Environmental Health and Safety
Welding, burning and cutting program

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Purpose

The Welding, Burning and Cutting program is pursuant to 29 CFR § 1910 Subpart Q and 29 CFR § 1926 Subpart J.

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

This program details the process required to obtain and complete a hot work permit to perform these hot work activities at ASU, including welding, burning and cutting. The hazards associated with hot work can be reduced by implementing an effective control program. These procedures have been established to prevent:

- Accidental fires.
- Injury from exposure to sparks, heat or flames.
- Loss of life.
- Property loss.

The scope of this program covers all hot work activities performed by:

- Facilities Development and Management.
- Faculty and research departments.
- Individual department renovation and construction personnel.
- Outside contractor personnel.

This procedure includes, but is not limited to, the following hot work processes:

- Brazing.
- Glassblowing.
- Grinding.
- Heat treating.
- Soldering: Excluding electric soldering irons.
- Sweating pipe.
- Welding and cutting include but are not limited to oxyacetylene, electric arc, etc.

This procedure does not apply to, and is not limited to, the following operations:

- Bunsen burners or hot plates in laboratories.
- Electric soldering irons are used for only small electronics.
- Enclosed heat-producing equipment such as ovens and electric kilns.
- Hand-held electric heat guns.

Introduction

ASU's academic and research laboratories and other operations, including Facilities Development and Management and outside contractors, are often involved in hot work, including welding, cutting, brazing or similar operations such as using an open torch during daily activities.

ASU Environmental Health and Safety 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 operations may create hazardous conditions and fire danger. All personnel involved in hot work operations must follow these guidelines and adhere to the programs linked to this document to address potential hazards adequately. This will help ensure compliance with applicable codes and regulations and promote a safe environment.

Overview of requirements

Fire protection and prevention

Supervisors must ensure that all employees involved in welding, burning, cutting and other hot work activities adhere to all protection and prevention procedures. Remove all other ignition sources and combustible and flammable materials from the work area or hazard zone.

The hazard zone is defined as within 35 feet of the hot work. Appropriate barriers or shielding, such as welding blankets, shall be provided to prevent sparks, slag or heat from igniting the flammable and combustible materials if all fire hazards cannot be removed. All use of flammable and combustible solvents must be stopped or moved at least 35 feet away from all ignition sources.

- A fire watch must be provided during hot work activities and 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 the use and capabilities of such equipment.
- All construction hot work must be performed under an EHS Fire Safety and Prevention Hot Work permit unless the work occurs in a designated hot work area as identified in this program.
- All contractors involved in hot work must complete a Service Provider Acknowledgement Agreement and comply with its requirements. All contractors must obtain a Hot Work Permit from the Capital Programs Management Group, as described in CPMG's Building Permit Process by completing an Application for Building Permit and checking the hot work permit box.
- Hot work associated with routine maintenance personnel shall be conducted by ASU FDM as identified in this program.

Hot work area

The area exposed to sparks, hot slag, radiant or convective heat because of hot work must be inspected before starting work to ensure the following:

- A minimum rating of 2-A, 20BC fire extinguishers must be readily available. Contractors must provide their own fire extinguishers, which must comply with the National Fire Protection Association standards.
    - All fire extinguishers shall be serviced and inspected within the last twelve-month period by a service contractor or trained professional.
- Designated hot work areas, as identified in this program, must be registered with EHS during the initial lab or shop inspection and submit an annual self-inspection form to EHS through the

Chemical Environmental Management System, or CEMS.

- Openings or cracks in walls, floors, ducts or shafts must be tightly covered to prevent passage of sparks or slag.
- Proper safety precautions or measures are taken to prevent fire danger. The inspection must confirm the hot work area is free of debris and that flammable liquids or vapors, lint, dust or combustible materials or storage are not at risk of ignition from sparks or hot metal.

Hot work equipment

Hot work equipment includes, but is not limited to, oxygen or fuel gas welding and cutting, ARC welding and cutting and metal cutting equipment:

- Emergency disconnects must be provided to ARC welding equipment, like a switch or circuit breaker. The electrical disconnect shall be labeled **emergency disconnect** and must be visible.
- Portable oxygen or fuel gas welding and cutting equipment inside 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.
- The operator must inspect hot work equipment before use.

Health and safety protection and ventilation

Engineering controls for the prevention of contamination and exposure control must be established for each work area as follows:

- Forced air ventilation is required when mechanical ventilation is not in place.
- Hot work activity in enclosed areas not designed for human occupancy must follow EHS 102: Confined Space Entry. Hot work conducted in confined spaces must follow the ventilation requirements in 29 CFR 1910. 254 (c)(4).
- The materials used to perform hot work have the potential to produce airborne contaminants.
    - **Note**: These contaminants may expose those involved with or near the hot work. All affected personnel should review safety data sheets on all products used for the operation, and they must be immediately available and provided to any employee requesting them.
- The vertical or horizontal dimensions of the affected space may confine movement of operation or restrict egress. All personnel involved in hot work must identify emergency egress procedures.

Responsibilities

Environmental Health and Safety

EHS is responsible for the following:

- Conducting any accident or incident investigations involving hot work.
- Developing and maintaining the written program, training programs and other resources that can be used by university personnel.
- Evaluating the overall effectiveness of the program periodically and making necessary changes.

- Maintaining centralized training records and inspection reports.
    - Verify that annual self-inspections are completed.
- Performing an initial inspection of designated hot work areas.
- Stopping hot work activities that do not have proper permitting.
- Working with the principal investigator or lab manager to ensure space is registered as a designated hot work area during the initial inspection.

EHS Fire Safety and Prevention

EHS Fire Safety and Prevention is responsible for the following:

- Contact the lead person or supervisor to obtain more specific information about hot work activities and visit the hot work sites to address fire-related issues.
- Reviewing and permitting of hot work permits for hot work activities for all new construction and renovation activities occurring on campus.
- Serving as a technical resource for fire prevention issues.
- Stopping hot work activities that do not display a proper permit.

ASU employees

ASU employees are responsible for the following:

- Assist EHS in the intent of this program including implementing corrective and preventive actions resulting from hot work accidents and incidents.
- Completion of:
    - Hot work safety awareness training annually if supervising or performing hot work.
    - Initial hot work and fire prevention inspection.
    - Space registration and marking designated hot work area during initial consultation.
    - The annual inspection checklist.
- To ensure:
    - A fire watch has been assigned.
    - Fire protection systems within buildings are available at the site 48 hours before starting the job.
    - The equipment used is in proper working condition.

Follow all warning signs, barricades and barriers posted around hot work activities.

- Hot work areas are initially reviewed and inspected by EHS Fire Safety and Prevention.
- Immediately report any signs of smoldering flames.
- Post hot work registration.
- Responsible for safely handling and using heating, cutting, welding or grinding equipment.

Review the work location to determine if combustible materials, hazardous atmospheres or hazardous materials are in the work area. Use appropriate protective equipment, such as welding helmets, gloves, jackets, etc., during hot work.

Capital Programs Management Group and Facilities Management

The CPMG and Facilities Development and Management are responsible for the following:

- Assist EHS in the intent of this program for new construction and renovation projects.
- To ensure:
    - All general and subcontractors post permits for the duration of the hot work.
    - Contractors complete and submit building permits when necessary and verify hot work is included in the permit.
    - The contractor is performing the required minimum fire watch.
- Maintain documentation of current and canceled permits.
- Manage:
    - All designated hot work areas following this procedure.
    - The routine maintenance hot work program.
- Verify contractors have a hot work or welding safety program.

Academic departments

Academic departments are responsible for the following:

- Maintaining documentation of current and canceled permits. Notify EHS of any potential issues.
- Verifying that:
    - Areas where hot work is being conducted are correctly registered.
    - Employees conducting hot work activities complete all the requirements of this program.

Work areas where hot work is performed on a continual or ongoing basis may be permitted annually. These fixed hot work areas must always be maintained free of combustible materials. They must be inspected periodically to ensure the area is safe for hot work.

Fire watch for welding activities

The fire watch is responsible for the following:

- Has a means of emergency communication in the event of a fire or other emergency.
- Is aware of the inherent hazards involved in hot work.
- Is familiar with the surrounding facilities to sound an alarm during a fire.
- Is trained in campus fire safety procedures and the use of fire extinguishing equipment.
- Keeps the complete hot work permit through the completion of the job.
- Knows how to report a fire or other emergency.
- Remain in the work area a minimum of 30 minutes after work is completed to ensure the risk of fire from hot work has passed, 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.
- Remaining in a location that allows immediate communication with the individuals performing the hot work.
- To ensure:
    - All covers from sprinkler heads are immediately removed upon completion of the hot work. Sprinkler heads cannot be covered after work hours, so covers must be removed.
    - Appropriate fire extinguishers are readily available at the job site.
        - Access to at least a 2-A, 20BC 20-pound rated ABC fire extinguisher at all times.

    - No condition arises or action is taken that will lead to a hazardous situation in the hot work area.
    - Safe conditions are maintained during the hot work.
- Uses appropriate personal protective equipment.

Note: 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 hot work is performed.

Permits

A hot work permit application submission, with the welder's photo identification, is required when performing hot work 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 EHS Fire Safety and Prevention before beginning any cutting and welding.

All current and completed hot work permits must be retained in departmental records for a minimum of 180 days for construction projects and one year for ASU shops:

- All CPMG project managers and FDM project coordinators supervising general contractors intending to perform hot work activities must also complete a hot work permit and submit it for review and approval.
- Complete the building permit application.
    - Click on the link located at the top of the web page. Open the document and check the hot work box in the permit type field. Submit hot work permit application to ASUfire@asu.edu for review and permitting.
- Perform a fire watch for at least 30 minutes after completing hot work activity.
- Post the signed and approved hot work permit in the hot work vicinity for the duration of the activity.
- Permits must be posted at the job site in an accessible and conspicuous location. Job site trailers are an acceptable location.
- Print or type all applicable information on the form. Do not leave any spaces blank.
- Send a copy of the completed permit to CPMG and EHS and file a copy in your department records after the work under the permit and the fire watch has been completed.
- Submit and mail two copies of the plans, if applicable, to **CPMG mail code 5512** or scan and email to Construction Support Services after completing the form.

The following are additional hot work permit requirements for pipe welding:

- Comply with the American Society of Mechanical Engineers, or ASME, code on significant renovations and new construction for building service piping or welding on main steam, condensate, and chilled water.
- Notify Asbestos Review if any pipe insulation will be removed for welding activity.
- Provide a second spotter and fire extinguisher on site.
- Utilize a special inspector to inspect pipe welding.

The following are additional hot work permit requirements for structural welding:

- Comply with American National Standards Institute or American Welding Society Structural Welding Code.

- Provide a second spotter and fire extinguisher on site.
- Utilize a special inspector to inspect structural weld quality and profile.

Hot work permit rejection conditions

Hot work permits may be rejected for the following conditions:

- All wall and floor openings are open and not covered.
- An appropriate fire extinguisher is not immediately available for use.
- An explosive atmosphere exists. Use air-monitoring equipment to determine safe levels of combustible gases and vapors.
- Combustible or flammable materials are within 35 feet and cannot be moved or protected from ignition sparks.
- Cutting or welding pipes or other metals conduct enough heat to ignite nearby combustible materials.
- Fire watch personnel are performing other duties.
- Sprinkler protection or fire alarm impairment has not been properly veted is required to prevent false alarms and evacuations. Contact the FDM plumbing shop for assistance.
- Sprinklers, hose streams and extinguishers are not in service inoperable. Contact the FDM plumbing shop for assistance.
- Work is not covered underneath by a fire-resistive tarpaulin or similar material.

Designated hot work areas

A designated hot work area may be established where hot work activities occur frequently and conditions are maintained in compliance with this program. The designated hot work area is exempt from the requirement to obtain a permit each time hot work is done.

Each area conducting hot work must register with EHS during initial consultation as a designated hot work area and complete the Safety Hot Work Checklist identified in Appendix C. Copies must be maintained for at least one year for review by EHS during planned and unannounced inspections.

Art studios, theater shops and machine shops

These areas must be registered as hot work areas, as applicable:

- Hot work activities conducted in designated shop areas require an annual permit renewal, including completion of the yearly inspection.
- Hot work outside designated hot work areas must go through the CPMG permit process unless otherwise approved by Fire Safety and Prevention.

Compressed gas cylinders

Employees must comply with ASU's Compressed Gas Safety Program, including but not limited to performing hot work in confined spaces.

Compressed gas cylinders have inherent dangers in addition to hot work activities. Compressed gas cylinders must be handled and stored with great care. A primary danger of oxygen-fuel gas welding operations stems from welding compressed gas cylinders containing oxygen and acetylene. Gas can

escape with tremendous force if compressed gas cylinders are damaged, and the vessel can explode, causing severe injuries.

Handling

- Close and return cylinders when empty. Empty compressed gas cylinders must be marked **empty**.
- Compressed gas cylinders should be inspected before use and should not be used if any of the following defective conditions are discovered:
    - Broken gauges.
    - Burn marks.
    - Contaminated valves.
    - Corrosion.
    - Cracking.
    - Faulty connectors.
    - Leaking.
    - Worn hoses.
- Cylinder carts equipped with cylinder restraints, such as a chain or strap, should be used for transporting and using compressed gas cylinders. Avoid dropping cylinders or letting items fall on them.
- Cylinders should be secured in an upright position to prevent tipping.
- Do not accept delivery of acetylene compressed gas cylinders that arrive horizontally.
    - Transporting cylinders in this manner makes them much more susceptible to explosion.
- Never open the main valve until regulators are drained of gas and pressure-adjusting devices are released. Point outlets away from people and sources of ignition and open valves slowly when opening compressed gas cylinders.
    - **Note**: Only use the supplier-recommended wrenches on valves without handle wheels. Never use wrenches on valves with handle wheels. Never use a hammer to turn a handle wheel open or closed.
- Regulators must be compatible with the cylinder and its content.
    - **Note**: 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.

Storage

Gas cylinders have the following storage guidelines:

- Check the manufacturer's model number and compare it with the gas supplier's requirements and the compressed gas cylinder.
- Cylinder carts must transport compressed gas cylinders from location to location.
- Compressed gas cylinders must be secured from tipping and secured upright. The cylinder must be braced from tipping over by placing a strap or chain around the top third.
- Empty or unused compressed gas cylinders must be promptly returned to the supplier.
- Heavy portable equipment mounted on wheels must be securely blocked to prevent movement.
- Oxygen and acetylene must be stored at least 20 feet apart or separated by a non-combustible barrier at least five feet in height.
- Oxygen and fuel gas cylinders must be stored separately with protective valves.

- Protective valve caps should be placed on the compressed gas cylinder when stored and transported. This will reduce the likelihood that a blow to the valve will result in leakage.
- Regulators must be compatible with the compressed gas cylinder and designed for the appropriate cylinder.
- Stored compressed gas cylinders should be arranged to use old stock before new stock.

Welding carts

Welding carts have the following guidelines:

- Carts must follow:
  - International Fire Code section 3505.5 is to be kept from the cutting or welding operation, and fire-resistance shields must be provided.
  - International Fire Code section 5003.10.3.
- Compressed gas cylinder valve:
  - Outlet connections must conform to the CGA V-1 requirements.
  - Not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while the cylinders are in service.
  - Must be closed before moving with the cart and when work is finished.
  - Shall be secured to the cart to resist movement.

Confined spaces

Confined spaces have the following guidelines:

- Avoid bringing hot work into non-permit required confined spaces. The status of the space will change, and a permit will be required to enter if hot work hazards are introduced.
- De-energize electrode holders by electronically disconnecting the power supply when arc welding is suspended for an appreciable amount or when the welder must leave the job.
- Employees must comply with ASU's Confined Space Entry Program when performing hot work in confined spaces.
- Ensure that available ventilation in the confined space meets the ventilation requirements.
- Keep all gas cylinders and welding equipment outside of confined spaces. Examples of such locations include boilers, tanks or pressure vessels.
- Positively isolate the gas supply outside the confined space when torches are not used substantially, such as during lunch. Employees should remove torches and hoses from confined spaces when practical.

Engineering and administrative controls

Engineering controls for the prevention of contamination and exposure control must be established for each work area as follows:

- 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. **Contact EHS at 480-965-1823** for assistance.

- Forced air ventilation is required for indoors or confined spaces where mechanical ventilation is not in place.
- Hot work activity in enclosed areas not designed for human occupancy must be conducted following EHS 102: Confined Space Entry. Hot work conducted in confined spaces must follow the ventilation requirements in 29 CFR 1910. 254 (c)(4).
- Hot work should not be conducted in the presence of explosive mixtures of flammable gases, vapors, liquids or dust or where explosive mixtures could develop inside improperly prepared tanks or equipment.

The affected space's vertical or horizontal dimensions may confine the operation's movement or restrict egress. All personnel involved in hot work must identify emergency egress procedures.

The materials used to perform hot work can potentially produce airborne contaminants. These contaminants may potentially expose those involved with or near the hot work. All affected personnel should review all Safety Data Sheets for products used in the operation, and they must be immediately available and provided to any employee requesting them.

Ventilation should be adequate, depending on the:

- Location of the welding breathing zone.
- Natural air flow rate where operations are taking place.
- Number and type of operations that are generating contaminants.
- Whether ventilation can be obtained mechanically or naturally.
- Volume and configuration of space.

Minimum ventilation for welding requires:

- A minimum of 2000 cubic feet per minute per welder as general ventilation.
- Local exhaust ventilation — at the point of contaminant generation — of 100 linear feet per minute.
  per 29 CFR § 1910.252.

Ventilation techniques for welding operations vary depending on size and type. Fans will provide enough ventilation for basic operations. However, ventilation should never be relied on as the only method of protecting employees when suspected air contaminants are present.

Respirator use should be evaluated before hot work activities where poor ventilation or exposure to air contaminants, such as welding or cutting, may be present. Ventilation of the space where hot work will occur should be evaluated based on exposure to air contaminants generated by welding or cutting, respiratory protection, or a combination of the two while working in poorly ventilated spaces.

Fire watch

A fire watch is required whenever welding or cutting is performed and when:

- Appreciable combustible materials are closer than 35 feet to the point of operation and 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.

- In locations where an incipient stage fire might develop.
- Wall or floor openings within a 35-foot radius are exposed to combustible materials in adjacent areas, including spaces on walls or floors.

Note: A fire watch must be maintained for a minimum of 30 minutes after completion of hot work to detect and extinguish smoldering fires. Suitable 2-A, 20BC 20-pound ABC fire extinguishing equipment must be maintained and be ready for use while welding, cutting and burning activities are performed and during fire watch. The fire watch must be trained in the use and operation of portable fire extinguishers.

Warning signs, barricades and barriers

Barriers and proper signs must be posted to ensure traffic is not exposed to hot work areas. Shields must be used to prevent exposure to sparks and flashes. A clear path to an exit of at least 44 inches must always be maintained. Vehicular traffic should be kept out of hot work areas whenever possible while work is in progress.

Isolation of fire detection system

Fire detection equipment must be protected from false activation and damage, including but not limited to:

- Automatic sprinkler systems.
- Fire alarm systems.
- Other suppression or detection systems.

The FDM building systems technicians must be notified of proper instructions to deactivate, disable or take off-line any devices in the impacted areas if hot work impacts the fire detection system. Work must not proceed until the FDM building systems technician confirms the deactivation of the affected fire alarm devices. Minimal impairment of the fire detection systems must always be maintained. The project manager, tradespeople, and contractors must ensure that fire detection systems are isolated from where hot work is performed, as appropriate.

Return all fire detection systems to normal working conditions once hot work activities are complete.

Personal protective equipment

The following PPE must be used to protect the employee from physical hazards while performing hot work:

- Flame-resistant gloves must be worn for hand protection during hot work activities.
- Goggles or safety glasses must be worn for eye protection.
- Protective clothing and boots 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 users from arc rays, welding sparks and splatters.

Training requirements

All employees intending to perform hot work activities must attend the following annual training:

- Annual Fire Safety training.
- Hot work or welding safety training.
- Refresher training.

Employees must also 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.

Welding safety training includes the following topics:

- Compressed gas cylinders 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 PPE selection and use.

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, Hot Work and confined space training are available through the EHS website. The individual department training sessions may also be conducted by contacting EHS depending on need.

Information and external references

- American National Standard Institute, 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 Facilities Building Permit and Inspection Requirements.
- ASU Fire Prevention and Safety Plan.
- ASU Hot Work Operations, Cutting and Welding Compliance Guidelines IFC.
- National Fire Protection Association Standard.
- Occupational Health and Safety Administration 29 CFR § 1910 Subpart Q.
- Occupational Health and Safety Administration 29 CFR § 1926 Subpart J.
- Structural Welding Code D1.1/D1.1M (2006).

Appendix A: 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 the workpiece, so only the added metal is melted, not the workpiece. Brazing produces a stronger joint than soldering and is often used to join metals other than steel, such as brass. Brazing can also apply coatings to parts to reduce wear and protect against corrosion.

Combustible materials: Solid materials that can burn and ignite.

Confined space: OSHA 1910.146(b) defines a confined space as "large enough and so configured that a person can bodily enter. It has limited or restricted means for entry or exit; it is not designed for continuous occupancy."

Confined spaces can be classified into non-permit-required confined spaces and permit-required confined spaces.

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

EHS Fire Safety and Prevention: The Arizona Department of Forestry and Fire Management — Office of the State Fire Marshal has delegated the EHS Fire Safety and Prevention as the authority having jurisdiction for plan review and construction inspections at ASU campuses. The EHS Fire Safety and Prevention group also has the responsibility and authority to enforce the state fire marshal regulations and requirements on campus.

Designated hot work area: A room or other enclosed location designated for hot work and registered with EHS as a laboratory or for storing hazardous materials.

Fire watch for welding activities: At least one individual dedicated **solely** to the lookout 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 can ignite at a low temperature and continue to burn.

Hot work: Operations such as welding, cutting, burning, heating, grinding, glassblowing or similar spark, slag or intense heat-producing activities that can ignite combustible materials or flammable atmospheres or provide a source of ignition for a fire.

It is also defined as cutting and welding operations for construction or demolition activities that involve using portable gas or arc welding equipment, open flame, or spark-producing apparatus. Activities and equipment not considered hot work include, but are not limited to, Bunsen burners or hot plates in laboratories, hand-held electric heat guns, electric soldering irons used only for small electronics and enclosed heat-producing equipment, such as ovens.

Hot work permit: A hot work permit is how the 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 reminds 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 constructing these hazards and implementing control measures to help mitigate them.

New construction: New work 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 or welding for equipment or 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 or welding reinforcing steel and structural steel for all the project's structural work, such as tunnel construction, building super-structure and site work.

Nonflammable compressed gas: These gases do not catch fire easily or burn quickly but will eventually burn and pose other dangers. The cylinder label and SDS will describe specific nonflammable compressed gases' toxic properties and physical hazards. These include:

- Argon.
- Carbon dioxide.
- Nitrogen.
- Nitrous oxide.
- Oxygen.

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.

Verify materials that will be welded and do not contain ammonia or chlorine as they may pose additional hazards.

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

- **Demolition hot work**: Dismantling built-in equipment, removing discontinued or abandoned services, new service tie-ins, building system installations or modifications.
- **General hot work activities**: All other cutting or welding for equipment or building component installations, i.e., handrails, guardrails, specialties and ornamental metal.
- **Mechanical hot work**: Removal of discontinued or abandoned services, new service tie-ins, building system installation or 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 "hot work" that is not related to construction or renovation projects, such as welding shops, places 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 is generally evidenced by smoke and increased 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 that prevent 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. 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.
- **Oxygen-fuel gas welding** is joining metal by generating extremely high heat during combustion.
- **Resistance welding:** The act of joining or cutting metals by generating heat through resistance created by the flow of an electric current.

Appendix B: Building Permit application

Building permit application
Construction Support Services

Permit type: Select **Campus name: Select**

Existing permit #: **Addendum #:**

☐ **HW–Hot Work** (Hot Work requires a photo ID and Structural Welding requires certifications and photo ID)

☐ **RK–Record keeping review** ☐ **OP– Other permit type:**

CPMG: Email permit application to: ConstructionSupportServices@asu.edu. Place construction documents in the Project Folder located at: T:\Shared\Projects\Open Projects.

Facman: Email permit application, drawings and applicable manufacturer's specifications to: ConstructionSupportServices@asu.edu. Construction documents that are too large to email may be placed in the FM Construction Team Folder located at: R:\FM Construction Team.

ASU's permit and inspection requirements are available at: http://cfo.asu.edu/fdm-bldg-permit-requirements

Project information			**Request date:**
Bldg name/area:		**Bldg #:**	**Room(s):**
Work order#:	**ASU project#:**	**Project start date:**	**Completion date:**
Current use of area:		**Use of remodeled area:** (If remodeled area is a lab, provide lab details)	
Project scope:			

Air quality: Will project include installation/replacement of fuel burning equipment? (Ex: furnaces/generators) Yes ☐ No ☐ Email specifications to EHS.

Demolition: Will demolition project consist of wrecking any load-supporting structural member? Yes ☐ No ☐ Email NESHAP notification to CSS.

Drywell: Will project include a new drywell installation, drywell closure or other type of drainage system installation? Yes ☐ No ☐

Dust control: Provide the square footage of area that will be disturbed S/F. Projects that have dust generating activities that disturb surface area of 1/10 acre or more require a Maricopa Dust Permit to be submitted to CSS

Stormwater: Provide the square footage of construction activities (clearing, grading, excavating) that will cause land disturbance S/F. Projects that disturb land area equal to or greater than one or more acres of land require a State Stormwater Permit (CGP), provide a copy to CSS.

Project estimation: Is this project estimated to be at or over $250,000.00? Yes ☐ No ☐

ASU project manager:	**Cellphone:**
Design professional name and email:	

Contractor:	**ROC#:**	**Phone:**
Superintendent name:	**Email:**	**Cellphone:**

Plan review	**Signature**	**Date**	**Comments**
Asbestos Services			
Building Code and ADA			
EHS–Air Quality			
EHS–Biosafety and Lab Safety			
EHS–Fire Safety			
Food Safety & Health Sanitarian			

Plan review notification comments			
ADA/Accessibility		**Office of the University Architect**	
Facman		**University Facilities Records Mgmt**	
Parking and Transit		**Enterprise Technology**	

Appendix C: Hot work safety checklist

Annual hot work area

Please **complete this hot work area safety inspection checklist** within one week of receipt and return it to Environmental Health and Safety. Email EHS or call 480-965-1823 to discuss any "**no**" responses on the checklist that cannot be addressed before scheduled hot work.

EHS will send this form to you annually. Failure to complete and return checklists may negate your hot work area designation.

Designated hot work area location:

_____

Building Room

The item must be verified as in place or ongoing for each designated work area.	Yes	No	Not applicable	Comments
A fire watch is assigned, and their duties and responsibilities are understood. A mandatory minimum observation time of 30 minutes is identified and understood.				
A fully operational rated fire extinguisher — 2A: 20BC minimum — is available within 30 feet of the designated hot work area.				
A hot work permit application has been submitted for hot work conducted by ASU FACMAN or contractors.				
A hot work permit application has been submitted for hot work conducted by ASU students, faculty and staff who perform hot work activities outside their assigned shop area.				
A welder's curtain, screen or other approved barrier is in place.				
Check that the valves are installed on both torch inlets and operate correctly.				
Check valves can stop the reverse flow of gases, but do not prevent flashbacks.				
Compressed gas cylinders are secured at least two-thirds of the cylinder's height.				

Designated rooms or shops have posted current EHS safety registration signage.				
The item must be verified as in place or ongoing for each designated work area.	**Yes**	**No**	**Not applicable**	**Comments**
Exposed surfaces are made of noncombustible materials or — if combustible — protected by a fire blanket or other noncombustible surfaces.				
Flash arrestors are placed on oxygen and fuel gas lines or contained within the torch.				
The floors and immediate area are kept clean.				
Hoses are in good repair and compatible with the gases used.				
Hot work equipment used shall be in satisfactory operating condition and good condition.				
The item must be verified as in place or ongoing for each designated work area.	**Yes**	**No**	**Not applicable**	**Comments**
No exposed combustible materials are located on the opposite side of any partitions, walls, ceilings or floors potentially impacted by the hot work.				
Protective caps are in place when gas cylinders are not in use. Oxygen cylinders are separated from fuel gas cylinders by at least 20 feet or a one-hour firewall.				
The hot work site is clear of combustibles, or the combustibles are protected. There is a 35-foot distance or a barrier between the welding operation and combustible materials.				

Note: Protected is defined as a fire-retardant-treated material or other non-combustible, fire-retardant-treated barrier that separates the hot work from any combustible material exposure.

_____

Inspector Date

Email ASU Fire Safety and Prevention or call 480-965-1823 with questions or for more information about hot work.

References

- ASU Building Permit and Inspection requirements.
- ASU EHS Welding, Burning and Cutting Program.
- International Fire Code 2018 Edition. Chapter 35, Welding and other hot work.

Appendix D: Hot work permit

Hot work permit form

This form is for FDM, research and shop area hot work activities outside designated hot work areas.

Contractors must complete the Capital Programs Management Group hot work permit.

Issued by

_____

Printed name Signature

Permit duration

_____

Project name Days Weeks Months

Issued to: _____ Date_____ Time — a.m. or p.m.

Campus location: _____ Downtown Phoenix _____ Tempe _____ Polytechnic _____ West Valley

Building: _____ **Room**: _____

	Yes	No	Not applicable
All movable fire hazards in the vicinity have been taken to a safe location.			
All on-site contractors have been advised of unknown flammable material or hazardous conditions.			
Areas adjacent to affected walls are checked for combustibles, and any combustibles are removed or protected.			
Cutting or welding permitted in the area is firesafe.			
Combustible floors are kept wet, covered with damp sand or protected by fire-resistant shields.			
Dust and conveyor systems that might carry sparks to distant combustibles are protected or shut down.			
Fire extinguishers are available for immediate use — 2A: 20BC minimum.			
A fire watch is established for areas around combustible material.			
If combustible material is on the floor, the floors are swept clean in a 35-foot radius.			

Floor and wall openings, cracks, open doorways and windows should be protected or closed.			
	Yes	**No**	**Not applicable**
Guards are used to contain the heat, sparks and slag if fire hazards cannot be removed.			
The cutter or welder is trained in the safe operation of equipment and the safe use of the process.			

Welding or cutting containers

Yes	No	Not applicable	
			A confined space permit has been issued per OSHA 1910.146, if applicable.
			All pipelines or connections to containers are disconnected or blanked off — the opening is covered with a blank.
			Appropriate ventilation is provided.
			Containers are thoroughly cleaned and ventilated.
			Hot metal warning signs are posted to warn others.

When work is completed

Yes	No	Not applicable	
			Smoke and fire detectors have been reactivated if they were disabled for hot work.
			The work area has been inspected for fire sources, damage or potential.

☐ I verify that the above location has been examined and necessary precautions have been taken to prevent a fire outbreak due to hot work.

_____

Employee signature, issued Date Time

_____

Supervisor signature, issued Date Time

_____

Employee signature, closed Date Time

Email ASU Environmental Health and Safety or call 480-965-1823 with questions or more information.

Note: Welding or cutting is only done in management-authorized areas. No welding or cutting is allowed in buildings where the sprinkler system is impaired in explosive atmospheres or readily ignitable material storage areas.