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Management Plan for Welding, Cutting, & Brazing

IEA PROJECT #201710490



Northfield Public Schools

Management Plan for Welding, Cutting, and Brazing

Table of Contents

Annual Review Form

1.0 Introduction 1

2.0 Safety Instructions 1

 2.1 General Requirements 1

 2.2 Hot Work Permit 1

 2.3 Prohibited Areas 1

 2.4 Signage 1

3.0 Fire Prevention and Protection 2

 3.1 Preparation of Work Area 2

 3.2 Fire Watch 2

4.0 Protection of Personnel 2

 4.1 Protective Clothing 2

 4.2 Eye Protection 2

 4.3 Respiratory Protection 3

 4.4 Ventilation 3

5.0 Oxygen-Fuel Gas Welding and Cutting 3

 5.1 General Requirements 3

 5.2 Storage of Cylinders 3

 5.3 Operating Procedures 3

6.0 Arc Welding 4

 6.1 Voltage 4

 6.2 Installation 4

 6.3 Operations and Maintenance 4

7.0 Resistance Welding 5

 7.1 Installation 5

 7.2 Voltage 5

 7.3 Maintenance 5

8.0 Training 5

9.0 Review 5

Appendices: - Appendences are maintained in the Building and Grounds office with the Health & Safety files.

- A Shade Selection Guide for Eye Protection
- B Hot Work Permit and Checklist

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1.0 Introduction

Welding, cutting, and brazing are potentially hazardous activities that pose a unique combination of fire, safety and health risks. The purpose of this written program, beyond compliance with applicable OSHA regulations, is to reduce the risk of hazardous situations developing and to protect the health and safety of employees who are involved in welding, cutting, and other hot work operations.

2.0 Safety Instructions

2.1 General Requirements

All welding and oxyacetylene cutting outside a classroom setting shall be performed by trained persons. Prior to each welding or oxyacetylene cutting job, the condition of the equipment shall be inspected. Equipment in poor condition shall not be used until replaced or repaired. Examples of unacceptable conditions include cracked hoses and/or leads, taped hoses and/or leads, damaged sealing surfaces on fittings, regulators with inoperable gauges or other damage, missing backflow prevention devices, and flashback arrestors, etc.

Prior to each welding and oxyacetylene cutting job or other hot work:

- The work area shall be inspected for materials that are combustible or flammable. Combustible and flammable materials shall be moved to a safe distance from the work.
- Confirm that fire protection equipment, including fire extinguishers and sprinkler systems, are in working order.
- Confirm that exhaust systems, where needed, are operating.
- Obtain and complete the hot work permit and post at the job site until hot work is completed.
- Know when a fire watch is required and do not start work until the fire watch is present.
- Obtain and wear the necessary personal protective equipment.
- Welding screens shall be used where others in the area may be exposed to arc flash and/or cutting or welding splatter.

When hot work is completed:

- Return the hot work permit to the District Office when hot work is completed.
- Inspect the area after work is completed for weld splatter or sparks that may start a fire.
- Clean up welding or cutting residue and place in a clean metal container.
- Store welding and oxyacetylene cutting equipment properly.

2.2 Hot Work Permit

A hot work permit is required for the following operations **if** hot work is performed outside designated welding classrooms or welding, cutting and brazing areas in shops:

- Welding
- Oxyacetylene cutting
- Soldering with open flame
- Other open flame work

District employees and outside contractors are required to obtain a hot work permit for the hot work activities mentioned above. A hot work permit and checklist can be found in the Appendices.

2.3 Prohibited Areas

Cutting, welding or other hot work activities are not permitted in buildings with impaired sprinkler systems, areas with explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or areas where explosive atmospheres may develop.

No welding, cutting or other hot work shall be performed on used drums, barrels, tanks, bins, ductwork or other containers until they have been cleaned so that materials are no longer present inside.

2.4 Signage

Where hot work area is accessible to persons other than the operator of the hot work equipment, signs shall be posted to warn others before they enter the hot work area. Such signs shall display the following warning:

CAUTION - HOT WORK IN PROGRESS - STAY CLEAR.

3.0 Fire Prevention and Protection

3.1 Preparation of Work Area

Combustible/Flammable Materials

If object to be welded or cut cannot be moved to a designated hot work area, all moveable fire hazards must be relocated at least 35 feet horizontally from hot work. Where relocation of combustible materials is impracticable, combustibles shall be protected with flame-proof covers. If fire hazards cannot be removed, then guards shall be used to confine heat, sparks, and slag and to protect the immovable fire hazards. If the above requirements cannot be met, then welding, cutting or other hot work must be performed with a fire watch.

Openings/Floors/Sprinkler Detection

Openings or cracks in walls, floors, ducts, or shafts within the hot work area shall be tightly covered to prevent the passage of sparks to adjacent combustible areas. Floors shall be swept clean of all combustible materials such as paper clippings, wood shavings, or textile fibers for a radius of 35 feet. Welding or cutting on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs shall not be undertaken if the work is close enough to cause ignition by conduction. Automatic sprinkler protection shall **not be** shut off while hot work is performed.

3.2 Fire Watch

A fire watch is required where combustible materials cannot be moved 35 feet from the hot work area and cannot be covered with a fire-resistant covering, or where hot work is performed in a building or area without automatic sprinkler protection. The fire watch is responsible for ensuring that no sparks or hot embers land on combustible materials, and that fire protection equipment, such as fire extinguishers, is in the immediate work area and ready for use if needed. The minimum required fire protection is a 2A.20BC rated fire extinguisher. The fire watch is also responsible for extinguishing spot fires, communicating an alarm, and performing inspections of the work area after the hot work is completed. The final inspection of the work area shall take place no longer than 30 minutes past completion of the work.

4.0 Protection of Personnel

4.1 Protective Clothing

Appropriate protective clothing required for any welding operation will vary with size, nature and location of the work to be performed. Employees should always select clothing materials that will provide maximum protection from sparks, hot metal and arc flash. Employees performing cutting and welding shall avoid synthetic fibers that may melt and adhere to the skin when in contact with flames/sparks. Leather aprons and gloves provide the best protection. Cotton will burn and turn to ash rather than reacting like most synthetic fibers; therefore, it is also an appropriate option for clothing. Shirts should have full sleeves, no pockets, and should be worn outside the trousers with collar buttoned. High-top leather work shoes covering the ankle should be worn by employees performing hot work. Trousers should have no cuffs and should extend down over the top of the shoes.

4.2 Eye Protection

Helmets or hand shields shall be used during all arc welding or arc cutting operations. Helpers or attendants shall be provided with proper eye protection. Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc. Helmets shall be provided with filter plates and cover plates designed for easy removal.

Note: Reference “**Proper Shade Selection for Eye Protection during Welding Operations**” for selecting appropriate shade numbers (see Appendices).

Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations.

Note: Spectacles without side shields, with suitable filter lenses, are permitted for use during gas welding operations on light work, for torch brazing, or for inspection.

All operators and attendants of resistance welding or resistance brazing equipment shall use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes, as required. Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.

4.3 Respiratory Protection

Respiratory protection shall be required when welding or cutting of materials with zinc, lead, beryllium, cadmium, stainless steel, and other coatings. Respiratory protection may be required for welding and cutting of other metals depending upon the potential worker exposure. Factors affecting worker exposure include length of work, amount of work, work area size and ceiling height, work area ventilation, etc.

4.4 Ventilation

Local exhaust mechanical ventilation shall be required when welding or cutting of materials with zinc, lead, beryllium, cadmium, stainless steel and other coatings. Adequate ventilation is required when performing welding and cutting operations in confined spaces. Mechanical ventilation is required if the work area has a volume of less than 10,000 cubic feet per welder or a ceiling height less than 16 feet.

5.0 Oxygen-Fuel Gas Welding and Cutting

5.1 General Requirements

Mixtures of fuel gases and air or oxygen may be explosive and shall be guarded against. No device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption—except at the burner or in a standard torch—shall be allowed. Under no condition shall acetylene be generated, piped or utilized at a pressure in excess of 15 psig (pounds per square inch gauge) or 30 psia (pounds per square inch absolute).

5.2 Storage of Cylinders

Cylinders shall be stored in accordance with the district's Compressed Gas Management Plan.

5.3 Operating Procedures

- Cylinders, cylinder valves, couplings, regulators, hose and apparatus shall be kept free from oily or greasy substances.
- Oxygen cylinders or apparatus shall not be handled with oily hands or gloves.
- A jet of oxygen must never be permitted to strike any oily surface, greasy clothes or enter a fuel oil or other storage tank.
- Cylinders shall be kept far enough away from welding or cutting operations that sparks or flame will not reach them, or protect cylinders with fire-resistant shields.
- Acetylene cylinder valves shall never be opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn (this permits adequate flow of acetylene and allows ready closing of the valve in an emergency).
- If the valve outlet of a cylinder becomes clogged with ice, thaw with warm (**not boiling**) water.
- Prior to attaching the regulator, stand to one side of the cylinder and open the valve slightly for an instant and then close it. This "cracking" of the cylinder valve will clean the valve of dust or dirt which may have accumulated during storage.
- Before a regulator is removed from a cylinder valve, the valve shall be closed and the gas released from the regulator.
- Hoses showing leaks, burns, worn places or other defects rendering it unfit for use shall be repaired or replaced.

Note: Hoses shall not be taped up to cover leaks.

- When inspecting hoses, employees shall look for charred sections close to the torch. These may have been caused by flash-back.
- Cylinders are kept far enough away from welding or cutting operations so that sparks, hot slag, or flames will not reach the cylinder. If this is not possible, a fire resistant shield is provided.
- Cylinders are not placed in an area where they might come into contact with or become part of the electrical circuit.
- Cylinders are not used as a ground for an arc welder.
- Electrodes are not taped against cylinders.
- Cylinders without fixed hand wheels have keys, handles, or nonadjustable wrenches on valve stems while the cylinders are in service. Multiple cylinder applications require one key or handle for each manifold.
- Cylinders are never used as rollers or supports, whether full or empty.
- No person, other than the gas supplier, attempts to mix gases in a cylinder. No one, except the owner of the cylinder or person(s) authorized by the owner, refills the cylinder.
- No one tampers with or removes cylinder or valve safety devices.
- Drain valves are opened frequently and completely to drain excess fluid.
- Open cylinder valves slowly. Acetylene cylinder valves are not opened more than one and one-half turns and are not used at more than 15 pounds pressure.
- Never use fuel-gas from cylinders through torches or other devices equipped with shutoff valves without using a regulator on the cylinder valve or manifold to reduce the pressure.

6.0 Arc Welding

6.1 Voltage

The following limits shall not be exceeded:

- Alternating current (AC) machines:
 - Manual arc welding and cutting – 80 volts.
 - Automatic (machine or mechanized) arc welding and cutting – 100 volts.
- Direct current (DC) machines:
 - Manual arc welding and cutting – 100 volts.
 - Automatic (machine or mechanized) arc welding and cutting – 100 volts.
- For AC welding under wet conditions or warm surroundings where perspiration is a factor, the use of automatic controls for reducing no-load voltage is recommended to reduce the shock hazard.

6.2 Installation

The district shall document that arc welding equipment has been properly installed. The frame or case of the welding machine (except engine-driven machines) shall be grounded under conditions and according to the methods prescribed in *29 CFR subpart S, Electrical*. Conduits containing electrical conductors shall not be used for completing a work-lead circuit. Under no conditions shall the ground lead be connected to an electrical conduit, a threaded pipe (a loose connection might generate a spark), bolted flanged joints (most have no flat-ground surfaces but have gaskets between them thus eliminating electric conductivity), or a caulked joint (caulking material which is similar to the one used in connecting cast iron sewer pipes is an insulator).

6.3 Operations and Maintenance

Before starting operations:

- All connections to the machines shall be checked by authorized personnel to make certain that they are properly made.
- The work lead shall be firmly attached to the work.
- Magnetic clamps shall be free from adherent metal particles of spatter on contact surfaces.
- Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.

During welding operations:

- Cables with splices within 10 feet of the holder shall not be used.
- Welders shall not coil or loop welding electrode cable around parts of the body.
- Cables with damaged insulation or exposed conductors shall be replaced.
- Joining lengths of work and electrode cables shall be done by the use of connecting means specifically intended for that purpose.

7.0 Resistance Welding

7.1 Installation

The district shall document that resistance welding equipment has been properly installed by a qualified electrician in conformance with *29 CFR subpart S, Electrical*. Welding machines shall be spotted and seamed:

- All doors, access panels and control panels shall be kept locked and interlocked to prevent access to live portions of the equipment by unauthorized persons.
- Where there is a possibility of the operator's fingers being under the point of operation, effective guards must be used. Examples include:
 - Electronic eye safety circuit
 - Two-hand controls

Protective shield guards of safety glass or suitable fire-resistant plastic shall be installed at the point of operation to eliminate the hazard of flying sparks. Additional shields or curtains shall be installed as necessary to protect passing persons from flying sparks. All foot switches shall be guarded to prevent accidental operation of the machine. Two or more safety emergency stop buttons shall be provided on all special multi-spot welding machines, including 2-post and 4-post weld presses.

7.2 Voltage

All external weld initiating control circuits shall operate on low voltage, not over 120 volts, for the safety of the operators.

7.3 Maintenance

Periodic inspections shall be made by qualified maintenance personnel. Certification records shall be maintained for each periodic inspection and will contain the following:

- Date of inspection
- Signature of person performing inspection
- Serial number or other identifier of equipment inspected

Employees shall report any equipment defects to the district contact person, and the use of equipment shall be discontinued until safety repairs have been completed.

8.0 Training

Employees who conduct welding and cutting are trained on the safe use and operation of welding/cutting equipment and on flammable materials or hazardous conditions that may be present during such operations. This training is typically conducted during Employee Right-to-Know training and therefore occurs annually. Documentation of training is maintained for a minimum of three years at the Director of Building and Grounds Office.

9.0 Review

This program is reviewed annually and updated when necessary.