SECTION 12

Hot Work

SECTION 12: HOT WORK

OVERVIEW

Welding, soldering, brazing, and other activities that require open flames or produce heat are commonly known as "hot work." Hot work presents increased potential for fire and explosion, especially when performed in confined or other enclosed spaces. You must be aware of these hazards to work safely and avoid accidents and injuries. Contact the EH&S Office regarding the Campus Hot Work Program and for further specifics on any of the information below.

WHO CAN DO HOT WORK ON CAMPUS?

All welding, brazing, soldering, and other hot work operators (including third party contractors) must be trained on each piece of equipment they use. You must be trained by your supervisor or other qualified person before conducting any type of hot work. All training must be documented and kept on file.

You must have a designated hot work area or pull a hot work permit before conducting any type of hot work on campus. Contact the EH&S Office to discuss designating a hot work area, or contact your permit authorizing individual to issue a permit. Table 12.1 provides a summary of hot work safety requirements.

Employees performing hot work at off-campus facilities shall obtain necessary training, permits and/or designated area approvals accordingly.

COMMON HAZARDS

Air Contaminants

Hot work produces air contaminants. The most common contaminants include metal fumes and gases. Hazardous fumes may be produced from heating toxic metals found in common alloys. Some examples are beryllium, cadmium and nickel. The particles created are small and can deposit deep in the lungs.

Toxic gases, including ozone, carbon monoxide, and nitrogen oxides, can result from fluxing and degreasing operations.

Be aware of hazardous materials that may be present in solder (e.g., lead). Fluxes may also produce hazardous gases. Always work with the proper ventilation and substitute less hazardous fluxes and solders when possible. The adverse health effects of exposure to welding fumes and gases can range from respiratory tract irritations to systemic poisoning. These effects can be short or long term, depending on the level of exposure. Setting up an appropriate work environment and using the appropriate goggles, face shields, and/or respirators will protect you from contaminants.

Radiation

Both visible ultraviolet (UV) and infrared (IR) radiation are produced when welding and cutting. These types of radiation can cause skin damage (sunburn and cancer) and eye damage (welder's flash, cataracts, and burns). You may not be aware of these injuries until after they occur since UV and IR radiation is not detectable by the senses. Appropriate clothing and filter lenses will protect you from radiation damage.

Burns and Fires

Hot work can be a fire hazard. Burns, fires, or explosions can result from flames, arcs, molten metals, heated

surfaces, or metal splatters. Sparks from welding operations have been known to travel as far as 35 feet horizontally from the welding sight.

Be aware of fire hazards when welding and remember that you can cause fires or be burned when working. Unplug and place soldering irons or guns in holders or stands when not in use. Always assume that a soldering iron or gun is hot. Give equipment time to cool down before touching tongs and tips.

Electrical Shocks

Every year welders die from electric shock. Electric shocks can occur when proper precautions are not taken. Equipment must meet Underwriters Laboratories (UL) code and be checked and serviced regularly. Servicing and installation must only be undertaken by a qualified licensed electrician.

Never tamper with electrical supply circuits or systems. Welders are only responsible for making connections in the welding circuit and for setting external welding machine controls.

Be aware of your work environment. Do not work in wet conditions or on non-insulated surfaces. Use wooden platforms and rubber mats for protection, especially in confined spaces.

Always use fully insulated electrode holders and never touch an energized electrode when in contact with the work circuit. Remember, hot work poses the risk of electrocution. If you sweat profusely, stop working – this will increase the risk of electrocution. Do not touch electrodes or welding wire with your bare hands, and never place holders or welding guns under your armpits.

HOT WORK SAFE PRACTICES

For your protection, make sure all work areas are well-ventilated. Use hoods or local exhaust ventilation (LEV) to minimize exposure to hazardous fumes, gases, and heat.

Consider the safety of other workers around you. Use light filters and welding **screens**, and always have fire extinguishers readily available.

Do not work around sources of ignition. Keep flammable chemicals in approved storage cabinets. Keep combustible material at least 35 feet (11 meters) away from hot work operations. If this is not possible, then make sure these items are properly shielded. Remember that walls, ceilings, and floors are also combustible. Shield these areas as necessary. Seal or guard any cracks and holes where hot sparks might fall.

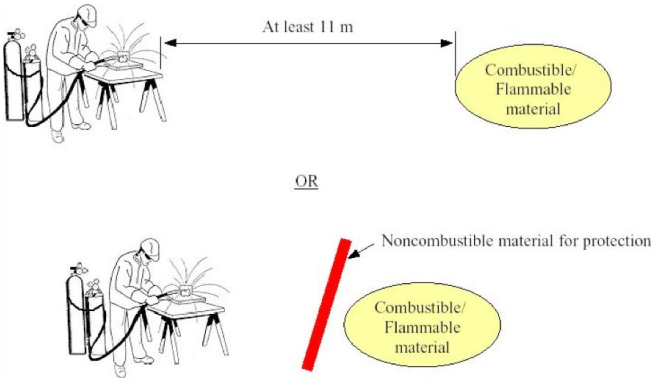

Table 12.1 – Hot Work Fire Safety Precautions

Before the Work– *All* of the following precautions must be taken:

- ☐ All cutting and/or welding equipment inspected and free of damage or defects.
- ☐ A fully charged, multi-purpose, dry chemical portable fire extinguisher in the work area.
- ☐ Accessible fire alarm pull station or means of contacting the fire department (e.g., site telephone) is available.
- ☐ Floor areas under and at least 35 feet around the cutting/welding operation free of combustible and flammable materials OR proper shielding in place.

Where applicable, the following precautions must be taken before the work begins:

- ☐ Fire resistant shields (fire retardant plywood, flameproof tarpaulin etc.), covering combustible floors.
- ☐ Spark/slag catchers (fire retardant plywood, flameproof tarpaulins etc.) suspended below any elevated cutting/welding operation.
- ☐ All floor and wall openings covered to prevent sparks/slag from traveling to other, unprotected areas.
- ☐ Containers in or on which cutting/welding will take place purged of flammable vapors.

During/After the Work – *All* of the following precautions must be taken:

- ☐ Person(s) assigned to a fire watch during and for at least 30 minutes after all cutting/welding ceases.
- ☐ Fire watch person(s) supplied with multi-purpose dry chemical, portable fire extinguisher and trained in its use.
- ☐ A fire alarm pull station or means of contacting the fire department (e.g., site telephone) available and accessible to fire watch person(s).

Always use appropriate guards when welding. Do not put fingers between tongs or linkages when spot-welding. Make sure that guards are always in place, and follow Lockout/Tagout procedures when welding energized or powered equipment.

Gas welding and cutting tasks pose a high level of fire and explosion hazards due to the flammability of the gas cylinders. Always use appropriate pressure and backflow prevention devices when using gas systems. Ignite torches with approved friction devices. Remember to close gas valves before removing regulators.

Protect cylinders from hot metal and sparks by positioning them away from your point of operation. When not in use, store welding and cutting gases away from oxygen cylinders in approved cylinder racks with the valves turned off.

Required PPE

Welding, soldering, or brazing without the proper personal protective (PPE) equipment can be dangerous. Because hot work involves an open electric arc or flame, the risk of burns is significant. To prevent burns, you must wear the proper PPE, such as heavy leather gloves and protective long sleeve jackets.

Additionally, the brightness of the weld area can lead to a condition called arc eye, in which ultraviolet light causes inflammation of the cornea and can burn the retinas of the eyes. Goggles and welding helmets with dark faceplates prevent this exposure.

There are newer helmet models with a faceplate that self-darkens upon exposure to high amounts of UV light. If using a standard faceplate, be sure to use the appropriate shade scale to protect against radiation.

To protect bystanders, translucent welding screens can be placed around the welding area. These curtains, made of a polyvinyl chloride plastic film, shield nearby workers from exposure to the UV light from the electric arc.

Required PPE

1. Thermal fire resistant gloves
2. Fire-resistant long sleeve shirt/jacket or cover based on operation
3. Fire resistant cuff-free long pants
4. Protective goggles or face shield
5. Work shoes or boots
6. Hearing protection where applicable
7. Respirator where applicable