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Welding/Cutting/Brazing with Hot Work Permit

For

<Insert Organization Name>

Adopted
<Insert date policy is adopted>
Introduction
As part of Organization’s overall safety and health program, a welding, cutting and brazing program has been established. The program is designed to comply with the Occupational Safety and Health Administration (OSHA) standards 29 CFR 1910.252 – 1910.255 (Subpart Q – Welding, Cutting and Brazing).

I. Objective
Organization employees may periodically perform welding, cutting, brazing or other various hot work. These activities present hazards from heat, fire, explosion, electrical shock, radiation and fumes. The purpose of this program is to provide our employees with the proper procedures and equipment to perform hot work without injury.

II. Scope
This program is intended for maintenance or other one-time welding and hot work projects.

III. Responsibilities
A. <Insert title of Program Coordinator> is the designated Welding Program Coordinator, and is responsible for the following:
   1. Develop and administer the written Welding / Cutting / Brazing Program.
   2. Ensure that supervisors and employees receive the proper training, and are qualified to weld, cut or braze.
   3. Ensure that employees have the proper equipment and personal protective equipment to perform hot work.
   4. Periodically inspect the work area to make sure that employees are following the program when performing hot work.

B. Supervisors are responsible for the following:
   1. Ensuring that their employees receive periodic training to verify that they are using the proper techniques and safety precautions when performing hot work.
   2. Ensuring that their employees use the proper protective equipment that is required when performing hot work.

C. Employees are responsible for the following:
   1. Attend and participate in all safety training.
   2. Wear are/or use appropriate protective equipment when performing hot work.
   3. Inspect and maintain all welding, cutting and brazing equipment.
   4. Contact their supervisor when they have questions regarding safety.
   5. Follow the recommended steps for welding, cutting and brazing found in this program, including obtaining a hot work permit prior to beginning the job.

IV. Welding Hazards
Specific hazards are created while performing hot work. These hazards present health risks to the individuals who are welding, cutting or brazing, as well as to other workers in the area. The following hazards are created while performing hot work:
A. Sparks/Spatter – Employees will need to take into consideration that sparks and spatter will be generated during welding, cutting or brazing. Spatter can travel as far as 35 feet from the welding operation; therefore, employees must remove or shield all combustible/flammable material within a 35 foot radius. The job should
also be protected by a welding curtain or partition to protect other people who are working in, or may walk past the hot work area.

**Note:** All open loose clothing pockets must be taped so that spatter is unable to fall inside the pocket. Employees must remove butane lighters from their pockets prior to performing hot work.

**B. Light** — Light is generated from the electric current arcing from the electrode to metal. Eye damage can occur from the flash and ultraviolet (UV) rays that are generated. Eye protection must be worn at all times. Exposed skin can also be affected by UV rays. All skin must be covered for protection, as exposure to UV rays may result in a sunburn-like effect.

Employees not directly involved in the hot work project are still susceptible to adverse effects of UV rays. Therefore, it is mandatory that the hot work is shielded by a welding curtain or other barrier. Fixed stations will be enclosed by a welding curtain as well.

**C. Fumes**

1. Fumes will be given off while welding, cutting or brazing. The composition and concentration of these fumes are difficult to classify. In general, the specific hazards of any welding, cutting or brazing operation depend upon:
   a. The type of welding, cutting or brazing being performed.
   b. The type of filler metal, fluxes coatings and base metals being used.
   c. The length of time the employee is exposed.
   d. The amount of ventilation (general or local) available during the welding, cutting or brazing activities.

2. The following is a list of materials used commonly:
   a. Carbon-steel: Iron oxide is the primary element found in the fumes when carbon-steel is welded or cut. There are no serious health hazards associated with iron oxide.
   b. Galvanized stock: Zinc oxide fumes are given off when welding/cutting on galvanized steel. High concentrations of freshly generated zinc oxide fumes can cause a temporary condition referred to as metal fume fever or zinc chill. Symptoms of metal fume fever include fever, chills, nausea, fatigue and general aching of the head and body. These symptoms are reversible and rarely last longer than 24 hours.
   c. Brazing flux and solders: Solders are composed of different types of metals. Depending on the operation, these metals may include the following:
      i. Lead: These solders will come with varying percentages of lead ranging from 10% to 70%. Lead oxide is present in the fumes when welding, cutting or brazing materials that contain lead.

      Lead can accumulate in the body from repeated exposure to lead oxide fumes as the lead builds up in the body over a period of time. Lead poisoning could result with such symptoms as a metallic taste in the mouth, loss of appetite, nausea and abdominal cramping.

      ii. Cadmium: Cadmium will usually be present in solder in the range of 75% to 85%. Short-term exposure to high concentrations of cadmium fumes can produce severe lung irritation. Long-term exposure to low levels of cadmium in air can result in damage to the kidneys.
V. Equipment Needed

A. Hot Work Equipment – All hot work equipment must be approved and marked by a nationally recognized testing laboratory. The manufacturer of equipment, (torches, torch tips, hoses, personnel protective equipment etc.) will provide instructions on its safe use.

B. Personal Protective Equipment – All personal protective equipment will be purchased and supplied at no cost to the employees by the Organization, including:

1. Eye protection – When performing hot work, the eye is exposed to sparks, slag, fumes and the flash, all of which can cause severe damage. All employees performing hot work are required to wear eye protection. The shade of the eye protection will depend on the type of hot work performed. The following chart must be used when determining the shade number for the lens being used:

<table>
<thead>
<tr>
<th>Welding Operation</th>
<th>Shade Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering</td>
<td>2</td>
</tr>
<tr>
<td>Torch Brazing</td>
<td>3-4</td>
</tr>
<tr>
<td>Light Cutting, less than 1 inch</td>
<td>3-4</td>
</tr>
<tr>
<td>Medium Cutting, one to six inches</td>
<td>3-5</td>
</tr>
<tr>
<td>Heavy Cutting, six inches and greater</td>
<td>5-6</td>
</tr>
<tr>
<td>Gas Welding, up to – inch</td>
<td>4-5</td>
</tr>
<tr>
<td>Gas Welding, – inch to ½ inch</td>
<td>5-6</td>
</tr>
<tr>
<td>Gas Welding, Greater than ½ inch</td>
<td>6-8</td>
</tr>
</tbody>
</table>

2. Clothing – The type of hot work employees perform varies from light to heavy. All employees are responsible for wearing necessary protective clothing. No rings, necklaces, watches, or other jewelry can be worn during hot work operations. Following is a list of clothing for the various types of hot work.

a. Soldering:
   i. Safety glasses with a number two-shaded lens.
   ii. Cotton work gloves.
   iii. Long sleeved shirts (or cotton sleeves if available from your local safety supply vendor.)

b. Torch brazing:
   i. Safety glasses with a number three or four shaded lens.
   ii. Cotton work gloves.
   iii. Long sleeved shirts (or cotton sleeves if available from your local safety supply vendor.)

c. Light cutting/welding:
   i. Cutting – safety goggles with a number three or four shaded lens.
      Welding – safety goggles with a number four or five shaded lens.
   ii. Welding gloves.
   iii. Long sleeved heavy wool or cotton shirt.

d. Heavy cutting/welding:
   i. Cutting – welding helmet with a five to six shaded lens.
      Welding – welding helmet with a six to eight shaded lens.
   ii. Welding gloves.
iii. Welding jacket, half jacket or apron with sleeves.

3. Ventilation – Fixed stations for the performance of hot work will be equipped with a ventilation hood. The location of the ventilation draw will be installed such that the fumes will not be drawn from the work through the employee’s breathing zone whenever possible.

When performing hot work away from a fixed station (remote work), employees must keep their head away from the fume plume. When welding for an extended period of time, ventilation (ordinary fan for example) may be used to blow the fumes away from the individual. Another option is to provide a “mobile” ventilation system.

When using a lead or cadmium base solder, or welding/cutting for an extended period of time, a respirator may be required even if ventilation is used.

VI. Gas Welding and Cutting – Acetylene/Oxygen

A. Only authorized personnel will be allowed to gas weld. The Maintenance Manager will maintain a list of trained and authorized employees.

B. Cylinder Labeling – Certain labeling must be displayed by the manufacturer on any compressed gas cylinders brought into the facility. Employees will check to assure that all labels are present. If not, the cylinder should be taken out of use and returned to the vendor. Manufacturer’s labeling includes the following:
   1. The manufacturers' label (name and telephone number) must be located on the top of the cylinders' neck.
   2. Hazardous warnings will also be found on the neck of the cylinder.
   3. Labels must be legible.
   4. Cylinders that are not labeled properly are in violation with the Department of Transportation and OSHA regulations. They should be taken out of service and returned to the vendor for proper labeling.
   5. Labels must include the following:
      a. Oxygen.
         i. A green diamond shaped label marked NONFLAMMABLE GAS with a number 2 in the lower corner. This will be the only marking on the green diamond label.
         ii. UN 1072 must be placed on the cylinder near the green diamond shaped label.
      b. Acetylene.
         i. A red diamond shaped label marked FLAMMABLE GAS with a number 2 in the lower corner. This will be the only marking on the red diamond label.
         ii. UN 1001 must be placed on the cylinder near the red diamond shaped label.

Note: Never change any markings on a compressed cylinder. The only marking that should be placed on the cylinder by an employee is "MT" for empty.

C. Before placing the regulator on the cylinder, stand to one side of the valve and crack it open for a second; this will remove debris from the valve.

D. Never fix a leak on the welding apparatus while the regulator is on the cylinder.

E. Welding apparatus and cylinders must be secured to the vehicle when being transported. The use of bungee cords is sufficient for small cylinders.
F. Regulators must be removed and safety caps placed on the cylinders while in transit.
G. Never lift or move a cylinder by its safety cap.
H. Cylinder valves must be closed when not in use.
I. Hoses and fittings must be free of grease and oil.
J. When taping supply hoses together, tape must not exceed four inches in length. Taping must not be closer than twelve inches apart.
K. Pressure regulators and gauges must remain in good operating condition at all times.
L. Any leaking equipment must be immediately taken out of service and repaired.
M. Cylinder Storage
N. When storing compressed gas cylinders, they must be secured, have their safety caps on, and be stored away from heat sources. Bottles not actively in use at the job site will be considered “stored”, and will remain chained to the cart until actively being used.

Oxygen cylinders must never be stored near highly combustible material (especially oil and grease) or near acetylene or other fuel gas cylinders. There will be a minimum distance of 20 feet separating the storage areas for oxygen and fuel gas cylinders, or a wall to separate the 2 storage areas, that it is at least 5 feet in height, does not contain any holes or other openings, and has a fire rating of at least 1 hour.

VII. Arc Welding and Cutting
A. Arc welders normally use 110 to 220 volts with a 20 to 60 amp service.

   **Note:** It only takes 0.01 amp to a major organ (heart) to kill a person.

B. Only authorized personnel will be allowed to arc weld. The Organization will maintain a list of trained and authorized employees.
C. Employees must:
   1. Inspect all electrical equipment prior to use.
   2. Maintain a dry working area.
   3. Use a designated circuit for the arc welder.
   4. Wear rubber soled shoes; this provides resistance to electrical flow.
D. Employees must never remove or override an electrical safety feature.
E. Faulty equipment must immediately be removed from service.
F. Machine terminals and connectors must be protected to prevent accidental contact.
G. Electrical welding equipment must be properly grounded and a disconnecting switch supplied if the equipment does not have one.
H. Welding leads cannot be rated less than the primary welding current.
I. Welding leads must not have any splices within 10 feet of the holder.

VIII. Welding Around Combustible/Flammable Materials
Never weld or cut around combustible/flammable materials. If it is not possible to move the combustible/flammable materials away from the welding site, the following steps will be taken:
A. Shield the combustible materials with either a welding curtain or partition.
B. Have a fire extinguisher at the welding site ready to be used.
C. A second person as fire watch will be present at the work area, trained and ready to use the fire extinguisher. (A fire watch is also necessary when work is being performed above ground and sparks may land on combustible material. The fire watch will be stationed on the ground, not the work platform.)

IX. Welding in a Confined Space
Prior to welding in a confined space (boiler, air handler, tank, pit, sewer, tunnel, etc.) see the Organization’s Confined Space Program. Never allow an employee to weld in a confined space without following the Confined Space Program.
A. Required Equipment – When performing hot work in a confined space the following equipment will be required at a minimum:
   1. The personal protective equipment required for the specific hot work being performed.
   2. An oxygen deprivation monitor.
   3. A lower flammable limit monitor.
   4. Continuous ventilation.
B. Steps
   1. Continuously monitor the space for oxygen content, lower explosive limit (LEL), and any other hazardous materials resulting from welding, cutting or brazing.

   Some hazardous materials cannot be monitored on a continuous basis; therefore, periodic monitoring is required.

   2. Continuously vent the space using forced air ventilation directed at the work area.

X. Training
Employees who perform hot work will be informed of the proper steps and procedures for performing hot work. Training records will be maintained for the length of employment. Training records will be maintained by the Organization. Training will cover the following material:
A. General Training
   1. The steps required to perform welding, cutting and brazing via arc and gas.
   2. How to properly ground an arc welder.
   3. How to properly transport compressed gas cylinders.
   4. Proper storage of electrode holders to prevent electrical contact with people, conducting objects, fuels or compressed gas tanks.
   5. How to prevent electrical shock including splicing requirements and the safe handling of welding electrode cables.
   6. Personal protective equipment required when performing the different types of hot work.
   7. Health hazards associated with hot work.
   8. How and when to perform inspections on the hot work equipment.
   9. How to meet the requirement of obtaining a Hot Work Permit prior to beginning any hot work at a remote location, away from a fixed hot work station.
   10. Hazard communications training on contents of welding rods, acetylene and oxygen.
B. Specific Training – When an employee is required to perform hot work that they are not familiar with, or is in a location (confined space, etc.) that could pose additional hazards, they must receive task specific training. This
training will cover special equipment and procedures required for the employee to safely perform the job, and be conducted by the management employee assigning the work to be done.

XI. Hot Work Permit
No employee will begin a hot work operation until they have received a permit to do so. Only <Insert title(s) of person/persons authorized to issue permits> will be authorized to issue a hot work permits. Under no circumstances is an employee allowed to permit their own operation.

Permits are required for every hot work assignment, except those that will be completed at a fixed workstation designated for weld/cutting or brazing. However, even when the employee is at the fixed station, they will inspect the area to assure that no one has inadvertently stored flammable or combustible materials within at 35-foot radius.