Welding, Cutting, Brazing and Soldering

Short description

This section outlines the guidance for assessing and controlling hazards associated with welding, cutting, brazing and soldering.

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1 Objective and area of application

The objective of this section of the HSEQ Manual seeks to inform Centennial employees and subcontractors of their obligations to develop the appropriate hazard prevention and control methodologies designed to prevent workplace injuries, illnesses and property damage occurring from of welding, cutting, brazing and soldering activities and/or equipment.

All personnel who use welding, cutting, brazing or soldering equipment on Centennial project sites shall be able to recognize the hazards associated with the different types of equipment and the safety precautions necessary to prevent incidents and injuries.

Any piece of welding, cutting, brazing or soldering equipment that is not in compliance with any applicable requirement of this section is prohibited and shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from the project site.

2 Superior and additional applicable documents

1000_GP_11_01_en_5.0 Global Policy on Health, Safety, Environment/Sustainability and Quality (HSEQ)

1000_GS_11_19_en_1.0 Global Standard on Hot Work

29 CFR 1926

29 CFR 1910

This section of the HSEQ Manual applies to all Centennial employees and subcontractors who are performing work in Centennial facilities and / or on project sites. There may be more stringent requirements than this section as defined by specific State, local or contact specific HSEQ requirements. If there is a conflict between this section and other applicable regulations, the more stringent will apply.

3 Definitions

The following definitions of terms are important for an understanding of this procedure.

Term	Definition
Adequate ventilation	Ventilation flow that allows fresh air to circulate and replace contaminated air, which is simultaneously removed
AHA	Activity Hazard Analysis
Brazing and soldering	The process of using molten metal to join two pieces of metal
Centennial	All Centennial employees, joint venture employees, subcontractors and business partners
Combustible	Solid materials that are capable of burning and/or igniting
Cutting	Any process, including grinding, which produces sparks capable of igniting combustible or flammable materials and transmits

	heat to the work material
Fire watch	Person(s) assigned to inspect for fires resulting from welding, cutting, brazing or soldering
Hotwork	Welding, cutting, brazing and soldering work or any other work that produces an open flame or excessive heat
Hotwork permit	A documented approval process required prior to performing welding, cutting, brazing or soldering work
HSEQ Director	Leads the HSEQ Team
Ignitable material	Any material that is capable of burning
Shielding	Non-combustible welding drapes or screens, used in hot work areas
Smoldering	A slow combustion of material without visible light and generally evidenced by smoke and an increase in temperature
UV	Ultra-violet rays

4 Work site preparation

Workers involved in welding, cutting, brazing and soldering operations shall be trained in the specific operation that they will perform, the personal protective equipment required, fire protection and the safe operation and maintenance of their equipment. Hotwork permits shall be utilized as required by contract, customers or facilities where hotwork will take place. Hotwork shall only be permitted near combustible or flammable materials under an approved hotwork permit. All work areas shall be surveyed and potential combustible or flammable materials removed or protected prior to performing any hotwork. A fully charged and serviceable fire extinguisher shall be immediately available at the location of work.

All welding equipment shall be inspected before each use to ensure that all required safety devices and ancillary equipment are in place and properly functioning. Defective equipment shall be removed from service, replaced or repaired, and re inspected before again being placed in service.

Prior to beginning welding, cutting, brazing or soldering operations, the following work site preparation shall be completed:

- Check the work area (35' radius) to ensure that no fire hazards including oily or greasy materials are present
- Remove all combustible materials within 35’ not necessary for the operation. Any combustible material that cannot be removed should be covered with a flame-resistant material
- Inspect and ensure that all equipment is in good working condition
- Inform workers and affected personnel in the immediate area and display warning signs at the worksite to alert others of the potential hazards

4.1 Fire watch

A fire watch shall be utilized in any instance where combustible or flammable materials could be exposed to potential fire hazards (i.e. welding, open flame, hot metals etc.). The fire watch shall inspect the immediate and surrounding work areas prior to and during hotwork

operations and shall remain at the hotwork location for at least 30 minutes after work is completed to inspect for potential fire hazards and extinguish possible smoldering fires. The fire watch shall be trained in the methods of recognizing potential fire hazards, the use of fire extinguishing equipment and sounding the alarm in the event of a fire.

5 Eye and face protection

The eyes and face of welders shall be protected against ultra violet (UV) and infrared radiation and flying objects during welding, brazing and soldering operations. Personnel performing and/or exposed to welding, cutting, brazing, soldering and chipping operations shall utilize appropriate eye and face protection based on the hazards.

The following apply to eye and face protection during welding, cutting, brazing, soldering and include but are not limited to:

- Appropriate shaded eye protection shall be utilized based on the equipment and type of work performed
- Protective helmets shall have non-reflective surfaces and shall be free from cracks, voids or other damage
- All protective lenses shall meet ANSI Z87.1 ratings for UV, luminous and infrared requirements
- Welding helmets shall be used in conjunction with ANSI Z87.1 rated safety glasses with top and side protection unless the helmet incorporates such protection
- Eye and face protection shall be adequate for protection against the particular hazards for which they are designed
- Protection shall fit snugly and shall not unduly interfere with the movements of the wearer
- Protection shall be capable of being disinfected

The chart below shows the required eye protection and shading requirements for specific operations:

Operation	Shade Number
Soldering	2
Torch brazing	3 or 4
Cutting- light (up to 1 inch)	3 or 4
Cutting- medium (1-6 inches)	4 or 5
Cutting- heavy (6 inches or more)	5 or 6
Gas welding- light (up to 1/8 inch)	4 or 5
Gas welding- medium (1/8 to 1/2 inch)	5 or 6
Gas welding- heavy (1/2 inch or more)	6 or 8
Atomic hydrogen welding	10-14
Inert-gas metal arc welding- nonferrous (1/16 to 5/32 inch electrodes)	11
Inert-gas metal arc welding- ferrous (1/16 to 5/32 inch electrodes)	12
Shielded metal arc welding (1/16 to 5/32 inch electrodes)	10
Shielded metal arc welding (3/16 to1/4 inch electrodes)	12
Shielded metal arc welding (5/16 to 3/8 inch electrodes)	14
Carbon arc welding	14
Plasma arc cutting up to 100 amps	8
Plasma arc cutting 101-200 amps	10
Plasma arc cutting 201-400 amps	12
Plasma arc cutting greater than 400 amps	14

6 Oxy-fuel gas welding and cutting

The following controls shall be implemented during oxy-fuel operations:

- Prior to beginning welding or cutting operation, an inspection shall be performed verifying that the cylinders, regulators, backflow prevention device, flame arrestors, hoses, clamps, and torches are in good working condition
- Fuel gas and oxidizers shall pass through a pressure-reducing regulator prior to being used
- Pressure reducing regulators shall only be used at or below the rated pressures and must be specific to the type of gas being used

- Prior to connecting a pressure regulator, cylinder valves should be "cracked" to clear the dust or dirt that might otherwise enter the regulator. This procedure shall be performed away from other welding work or sparks
- Oxy-fuel welding and cutting equipment shall be listed by a nationally recognized testing laboratory
- Oxygen cylinders and apparatus shall be kept free from oil, grease and other flammable or explosive substances and shall not be handled with oily hands or gloves
- Cylinders must be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them, or fire-resistant shields must be provided
- Oxy-fuel cylinders shall not be placed or used in confined spaces with personnel
- Fuel gas hoses and oxygen hoses shall be readily distinguishable from each other
- Torches shall be inspected before each use and defective torches shall not be used
- Torches shall be lit by friction lighters or other approved devices not by open flame
- Prior to removing a regulator from a cylinder, personnel must close all cylinder valves, and release the gas from the regulator

6.1 Storage of oxy-fuel equipment

- Oxygen and fuel gas cylinders shall be stored separately with protective caps in place
- Oxygen and acetylene shall be stored at least 20 feet apart or separated by a non-combustible wall or barrier at least 5 feet in height
- Regulators shall be compatible with the CGA (Compressed Gas Association)
- Cylinders shall be secured from tipping and in an upright position while not in use
- Cylinders shall be inspected before each use
- Protective valve caps shall be placed when equipment is not being used for a period of more than 12 hours

7 Arc welding and cutting

Arc welding and cutting operations shall be shielded by noncombustible or flameproof screens that will protect employees and other persons working within 35 feet from the direct rays of the arc, sparks, molten metal, spatter, and chipped slag.

- Welding curtains shall be suitable for the welding process and amperage
- Welding curtains shall provide a high degree of safety against ultraviolet radiation and blue light
- Welding curtains shall be fade resistant and flame retardant
- Electrode holders and current carrying parts shall be rated, designed and fully insulated for the maximum voltage encountered to ground
- Welding cables shall be inspected for wear or damage before each use and damaged cables or parts shall not be used
- Circuits from welding machines shall be grounded
- Welding leads shall not be permitted to contact metal parts so that may become energized or hazardous
- Equipment shall be shut down when leads are left unattended
- Arc welding and cutting operations shall be shielded by non-combustible or flameproof screens to protect workers or other affected personnel from the direct rays of the arc

- Welders and other affected personnel who are exposed to radiation shall be protected so that the skin is covered to prevent burns and other damage from UV rays

8 Amendment history

Date	Version	Revised content
04.01.2016	1.0	Initial Preparation
01.01.2018	2.0	Updates to Paragraph 2 Superior Documents to add the Group Policy and Global Standards, Paragraph 3 Definitions (Centennial and HSEQ Director) and Paragraph 4 Work Site Preparation (fire extinguisher at location)

9 Appendix

There are no appendices to this section.