

# 1. PURPOSE AND SCOPE

Welding, cutting and grinding are associated Hot Work activities that can produce heated byproducts and sparks that can ignite flammables and combustibles which may result in fire, damages, and/or injuries. The purpose of this program is to establish proper Hot Work operations and procedures that must be followed by all employees and students of California State University Sacramento (CSUS) performing Hot Work or welding procedures in order to prevent such injuries from occurring. This program applies to everyone in CSUS that performs or will partake in any Hot Work operations. The CSUS Hot Work Program consists of the following parts:

- 1) This written program
- 2) Attached list of Hot Work supervisors

All Hot Work, as defined below, shall be accomplished in accordance with:

- 1) This written program
- 2) The manufacturers' recommended safety precautions for the equipment used in welding/cutting/grinding/brazing processes.

## 2. **DEFINITIONS**

### 2.1 *Hot Work*

Hot work is: Electric or gas welding, cutting or brazing or any extreme heat-, flame-, or spark-producing procedures or operations that can produce heated materials that can possibly invoke fire, create smoke and/or explosions.

## 2.2 Hot Work Supervisor

A Hot Work Supervisor is a person with training, experience and judgment to oversee Hot Work operations and who has the authority to direct changes or stop the work if necessary. A Hot Work supervisor shall be designated in writing by the manager of his/her organization. The Environmental Health and Safety Department shall also be notified in writing of the hot work supervisor designation

## 2.3 Hot Work Permit

The CSUS Hot Work Permit is filled out to specify the details of Hot Work proposed to be done on campus, except for that Hot Work which does not require a permit. Filling out and signing the permit is a safety review process meant ensure that the proposed work has been reviewed for all applicable safety considerations. Permitted Hot Work shall be done in accordance with the details spelled out on the permit. If conditions change, the permit must be modified or reissued by the Hot Work supervisor. Completed permits shall be maintained in the department conducting the work for one year.

## 3. **RESPONSIBILITIES**

#### 3.1 Environmental Health and Safety Department:

- Maintain the list of Hot Work supervisors to this program.
- Periodically review and apply any regulatory changes related to Hot Work



• In the absence of a Hot Work supervisor: Oversee and approve permits for any Hot Work activities occurring in the campus

#### 3.2 Hot Work Supervisor:

- May approve the Hot Work-related activities in the form of a written permit in locations other than the pre-approved locations specifically listed in section **4.2** of this program.
- The Hot Work supervisor shall determine the combustible materials and hazardous areas present or likely to be present at the location where Hot Work operation ensues.
- If independent contractors are involved with any Hot Work operations in the campus, assure the following:
  - Ensure they follow the provisions written in this program
  - Verify that contractors have posted a permit for the duration of the Hot Work operation.
  - Determine if the contractor adhered to the minimum required Fire Watch needed with any Hot Work operations.
- Be wary of any creases or openings in any wall in which sparks or heated materials may spread.
- Make sure that equipment being used in a Hot Work operation is ready to use and safe.
- Ensure that adequate ventilation systems are present in the area where Hot Work operations are being conducted.
- Ensure that all employees performing Hot Work operations comply with the content of this program.

#### 3.3 Students and Employees performing Hot Work operations:

- Avoid unsafe practices and to work safely even in the absence of specific guidance.
- Adhere to and understand the content of this program.
- Advise other workers about any special precautions or conditions related to the job.
- Be aware of the location of the nearest fire alarm, fire extinguisher, emergency communication system, first aid kit, etc., before performing any Hot Work operations and know how to use it.
- As much as possible, limit all slags, sparks, and any other heated Hot Work byproduct from leaving the designated work area.
- Properly wear any required PPEs for the entire duration of the Hot Work operation.

## 4. HOT WORK PERMIT

4.1 A Hot Work permit is required whenever Welding, Cutting, or any other Hot Work operation is done in a place that is NOT meant to handle and confine the different hazardous materials and byproducts associated with Hot Work operations. The Hot Work Permit form can be found in the Appendix A of this document. An electronic fillable PDF Hot Work Permit can also be located on the CSUS EHS website:



https://www.csus.edu/campus-safety/environmental-health-safety/safetymanagement/resources-forms.html

- 4.2 With the absence of any would-be combustibles, the following CSU Sacramento locations do not need a Hot Work permit:
  - Facilities Management Metal Shop
  - Engineering Tech Shops and Welding Lab (Santa Clara hall, Rooms 1245 and 1325).
  - Art Sculpture Lab, Room 112
  - Central Plant workshop, room 106. Note: because of the presence of combustibles in room 106, Hot Work is limited to brazing, soldering, and heating. Torch cutting and all other types of welding may be done without any written permit in the parking area located immediately west of the Central Plant building or in the area of the boiler room roll-up door, but not within 35 feet of the Solano Hall air intake.
  - Any other outdoor location free of combustibles that is determined by a Hot Work Supervisor, at the time of operation, to be safe for Hot Work.
- 4.3 The Hot Work permit is only valid for the date(s) and time specified on the permit. Until completion of work (can be verified with the Hot Work supervisor), a copy of the permit must remain at the location where Hot Work operation is being conducted.
- 4.4 All requirements indicated on the Hot Work permit must be met and verified by the Hot Work Supervisor prior to any Hot Work procedure are started.

## 5. FIRE WATCH

- 5.1 Fire watchers are required whenever welding or cutting is performed in locations where other than an incipient stage fire might develop, or whenever any of the following conditions exist:
  - Appreciable combustible materials are closer than 35 feet to the point of operation;
  - Appreciable combustibles are present which can be ignited by sparks;
  - Wall or floor openings within a 35 feet radius expose combustible materials 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.
- 5.2 A fire watch must be maintained, depending on the level of flammability in the location where Hot Work operations are performed, for a **minimum** of 30 minutes after the completion of the Hot Work operation to detect and extinguish smoldering fires.
- 5.2 Fire Watch Duties:
  - Fire watchers must be trained in the use of fire extinguishing equipment.
  - Be familiar with facilities for sounding an alarm in the event of a fire.
  - Observe and watch for fires in all exposed areas, sound the alarm if necessary, and try to extinguish them only when obviously within the capability of the equipment available.





- Ensure that suitable fire extinguishing equipment, with a minimum of <u>2-A:20-B:C</u> Portable Fire Extinguisher is properly maintained, within reach, and ready for use while welding, cutting, or any other Hot Work operations are being performed.
- Ensure that no condition or actions are performed that will result in an unsafe situation within the area where Hot Work operations are conducted.
- Know about the available means of communication in the event where emergency and/or any other hazardous situation arises.

# 6. GENERAL SAFETY PROCEDURES

- 6.1 Cutting or welding shall be permitted only in areas that are, or have been made, fire safe. If combustible materials are found in the area where Hot Work is planned, the supervisor shall reduce or abate the hazardous condition with one of the following methods:
  - Have the work moved to a location free from dangerous combustibles.
  - If the work cannot be moved to another location, have the combustibles moved to a safe distance of <u>at least</u> 35 feet away from where the Hot Work operation is scheduled to take place.
  - If the identified combustibles cannot be moved to a safe distance, have it properly shielded using one or more of the following:
    - Flameproof covers
    - Metal or guards sufficient enough to prevent contact with heated Hot Work byproduct
  - If the determined combustible is the floor where the Hot Work operation will take place, it shall be protected from ignition by doing one or more of the following:
    - Cover the combustible floor using damp sand
    - Protect the combustible floor by using fire-resistant shields
    - The combustible floor shall be wetted down to prevent ignition\*
- 6.2 Safety precautions for non-approved areas where Hot Work operation is to be done include, but are not limited to:
  - Where cracks or openings in the floor, walls, open doorways or windows exist and which cannot be closed or covered, 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 or other opening.
  - 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.
  - When performing Hot Work operations near ducts, conveyor systems, and pipping, be wary of the sparks that might get transported through and ensure that they are either shut down or closed off.

<sup>(\*</sup>**Exception**: When a Hot Work operation is performed using arc welding or any other cutting equipment that may cause shock and/or electrocution, the combustible floor shall not be wetted down to prevent any injuries related to electricity.)



- Sparks, slags, or any other Hot Work byproduct must be contained within the work area by using portable welding curtains or shields.
- Hot Work operations must not be attempted on a metal partition, ceiling, or roof containing a combustible sandwich panel construction as it may cause fire and explosion.
- Hot Work operations, when done on pipes or any other metal substances in contact with combustible walls, partitions, ceiling, roofs, etc., shall not be permitted if the work is close enough where it can cause ignition.
- Floors within 35 feet where the Hot Work operation is scheduled to be done must be swept clean of combustibles
- 6.3 Cutting and welding operations shall be conducted and permitted only when the following protections are in place:
  - Personnel are properly outfitted with personal protective equipment.
  - Shielding is in place to keep others from viewing the arc (if required by the Hot Work Supervisor).
  - Adequate ventilation is in place and functioning to keep operators from inhaling the toxic gases.
- 6.4 When a Hot Work operation is to be performed above or within ten feet of a combustible material, or above a place where workers are employed, noncombustible shields shall be placed to protect such materials and persons from sparks, slags, and any other heated products produced by the Hot Work operation.
- 6.5 When a Hot Work operation is to be done in a permanent building or structure:
  - A Hot Work Permit is required, with the exception of the permitted areas listed in 4.2;
  - Nearby smoke alarms must be disabled prior to beginning work;
  - If smoke alarms are disabled, Public Safety must be notified of the exact location of the work;
  - Disabled smoke alarms must be reactivated after completion of the work. When work is complete, Public Safety must be notified that the work is complete and alarms have been reactivated.

# 7. PERSONAL PROTECTIVE EQUIPMENT

- 7.1 As an extra protection from various hazards related to Hot Work operations, Personal Protective Equipment (PPE) described in this section must be properly worn at all times.
- 7.2 The welder's vision shall be protected with lens shades which meet the following minimum standard:



Welding Operation						Shade Number					
Shiel	ded metal-arc	: weldina:	1/16, 3/32, 1	/8.5	/32 inc	h electro	odes				10
Shielded metal-arc welding: 1/16, 3/32, 1/8, 5/32 inch electrodes Gas metal-arc welding (nonferrous): 1/16, 3/32, 1/8, 5/32 inch electrodes											
				, 							11
Gas	metal-arc	welding	(ferrous)	_	1/16,	3/32,	1/8,	5/32	inch	electrodes	
							12				
Shiel	ded metal-arc	welding -	- 3/16, 7/32,	1/4 i	nch ele	ctrodes					12
5/16, 3/8 inch electrodes							14				
Atomic hydrogen welding							10-14				
Carbon arc welding							14				
Soldering							2				
Torch brazing							3 or 4				
Light cutting, up to 1 inch						3 or 4					
Medium cutting, 1 inch to 6 inches						4 or 5					
Heavy cutting, 6 inches and over						5 or 6					
Gas welding (light) up to 1/8 inch						4 or 5					
Gas welding (medium) 1/8 inch to ½ inch						5 or 6					
Gas welding (heavy ½ inch and over					6 or 8						

#### 7.3 Head and Eye protection



#### (a) Shielded Metal Arc Welding (SMAW)/ Electric Welding Helmet

- In accordance with Cal-OSHA standard §3881, a helmet intended for SMAW operations must meet the ANSI Z87.1 standard and shall be used as it offers ample protection from flying or falling objects and/or electric shocks and burns.
- The selected SMAW helmet must have the appropriate shade number as listed on part 7.2 of this program.

#### (b)/(c) Gas Welding Goggle & Gas Welding Glasses

- As with the SMAW helmet, a welding goggles or glasses must have the appropriate shade number listed on part 7.2 of this program.
- Unlike SMAW helmets, Goggles & Glasses meant for gas welding are NOT designed to protect against UV rays and therefore should ONLY be strictly use when conducting Gas welding activities.

#### (d) Welding Cap\*

• Caps intended for welding is recommended as it offers head and neck protection and therefore must be worn backwards with the cap bill covering the back of the neck.

<sup>\*(</sup>Note: A cap meant for welding is NOT the same as an ordinary baseball cap; these welding caps are specifically tailored to be fire resistant)



7.4 <u>Hand Protection</u> - The type of hand protection needed for welding will depend on the type of welding done has different work requirements and produces varying heated temperatures.

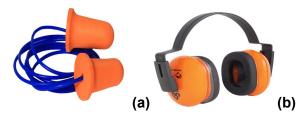


#### (a) Thick leather welding gloves

• This type of welding gloves is recommended when performing Metal Inert Gas Welding (MIG) and SMAW as these types of welding operations do not require a lot of dexterity and generally produce extremely high temperatures that can harm a worker's hands.

#### (b) Medium weight welding gloves

- Welding using acetylene and oxygen does not produce the same levels of high temperature like MIG and SMAW do. As such, medium weighted welding gloves that provide sufficient heat resistance will suffice.
- 7.5 <u>Hearing Protection</u> Hot Work operations involving cutting of metals can produce noises that are considered to be harmful. Hearing protectors should be worn in accordance with the campus Hearing Conservation program.



(a) Ear Plugs - An Ear Plug's effectiveness highly depends on its proper usage. As such, whenever using earplugs, ensure that it is worn correctly.

(b) Ear muffs - Like with the Ear Plugs, make sure that it is properly worn. Equipping Ear muffs with Ear plugs yields synergistic effects; however, for tasks such as welding, because the Ear muffs may interfere with the welding helmet, most prefer the use of ear plugs.

7.6 **Body Protection** - Employees performing Hot Work operations should wear appropriate clothing to shield their bodies from the heated Hot Work byproducts. As such, clothing made from polyester be AVOIDED; instead, welding jackets, denim blue jeans, fire resistant long sleeve shirts, or any other appropriate clothing that provides equal protection must be used.



# 7.7 <u>Feet Protection</u> - Because of the Hazards related to Hot Work operations, work boots are preferred as it provides adequate protection from heated slag. Never wear footwear such as tennis shoes that could melt/catch on fire when in contact with slag.

## 8. Electric Welding Safe Operating Procedures

#### 8.1 Arc Welding and Cutting

- Only equipment free of defects shall be used.
- Maximum voltage used shall NOT exceed the following:
  - Manual arc welding and cutting 80 volts
  - Automatic arc welding and cutting 100 volts
  - o Manual or automatic direct-current machines 100 volts
- Welders shall be enclosed in booths painted using low reflective paints such as zinc oxide and lamp black.
- Employees working adjacent to welding areas shall be protected from rays by noncombustible flameproof screens or shall be required to wear appropriate goggles.
- When electrical welding is done inside a confined space, welding machines shall be left outside of the confined space and heavy portable equipments shall be blocked in order to prevent accidental movement.
- Whenever electrical welding operation ceases, such as during lunch or overnight, welding machines shall be shut off. Where practicable, unattended electrodes and electrode holders shall be removed from the confined space and shall be separated from each other to avoid accidental contact and to prevent employee injury.
- Upon completion of a welding activity, the welder must warn other workers about the presence and location of the hot surface where the weld work was done.
- Ensure that appropriate manual electrode holders that can handle the maximum current required for the job to ensure is used.
- Parts carrying current that has contact with the welder, including the outer surface of the electrode holder's jaw, shall be insulated against the maximum voltage to ground.
- Ensure that arc welding, cutting cables, and other exposed metal parts are properly insulated, free of repairs 10 feet from the electrode holder, and is capable of handling the maximum current being used in during the operation.
- Never use cables with wears and tears.
- Use only insulated connectors with sufficient current-carrying capacity when connecting or splicing a cable.
- Only ground return cables with adequate current-carrying capacity shall be used.
- Only structures or pipelines without flammable contents, any electrical circuit, and has proper electrical contact at all joints, may be used as ground return.
- Heated electrodes must not be dipped in water.
- Whenever electric welding ceases or any electrical welding machines are moved, proper lockout-tagout procedure must be followed to prevent employee injury.
- When arc welding is performed in wet and/or high humidity areas, additional protection, such as rubber pads or boots sufficient enough to protect from electric shock shall be used.
- When MIG arc-welding operations are performed, chlorinated solvents shall not be used within 200 feet of the exposed arc as the heat and ultraviolet radiation produced by MIG welding operations are enough to decompose and produce a highly toxic and irritating



phosgene gas. Areas that were recently exposed to chlorinated solvents prior to MIG welding shall be properly dried before welding is performed.

• Without adequate ventilation, MIG arc-welding procedures on stainless steel shall not be performed.

# 9. Gas Welding Safe Operating Procedures

- Only equipments free of defects shall be used.
- Except at the burner, a standard torch, and blowpipes, fuel gases, when mixed with air or oxygen, can yield explosive results and therefore must be prevented and shall be guarded.
- Backflow protection devices must be present on either the torch or the station outlet and an approved device capable of preventing oxygen from flowing into the fuel-gas system or vice-versa shall be used.
- No liquid acetylene shall be used.
- Oil or grease shall not be permitted near oxygen cylinders, valves, regulators or any other contained oxygen as the mixture of oil and oxygen and cause explosions.
- Oxygen contained in a cylinder and fuel gases shall not be used unless an adequate pressure-reducing device intended for oxygen is provided.
- Welding fuel-gas cylinders shall be placed with valve end up whenever they are in use.
- Cylinders shall be handled carefully as rough handling, knocks, falls and any other unwanted cylinder movement may result in leakage.
- Storage of liquefied gas shall be done with the valve end up.
- Prior to the connection of regulator into a cylinder valve, the process of "cracking" that involves opening the valve slightly in and closing it immediately shall be performed in order to clear any dust or dirt that is residing in the valve that can potentially enter the regulator.
- Before removing a regulator from a cylinder, the cylinder valve shall be closed.
- Cylinders that are found to have leaks shall be taken away from ignition sources and slowly emptied in a safe place.
- Cylinders with leaks shall be appropriately tagged to prevent accidental usage.
- Cylinder valves shall be opened slowly.
- Torches must be properly inspected for clogs, leaks, and any other defects prior to the start each work shift.
- Clogged torches are to be cleaned using suitable cleaning wires, drills, or other devices suited and deemed safe for the task.
- Except on listed equipments, unalloyed copper shall not be used for acetylene or any other compounds containing acetylene as the combination of copper and acetylene can result in violent explosion.
- Other than the gas supplier, mixture and refilling of gases in a cylinder is prohibited.
- Whenever Gas Welding operation is suspended, appropriate lockout-tagout procedures shall be followed.



## **10. Program Maintenance**

- 10.1 This program is administered and maintained by the CSUS Environmental Health and Safety Department. Comments are welcome. Comments, changes and suggestions should website be communicated to EH&S via their at https://www.csus.edu/campus-safety/environmental-health-safety/ .
- 10.2 The Hot Work Permit and list of Hot Work supervisors are attached and maintained as a part of this program.
- 10.3 Resources used to develop this program:
  - 29 CFR 1910.251 to 1910.255 Welding, Cutting, and Brazing.
  - Title 8 CCR Article 90. Electric Welding, Cutting and Heating (Sections 4850 4853).
  - Title 8 CCR Group 10. Gas Systems for Welding and Cutting (Section 4845).
  - Title 8 CCR Group 2. Safe Practices and Personal Protection (Sections 3380 3385).

## **11. Approved Hot Work Supervisor List**

11.1 CSUS Supervisors listed here may approve the Hot Work-related activities in the form of a written permit for locations other than the pre-approved locations specifically listed in section **4.2** of this program.

The CSUS personnel listed below have been approved as Hot Work Supervisors (each within the scope of his job description) in accordance with the CSUS Hot Work Program.

Facility Maintenance Personnel:

Matt Smith	Supervising Metal Worker
James Meredith	Metal Worker
Michael Kramer	Supervising Plumber
Michael Hendren	Plumber
Tim Arkebauer	Plumber
Kenny Burley	Plumber
Glen Schaezlein	Interim Director of Custodial and Grounds
Tim Bair	Director of FM Operations, Engineering Services
Michael Williams	Building Service Engineer Manager

Collage of Engineering and Computer Science:

Marcos Frederickson	Instructional Technician II
Michael Newton	Equipment Technician III

Art Department: Kevin Ptak Ben Hunt

Instructional Technician III Instructional Technician III

Residential Life: Joseph Reynolds

Facilities Worker I, Residential Life



Environmental, Health & Safety: Tom Scarry

**Occupational Safety Specialist** 

# 12. Appendix A

12.1 This Hot Work Permit to be completed and all aspects verified by the Hot Work Supervisor.

1. Hot Work Supervisor	2. Date & Time of Worl	ĸ	3. Have emergency fire response procedures been reviewed?			
			🗆 Yes 🗆 No			
4. Is a confined Space Required?	5. Is Lockout/Blockout/ required?	Tagout	6. Hot Work Equipment to be used			
🗆 Yes 🗆 No	□ Yes	🗆 No				
7. Location and equipment to be we	orked on:					
8. Reason for completing this Hot V	Nork Permit (check all th	nat apply)	9. Yes /No			
□ Combustible materials in th	ne work area		Fire alarm(s) disabled?			
$\Box$ Work area has potential for	flammable vapors	□ No □ Yes				
$\Box$ Work area has potential for	r an oxygen-enriched at	nosphere Campus Police notified?				
Work will be done in a perr	nanent building		🗆 No 🔅 Yes			
10. Fire Prevention Procedures to b	be used during hot work	:				
Yes /No		Yes /No				
□ □ Lockout/Blockout/Tagout		Confined Space Entry Procedure				
$\Box$ $\Box$ Test for flammable vapors v	with gas detector	$\Box$ Displace pipeline/tank with water				
□ □ Erect fire-resistant barriers		$\Box$ $\Box$ Ventilate area to control flammable va				
□ □ Place fire extinguishers aro	und work site	□ □ Clear work area of combustibles				
Wet down floor		□ □ Place water hoses around work site				
$\Box$ $\Box$ Cover floor with wet sand		□ □ Other	(list below)			
$\Box$ Drums filled with wet sand						
$\Box$ $\Box$ Drums filled with water						
□ □ Fire watch						
11. Persons Conducting Hot Work:						
Name and Department						



 Name and Department

 Name and Department

 Fire Watch, Name/Department

 Fire Watch, Name/Department

 12. This Permit is authorized and issued by a Hot Work Supervisor.

 Name

 Signature

 13. Fire Watch (if assigned) has been maintained for 1/2 hour after completion of hot work. All ignition sources have been extinguished. This permit is closed. Date/Time

 Name

 Signature