

Procedure Title:	Welding, Cutting & Burning	SOP Number:	SOP-100-03-PR-026
Procedure Owner:	Corporate HSE	Issuing Authority:	Chief Safety Officer

WELDING, CUTTING & BURNING

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1.0 PURPOSE

The purpose of this procedure is to establish the minimum requirements for Welding, Cutting and Burning for STIS DBA Southeast Texas Industrial Services.

2.0 SCOPE

This procedure applies to all HenSu Holdings employees, contractors, subcontractors and visitors associated with an HenSu Holdings site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- HenSu Holdings Managers
- HenSu Holdings Supervisors
- HenSu Holdings Employees
- HenSu Holdings Contractors
- HenSu Holdings Subcontractors
- HenSu Holdings Visitors

4.0 PROCEDURE

Each site shall make every attempt to prevent the possibility of incidents and accidents to employees while performing work activities involving welding, cutting or burning through compliance with safety regulations, training of employees to properly perform their job activities and through employee involvement in safe work activities.

4.1 GENERAL REQUIREMENTS

4.1.1 No welding, cutting or burning shall be performed by HenSu Holdings employees in areas that have not been authorized and permitted.

4.1.1.1 Welding, cutting or burning within customer sites shall follow their procedures.

4.1.2 If welding, burning or cutting is to be performed in areas where a hot work permit has not been provided, then the procedures outlined in SOP-100-03-PR-002 - Confined Space and SOP-100-01-PR-010 – Permits and Work Authorizations shall be followed.

4.1.3 Welding and cutting shall only be performed by trained and qualified personnel.

4.1.4 Suitable fire extinguishing equipment shall be available for immediate use.

4.1.5 Fire watch attendants shall be present when required.

4.1.5.1 Conditions which require the use of a fire watch include:

- Welding, cutting or burning is being done in locations where other than a minor fire could develop.
- Flammable or combustible materials are within 35 feet of the area where hot work is to be performed.
- Flammable liquids or other easily ignitable products are in the near vicinity and could become ignited.
- There is the potential for flammable material to be within a concealed space.

4.1.5.2 Fire watches shall be maintained for a minimum of thirty (30) minutes after the completion of all welding or cutting operations.

4.1.5.3 For more information on a Fire Watch Attendant's responsibilities and duties, refer to SOP-100-03-PR-007 – Fire Prevention.

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- 4.1.6 Welding shall not be done over open sewers, floor openings or cracks unless they can be adequately protected (i.e., being covered or closed).
- 4.1.7 Welding shall not be done over unprotected flammable objects such as paint, oily rags, combustible trash, gasoline, etc. If the fire hazard cannot be removed from the area of the operation, then screens or other protective devices shall be employed.
- 4.1.8 When necessary, all arc welding or cutting operations shall be protected by flameproof screens to protect employees from welding arc flash and slag spatter.
- 4.1.9 When arc welding, the area shall be dry, and all cables and electrodes shall be in good condition.
- 4.1.10 Welding cables and hoses shall be protected where they cross a pathway, roadway or vehicle traffic aisle. Vehicles shall not be allowed to run over exposed cables or hoses.
- 4.1.11 Electrodes shall be removed from the holder when welding has ceased, or they are unattended.
- 4.1.12 An arc shall never be struck on a compressed gas cylinder.
- 4.1.13 Cables should not enter a confined space through the same passageway that workers use for entrance and exit.
- 4.1.14 Hoses, cables and other equipment shall be kept clear of ladders and stairways.
- 4.1.15 Welders and burners shall wear proper personal protective equipment (PPE). The PPE shall follow the requirements of SOP-100-03-PR-001 - Personal Protective Equipment (PPE)

4.2 SAFE WELDING PROCEDURES

- 4.2.1 Welding, burning, cutting, hot tapping, and other types of hot work are strictly prohibited without a safe work permit unless work is done in a designated area, such as shops.
- 4.2.2 Welding and cutting should be kept to a minimum and extra safety precautions shall be taken when welding or cutting on any tank, pump, or line containing flammable gas or liquid.
 - 4.2.2.1 In addition, a specific area should be designated as the welding area. An HenSu Holdings Supervisor shall approve this area and all welding and cutting shall be restricted to this area.
- 4.2.3 Before welding or burning, equipment shall be inspected for the following:
 - 4.2.3.1 Welding leads shall be completely insulated and in good condition.
 - 4.2.3.2 Cutting tool hoses shall be leak free and equipped with proper fittings, gauges, regulators, and flashback devices.
 - 4.2.3.3 Oxygen and gas bottles shall be secured in a safe place.
 - 4.2.3.4 Defective equipment shall be red tagged or otherwise marked and not used until repaired by authorized personnel or replaced.
- 4.2.4 In addition, the following general safety practices apply to most cutting or welding procedures:
 - 4.2.4.1 Cutting and welding should be done in a designated area free from flammable materials. When welding or cutting is necessary in hazardous or undesignated areas, one (1) person shall stand as a fire watch with a fire extinguisher.
 - 4.2.4.2 Welding and cutting areas shall be checked periodically for combustible atmosphere.

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- 4.2.4.3 All employees shall wear eye and face protection. Depending on the nature of the work and the proximity of other welders, employees may also need to wear the following as appropriate:
- Flame Retardant Clothing (FRC)
 - Hardhat
 - Ear protection
 - Filtered face shields, and
 - Respiratory protection.
- 4.2.4.4 Care shall be taken to prevent sparks from starting fires.
- 4.2.4.5 Oxygen cylinder fittings and hoses shall be free from oil and grease.
- 4.2.4.6 Hoses should be kept out of doorways and away from other workers. If the hose is flattened, a flashback may occur.
- 4.2.4.7 If flammable gas is detected, welding or cutting operations shall be shut down.
- 4.2.4.8 All welding operations shall be performed according to authorized procedures.
- 4.2.4.9 Hot metal should be marked with a sign or other visual or verbal warning when welding is complete.
- 4.2.4.10 When working in confined spaces, workers shall follow additional safety precautions and procedures as outlined in SOP-100-03-PR-002 - Confined Space.
- 4.2.4.11 For information on the proper handling and use of gas cylinders, see SOP-100-03-PR-010 – Compressed Gas Cylinders.

4.3 ACETYLENE (GAS) WELDING AND CUTTING TOOLS

The following precautions shall be taken with gas welding and cutting equipment:

- 4.3.1 Employees shall be qualified to use welding equipment.
- 4.3.2 Pressure on the acetylene shall be set at or below fifteen (15) psig.
- 4.3.3 Cylinder valves shall be closed whenever work is finished, the cylinder is moved, or the cylinder is empty.
- 4.3.4 Dirty or defective hoses shall be repaired, replaced, or cleaned. No attempts to repair or tamper with cylinders, valves, or regulators shall take place.
- 4.3.5 Hoses and torches shall be carefully purged before connecting a cylinder.
- 4.3.6 Regulator or pressure gauges shall not be interchanged with other gas cylinders.
- 4.3.7 Before opening the cylinder valve, removed the valve protection cap and attach the regulator and flow restrictor. Ensure the pressure on the regulator adjusting screw is released (backed off).
- 4.3.8 Do not stand in front of the regulator while opening the cylinder valve.
- 4.3.9 The minimum acceptable flow rate shall always be used.
- 4.3.10 The transfer of acetylene from one cylinder to another shall never be attempted.
- 4.3.11 A match shall never be used to ignite a welding torch. An approved torch lighter shall be used.
- 4.3.12 A torch lighter shall never be carried into a combustible atmosphere.
- 4.3.13 A cylinder shall never be heated in order to raise the pressure.

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4.4 CONTROLLING SPARKS AND HEAT

The following precautions shall be used to control heat, sparks, and slag when welding, burning, or performing hot work:

- 4.4.1 Cracks, holes, and openings shall be covered with spark-resistant material. Precautions shall be taken to protect people and equipment below the worksite.
- 4.4.2 Both sides of a partition or tank shell shall be checked before welding on it, and any combustibles found shall be removed.
- 4.4.3 When working near wood or grassy areas, someone shall stand as a fire watch with a fire extinguisher.
- 4.4.4 When working in confined spaces, all cylinders and welding machines shall be placed outside the confined space.
- 4.4.5 Equipment, piping, or containers with flammable materials shall not be opened adjacent to a welding area.
- 4.4.6 Working over oily ground shall be avoided.
- 4.4.7 Welding shall always be done upwind of potential vapor generation.

4.5 ELECTRIC WELDING AND CUTTING TOOLS

The following precautions shall be taken with electric welding and cutting equipment:

- 4.5.1 Arc welding tools shall be stored in an area free from combustible vapors.
- 4.5.2 Arcs should be hooded or screened.
- 4.5.3 Proper and appropriate eye protection shall be worn.
- 4.5.4 Electrical circuits shall be grounded as close to the worksite as possible.
- 4.5.5 Frames or cases of arc welding equipment shall be grounded.
- 4.5.6 Coiled cable shall be spread out to prevent overheating.
- 4.5.7 Welding cables and equipment shall be kept clear from passageways, ladders, and stairways to prevent trips and falls.
- 4.5.8 Welding cables shall be replaced if there is a splice or repair within ten (10) feet of the electrode holder.
- 4.5.9 All welding cable having damaged insulation or exposed conductors shall be repaired or replaced per federal regulations.
- 4.5.10 Contact with grounded circuits shall be avoided when changing electrodes.
- 4.5.11 Electrodes shall never be left unattended in the holder.

4.6 HEALTH PROTECTION AND VENTILATION

The factors that govern the amount of contamination welders in arc and gas welding may be exposed to include:

- 4.6.1 The dimension of space, especially the height of the ceiling, in which the welding is to be done.
- 4.6.2 The number of welders.
- 4.6.3 The possible evolution of hazardous fumes, gases, or dust according to the metals involved.
- 4.6.4 For ventilation, when welding is done in an entirely screened space, the screens shall be arranged so as not to restrict ventilation.

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4.6.5 Local exhaust or general ventilating systems shall be provided and arranged to keep the amount of toxic fumes, gases, or dust below the maximum allowable concentration as specified by OSHA regulations. This could require up to five (5) air exchanges each hour.

4.6.5.1 The number of minutes for one (1) air exchange can be calculated by dividing the volume of the space in cubic feet by the capacity of the ventilation device(s).

$$\frac{\text{Volume of the space (ft}^3\text{)}}{Q \text{ (Capacity of Blower)}} = \text{Time (min)}$$

4.6.6 A number of potentially hazardous materials are used in fluxes, coatings, coverings, and filler metals in welding and cutting and are released in the atmosphere during welding and cutting.

- Some of these include beryllium, cadmium, cleaning compounds, fluorine compounds, lead, mercury, stainless steel, and zinc.

4.6.7 The suppliers of these materials shall determine the hazard, if any, associated with their use in welding and cutting and provide warnings through tags, signs, etc., on boxes and containers. Employers shall also follow the ventilation requirement specified in the standard for these materials.

4.6.7.1 Employees shall wear a NIOSH approved air purifying respirator to protect against metal fumes when welding, cutting, or grinding the following:

- Zinc metal
- Metal coated with lead or lead base paint
- Metal containing mercury or cadmium
- Hard facing with manganese
- Metal containing chrome.
- DISCLAIMER: This shall be done unless the proper I.H. surveys have been conducted.

4.6.8 Goggles or other suitable eye protection (helmets, hand shields) shall be used during cutting operations as a protection against sparks and debris.

4.6.9 Workers adjacent to the welding areas should be protected from ultraviolet rays by non-combustible or flameproof screens or shields or shall be required to wear appropriate goggles.

4.6.10 Employees in welding, cutting and brazing operations shall be protected by PPE that meets OSHA requirements.

4.7 ADDITIONAL GUIDELINES

4.7.1 Only authorized HSE and/or site Supervision, with the authorization from HSE, can sign a hot or safe work permit for welding, burning, cutting, hot tapping, or other hot work procedures. They shall review the job and necessary safety requirements with field personnel.

4.7.2 Employees shall establish areas for cutting and welding based on the fire potential of the area. OSHA standards are very specific:

4.7.2.1 Cutting or welding should be done in an area with no surrounding combustible materials.

4.7.2.2 If combustibles in the immediate vicinity are unavoidable, guards shall be erected to protect the fire hazards from the heat and sparks of the welding or cutting operations.

4.7.2.3 Suitable fire extinguishing equipment (pails of water, buckets of sand, hose, or portable extinguisher) shall be available for instant use, and

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4.7.2.4 Fire Watches shall be in attendance as required.

4.7.3 Torch cutters and welders shall be suitably trained in the safe operations of their equipment. Printed rules and instructions covering the operation of equipment supplied by the manufacturers shall be strictly enforced.

4.7.4 Replacement tips for torches are acceptable as long as they are made to the same specifications as the original tip of the torch at the time it was approved. They are also acceptable when their use in conjunction with converters or adapters results in the same specifications as the original tip at the time it was approved.

4.7.5 A welder or helper working on platforms, scaffolds or runways shall always be protected against fall hazards.

4.7.6 If gas shielded arc welding is done, they shall be familiar with the American Welding Society Standard A6-1-1966.

4.8 TRAINING

4.8.1 Employees who are authorized to perform welding, cutting and burning operations shall be trained to this SOP.

4.8.2 Documentation of training shall be maintained in the HSE Training Database.

5.0 REFERENCES

OSHA 1910.1000	Air Contaminants
OSHA 1910 Subpart Q	Welding, Cutting and Brazing
OSHA 1910 Subpart I	Personal Protective Equipment
OSHA 1926.350	Gas Welding and Cutting
SOP-100-03-PR-010	Compresses Gas Cylinders

6.0 TERMINOLOGY

Site	Any location where HenSu Holdings personnel are involved in work activities.
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7.0 EXHIBITS

None