contractors must provide their own fire extinguishers which must be compliant with NFPA standard.
4. Designated Hot Work areas as identified in the ASU Welding Safety Program must be registered with EHS and submit a quarterly self-inspection form to EHS.

Hot work equipment
Hot work equipment includes but not limited to, oxygen/fuel gas welding and cutting, ARC welding and cutting, and metal cutting equipment.

1. HW equipment must be inspected by the operator prior to use.
2. Portable oxygen/fuel gas welding and cutting equipment located inside of a building must be stored in a well-ventilated dry location at least 20 feet from combustible materials and away from elevators, stairs, or means of egress.
3. Emergency disconnects must be provided, e.g., a switch or circuit breaker must be provided to ARC welding equipment – the electrical disconnect shall be labeled "Emergency Disconnect" and must be visible.

Health and Safety protection and ventilation
Engineering controls for prevention of contamination and exposure control must be established for each work area as follows:

1. The materials used to perform HW have the potential of producing airborne contaminants that may potentially expose those involved with or near the HW. Safety Data Sheets on all products used for operation should be reviewed by all affected personnel and must be immediately available and provided to any employee requesting them.
2. The dimension of the space vertically or horizontally may confine movement of operation or restrict egress. All personnel involved in HW must identify emergency egress procedures.
3. Forced air ventilation is required in locations where mechanical ventilation is not in place.
4. HW activity in enclosed areas not designed for human occupancy must be conducted in accordance with the ASU Confined Space Entry Policy [EHS102]. HW conducted in confined spaces must follow the ventilation requirements in 29 CFR 1910. 254 (c)(4).
Responsibilities

**Environmental Health and Safety**
- Audit HW permits and procedures on a periodic basis
- Contact lead or supervisor to obtain more specific information about HW activities, or visit the work site, as deemed necessary.
- Coordinate and or conduct welding, burning, and cutting training.
- Serve as a technical resource for fire prevention issues.
- Stop HW activities that do not have a proper permit on display.

**ASU Fire Marshal office**
- Contact lead person or supervisor to obtain more specific information about HW activities, or visit the work site, as deemed necessary.
- Performs review for all HW permits for all HW activities for all new construction and renovation activities occurring on campus.
- Serve as a technical resource for fire prevention issues.
- Stop HW activities that do not have a proper permit on display.

**ASU Employees**
- Follow all warning signs, barricades, and barriers posted around HW activities
- Immediately report any signs of smoldering flames.

**Capital Programs Management Group and Facilities Management**
- Complete required HW permit request form when necessary.
- Ensure that all contractors, both general and sub, post permits for the duration of the HW DL.WG.CPMG.BCSS@exchange.asu.edu.
- Ensure that fire protection and extinguishing equipment is available at the site at least 48 hours before starting the job.
- Ensure that the contractor is performing the required minimum fire watch.
- For new construction activities and renovation projects, assist EHS in the intent of this program.
- Maintain documentation of current and cancelled permits.
- Manage all designated HW areas in accordance with this procedure.
- Manage the Routine Maintenance Hot Work Program identified in Appendix D.
- Provide copy of contractor's HW or welding safety program to the ASU Fire Marshal Office for review.
Academic departments

- Assist EHS in the intent of this program.
- Attend required initial and refresher Welding Safety training.
- Be responsible for the safe handling and use of heating, cutting, welding, or grinding equipment.
- Complete required HW permit request form and obtain permit before initiating work.
- Ensure that a Fire Watch has been assigned.
- Ensure that equipment used is in proper working condition.
- Ensure that the fire protection system within buildings is available at the site at least 48 hours before starting the job.
- Ensure that workers performing HW are trained and know the procedures that apply to the specific work or task being performed.
- Maintain documentation of current and cancelled permits.
- Post permits for the duration of the HW.
- Review the work location to determine if combustible materials, hazardous atmospheres, or hazardous materials are present in the work area.
- Reviewed and inspected by EHS Fire Marshall.
- Use appropriate PPE while performing HW such as welding helmets, gloves, jackets, etc.
- Work areas where HW is performed on a continual or on-going basis may be permitted for this work on a yearly basis. These designated fixed HW areas must be maintained free of combustible materials at all times, and must be inspected periodically to assure that the area is safe for HW to continue.

Fire watch for welding activities

- Be aware of the inherent hazards involved in HW.
- Be familiar with the surrounding facilities to sound an alarm in the event of a fire.
- Be trained in campus fire safety procedures and the use of fire extinguishing equipment.
- Contractors must provide their own fire extinguishers which must be compliant with NFPA standard.
- Ensure that any covers from sprinkler heads are immediately removed upon completion of the HW. Sprinkler heads cannot be covered after work hours and must be removed.
- Ensure that appropriate fire extinguishers are readily available at the job site
- Ensure that no condition arises, or action is taken, that will lead to a hazardous situation in the HW area
- Ensure that safe conditions are maintained during the HW.
- Have access to at least a 2-A, 20BC twenty (20) pound ABC fire extinguisher at all times.
- Have means of emergency communication to ASU Police Department.
• Know how to report a fire or other emergency situation.
• Must remain in a location that allows immediate communication with the individual(s) performing HW.
• Must remain in the work area after work is completed to ensure the risk of fire from HW has passed, minimum of thirty (30) minutes.
• Return the completed HW permit to file.
• The Fire Watch may only be performed by an individual who is not performing any other duties that would take attention away from the area where the HW is performed.
• Using appropriate Personal Protective Equipment, or PPE.
• Watch for fires in all exposed areas for a minimum of thirty (30) minutes – including lunch and break times – sound the alarm if necessary, and try to extinguish fires only when obviously within the capability of the equipment available.

Permits
A Hot Work Permit application submitted with welder’s photo identification is required when performing HW involving welding, cutting, use of an open torch, brazing or other similar operations on campus. These documents are required from all contractors including campus facilities departments. Contact ASU’s Fire Safety and Prevention before beginning any cutting and welding. Their website, cfo.asu.edu/ehs-hot-work-welding, contains cutting and welding compliance guidelines.

All current and completed HW permits must be retained in department records for a minimum of 180 days for construction projects and one (1) year for ASU Shops.

• After completing the form submit two copies of plans, if applicable, to CPMG Mail Code 5512 or scan and email to DL.WG.CPMG.BCSS.
• After the work under the permit is completed and the Fire Watch has been completed, send a copy of the completed permit to CPMG and EHS and file a copy of the permit in your own department records.
• All CPMG Project Managers and ASU Facilities Management Project Coordinators supervising general contractors intending to perform HW activities must also complete an HW permit and submit for review and approval.
• Go to the EHS web site (https://cfo.asu.edu/fdm-forms) and click on “Application for Building Permit”, located at the top of the web page. Open the word document and check the “Hot Work” box in the Permit Type field.
• Once the HW has been stopped, finished, or completed, perform a Fire Watch for at least thirty (30) minutes after hot work activity has been completed.
• Post the signed and approved hot work permit in the vicinity of where the HW will be performed and for the duration of the HW activity. Permits must be posted at the job site in an accessible and conspicuous location. Job site trailers are an acceptable location.
• Print out or type in the applicable information on the form. Do not leave any spaces blank.
Additional hot work permit requirements for pipe welding

- Comply with ASME code on major renovation and new construction for building service piping, welding on main steam, condensate and chilled water.
- Notify Asbestos Review if any pipe insulation is to be removed for welding activity
- Provide a 2nd spotter and fire extinguisher on site.
- Special Inspector to inspect pipe welding.

Additional hot work permit requirements for structural welding

- Comply with ANSI/AWS Structural Welding Code.
- Provide a 2nd spotter and fire extinguisher on site.
- Special Inspector to inspect structural weld quality and profile.

Art studios theater shops and machine shops

HW activities that are conducted in designated shop areas require an annual inspection and annual permit. HW done outside of the shop and in or near any facility must go through the CPMG permit process unless otherwise approved by the ASU Fire Marshal. All current and completed HW permits must be retained in department records for one (1) year for ASU Shops.

A Hot work permit will not be issued if the following conditions exist:

- All wall and floor openings are open and not covered.
- An explosive atmosphere exists. Use air-monitoring equipment to determine safe levels of combustible gases and vapors.
- Appropriate fire extinguisher is not immediately available for use.
- Combustible or flammable materials are within thirty-five (35) feet and cannot be moved or protected from ignition sparks.
- Cutting or welding on pipes or other metals conducts enough heat to ignite combustible materials located nearby.
- Fire Watch personnel performing other duties.
- Sprinkler protection is impaired. Contact the Facilities Management Plumbing Shop for assistance.
- Sprinklers, hose streams, and extinguishers are not in service and inoperable. Contact the Facilities Management Plumbing Shop for assistance.
- Work is not covered underneath by a fire-resistant tarpaulin or similar material.

Designated hot work areas

A designated HW area may be established where HW activities are occurring frequently and conditions are maintained in compliance with this program. The designated HW area is exempt from the requirements to obtain a permit each time HW is done. Each HW area must register with EHS as either a laboratory or other location storing and using...
hazardous materials and must complete the Safety Hot Work Checklist identified in Appendix C monthly and maintain copies for at least one (1) year for review by EHS during planned and unannounced inspections.

**Compressed gas cylinders or CGCs**


Confined Space Entry Program Compressed gas cylinders have inherent dangers aside from using them in HW activities. The handling and storage of compressed gas cylinders must be undertaken with great care. A primary danger of oxygen-fuel gas welding operations stems from welding with CGC’s containing oxygen and acetylene. If CGC’s are damaged, gas can escape with tremendous force and the vessel itself can explode, causing severe injuries.

**Handling**

- CGC's should be inspected before using to check for leaking, corrosion, cracking, burn marks, contaminated valves, worn hoses and faulty connectors, or broken gauges. If any defective condition is discovered, the CGC should not be used.
- Cylinder carts equipped with cylinder restraints such as a chain or strap should be used for transporting and while using CGC's. Never drop cylinders or let items fall on them.
- Cylinders should be secured in the upright position to prevent tipping.
- Do not accept delivery of acetylene CGC's that arrive in the horizontal position. Transporting cylinders in this manner makes them much more susceptible to explosion.
- Never open valves until regulators are drained of gas and pressure adjusting devices are released. When opening CGC's, point outlets away from people and sources of ignition and open valves slowly. On valves without handle wheels, use only supplier recommended wrenches. On valves with handle wheels, never use wrenches. Never use a hammer to turn a handle wheel open or closed.
- Regulators must be compatible with the cylinder and its content. Many regulators are similar in design and construction, so it is necessary to check the regulator's model number and compare it with the cylinder's requirements to ensure compatibility.
- When cylinders are empty, close and return them. Empty CGC's must be marked MT or Empty.
Storage

- Check the manufacturer's model number and compare it with the gas supplier's requirements and with the gas cylinder.
- Cylinder carts must be used to transport cylinders from location to location.
- Cylinders must be secured from tipping and secured in an upright position while in use. The cylinder must be braced from tipping over by placing a strap or chain around the top third of the cylinder.
- Empty or unused gas cylinders must be promptly returned to the supplier.
- Gas cylinders and welding equipment must be left outside the work space where the work was performed. Examples of such locations include boilers, tanks, or pressure vessels.
- Heavy portable equipment mounted on wheels must be securely blocked to prevent movement.
- Oxygen and acetylene must be stored at least twenty (20) feet apart and separated by a non-combustible wall at least five (5) feet in height.
- Oxygen and fuel gas cylinders must be stored separately with protective valves in place.
- Protective valve caps should be in place on the CGC when it is placed into storage. This will reduce the likelihood that a blow to the valve will result in leakage.
- Regulators must be compatible with the CGC and designed for the appropriate cylinder.
- When stored, CGC's should be arranged in such a way that old stock will be used before new stock.

Confined spaces

- Avoid bringing hot work into non-permit required confined spaces. If HW hazards are introduced into these spaces, the status of the space will change and a permit will be required to enter these spaces.
- De-energize electrode holders by electronically disconnecting the power supply when arc welding is to be suspended for an appreciable amount of time or when the welder must leave the job.
- Ensure that available ventilation in the confined space meets the ventilation requirements.
- Keep all gas cylinders and welding machines outside of confined spaces.
- Positively isolate the gas supply outside the confined space when torches are not in use for a substantial period of time (such as during lunch). When practical, employees should remove torches and hoses from confined spaces.
- When performing HW in confined spaces, employees must comply with ASU’s Confined Space Entry Program at asu.edu/ehs/documents/asu-confined-space-entry-plan.pdf.

Engineering controls

Ventilation should be adequate, depending on volume and configuration of space, number
and type of operations that are generating contaminants, natural air flow rate where operations are taking place, location of the welding breathing zone, and whether ventilation can be obtained mechanically or naturally. Minimum ventilation for welding requires: (1) a minimum of 2000 cubic feet per minute per welder as general ventilation, or (2) local exhaust ventilation (at the point of contaminant generation) of 100 linear feet per minute (29 CFR § 1910.252).

**Ventilation and atmospheric testing**

Ventilation techniques for welding operations vary depending on size and type. For basic operations, fans will provide enough ventilation. However, ventilation should never be relied on as the only method of protecting employees when it is suspected that air contaminants are present. Where ventilation is poor, respirator use should be evaluated before HW activities commence. Ventilation of the space where HW is going to occur should be evaluated based on the guidelines provided below:

- Atmospheric testing and monitoring for combustible gases and vapors must always be conducted inside a confined space before work commences and at regular and predetermined intervals thereafter. Contact EHS for additional assistance.
- HW should not be conducted in the presence of explosive mixtures of flammable gases, vapors, liquids, or dusts or where explosive mixtures could develop inside improperly prepared tanks or equipment.
- While working in poorly ventilated spaces, exposure to air contaminants generated by welding or cutting must be controlled by ventilation, respiratory protection, or by a combination of the two.

**Fire watch**

- A Fire Watch is required whenever welding or cutting is performed in locations where an incipient stage fire might develop. Appreciable combustible materials are closer than thirty-five (35) feet to the point of operation.
- Appreciable combustibles are present which can be ignited by sparks.
- 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.
- Wall or floor openings within a thirty-five (35) feet radius exposure to combustible materials in adjacent areas including concealed spaces in walls or floors.

A fire watch must be maintained for a minimum of **30 minutes** after completion of HW to detect and extinguish smoldering fires. Suitable fire extinguishing equipment must be maintained and be ready for use while welding, cutting, and burning activities are performed and during the fire watch.

**Warning signs, barricades, and barriers**

In order to control traffic, barriers and proper signs must be posted to ensure traffic is prevented from exposure to HW areas. Shields must be used to prevent exposure to sparks and flashes. A clear path to an exit of at least forty-four (44) inches must be maintained at all times. Whenever possible, vehicular traffic should be kept out of HW areas while work is in progress.
**Isolation of fire detection systems**
Fire detection equipment must be protected from false activation and damage. If HW impacts the fire detection system, the FM Building Systems Technicians must be notified for proper instructions to deactivate, disable, or take off line any devices in the impacted area. Work must not proceed until the FM Building Systems Technician confirms the deactivation of the impacted fire alarm devices. Minimal impairment of the fire detection systems must be maintained at all times. Project Manager (PM), tradesmen, and contractors must ensure fire detection systems are isolated where hot work is being performed, as appropriate.

**Personal Protective Equipment or PPE**
The following PPE must be used to protect the employee from physical hazards while performing HW:
- Flame-resistant gloves must be worn to protect the hands during HW activities.
- Goggles and/or safety glasses must be worn to protect the eyes.
- Protective clothing must be worn to cover all body parts and to protect against ultraviolet and infrared flash burns.
- Welding helmets must be worn to protect the face and to protect users from arc rays, welding sparks, and splatters.

**Training requirements**
All employees intending to perform HW activities must attend the following training:
- Initial Welding Safety, or Hot Work, training.
- Refresher training every three years.

Employees are also required to attend training when a new process or equipment has been obtained, when an unsafe act has been observed, or when the supervisor feels that retraining is necessary. Training is required when employees are first hired and every three years for refresher training.

Welding Safety training includes the following topics:
- Compressed gas cylinder safety.
- Fire precautions.
- Fire watch.
- Handling and storage of welding materials.
- Hazard control.
- Hot work procedures, including how to obtain the written hot work permit.
- Physical and chemical hazards.
- PPE selection and use.
- Proper equipment operation.

Confined space training is required when the work necessitates confined space entry. Documentation of all training is required. Welding Safety, or Hot Work, training sessions are available through the EHS website at [https://cfo.asu.edu/ehs-training](https://cfo.asu.edu/ehs-training). Depending on the
need, individual department training sessions may also be conducted by contacting EHS.

**Information and external references**

- **American National Standard Institute (ANSI) ANSI Z49.1: Safety in Welding, Cutting and Allied Process.**
- **Arizona Administrative Code R4-36-201 et seq.**
- **ASU Compressed Gas Safety Plan** 
- **ASU Confined Space Entry Program** asu.edu/ehs/documents/asu-confined-space-entry-plan.pdf.
- **ASU Facilities Building Permit and Inspection Requirements** cfo.asu.edu/fdm-forms.
- **ASU Hot Work Operations/Cutting and Welding Compliance Guidelines** cfo.asu.edu/ehs-hot-work-welding.
- **International Building Code, or IBC.**
- **International Fire Code, or IFC.**
- **National Fire Protection Association, or NFPA, Standard.**
- **Occupational Health and Safety Administration (OSHA) 29 CFR § 1910 Subpart Q.**
- **Occupational Health and Safety Administration (OSHA) 29 CFR § 1926 Subpart J.**
- **Structural Welding Code D1.1/D1.1M (2006).**
Definitions

**Brazing and soldering** – Soldering and brazing uses 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.

**Combustible materials** – Solid materials that are capable of burning and igniting.

**Confined space** – A space that has all of the following characteristics:
   1. It is large enough and so configured that a person can bodily enter; and
   2. It has limited or restricted means for entry or exit; and
   3. It is not designed for continuous occupancy.

Confined spaces can be classified into two categories:
   - Low-hazard non-permit required confined space.
   - High-hazard permit-required confined space.

Low-hazard confined spaces are those confined spaces that do not contain or have the potential to contain any atmospheric or other hazards capable of causing death or serious physical harm. A low-hazard confined space may become a high-hazard confined space if there are hazardous materials brought into the space or if hazardous activities (such as welding, brazing, or cutting) are conducted in the space.

Permit-required confined spaces are those spaces that contain high hazards and are based on their inherent hazard potential. For a high-hazard permit-required confined space, an entry permit is used to ensure proper hazard evaluation, safe entry, safe work and safe exit. See Section 5.4 for additional information on confined spaces.

**Cutting** – Any process, including grinding, which produces sparks capable of igniting combustible or flammable materials and transmits heat to the work material from a hot gas.

**ASU Fire Marshal Office** – Also known as ASUFMO. At ASU campuses, the State Fire Marshal’s office has delegated the designated ASUFMO as the Authority Having Jurisdiction for plan review and construction inspections. The ASUFMO also has the responsibility and authority to enforce State Fire Marshal regulations and requirements on campus.

**Designated hot work area** – A room or other enclosed location designated for the purpose of hot work and registered with EHS as a laboratory or for storage of hazardous materials.

**Fire watch for welding activities** – At least one individual dedicated solely to the look out and control of stray fires.
**Flammable compressed gas** - Flammable compressed gases have dangers besides high pressure. These gases can easily catch fire and burn rapidly. These include acetylene, hydrogen, natural gas and propane.

**Flammable materials** – Solid or liquid materials that are capable of igniting at a low temperature and continuing to burn.

**Grinding** – See the definition for Cutting.

**Hot work** – Operations such as welding, cutting, burning, heating, grinding, or similar spark, slag, or intense heat producing activities that are capable of igniting combustible materials or flammable atmospheres or providing a source of ignition for a fire. Also defined as cutting and welding operations for construction/demolition activities that involve the use of portable gas or arc welding equipment, open flame or spark-producing apparatus.

**Hot work permit** – A hot work permit is the means by which Capital Programs Management Group, or CPMG, and EHS can stay aware and keep track of construction and all other activities that involve hot work. EHS also provides a step-by-step checklist for hot work fire safety and serves as a reminder to contractors of their fire prevention responsibilities before, during, and after any hot work is conducted. The permit system is intended to educate the parties involved in construction of these hazards to implement control measures to help mitigate them.

**New construction** – New work that is comprised of structural and mechanical work creating new buildings. The following are the types of hot work anticipated for new construction:

- General activities hot work: All other cutting/welding for equipment/building component installations – handrails, guardrails, specialties, and ornamental metal and HVAC equipment installations.
- Mechanical work: Tunnel services connections, building system installations, HVAC equipment installations.
- Structural hot work: Cutting/welding reinforcing steel and structural steel for all of the project’s structural work (tunnels construction, building super-structure, site work).

**Nonflammable compressed gas** - These types of gases do not catch fire easily or burn quickly, but will eventually burn and possess other dangers. The cylinder label and Material Safety Data Sheet, or MSDS, will describe the toxic properties and physical hazards posed by specific nonflammable compressed gases. These include: ammonia, argon, carbon dioxide, nitrogen, oxygen, chlorine, and nitrous oxide. Symptoms of exposure include dizziness, unconsciousness, or suffocation under certain circumstances. They can also be harmful if inhaled, and can cause irritation to the eyes, nose, throat, and lungs.

**Renovations and remolds** - New work that takes place in an existing building. The following are the types of hot work anticipated for renovations/remodels:

- Demolition hot work: Dismantling built-in equipment, removal of discontinued/abandoned services, new services tie-ins, building system
installations/modifications.

- General hot work activities: All other cutting/welding for equipment/building component installations (handrails, guardrails, specialties, and ornamental metal).
- Mechanical hot work: Removal of discontinued/abandoned services, new services tie-ins, building system installation/modifications.

**Shielding** – Non-combustible welding drapes, used in hot work areas. Visible signs should be displayed on shielding while hot work is being performed.

**Shop** - Any area designed as a shop or work area for any type of “hot work” that is not related to construction or renovation projects (i.e., welding shops, areas and equipment utilizing grinding tools, torches, etc…that may cause sparks, fire or hazardous vapors or fumes).

**Smoldering** – A slow combustion of material without visible light and generally evidenced by smoke and an increase in temperature.

**Soldering** - Soldering uses metals with a melting point below 800 degrees Fahrenheit. Soldering is commonly used to join electrical, electronic, and other small metal parts.

**Thawing pipe** – Devices for thawing the frozen fluid in pipes or pipes having the means for preventing the fluid from freezing or the pipe from bursting when the fluid freezes.

**Torch operations** – A plasma torch is used as an advanced tool for welding and cutting operations. Intense ultraviolet radiation, high noise levels, and gases are generated during this process.

**Welding** – Welding is the most common way of permanently joining metal parts. In this process, heat is **applied** to metal pieces, melting and fusing them to form a permanent bond. The following lists the most commonly practiced forms of welding:

- **Arc Welding** – The act of joining or cutting metals by generating heat from an electric arc that extends between the welding electrode and the electrode placed on the equipment being welded.
- **Resistance Welding** – The act of joining or cutting metals by generating heat through resistance created by the flow of an electric current.
Appendix B
CPMG Building Permit Application
# Building Permit Application

Arizona State University  
Facilities Development and Management  
CPMG – Construction Support Services

|--------------|----------------|----------------|---------------------|--------------|---------------------|-------------------------------|-------------------------|----------------|-----------|

*Polytechnic Building Demos require URED Approval*

Attach 2 copies of plans and deliver to CPMG, MC 5512 or scan and email to DL.WG.CPMG. BCSS. ASU’s Permit and Inspection Requirements are available at: [cfo.asu.edu/fdm-bldg-permit-requirements](http://cfo.asu.edu/fdm-bldg-permit-requirements).

### Project Information

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<th>Request Date:</th>
<th>Build #:</th>
<th>Room(s):</th>
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<td>Bldg Name/Area:</td>
<td>ASU Project#:</td>
<td>Current Use of Area:</td>
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<td>Work Order#:</td>
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<td>Project Scope:</td>
<td>Completion Date:</td>
<td>If remodeled area is a lab, provide lab details.</td>
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### Occupancy Information

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<th>Occupancy to be Changed?</th>
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<th>Construction Type:</th>
<th>Sprinklered:</th>
<th>Yes</th>
<th>Partial</th>
</tr>
</thead>
</table>

### Demolition

If project is a demolition, will demo consist of wrecking any load-supporting structural member? Yes

Deliver NESHAP Notification to CSS.

### Dust Control

Is construction activity a dust generating activity that disturbs surface area of 1/10 acre or more? Yes

Deliver Dust Control Plan and Permit to CSS.

### Stormwater

Will construction activities (clearing, grading, excavating, stockpiling) result in land disturbance equal to or greater than one or more acres of land or will construction activities disturb less than one acre of land that is part of a larger common plan of development that will ultimately disturb one or more acres? Yes

Deliver Stormwater documents to CSS.

### Applicant Information

<table>
<thead>
<tr>
<th>Project Manager:</th>
<th>Phone:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requesting Dept Contact:</td>
<td>Phone:</td>
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### Contractor Information

<table>
<thead>
<tr>
<th>Company Name:</th>
<th>ROC#:</th>
<th>Phone:</th>
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<tbody>
<tr>
<td>Superintendent Name:</td>
<td>Email:</td>
<td>Phone:</td>
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### CSS Use Only

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<tr>
<th>ADA Code Review</th>
<th>Asbestos Services</th>
<th>Building Code Review</th>
<th>EHS – Fire Safety</th>
<th>EHS – Lab Safety/Biosafety</th>
<th>Health Services</th>
<th>Approved by CSS</th>
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### Plan Review Notification

<table>
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<tr>
<th>ASU Police</th>
<th>Parking and Transit</th>
<th>University Facilities Records Mgmt</th>
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<tr>
<td>Blue Stake/Drainage</td>
<td>Office of the University Architect</td>
<td>UTO-Ops Design/OPS Network Com</td>
</tr>
<tr>
<td>Facman</td>
<td>University Business Services</td>
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</tr>
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</table>
Appendix C

Hot Work Safety Check List
Hot work safety checklist

☐ A fully operational (2A:20BC minimum) rated fire extinguishers are operable and available with 30 feet of hot work area.

☐ Exposed construction is of noncombustible materials or, if combustible, then protected.

☐ Fire watch is assigned.

☐ Floors are kept clean.

☐ Hot work equipment to be used shall be in satisfactory operating condition and in good repair.

☐ Hot work permit application has been submitted for hot work conducted by contractors if applicable.

☐ Hot work permit application has been submitted for hot work conducted by ASU faculty/staff/students who conduct hot work activities outside the assign shop area where applicable.

☐ Hot work site is clear of combustibles or combustibles are protected.

☐ No exposed combustibles are located on the opposite side of partitions, walls, ceilings or floors.

Note: Protected means a fire-retardant treated material or other non-combustible, fire retardant treated barrier separates the hot work from any exposures to combustible material.

Any questions contact the ASU Fire Marshal at asufire@asu.edu or call at 480.965.1823 and ask for the ASU Fire Marshal.

Information on check list derived from:

- 2003 International Fire Code: Section 2604.3.1.
- ASU Building Permit and Inspection Requirements cfo.asu.edu/fdm-bldg-permit-requirements#typesBuildingPermit
Appendix D

Facilities Development and Management

Hot Work Procedure
IAW 29CFR1910, Subpart Q
**General definitions**

Hot Work - Work involving burning, welding, or a similar operation that is capable of initiating fires or explosions.

Designated Area - A permanent location designed or approved for hot work operations.

Management - For the purpose of hot work, all persons, including owners, contractors, educators, and so on, who are responsible for hot work operations.

Permit - A document issued by the authority having jurisdiction for the purpose of authorizing performance of a specified activity.

Permit Authorizing Individual, or PAI - The individual designated by management to authorize hot work.

Welding and Allied Processes - Processes such as arc welding, oxy–fuel gas welding, open-flame soldering, brazing, thermal spraying, oxygen cutting, and arc cutting.

**Application**

This procedure shall apply to the following hot work processes:

- Grinding.
- Heat treating.
- Hot riveting.
- Powder-driven fasteners.
- Similar applications producing a spark, flame, or heat.
- Thawing pipe.
- Torch-applied roofing in conjunction with the requirements of NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- Welding and allied processes.

**Permanent FDM shop designated locations**

FDM departments that perform hot work on a routine basis in a permanent FDM Shop or other designated work site will be exempt from the above permit requirements only if the area is inspected, approved and issued a permit by the designated Hot Work Coordinator (FSM) or ASU Fire Marshal’s Office. These permits must be renewed on a yearly basis – old permits should be kept in file for 5 years – or when changes in the shop
warrant a repeat inspection. When approved by the inspector a sign will be posted at the work site that reads "Hot Work Approved Area". The FSM will re-inspect these areas during his or her annual fire and/or shop inspection of the approved area. Any deficiencies to the designated hot work area or shop must be corrected to continue the designation of "Hot Work Approved Area.

**Basic precautions**

For elaboration of these basic precautions as well as a delineation of the fire protection and prevention responsibilities of welders and cutters, their supervisors – including outside contractors – and those in management on whose property cutting and welding is to be performed, see, Standard for Fire Prevention in Use of Cutting and Welding Processes, NFPA Standard 51B,1962, which is incorporated by reference as specified in Sec. 1910.6. The basic precautions for fire prevention in welding or cutting work are:

**Fire hazards.** If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place.

**Guards.** If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.

**Restrictions.** If the requirements stated in this procedure cannot be followed then welding and cutting shall not be performed.

**Special precautions.** When the nature of the work to be performed falls within the scope of paragraph (a)(1)(ii) of this section certain additional precautions may be necessary:

**Combustible material.** Wherever there are floor openings or cracks in the flooring that cannot be closed, precautions shall be taken so that no readily combustible materials on the floor below will be exposed to sparks which might drop through the floor. The same precautions shall be observed with regard to cracks or holes in walls, open doorways and open or broken windows.

**Fire extinguishers.** Suitable fire extinguishing equipment shall be maintained in a state of readiness for instant use. Such equipment may consist of pails of water, buckets of sand, hose or portable extinguishers depending upon the nature and quantity of the combustible material exposed.

**Requirements within 35 feet:**

- Area within 35 feet of the work area has been properly swept to remove any combustible debris.
- Combustible floors covered with fire-resistant material.
- Cracks or holes in floors, walls and ceilings, including ductwork, are covered or plugged.
- 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.

Requirements within 50 feet:

- Areas adjacent to walls being worked on are checked for combustibles and any combustibles are either removed or protected.
- Construction is noncombustible and has no combustible covering or insulation.
- 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.

Work on walls or Ceilings:

- Areas adjacent to walls being worked on are checked for combustibles and any combustibles are either removed or protected.
- Construction is noncombustible and has no combustible covering or insulation.

Fire watch

Fire watchers shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

Appreciable combustible material, in building construction or contents, closer than 35 feet (10.7 m) to the point of operation.

Appreciable combustibles are more than 35 feet (10.7 m) away but are easily ignited by sparks.

Wall or floor openings within a 35-foot (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.

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.

Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fire.
Authorization

Before cutting or welding is permitted, the area shall be inspected by the individual responsible for authorizing cutting and welding operations. He shall designate precautions to be followed in granting authorization to proceed preferably in the form of a written permit.

Floors. Where combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, the floor shall be swept clean for a radius of 35 feet (10.7 m). Combustible floors shall be kept wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock.

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

- In areas not authorized by management.
- In sprinklered buildings while such protection is impaired.

In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.

In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.

Relocation of combustibles. Where practicable, all combustibles shall be relocated at least 35 feet (10.7 m) from the work site. Where relocation is impracticable, combustibles shall be protected with flame proofed covers or otherwise shielded with metal or asbestos guards or curtains.

Ducts. Ducts and conveyor systems that might carry sparks to distant combustibles shall be suitably protected or shut down.

Combustible walls. Where cutting or welding is done near walls, partitions, ceiling or roof of combustible construction, fire-resistant shields or guards shall be provided to prevent ignition.

Noncombustible walls. If welding is to be done on a metal wall, partition, ceiling or roof, precautions shall be taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided.
Combustible cover. Welding shall not be attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.

Pipes. 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.

Management. Management shall recognize its responsibility for the safe usage of cutting and welding equipment on its property and:

Based on fire potentials of plant facilities, establish areas for cutting and welding, and establish procedures for cutting and welding, in other areas.

Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.

Insist that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and the safe use of the process.

Advise all contractors about flammable materials or hazardous conditions of which they may not be aware.

The Supervisor:

- Have the work moved to a location free from dangerous combustibles.
- If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustibles properly shielded against ignition.
- See that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding.
- Shall be responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.
- Shall determine that fire protection and extinguishing equipment are properly located at the site.
- Shall determine that the cutter or welder secures his approval that conditions are safe before going ahead.
- Shall determine the combustible materials and hazardous areas present or likely to be present in the work location.
- Shall protect combustibles from ignition by the following:
- Shall secure authorization for the cutting or welding operations from the designated management representative.
- Where fire watches are required, he shall see that they are available at the site.
Fire prevention precautions. Cutting or welding shall be permitted only in areas that are or have been made fire safe. When work cannot be moved practically, as in most construction work, the area shall be made safe by removing combustibles or protecting combustibles from ignition sources.

**Welding or cutting containers**

Used containers. No welding, cutting, or other hot work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. Any pipe lines or connections to the drum or vessel shall be disconnected or blanked.

Venting and purging. All hollow spaces, cavities or containers shall be vented to permit the escape of air or gases before preheating, cutting or welding. Purging with inert gas is recommended.

**Confined spaces**

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.

Torch valve. 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 area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable, the torch and hose shall also be removed from the confined space.

Questions? Contact ASU Environmental Health and Safety at 480-965-1823 or email asuehs@asu.edu.

Revision date 4/27/2022
Hot Work Permit

Issued by: Dan Meraz, EHS, Safety Mgr; _______________________.

Permit Duration: ______ Project ______ Day ______ Week ______ Month

Issued to: Plumbing Shop; Date: 10/28/13; Time: 09:00 hours

Campus: T W P DPC Bldg. /Room: ______________________ / ______________________

Yes / No

____ ____ Cutting or welding permitted in an area that has been made fire safe.
____ ____ All movable fire hazards in the vicinity have been taken to a safe place.
____ ____ Guards used to contain the heat, sparks and slag if fire hazards cannot be removed.
____ ____ Floor or wall openings or cracks, open doorways and windows protected or closed.
____ ____ Fire extinguisher available for instant use.
____ ____ Fire watch in areas where other than a minor fire might develop such as around combustible material.
____ ____ Floors swept clean of combustible material for a radius of 35’.
____ ____ Areas adjacent to walls being worked on are checked for combustibles and any combustibles are either removed or protected.
____ ____ Combustible floors have been kept wet, covered with damp sand or protected by fire resistant shields.
____ ____ Welding/cutting done only in areas authorized by management. No welding/cutting in sprinkled building when sprinklersystem is impaired or in presence of explosive atmosphere, or in area of storage of readily ignitable material.
____ ____ Ducts and conveyor systems that might carry sparks to distant combustibles protected or shutdown.
____ ____ Cutter/welder is trained in safe operation of equipment and the safe use of the process.
____ ____ Any on-site contractors advised about flammable material or hazardous conditions of which they may not be aware.

Welding or Cutting Containers:

____ ____ Container thoroughly cleaned and ventilated;
____ ____ Any pipe lines or connections to containers disconnected or blanked;
____ ____ Warning sign posted to warn other workers of hot metal;
____ ____ Appropriate ventilation provided;
____ ____ When working in confined spaces a permit has been issued as per 1910.146.

When Work Is Completed

____ ____ Work area has been inspected for any fire sources, fire damage, or potential for fire.
____ ____ Reactivated smoke / fire detectors that were disabled because of the hot work.

I verify that the above location has been examined and the necessary precautions have been taken to prevent the outbreak of fire due to Hot Work.

Employee Signature (Issued): ______________________ Date: ______________________ Time: ______________________

Employee Signature (Closed): ______________________ Date: ______________________ Time: ______________________

Supervisor Signature: ______________________ Date: ______________________ Time: ______________________