



APPENDIX N. WELDING, CUTTING, HOT WORK SAFETY PROGRAM

Purpose

VSC Fire & Security (hereinafter VSC) is dedicated to the protection of its employees from occupational injuries and illnesses. The objective of this program is to provide specific standards regarding Welding, Cutting and Hot Work to ensure that each employee is adequately trained and fully aware of required safety procedures.

Welding, Cutting and Hot Work, such as brazing or grinding, presents a significant opportunity for both employee injury and fire to premises. VSC employees and subcontractors must apply precautions contained in this program prior to performing any welding or hot work. In the event an unsafe condition arises employees shall immediately alert co-workers and the jobsite lead person. When working on the premises of others, VSC will comply with the host's guidelines, as long as they meet OSHA standards.

Any VSC employee who disobeys and/or disregards the guidelines set forth in this safety program will be subject to disciplinary action as outlined in the VSC "Employee Handbook".

Regulatory Scope

This program addresses the regulatory requirements found under OSHA 29 CFR 1910.252; OSHA 29 CFR 1926.150 (e)(1) and 1926.350; Corps of Engineers EM 385 1-1 93, 207.

Training (Welding, Cutting, Hot Work)

VSC employees and their supervisors are required to understand the safety guidelines regarding Welding and Cutting operations. Designated welders, cutters and their supervisors must receive annual training and must demonstrate their understanding of these guidelines to the trainer.

Training will include:

1. Review of requirements listed in OSHA 1910.252 & 1926.350.
2. Use of Hot Work Permit System.
3. Supervisor Responsibilities.
4. Fire Watch Responsibilities.
5. Operator Responsibilities.
6. Contractors Responsibilities.
7. Documentation Requirements.
8. Respirator Usage Requirements.
9. Fire Extinguisher Training.

Upon completion of Welding and Cutting training VSC will certify in writing that each designated welder has received and understands safety requirements. The certification card will include the employee's name, name of the trainer, date of training, and subject of certification.

Training (Fire Watch)

Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with the facilities and how to sound an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only if it is obvious that they are within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

Recordkeeping

VSC's Risk & Safety Department (hereinafter "Risk-Safety") will maintain training records of all employees who have been trained in this Welding, Cutting and Hot Work safety program. Records will include: employee name, training topic-to include course content, date of training, certification (where applicable), and date of future training to maintain certification.

Welding & Hot Work Procedures

Welding and hot work procedures are those activities which result in sparks, fire, molten slag, or hot material which has the potential to cause fires or explosions. Hot work includes: cutting, brazing, soldering, thawing pipes, grinding and welding.

VSC employees and sub-contractors will comply with the following:

- Before cutting or welding is permitted the area shall be inspected by the individual responsible for authorizing cutting and welding operations. The individual shall provide a written permit, which will designate the precautions to be followed.
- Prior to commencing any hot work that requires the use of respiratory protection, affected employees must comply with requirements as specified in Appendix H. "*Respiratory Protection Safety Program*" of the VSC Health & Safety Program.
- PPE appropriate to the type of hot work being conducted will be provided and must be worn by the affected employees.
- When performing hot work overhead creating the hazard of falling sparks or slag, the employee needs to take practical precautions including the use of a welder's jacket or elastic/tight fitting shirt cuffs or gloves with adequate sized gauntlets to avoid injuries from hot fragments falling into open sleeves/cuffs.
- When performing hot work overhead, due to the hazard created by falling hot fragments, necessary precautions in the form of barricades or warning signs will be erected to ensure no person stands beneath the work zone.
- All combustibles will be relocated at least 35 feet from the work site. Where relocation is impractical, combustibles must be protected with flameproof covers, shielded with metal guards, curtains, or wet down to help prevent ignition of material.
- Ducts, conveyor systems, and augers that might carry sparks to distant combustibles must be protected or shut down. Shutting down these systems and/or applying lockout/tagout procedures, must be coordinated with the customers designated safety representative or the facility maintenance manager.
- Where cutting or welding is done near walls, partitions, ceilings, or a roof of combustible construction, fire-resistant shields or guards will be provided to prevent ignition.
- If welding is to be done on a metal wall, partition, ceiling, or roof, precautions must be taken to prevent ignition of combustibles on the other side, due to conduction or radiation of heat.
- Where combustibles cannot be relocated on the opposite side of the work, a fire watch person will be provided on the opposite side of the work.
- Welding will not be attempted on a metal partition, wall, ceiling or roof having a covering, or on walls having combustible sandwich panel construction.
- Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs will not be undertaken if the work is close enough to cause ignition by combustion.
- Cutting or welding will not be undertaken in close proximity to wiring that is not properly protected by appropriate conduit, fire-resistant shields, or guards.
- In areas where there is dust accumulation of greater than 1/16 inch within 35 feet of the area where hot work or welding will be conducted, all dust accumulation will be cleaned up following the housekeeping program of the facility before hot work or welding is permitted.
- Prior to any hot work the work zone will be inspected for any flammable trash and debris such as: paper, cardboard, or wood. Any trash or debris will be cleared from the zone and properly disposed of.
- At least (2) 10-lb. dry chemical fire extinguishers shall be accessible within 35 feet of work area. Extinguishers designated as part of the project site protection or building fire protection program must not be used for hot work.
- Prior to any hot work involving welding, cutting or grinding of surfaces coated or insulated with a known or suspected hazardous material such as lead, asbestos, or chromium a Job Hazard Analysis (JHA) will be completed. All site safety and environmental procedures identified by the JHA will be implemented *before* hot work begins.
- A cutting/welding permit will be issued on all welding or cutting outside of designated welding areas.
- All procedures conducted upon premises away from VSC properties must be approved by the Host.
- Fire alarm devices or alarm system (i.e. telephone system, or siren) shall be established whereby employees on the site can quickly alert the local fire department to any resultant emergency. The alarm code and reporting instructions are to be conspicuously posted at the alarm panel.

Cutting or welding will not be permitted in the following places:

- Areas not authorized by management.
- Buildings equipped with a fire suppression system, while the system is impaired and an adequate fire watch is not posted.
- In the presence of potentially explosive atmospheres.
- Areas near the storage of large quantities of exposed, flammable or ignitable materials.
- Areas in close proximity to fire sprinklers and/or detectors.

Requirements for Welding Outside of Designated Areas

- Portable welding curtains or shields must be used to protect other employees in the welding area.
- A hot work permit must be completed prior to conducting welding operations.
- Respiratory protection is mandatory unless an adequate monitored airflow, near the welder and others present, can be established and maintained.
- Plastic materials must be covered with welding tarps during welding procedures.
- Fire Watch must be provided for all hot work operations.

Welding Standard Operating Procedures (SOP) for Electric and Gas Welding

Electric Welding

- Perform Safety Check on all equipment.
- Ensure fire extinguisher is charged and available.
- Ensure electrical cord, electrode holder and cables are free from defects. Note: no cable splices are allowed within 10 feet of the electrode holder.
- Ensure PPE (welding hood, gloves, rubber boots/soled shoes, and aprons) are available and have no defects.
- Ensure the welding unit is properly grounded.
- The operator should report any equipment defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured. Repairs shall be made only by qualified personnel.
- Remove flammables and combustibles
- No welding is permitted on or near containers of flammable material, combustible material or unprotected flammable structures.
- Place welding screens or suitable barricades around the work area to provide a fire safety zone and prevent injuries to passersby. Note: Do not block emergency exits or restrict ventilation.
- Ensure adequate ventilation and lighting.
- Execute Hot Work Permit procedures.
- Set Voltage Regulator no higher than the following for:
 - Manual Alternating Current Welders - 80 volts
 - Automatic Alternating Current Welders - 100 volts
 - Manual or Automatic Direct Current Welders -100 volts
- Uncoil and spread out welding cable.
- To avoid overheating, ensure proper contact of work leads and connections, remove any metal fragments from magnetic work clamps. Note: To avoid electric shock do not wrap welding cables around a body part and avoid welding in wet conditions.
- Provide fire watch for one half hour after welding & until all welds have cooled.
- Perform final fire watch and terminate permit.

Gas Welding

- Perform Safety Check on all equipment.
- Ensure gas tank fittings are tight.
- Ensure fire extinguishers are charged and available.
- Inspect hoses for defects.
- Ensure PPE (welding hood, gloves, rubber boots/soled shoes, and aprons) are available and have no defects.
- All defective equipment must be repaired or replaced before use.
- Remove all flammables and combustibles.
- No welding is permitted on or near containers of flammable material, combustible material, or unprotected flammable structures.
- Place welding screen or suitable barricade around work area to provide a fire safety zone and prevent injuries to passersby. Do not block emergency exits or restrict ventilation.

- Use an authorized Air Filtering Respirator, if required.
- Ensure adequate ventilation and lighting.
- Execute Hot Work Permit procedures.
- Open valves on oxygen and gas tanks to desired flow.
- After welding is completed shut tank valves & relieve hose pressure. Store hoses.
- Provide fire watch for 30 minutes after welding and until all welds have cooled.
- Perform final fire watch and terminate permit.

Avoiding Contamination

In order to avoid welder's contamination due to the size of the welding area, the numbers of welders in that area, and the possible transmission of fumes, gas or dust, the following precautions will be taken:

- When welding must be performed in a space entirely screened on all sides, the screens will not allow any restriction of ventilation. The screens should allow for clearance about 2 feet 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.
- Local exhaust or general ventilating systems shall be provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in OSHA 1910.1000 & 1926.350.
- Any welding, cutting, or burning of lead base metals, zinc, cadmium, mercury, beryllium, exotic materials or paints shall have proper ventilation, respiratory protection, or both.

Equipment

Compressed Gas – (Care, Transporting, Moving and Storage)

- Valve caps on cylinders must be in place and secured. Valve caps must not be used for lifting. Do not pry cylinder caps while frozen. Loosen caps with warm water when applicable.
- Cylinders must be transported on a secured cradle only, and loaded into the cradle by tilting or rolling them.
- Cylinders must be moved by tilting and rolling them on their bottom edges. Avoid dropping cylinders or striking other cylinders.
- Cylinders transported by powered vehicles must be secured in a vertical position.
- Regulators must be removed and caps put in place prior to moving cylinders, unless cylinders are secured on a special carrier.
- Proper steadying devices must be used to keep cylinders from falling over while in use.
- Cylinder valves must be closed when cylinders are empty or when cylinders are moved.
- Oxygen cylinders must be stored separated from fuel gas cylinders or combustible material a minimum distance of 20 feet or by a five foot high non-combustible barrier with a fire-resistance rating of one-half hour.
- Cylinders stored inside buildings must be stored 20 feet from combustible materials where they are well protected, well ventilated, and dry. Cylinders must not be stored near elevators, stairs or gangways. Assigned storage locations must prevent cylinders from being knocked over or damaged.
- Cylinders must be kept away from welding or cutting operations to prevent sparks, hot slag, or flame from reaching them. Fire resistant shields must be used when this is impractical.
- Cylinders must be placed away from electrical circuits. Do not strike electrodes against a cylinder to strike an arc.
- Cylinders containing oxygen, acetylene, or other fuel gas must not be used in confined spaces.
- Cylinders must not be used as rollers or supports.
- Only the gas supplier is authorized to mix gases in a cylinder. Only licensed gas service professionals are authorized to refill gas cylinders.
- No damaged or defective cylinder may be used.

Use of Fuel Gas

- VSC employees will be instructed in the safe use of fuel gas.
- 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. Manifold or coupled cylinders must have a wrench available for immediate use. Do not place objects on top of cylinders or damage may occur to the safety device or interfere with the quick closing of the valve.
- Cylinders must be closed and the gas released from the regulator before removing the regulator.
- If cylinders, valves, regulators, plugs, or other safety devices are damaged, they must be tagged out of service and removed from the work area.

Manifolds

- Fuel gas and oxygen manifolds must bear the name of the substance they contain.
- Fuel gas and oxygen manifolds must not be placed in confined spaces, but will be placed in safe, well ventilated, and accessible locations.
- Hose connections must be made so that they cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Keep hose connections free of grease and oil. Do not use adapters to interchange hoses.
- Manifold and header hose connections must be capped when not in use.
- Nothing may be placed on manifolds that will damage the manifold or interfere with the quick closing of the valves.

Hoses

- A fuel gas hose and oxygen hose must be distinguishable from each other; they are not interchangeable. Contrast may be made by different colors or by surface characteristics distinguishable by the sense of touch.
- Employees will inspect all hoses in use at the beginning of each work shift. Defective hoses will be tagged and removed from service.
- Hoses subjected to flashback, or which show severe wear or damage, must be tested at twice the normal pressure for the hose, but not less than 300 psi. If defective, the hose must not be used.
- Hose couplings must be disconnected by rotary motion only.
- Hoses stored in boxes must be well ventilated.
- Hoses, cables, and other equipment must be kept clear of passageways, ladders and stairs.

Torches

- Torches must be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches may not be used.
- Clogged torch tip openings must be cleaned.
- Torches may be lit by friction lighters or other approved devices only.

Regulators and Gauges

- Pressure regulators and related gauges, must work properly while in use.

Oil and Grease Hazards

- Oxygen cylinders and fittings must be kept away from oil or grease. Cylinders and fittings must be kept free from oil or greasy substances and may not be handled with oily hands or gloves.
- Oxygen must not be directed at oily surfaces or greasy clothes. Also, oxygen must not be directed at or within a fuel oil or other type of storage tank or vessel.

Fire Protection

- 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 or protected.
- If the object to be welded, cut, or heated cannot be moved and if all the fire hazards cannot be removed, positive means must be taken to confine the heat, sparks, and slag. Protect the immovable object from the fire hazard by using guards, shields, fire blankets or other adequate protection designed to confine the heat, sparks or slag and to protect the immovable object.
- If the fire hazards cannot be safely moved, or guarding cannot be properly performed, the welding or cutting shall not be performed.
- Greater care must be taken when performing Welding and Hot Work in Special Hazard Occupancies. These are any areas containing Flammable Liquids, Dust Accumulation, Gases, Plastics, Rubber and Paper Products.
- Welding, cutting, or heating must not be performed in the presence of flammable paints, flammable compounds, or heavy dust concentrations.
- Fire extinguishers must be immediately available in the work area, free of obstruction, and maintained for instant use.
- When normal fire prevention precautions are not sufficient for the welding, cutting, or heating operation, the VSC Superintendent will assign a fire watch. A sufficient amount of time must be allowed following the completion of work to ensure that the possibility of fire does not exist. The designated fire watch personnel must be trained in firefighting equipment.
- Gas supplies must be shut off during lunch breaks, overnight, or during shift breaks. Hoses and torches must be removed from confined spaces when not in use.

- Any fire caused by hot work that burns beyond its incipient stage and results in property damage or injury must be fully investigated and documented by VSC management in conjunction with Risk-Safety. All corrective action must be implemented and any discharged fire extinguisher replaced. Hot work will not proceed until authorized by VSC management.

Fire Watch

Fire watchers shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop, or when any of the following conditions exist:

- Appreciable quantities of combustible material, in either building construction or contents, are located closer than 35 feet to the point of operation.
- Appreciable quantities of combustibles are located more than 35 feet (10.7 m) away from the operation but are easily ignited by sparks.
- Wall or floor openings within a 35-foot (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
- Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

