CSUDH

CALIFORNIA STATE UNIVERSITY, DOMINGUEZ HILLS

Hot Work Program

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Contents

Purpose

The CSUDH Hot Work Program has been established to protect the safety of CSUDH employees and property by establishing appropriate hot work procedures and designated areas for hot work operations. By adhering to this program, all hot work operations conducted on CSUDH property comply with regulations and requirements of Cal/OSHA §4848, §3219, §3221, its consensus organizations, California Fire Code, and Risk Management to maintain property insurance.

All employees and students who complete hot work or work in areas where hot work is taking place must follow the procedures outlined in this program. This includes maintenance workers in Facilities Maintenance, Central Plant, Physical Plant, University Theatre, Housing Maintenance as well as employees and students who complete hot work in campus laboratories, shops, or performance facilities.

Definitions

Allied processes – a code term used to describe hot work processes such as arc cutting, oxygen cutting, thermal spraying, and plasma cutting.

Combustible – generally refers to materials with a flash point above 100 degrees Fahrenheit. For purposes of this program, the terms combustible and flammable are used interchangeably unless specifically noted.

Designated hot work area - a permanent location designed for safe hot work operations.

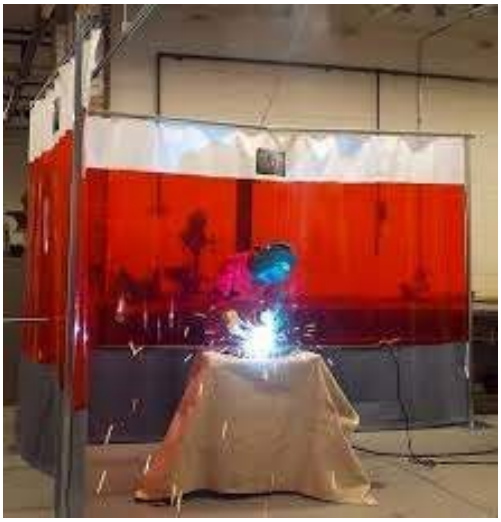
Flammable – generally refers to materials with a flash point below 100 degrees Fahrenheit. For purposes of this program, the terms combustible and flammable are used interchangeably unless specifically noted.

Hot work – any operation which requires use of an open flame, or which produces sparks or heat sufficient to ignite nearby materials; hot work operations include cutting, welding, brazing, soldering, thermite welding, induction welding, grinding, thermal spraying, installation of torch-applied roofing, or any other activity that uses open flame or generates temperatures sufficient to ignite materials.

Hot work permit – a document issued for the purpose of verifying the safety of an area where hot work is to be conducted, as per the requirements of this hot work program.

Non-ionizing radiation – ultraviolet light, lasers, and infrared light that is generated during hot work.

Qualified person – a person who by reason of training, education, and experience, has been determined by their supervisor to be knowledgeable in the operations to be performed and is competent to identify and control the hazards involved.



Welder – any operator of electric or oxy fuel gas welding or cutting equipment, or person performing allied processes.

Welding curtain/Blanket – a heat-resistant hanging barrier placed in areas designed to contain hazards that result from hot work including, but not limited to, sparks or ultraviolet light.

Welding pads – a heat-resistant fabric mat designed to protect materials underneath it against ignition; pads are placed on the surface of flammable materials directly under a hot work operation where hot debris might cause damage or start fires.

Authorized Personnel – Includes employees who are trained to perform hot work activities. (Managers, Supervisors, Principal Investigators, Leads, Competent Persons, PAI's, Operator's, and Fire Watch personnel)

Other Personnel – This includes employees or contractors who are neither authorized personnel nor fire watch personnel but are still exposed to areas where hot work is performed. Other personnel should not perform any hot work activities. Duties include wearing proper personal protective equipment when in a 35-foot radius of hot work.

Scope

All persons who perform operations that produce heat adequate to ignite materials on any CSUDH campus must adhere to this program. These include, but are not limited to:

- Oxy-fuel gas welding, cutting, heating
- Arc welding and cutting
- Resistance welding
- Plasma cutting
- Non-ionizing radiation for production of heat
- Brazing and soldering
- Heat treating
- Grinding
- Any work requiring use of a torch

Exceptions

- Candles used in research and theater arts, if attended for the duration of use.
- Ovens specifically designed and built by a reputable manufacturer with a Nationally Recognized Testing Laboratory (NRTL) certification (such as Underwriters Lab (UL)) for heat treatment or annealing of research materials.
- Electric soldering irons used for electronics and small electrical work.
- Kitchens and food preparation areas that have been designed and built for the purpose of cooking. Ansell fire suppression systems should be in place where all open flames or high heat (fryers) are located to prevent accidental fire. Fire Extinguishers shall be located in direct vicinity in all kitchen areas as well.
- Catering operations where open flames/BBQ are used for scheduled events.
- Bunsen burners and used in classrooms and research laboratories.
- Normal firepit usage in Phase III of housing

Responsibilities

Managers, Principal Investigators, & Lab managers

For work performed in designated hot work areas, supervisors must:

- Monitor the designated area and ensure that it is maintained to the standards outlined by this written program.

For work performed outside of designated hot work areas, supervisors, contractors, principal investigators, and laboratory managers must:

- Designate individuals to perform the programmatic roles of "permit authorizing individual (PAI)", "operator", and "fire watch".
- Designate individuals on all shifts who can approve hot work activities and issue permits in non-designated areas.
- Ensure that only qualified and trained authorized employees perform hot work activities.
- Develop safe usage protocols for all heat, flame and spark-producing equipment.
- Ensure that a hot work permit is issued by a permit authorizing individual (PAI) before the hot work starts.
- Ensure an area inspection is completed of the area for combustibles, and flammables before work starts.
- Ensure that a fire watch is present when required.
- Inspect designated hot work areas after each shift to ensure no smoldering materials are present.
- Ensure employees comply with all procedures described in this program.
- Retain records of training and all hot work permits for six months.
- Provide information to the Program Administrator regarding changes in procedures and need for changes or improvements to the Hot Work Program.

Permit Authorizing Individual (PAI)

The permit authorizing individual (PAI) must:

- Determine if the work can be completed or moved to a designated hot work area
- If the work cannot be moved to a designated hot work area, complete and sign the hot work permit.
- If approval for hot work is granted, issue and post hot work permits that list all required precautions.
- Ensure all combustible materials in the vicinity are removed.
- If all combustible materials cannot be removed, ensure that guards are in place to confine the heat, sparks and slag.
- Perform the initial safety assessment of the hot work area, as well as daily re-assessments before hot work resumes, for each day that the hot work permit is in effect.
- Ensure compliance with the safe work requirements required by the **hot work permit** section of this program each day that the hot work permit is in effect.
- Establishing a fire watch during and for no less than 30 minutes after completion of the hot work.

- Either act as fire watch or verify that a fire watch is on site and has signed the hot work permit.
- Never act as the operator.
- Communicate to employees regarding hot work activities to ensure their safety.
- The PAI should be a manager, supervisor or lead level employee, but can be a competent person appointed by the manager.

Fire Watch Personnel

A "fire watch" is required for all hot work activities outside of a designated hot work area.

The fire watch must understand hazards associated with the type of hot work being performed and the limitations that are placed on the work operation by the hot work permit. The fire watch must make certain the hot work area is maintained in a fire-safe condition throughout performance of the hot work and must stop the hot work if unsafe conditions are observed.

If it is not possible for one fire watch to observe the entire area for potential fire hazards, additional fire watches must be assigned to ensure that all exposed areas are monitored (2013 California Fire Code 3504.2.2).

Persons acting as fire watch must:

- Understand the basic hazards of any flammable construction and materials.
- Maintain proper isolation of all hot work operations from flammable or flammable materials.
- Mitigate fire exposure hazards that hot work creates to areas adjacent to, above or below the hot work operation.
- Watch for fires in all exposed areas and monitor adjacent areas for fires.
- Maintain fire watch for the duration of hot work and for at least 30 minutes after completion of the hot work. A responsible manager under this program is authorized to extend the fire watch based on the hazards or work being performed.
- Receive annual training on the safe operation of fire extinguishers.
- Keep a fire extinguisher with a minimum rating of 2A:20B-C.
- Know how to trigger the fire alarm.
- Extinguish small, controllable fires with extinguishing equipment available in hot work area
- Activate the fire alarm if an uncontrollable fir occurs.
- Ensure that the supervisor has conducted a final inspection after the fire watch period has concluded and signs off on the permit.
- Contact a supervisor and request a trained replacement if they must leave for any reason.

- The fire watch may also act as the PAI, but never the operator on the same job.

Operators

The operator is the person using the equipment that produces a potential ignition source. Operators have the following responsibilities:

- Must be qualified by their supervisor to operate the hot work equipment.
- Inspect hot work equipment prior to use and verify that it is safe to use.
- Perform the hot work in accordance with hot work procedures and all precautions listed on the hot work permit.
- Wear all required personal protective equipment (PPE).
- Ensure all persons within the hot work area are wearing appropriate PPE prior to performing hot work.
- Must stop work and inform their supervisor if conditions change after the hot work permit is issued.
- Must be qualified to fill the roles of PAI and fire watch, though they must not fill either of these roles while acting as operator.

When working outside of a designated hot work area, operators have the following additional responsibilities:

- Must not begin hot work until the hot work permit has been completed, signed, and posted on site by the PAI and fire watch when a fire watch is required.
- Must only perform hot work while the fire watch is present. If the fire watch leaves the area, the operator must stop work.
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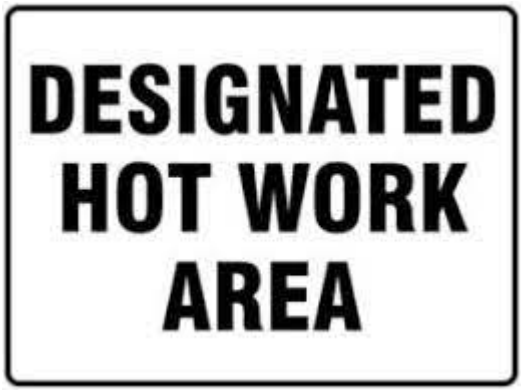
Contractors

Any contractor conducting hot work activities on campus must abide by their company's hot work program which at minimum meets Cal/OSHA and NFPA standards. If a contractor does not have their own Hot Work Permit, they must obtain one and will not be allowed to use CSUDH's Hot Work Permit.

Designated Hot Work areas

A designated hot work area is an area specifically designed and approved for hot work by the CSUDH EH&S. These areas do not require Hot Work Permits. Designated hot work areas must be inspected upon initial assignment and after any fire related incident or near miss. Re-inspections must be completed every three years, or if there is a change to the space.

Design and Maintenance of Designated Hot Work Areas

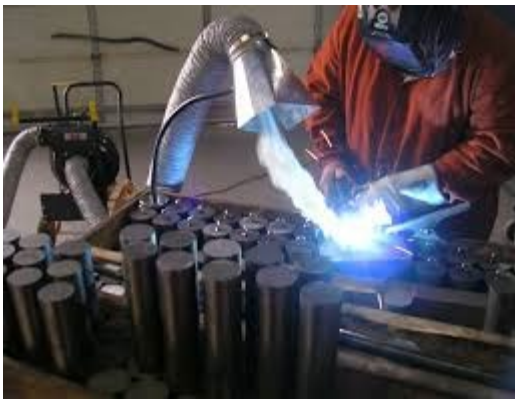


- Must be constructed of non-flammable or fire-resistive walls, doors and floor surfaces.
- Openings or cracks in walls, floors, ducts or shafts must be tightly covered to prevent the passage of sparks to adjacent or hidden areas. If they cannot be covered, they must be shielded by metal fire-resistance guards. Fire-safe curtains must be provided to prevent passage of sparks or slag out of the designated hot work area.
- Must be segregated from other areas of the building with non-flammable partitions. Partitions must be securely connected to the floor with no gaps between the floor and the partition.
- Openings in partitions must be protected by welding-grade curtains or other permanent physical barriers either attached to the structure or of rugged portable construction.
- Adjacent hot workstations must be separated with flame-resistant screens or shields.
- Hot work areas must be separated from personnel in adjacent areas with use of flame-resistant screens or shields.
- Flammable materials must be removed or isolated from adjacent areas by appropriate shielding to prevent ignition from sparks, slag or heat.
- If indoors, must have adequate ventilation or smoke filtration.
- Must be equipped with both portable fire extinguishers and fire alarm systems.
- Must have signage labeling the area “Designated Hot Work Area”.
- Equipment that contains (or has contained) flammable materials must be thoroughly cleaned, dried and purged prior to performing hot work.
- Good housekeeping must be maintained.
    - Keep gasses separated.
    - Remove all dust, debris, flammable objects and substances from the area.
    - Keep floors clean and free from trip, slip and fall hazards at all times.

Ventilation in Designated Hot Work Areas

Ventilation within the designated hot work area must be sufficient to keep concentrations of airborne contaminants that may be released during hot work below the Cal/OSHA Permissible Exposure Limits (PEL). If building ventilation is insufficient, mechanical ventilation (e.g., exhaust fans or smoke filters) must be provided. If action levels are still exceeded then operators must wear respirators.

Mechanical ventilation can include local exhaust, forced air, and/or general air movement. Local exhaust ventilation is preferred and should as close as practicable to the hot work. Forced ventilation includes fans that deliver air to workers. Forced air systems should be positioned so they move fresh air across the worker's face. Avoid Canopy style hoods where fumes can pass from a work area through the workers breathing zone and then up and out.



General Building Ventilation

General mechanical ventilation may be necessary in addition to forced ventilation. Examples include roof fans, wall or window exhaust fans, and similar large area air movers. General mechanical ventilation is not generally effective by itself and should be used to augment local exhaust or forced ventilation.

In locations where conditioned air or space-logistics prevent direct exhaust of smoke, a local smoke remover may be used. Smoke removers scrub hot work smoke and particulates from the air and exhaust the air back into the work area.

Cylinder Storage and Use

- Position welding fuel-gas cylinders valve end up when in use.
- Keep tops of acetylene cylinders clear of materials or obstacles which could damage the safety device or interfere with the quick closing of the valve.
- Store liquefied gases valve end up.

- Secure cylinders in an upright position with two non-combustible chains or straps. The top strap must be 1/3 of the distance from the top of the cylinder and the bottom chain 1/3 distance from the bottom.
- Store at adequate distance from welding or cutting operations so that sparks, hot slag, or flame will not reach them or have fire-resistant shields.
- Separate welding-gas cylinders by a distance of 20-feet or with a non-combustible metal partition at least 60 inches high.

Non-Designated Hot Work Areas

For all hot work being performed in non-designated hot work areas a hot work permit must be completed. A completed and signed permit must be emailed to EH&S@csudh.edu and posted at the jobsite. For emergency hot work tasks, permits must be completed and posted at the jobsite and emailed to EH&S@csudh.edu within 1 business day after the job starts. The permit must be completed by the Permit Authorizing Individual (PAI) and permits for indoor work and outdoor work require separate hot work permits, see appendix for hot work permit.

Personal Protective Equipment (PPE)

Hot work clothing provides sufficient coverage and is made of noncombustible and sturdy materials to minimize skin burns caused by sparks, spatter, radiant heat and ultraviolet light. Appropriate protective clothing for a hot work operation will vary by material and coverage based upon location worn on the body and type of hot work.

Clothing should be kept reasonably clean, as oil and grease can reduce its protective qualities and could be flammable. Frayed clothing is particularly susceptible to ignition and must not be worn when performing hot work. Never leave shirts untucked as they can increase risk of catching fire and wicking up the shirt. Flame resistant clothing made from tightly woven materials such as and heavy cotton or seamless leather is required.

Sparks may lodge in rolled-up sleeves, open pockets of clothing, or cuffs of overalls or trousers. Sleeves should be rolled down and collars kept buttoned. Pockets should be eliminated or protected by leather aprons or welding jackets worn over clothing. If pockets are worn, they should be emptied of combustible materials. Trousers should overlap shoe tops and ankles to prevent spatter from getting into shoes. Work boots that cover the ankle are preferable to low-rise shoes.

If coveralls are used, then no underneath clothing should be worn that increases risk of catching fire. Any and all clothing worn when performing hot work, should prevent the risk of flame or fire that could result in burns to the skin.

Hearing Protection

Hearing protection must be used where high noise hazards exist. Examples of high-noise hot work include air carbon arc cutting (gouging) and grinding steel prep work in a manhole. (Should we put action level of 85dba or above?)

Gloves

All welding and cutting must be conducted wearing flame resistant and electrically nonconductive gloves that allow adequate dexterity for manipulation of the welding equipment and controls in addition to weld-filler rods. Gloves must be in good repair with no holes or frayed seams and free of oil or water residue. Gloves must cover the cuff of long-sleeve shirts, fit snuggly around the forearm and preferably protect up to mid-forearm in length.

Respiratory Protection

When ventilation of the hot work area is not adequate to maintain healthy breathable air, respiratory protective equipment must be used. In locations where mechanical ventilation is not specifically installed to remove welding fumes, a respirator shall be worn to prevent inhaling toxic fumes and gases. Personnel wearing it must have previously contacted EH&S to complete a hazard assessment and determine if a respirator is the only option for protection from hazardous fumes. Only respirators provided and approved by EH&S and specific to the hot work hazards may be worn. The CSUDH Respiratory Protection Program requires medical clearance and fit-testing by our campus's medical provider. Training will be done by EH&S (or approved vendor) on respirator care and use. Annual enrollment, medical clearance and fit-testing may be required for every person enrolled in the Respiratory Protection Program. Costs of enrollment are by the department doing the hot work. Fluoride content info is listed on electrode rod Safety Data Sheets. If Welding Rod contains fluoride, acid gas respirator cartridges must be used.

Eye protection

Any persons who might be exposed to ultraviolet light (UV) generated by welding must wear eye protection with filter lenses specifically designated for the type of welding they are doing. Personnel must contain any long hair under PPE. Then, wear a welding helmet with full face shield over prescriptive glasses for eye and face protection. The welding helmet must include the appropriate lens shade number shown in the following table.

Permit procedure

For any hot work location that is not a designated hot work area, a completed and signed hot work permit must be posted for the job. See below for a copy of the hot work permit. The permit must be issued by a permit authorizing individual (PAI). For jobs that occur in both indoor and outdoor locations, a separate permit for each location must be issued. One permit may be used for the job if there are no changes to the hazard(s) or personnel.

Before a hot work permit is issued, the following safe work conditions must be verified by a PAI: (California Fire Code 3504.3)

1. Area inspection is required on the day of the hot work and before conducting any hot work activities.
2. The hot work equipment must be in safe operating condition and good repair.
3. Fully charged and operable fire extinguishers appropriate for the type of possible fire must be immediately available at the work area.
4. All combustible materials within a 35 foot radius from the hot work must be relocated. If relocation is impractical, the materials must be protected by an NRTL-approved welding curtain, welding blanket, welding pad, or equivalent barrier.
    a. To prevent the sparks from passing underneath covers, they must be tight against the floor and held in place from movement. Where covers overlap to cover a pile of combustible material, they must be tightly clipped together.
5. The floor must be swept clean for a radius of 35 feet from the hot work in areas where combustible materials such as paper, wood shavings, textile fibers, or rubber are on the floor.
6. Combustible floors must be kept wet, covered with damp sand, or protected by an NRTL-approved welding blanket, welding pad, or equivalent barrier.
    a. Where floors have been wet down, operators must be electrically-isolated from equipment and protected from possible shock.

7. Openings or cracks in walls, floors, or ducts within 35 feet of the site must be covered or sealed with approved fire-rated or non-combustible material to prevent the passage of sparks to adjacent areas.
8. Ducts and conveyor systems that might carry sparks to distant combustible materials must be shielded or, preferably, shut down.
9. If hot work is done near walls, partitions, ceilings, or roofs of combustible construction, they must be protected by an approved welding curtain, welding blanket, welding pad, or equivalent.
10. If hot work is done on one side of a wall, partition, ceiling, or roof, precautions must be taken to prevent ignition of flammable materials on the other side by relocating the materials. If it is impractical to relocate the materials, a person acting as fire watch must be provided on the side opposite from where the work is being performed.
11. Hot work must not be attempted on a partition, wall, ceiling, or roof that has a flammable covering or insulation, or on walls or partitions with flammable sandwich type panel construction.
12. Hot work that is performed on pipes or other metal that is in contact with flammable walls, partitions, ceilings, roofs, or other materials must not be undertaken if the work is close enough to cause ignition by heat conduction.
13. Access to the permitted hot work area by people not involved in the work must be controlled.
14. Curtains, closed doors, barricades or other means must be used to prevent any ultraviolet radiation from leaving the permitted area.
15. If water hoses are located within the permitted hot work area, they must be connected and ready for service, but it is not required that they be unrolled or charged with water.
16. A fire watch is required at all times including when the fire alarm systems have been taken offline.

Special precautions must be taken to avoid accidental activation of automatic fire or smoke detection or suppression systems such as sprinklers or other special extinguishing systems. When conducting hot work in close proximity to a fire sprinkler, a wet rag or similar heat barrier must be laid over the sprinkler head during hot work; and removed at the conclusion of the operation.

A request should be made to the CSUDH campus fire alarm company in order to disable fire detection devices in the vicinity of the work area. The PAI named on the hot work permit is responsible for calling the vendor to disable the alarms or detectors. The PAI is then responsible to call the vendor back to rearm the fire detection system.

Based on the scope of work and local conditions, the PAI must determine the length of time for which the hot work permit is valid and note this on the permit.

The hot work permit area must be inspected by a PAI at least once per day while the permit is in effect to ensure that it remains a fire-safe area.

Reducing or Increasing the Fire-Safe Distance

The PAI may enlarge or reduce the fire-safe work area, as local conditions allow, but must describe these deviations from protocol on the hot work permit. When, for example, windy conditions enable sources of ignition to travel farther than 35 feet, the permit conditions must be extended to the estimated distances and area indicated by local conditions. When it has been determined that the hot work will not generate or transport ignition sources outside of the immediate area, the permit conditions may be reduced to the area of safe operation.

Record Keeping

Hot work permits must be kept on file by the issuing department for 6 months. They must be made available for review by EH&S or other regulatory authorities upon request.

An inventory of designated hot work areas approved by EH&S is maintained by EH&S and the department where the designated hot work area exists.

Training records including rosters and subjects covered should be kept by the department and copies kept with EH&S.

Training for hot work should be conducted every 3 years, or as a retraining in the event of an incident. Fire Extinguisher training is required annually

Respiratory protection program training records must be kept for any employees who use respiratory protection. Those records must be maintained by the department responsible for the hot work and EHS.

Regulations

Title 8, California Code of Regulations (CCR)

- §3219 Maintenance of Fire Protection Equipment, Materials and Assemblies
- §3221 Fire Prevention Plan
- §4845 General Precautions
- §4848 Fire Prevention and Suppression Procedure
- §4850 Electric Welding, Cutting and Heating – General Requirements

California Fire Code, Chapter 26, Welding and other Hot Work

All electrical and other hot work equipment must be approved by an NRTL such as Underwriters Laboratory

National Fire Protection Association (NFPA) 51B-2009, Standard for Fire Prevention during Welding, Cutting, and Other Hot Work