**WELDING AND CUTTING**

Piedmont Service Group (PSG) realizes that welding and cutting are necessary in the mechanical trades. There are several hazards to consider when performing welding or cutting operations. These hazards include fires, explosions, electrocution, burns, welder's flash, oxygen depletion and toxic fumes. Project foremen will be responsible to ensure their personnel are aware of these hazards and have taken adequate steps to prevent such an occurrence. All workers are required to follow the outlined procedures.

**Training**

 It is the policy of PSG to permit only trained and authorized personnel to operate welding and cutting equipment. Furthermore, personnel acting as a designated fire watch shall be trained and authorized.

 The Project Foreman or Safety Director will conduct the initial training and evaluation. Training shall consist of the hazards associated with the welding and cutting equipment, hazards of the workplace, duties of the fire watch, use of fire extinguishers and general hazards that apply to most welding and cutting operations.

**Hot Work Procedures**

 When required by the owner or on projects where fire poses a significant risk of damage, a Hot Work Permit may be required. A Hot Work Permit should be obtained, reviewed and signed by the company supervisor. The Hot Work Permit must be posted in the immediate area of hot work activity.

 Objects to be welded, cut or heated must be moved to a designated safe location. If the object cannot be easily moved, all moveable fire hazards will be moved at least 35 feet from the worksite or protected with

 flame proof covers, metal guards or curtains.

 A fire watch shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop or if combustible material is within 35-feet of the hot work activity. Additional fire watch may be needed below if floor openings or shafts are present or adjacent to the hot work area where materials could become ignited from conduction or radiant heat through walls or ceilings.

 A fire extinguisher must be immediately available in the work area, free of obstruction and maintained for instant use. The fire extinguisher shall be of suitable size and rating for the work being performed.

 When conditions warrant, a fire watch person shall be provided during and for 30 minutes past the completion of the welding project.

Portable welding screens, partitions or curtains shall be used to protect other workers within 40 feet of the

working area.

The work area shall be kept clear of welding rod studs and other debris.

If material to be welded is plated, coated or painted with material, which may emit toxic fumes or vapors,

the welder shall wear an appropriate respirator in addition to any local ventilation.

If fire hazards cannot be taken to a safe location or guards cannot be used to confine heat, sparks and protect

the immovable fire hazards, then welding and cutting activities shall not be performed until a safe solution

has been applied.

**Electrical Welding**

 Ensure electrical cord, electrode holder and cables are free from defects (no cable splices are allowed within 10 feet of the electrode holder).

 Ensure the welding unit is properly grounded and of the correct ampacity. All welding equipment shall be turned off when work has stopped.

 To avoid overheating, ensure proper contact of work leads and connections, remove any metal fragments from magnetic work clamps.

 To avoid electric shock do not wrap welding cables around a body part and avoid welding in wet conditions.

 Broken or defective equipment shall be reported to your supervisor and immediately removed from service until it has been repaired or replaced.

 Respiratory protection or exhaust ventilation may be needed to protect against harmful gases, fumes and vapors.

**Gas Welding**

 Inspect pressure gauges, hoses and torches daily for defects. Ensure all fittings are tight. If cylinders, valves, regulators, plugs, or other safety devices are damaged, they must be tagged out of service and removed from the work area.

 Valves must be opened slightly and closed immediately before a regulator is connected to the cylinder. This is called “cracking” which clears the valve of dust and dirt. The employee must stand to the side of the outlet, not in front. Valves must be cracked away from welding work, sparks, flames or other sources of ignition.

 Valves must be opened slowly to prevent damage to the regulator. Valves must not be opened more than 1½ turns. If a wrench is required it must stay in position in case of emergency for a quick shut off.

 When work is complete, cylinders must be closed and the gas released from the regulator before removing the regulator.

 Oxygen cylinders and fittings must be kept free from oil or greasy substances and may not be handled with oily hands or gloves.

 Clogged torch tip openings must be cleaned. Torches may be lit only with friction lighters.

 For proper use, handling and storage of compressed gas cylinders refer to the compressed gas cylinder policy of this safety manual.

 Broken or defective equipment shall be reported to your supervisor and immediately removed from service until it has been repaired or replaced.

 Respiratory protection or exhaust ventilation may be needed to protect against harmful gases, fumes and vapors.

**Welding in a Confined Space**

• A Confined Space is large enough and so configured that an employee can bodily enter and perform assigned work.

• Has limited or restricted means for entry or exit (for example, tanks, vessels, coolers, storage bins,

hoppers, vaults, and pits are spaces that may have limited means of entry).

• Is not designed for continuous occupancy.

Refer to PSG's Confined Space Program before commencing any welding, cutting and/or brazing operations in an area meeting the requirements of a confined space. Ventilation is a prerequisite to work in confined spaces. When welding or cutting is being performed in any confined spaces, the gas cylinders and welding machines shall be left on the outside. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.

When a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of an emergency.

 • When safety belts and lifelines are used for this purpose, they shall be so attached to the welder's body that it cannot be jammed in a small exit opening.

 • An attendant with a preplanned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect.

When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine shall be disconnected from the power source.

In order to eliminate the possibility of gas escaping through leaks of improperly closed valves, when gas welding, the torch valves shall be closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. If practical, the torch and hose shall also be removed from the confined space.

When welding must be performed in a space entirely screened on all sides, the screens shall be so arranged that no serious restriction of ventilation exists. It is desirable to have the screens so mounted that they are about 2 feet (0.61 m) above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.

A fixed enclosure shall have a top and not less than two sides which surround the welding or cutting operations and a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet (30 m) per minute.

All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All air withdrawn will be replaced with air that is clean.

In circumstances for which it is impossible to provide such ventilation, airline respirators or hose masks approved for this purpose by the National Institute for Occupational Safety and Health (NIOSH) will be provided. In areas immediately hazardous to life, a full-face piece, positive pressure, self-contained breathing apparatus or a combination full-face piece, positive pressure supplied-air respirator with an auxiliary, self-contained air supply approved by NIOSH must be used.

Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, hose masks with blowers or self-contained breathing equipment, a worker shall be stationed on the outside of such confined spaces to ensure the safety of those working within.

**Fumes, Gases and Dust**

Sprinkler systems have to be considered when welding. The fumes will set them off.

Fumes produced by some welding processes can be toxic and may require source extraction. An assessment of the work to be performed must be completed before each job is undertaken. Fumes generally contain particles from the material being welded. Welding fumes can have an acute effect on the respiratory system.

Any welding, cutting or burning of lead base metals, zinc, cadmium, mercury, fluorides, beryllium or exotic metals or paints not listed here that could produce dangerous fumes shall have proper ventilation or respiratory protection. This includes inert-gas metal-arc welding or oxygen cutting of stainless steel.

Welders and helpers will refer to PSG's Respiratory Protection Program to determine the appropriate respiratory protection to be used during welding operations.

All welding and cutting operations shall be adequately ventilated to prevent the accumulation of toxic materials. This applies not only to the welder, but also to helpers and other personnel in the immediate vicinity.

**Personal Protection**

Helmets and hand shields shall be made of a material, which is an insulator for heat and electricity. Helmets, shields and goggles shall not be readily flammable and shall be capable of withstanding sterilization.

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.

All parts shall be constructed of a material, which will not readily corrode or discolor the skin.

Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.

All glass for lenses shall be tempered, substantially free from scratches, air bubbles, waves and other flaws. Except when a lens is ground to provide proper optical vision correction, the front and rear surfaces of lenses and windows shall be smooth and parallel. Lenses shall bear some permanent distinctive marking which may readily identify the source and shade.