APOLLO INDUSTRIAL SAFETY AND HEALTH PROGRAM

|  |  |  |
| --- | --- | --- |
| Title WELDING, CUTTING, AND HEATING OPERATIONS | NumberAISH 14 | Revision04 |
|  | Effective Date04/22/2017 | Page1 of 11 |

1. **Purpose**
2. To define the safety requirements for welding, cutting, and heating operations, and to ensure compliance with Federal/State requirements.
3. **Responsibility**
	1. The Key Supervisor shall be responsible for the following:
		1. Issuing permits, or complying with permits issued by others.
		2. Monitoring operations involving welding, cutting, and/or heating.
		3. Ensuring compliance with the provisions of this procedure, including required training for employees (e.g., fire watch, confined space, etc.).
	2. Employees shall be responsible for complying with the provisions of this procedure.
4. **Definitions**

Not Applicable

1. **General Requirements**
	1. Welding, cutting, and heating operations shall comply with the following statutory requirements:
		* 1. 29 Code of Federal Regulations (CFR) 1926, Subpart J; Welding and Cutting.
			2. 29 Code of Federal Regulations (CFR) 1910, Subpart Q; Welding, Cutting, and Brazing.
	2. A Welding, Cutting, and heating Permit (attachment AISH 14-A) shall be issued prior to any welding, cutting, or heating operations being conducted (refer to section 5.8).
	3. Engineering controls shall be implemented to control hazards to the extent feasible.
	4. A member of supervision (i.e. craft superintendent, foreman, “lead” craftsman, etc.) shall survey the jobsite at least once before the start of the job, and at least every 24 hours until the job is complete.
	5. Workers assigned to operate or maintain oxygen/fuel-gas supply equipment and resistance-welding equipment shall be thoroughly instructed in the safe use of such equipment. (Completion of a recognized apprenticeship or other curriculum, which includes these operations, satisfies this requirement.)
	6. Equipment shall be used only for operations for which it is approved, and as recommended by the manufacturer.
	7. Faulty or defective equipment shall not be used.
2. **Procedure**
	1. Gas Welding and Cutting Safety
		1. Fuel-gas hose and oxygen hose shall be easily distinguishable from each other. The contrast shall be made by different colors or by surface characteristics readily distinguishable by touch. Oxygen and fuel-gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.
		2. Gas welding and cutting equipment shall be inspected at the beginning of each shift to identify the following:

Leaking or damaged hose or hose couplings

Leaking or damaged fuel-gas pressure regulators and gauges and related connections

Leaking or damaged torch heads or shutoff valves and related connections

Clogged tip openings

* + 1. When parallel sections of oxygen and fuel-gas hose are taped together, not more than 4 inches out of 12 inches shall be covered by tape.
		2. All hose in use shall be inspected at the beginning of each working shift. Defective hose shall be removed from service.
		3. Hoses, cables, and other equipment shall be kept clear of walkways, ladders, and stairs.
		4. Clogged torch tip openings shall be cleaned with approved cleaning wires, drills, or other devices designed for this purpose.
		5. Torches shall be ignited by friction lighters or other approved devices only. Matches, flame lighters, or hot work shall not be used to ignite torches.
		6. Oxygen and fuel-gas pressure regulators, including related gauges, shall be in proper working order.
		7. Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves. Oxygen shall not be directed at oily surfaces or greasy clothes, or used within a fuel oil or other storage tank or vessel.
		8. Flash-back arresters shall be installed on all oxygen and fuel-gas set-ups.
		9. Torches and hoses shall be completely depressurized (bled) prior to storage, or at the end of each shift.
		10. Torches and hoses shall not be stored in enclosed areas (e.g., gang boxes, lockers) while connected to cylinders.
		11. The frames of all arc welding and cutting machines shall be grounded.
	1. Arc Welding and Cutting Safety
		1. Electrode holders shall be designed for arc welding/cutting and be capable of safely handling the maximum rated current required.
		2. Exposed current-carrying parts of electrode holders shall be insulated in a manner, which provides full protection against electrical shock for operators of arc welders/cutters.
		3. Arc welding/cutting cables shall be completely insulated and flexible, capable of handling the maximum current requirements of the work.
		4. Only cable, free from repair or splices for a minimum distance of 10 feet from the electrode holder shall be used. Cables with standard insulated connectors or splices with insulating quality that is equal to that of the cable may be permitted.
		5. If it is necessary to splice lengths of cable, insulated connectors equivalent to that of the cable shall be used. If connections are made by cable lugs, they shall be securely fastened together and provided a good electrical contact. Exposed metal parts of the lugs shall be completely insulated.
		6. If electrode holders are left unattended, the electrodes shall be removed and the holders placed so that they cannot make electrical contact with employees or conducting objects.
		7. Electrode holders shall not be dipped in water (to do so may cause electric shock).
		8. The power supply to the equipment shall be turned off whenever the welder or cutter leaves work or stops work for any appreciable length of time, or when the arc welding/cutting machine is to be moved.
		9. Faulty or defective equipment shall be reported to the supervisor and tagged out of service (using a “Danger-Do Not Use” tag) until repaired.
		10. Arc welding/cutting operations shall be shielded by noncombustible or flameproof screens, which will protect employees and other persons working in the vicinity from the direct ray of the arc.
		11. Some arc cutting (i.e. arc air, thermo cutters, etc.) and arc welding (i.e. TIG, MIG) can produce excessive concentrations of fumes and gases. Contractors may contact Apollo IS&H for technical assistance (prior to Job Safety Analysis (JSA) preparation/review/approval) to ensure adequate controls have been identified, based on conditions, type of material, rod composition, etc.
	2. Storage and Handling of Compressed Gas Cylinders
		1. Compressed gas cylinders shall be legibly marked with either the chemical or trade name of the gas. Such markings shall be stenciled, stamped, or labeled and not easily removable. The markings shall be located on the shoulder of the cylinder.
		2. Compressed gas cylinders shall be equipped with approved connections.
		3. Acetylene cylinders shall be stored valve end up.
		4. Oxygen cylinders shall not be stored near oil or grease or other highly combustible/flammable materials.
		5. Oxygen cylinders in storage shall be separated from fuel-gas cylinders by a minimum distance of 20 feet, or by a noncombustible barrier at least 5 feet high and having a fire resistance rating of at least ½ hour.
		6. Cylinders shall not be dropped, struck by objects, or permitted to strike against each other violently.
		7. Cylinder valves shall be closed before moving cylinders, at the end of the shift, or when work is finished.
		8. Empty cylinder valves shall be closed.
		9. Cylinders shall be kept far enough away from the actual welding/cutting operation so that sparks, hot slag, or flames will not reach them.
		10. Cylinder valves shall always be opened slowly.
		11. Acetylene cylinder valves shall not be opened more than one and one-half turns of the valve stem and preferably no more than three-fourths of a turn.
		12. Where a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use. In the case of manifold or coupled cylinders, at least one such wrench shall be available for immediate use.
		13. Regulators shall be removed, valve caps are in place, and valves closed when cylinders are transported by vehicles. All vehicles used to transport cylinders shall have a proper support rack installed.
		14. A suitable cylinder truck, chain, or other steadying device shall be used to prevent cylinders from being knocked over while in use or storage.
		15. Cylinders shall not be placed where they may become part of an electric circuit. Tapping of an electrode against a cylinder to strike an arc is prohibited.
	3. Personal Protective Equipment (also refer to AISH 10)
		1. Eye and Face Protection
			1. Welding helmets and hand shields shall be used during all arc welding/cutting operations, excluding submerged arc welding. Safety goggles or glasses (with side shields) shall also be worn (in addition to helmets/shields) during arc welding/cutting operations. The goggles or glasses may be either of clear or colored glass, depending upon the type of exposure in welding operations. Helpers or attendants shall wear appropriate proper eye protection (as required) in addition to standard safety glasses.
			2. Safety goggles or glasses with side shields and suitable filter lenses may be permitted for use during gas welding operations on light work, torch brazing, or inspection
			3. Operators and attendants on resistance welding or brazing equipment shall use face shields or goggles, depending on the particular job.
		2. Protective Clothing
			1. Except when engaged in light work, welders shall wear flameproof gauntlet gloves.
			2. Flameproof aprons/jackets made of leather, or other suitable material, may also be desirable protection against radiated heat and sparks.
			3. Woolen clothing is preferable to cotton because it is not so easily ignited. Nylon clothing is not permitted for welding/cutting operations. All outer clothing, such as jumpers or overalls, should be reasonable free from oil or grease.
		3. Respiratory Protective Equipment
			1. When respiratory protective equipment is required, the provisions of AISH 32 shall be adhered to. Respiratory protective devices may also be required when one or more of the following conditions exist:

Feasible engineering controls are insufficient to mitigate the hazards

Room size (with special regard to ceiling height) is limited, or there are large amounts of welding/cutting and ventilation is limited

Too many welders operating in an area at one time

Potentially unsafe atmospheric conditions

Too much heat generated

Presence of hazardous fumes, gases, or dusts of metals above allowable limits

* 1. Mechanical Ventilation: For purposes of this section, mechanical ventilation shall meet the following requirements.
		1. Mechanical ventilation consists of either general dilution systems or local exhaust systems.
		2. General mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits.
		3. Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them within safe limits in the breathing zone.
		4. Contaminated air exhausted from working spaces shall be discharged into the open air and away from the source of intake air.
		5. All makeup air (replacing that withdrawn) shall be clean and respirable.
		6. Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.
		7. Specific requirements apply to materials (including welding rods and fluxes) containing zinc, lead, mercury, beryllium, cadmium, and stainless steel to be cut, heated, and/or welded. Apollo IS&H shall be consulted for appropriate methods and controls.
	2. Fire Protection
		1. When possible, objects to be welded, cut, or heated shall be moved to a designated safe location. If this is not possible, all movable fire hazards in the workspace shall be taken to a safe place.
		2. If the object to be welded, cut, or heated cannot be moved and all fire hazards cannot be removed (e.g., equipment, walls, floors, etc.), positive means shall be taken to confine the heat, sparks, and slag to protect the immovable fire hazards.
		3. Welding, cutting, or heating shall not be performed where the application of flammable paint, the presence of other flammable compounds, or heavy dust concentration create a possible hazard.
		4. Approved fire extinguishing equipment shall be present in the immediate work area.
		5. Combustible materials, equipment, or building surfaces within 35 feet of the work or below the work shall be covered with fire-resistant welding blankets, moved, or wetted down.
		6. Openings in ducts, tanks, or other confined spaces within 35 feet of the work shall also be covered or plugged. (Fire-resistant welding blankets are used for electric arc operations instead of wetting the work area down.)
		7. Unless specific authorization is obtained from the owner and owner specified precautions are fully implemented, cutting and welding is prohibited as follows:

In explosive atmospheres of gases, vapors, or dusts or where explosive atmospheres could develop from residues or accumulations in confined spaces.

On metal walls, ceilings, or roofs built of combustible sandwich-type panel construction with combustible insulation, or those having a combustible covering.

* 1. Fire Detection and Suppression
		1. When automatic sprinkler protection cannot be shut off while hot work is performed, the following precautions shall be put in place:
1. The general contractor shall be notified and approve the hot work operations and protection methods.

A fire extinguisher must be readily available and accessible.

If entire building smoke detection and alarms systems cannot be shut down, smoke detectors in the area of hot work may be covered for the duration of hot work to prevent false alarms. As soon as hot work is completed the covering shall be removed.

Automatic sprinkler systems may not be shut down to perform hot work. Instead, individual sprinkler heads in the area of hot work may be covered with a wet rag to prevent accidental activation.

If hot work is within 5 feet of sprinkler heads, the work shall be re-evaluated. All efforts shall be made to pre-fabricate the pipe/duct to maintain the clearance from sprinkler system. If within 5 feet of sprinkler heads, the owner and foreman shall be notified and shall walk the system down to ensure all precautions are taken.

* 1. Fire Watch
		1. A fire watch shall be maintained for at least 30 minutes after completion of welding/cutting operations so that possible smoldering fire can be detected and extinguished.
		2. Fire watch personnel shall be instructed in the selection and use of appropriate fire extinguishers.
		3. Fire watch personnel shall be familiar with facilities and the procedures to be followed in the event of a fire. They watch for fires in all exposed areas, and attempt to extinguish fires only when obviously within the capacity of the equipment available.
		4. The requirement for a fire watch may be waived when, after completion of the Welding, Cutting, and Heating Permit, it has been determined that there is **NO POSSIBILITY OF SPARKS, SLAG, HOT MATERIAL, ETC. COMING INTO CONTACT WITH FLAMMABLE OR COMBUSTIBLE SOLIDS, VAPORS, LIQUIDS, OR RESIDUES.**
	2. Welding, Cutting, and Heating Permits
		1. Before any welding, cutting, or heating is performed, the area shall be inspected by the Key Supervisor responsible for authorizing welding and cutting operations.

EXCEPTION: The Key Supervisor is not required to issue a Welding, Cutting and heating permit where a permit is already provided by the customer.

* + 1. Welding, Cutting, and heating permits for temporary work locations (i.e., construction sites) shall be valid for a specific location for a specified period of time, as deemed appropriate by the Key Supervisor.
		2. Welding, Cutting, and Heating Permits for permanent locations where welding, cutting, and heating are an integral part of the day-to-day operations (fabrication shops, mechanical shops, etc.) are valid for a period of 6 months from the date of issue. Prior to the end of that 6-month period, Apollo Safety and Health shall conduct an inspection of the workplace and the permit is reissued based upon the results of the inspection. (Any defects related to performance of welding, cutting, and heating must be satisfactorily corrected before a permit is issued.)
			1. The permit shall be approved by the Key Supervisor or Apollo IS&H.
			2. The expiration date for Welding, Cutting, and Heating Permits shall be recorded in the space provided at the bottom of the permit.
	1. Welding/Cutting on Containers
		1. **Used Containers**: No welding, cutting, or other hot work shall be performed on empty drums, barrels, tanks, or other containers until they have been cleaned thoroughly. (This is to ensure that there are no flammable materials present or any substances such as greases, tars, acids, etc. which might produce a hazard when subjected to heat.) Any connection to the drum or vessel shall be disconnected or blanked off.
		2. **Venting and Purging**: Hollow spaces, cavities, or containers shall be ventilated to remove gases before preheating, cutting, or welding. Purging with inert gas is recommended.
	2. Welding, Cutting, and Heating in Confined Spaces: Procedures for welding, cutting, and heating in confined spaces are contained in AISH 16.
	3. Mani Folding of Cylinders
		1. Cylinder manifolds shall be installed under the supervision of an experienced person(s) and comply with NFPA/ANSI standards and be FM or UL listed/approved.
		2. Manifolds and parts shall be appropriate for the gases for which they are approved.
		3. When acetylene cylinders are manifold types, approved flash arresters shall be installed between each cylinder and the coupler block. One flash arrestor installed between the coupler block and regulator is acceptable for outdoor use only if the number of cylinders coupled does not exceed three.
		4. Each cylinder lead shall be provided with a backflow check valve.

**6.0 Records**

|  |  |  |
| --- | --- | --- |
| Document | Record SubmittalResponsibility | Record RetentionResponsibility |
| Welding, Cutting, and Heating Permit | Contractor | Construction Management |

**7.0 References**

Not applicable

**8.0 Attachments**

AISH 14-A Welding, Cutting, and Heating Permit

APOLLO WELDING, CUTTING AND HEATING PERMIT

THIS PERMIT IS TO BE COMPLETED WHENEVER WELDING, CUTTING, OR HEATING IS TO BE PERFORMED.

COMPLETED PERMIT MUST BE POSTED IN WORK AREA

|  |  |  |  |
| --- | --- | --- | --- |
| Area | Building | Issue date | Expiration date |
| Job Description: |
| WELDING/CUTTING/HEATING REQUIREMENT |
| YES | NO | NA |  |
|  |  |  | Automatic sprinklers in service**. If yes, Precautions must be taken to eliminate the accidental activation of system.*** Notify general contractor
* Sprinkler heads in the area of hot work covered to prevent accidental activation.
* Smoke detection and alarms systems covered for the duration of hot work to prevent false alarms.
* If within 5 feet of sprinkler heads, the foreman shall be notified and shall walk the system down to ensure all precautions are taken.
 |
|  |  |  | Duct smoke alarms and dampers protected. |
|  |  |  | Flammable liquids/solids relocated |
|  |  |  | Flammable vapors removed |
|  |  |  | Combustible work surfaces wetted down or covered |
|  |  |  | Other combustibles removed |
|  |  |  | Fire extinguisher provided and inspection tag current |
|  |  |  | Wall, floor, duct, and tank openings covered |
|  |  |  | Fire watches provided (only if can’t see sparks landing, holes,etc) |
|  |  |  | Equipment is proper working order and inspected |
|  |  |  | Proper electrical connections |
|  |  |  | Toxic residue from surfaces removed |
|  |  |  | Ventilation/exhaust adequate |
|  |  |  | Weld screens in place |
|  |  |  | All training current |
|  |  |  | Other: |
| PERSONAL PROTECTION REQUIREMENTS |
|  Leather gloves Safety Glasses Face Shield Hearing protection Respirator Welders hood Cutting goggles Hard Hat Apron/Weld Jacket |
| Remarks or special instructions: |
| Completed By: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fire Watch:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Key Supervisor;\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Personnel completing the hot work: |
| Name: | Signature: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |