

## 4123:1-3-17 Cutting and welding.

(A) Reserved.

(B) Definitions.

- (1) "Fire-resistive construction" means a method of construction which prevents or retards the passage of hot gases or flames as defined by the fire-resistance rating.
- (2) "Fire-resistance rating" means the measured time in hours or fractions thereof that the material or construction will withstand fire exposure, as determined by fire tests conducted in conformity to recognized standards.

(C) Responsibility.

- (1) The employer shall verbally and through demonstration instruct the employee in the safe operation and maintenance of cutting and welding equipment.
- (2) It shall be the duty of the employee to operate such equipment in accordance with such instructions.

(D) Maximum pressure.

Under no condition shall acetylene be generated, piped (except in approved cylinder manifolds), or utilized at a pressure in excess of fifteen pounds per square inch gauge pressure.

(E) Gas welding and cutting.

- (1) Equipment.  
Only approved equipment, such as torches, regulators, or pressure-reducing valves, acetylene generators, manifolds, cylinders, and containers shall be used.
- (2) Cylinders and containers.
  - (a) Marking.  
Compressed gas cylinders shall be legibly marked, for the purpose of identifying the content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removed.
  - (b) **Storage.**
    - (i) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of twenty feet or by a noncombustible barrier no less than five feet high, having a fire-resistance rating of no less than one-half hour.

- (ii) Cylinders, when not in use, shall be protected from any heat-radiating objects or open flame which could cause the cylinder to rupture or could cause the fusible plug to melt.
  - (c) Valve protection caps.
    - (i) All cylinders with a water weight capacity of over thirty pounds shall be equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve.
    - (ii) Employees shall be responsible for using valve protection caps when cylinders are moved from place to place or put in storage.
    - (iii) Where carriers are provided for moving cylinders which are connected for use, capping shall not be required but employees shall be responsible for seeing that cylinder valves are closed and pressure is released from regulators, hoses, and torches.
  - (d) Regulator protection.

Welders and cutters shall be instructed to close valves on oxygen and acetylene cylinders and bleed off hose pressure at the end of each workshift, to prevent malfunction of the regulators.
  - (e) Transporting cylinders by crane or derrick.

When cylinders are hoisted, they shall be secured on a cradle, slingboard, or pallet. They shall not be hoisted or transported by means of magnets or choker slings.
  - (f) Facilities for securely fastening cylinders; responsibility.

The employer shall provide facilities for securely fastening cylinders of compressed gas in an upright position.
- (3) Hose and hose connections.
- (a) Hose.
    - (i) **Identification.**

The color red shall be used for acetylene and other fuel-gas hose. The color green shall be used for oxygen hose. The color black shall be used for inert-gas and air hose.
    - (ii) **Hose in which flashback has occurred.**

Any length of hose in which a flashback has occurred and burned in the hose shall be taken out of service.
    - (iii) **Single hose with more than one gas passage.**

The use of a single hose having more than one gas passage, in which a wall failure would permit the flow of one gas into the other gas passage, is prohibited.

- (iv) Hoses taped together - limitation.

When parallel lengths of oxygen and acetylene hoses are taped together for convenience and to prevent tangling, no more than four inches out of twelve inches shall be covered by tape.

- (v) Damaged or defective hose.

Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall have the damaged portion removed.

- (b) Hose connections and couplings.

- (i) Hose connections for oxygen and fuel-gas shall be distinguished from each other. Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than three hundred pounds per square inch.

- (ii) Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.

- (c) Pressure reducing regulators.

Oxygen and fuel-gas pressure regulators, including their related gauges, shall be in proper working order while in use.

#### (F) ARC welding and cutting.

- (1) Manual electrode holders.

- (a) Only manual electrode holders which are specifically designed for ARC welding and cutting, and are of a capacity capable of safely handling the maximum rated current required by the electrodes, shall be used.
- (b) Any current-carrying parts passing through the portion of the holder which the ARC welder or cutter grips in his hand, and the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground.

- (2) Welding cables and connectors.

- (a) All ARC welding and cutting cables shall be of the completely insulated, flexible type, capable of handling the maximum current requirements of the work in progress, taking into account the duty cycle under which the ARC welding or cutting unit is working.
- (b) Cables with splices within ten feet of the holder shall not be used except that cables with standard insulated connectors or with splices whose insulating quality is equal to that of the cables are permitted.

- (c) When it becomes necessary to connect or splice lengths of cable one to another, substantial insulated connectors of a capacity at least equivalent to that of the cable shall be used. If connections are effected by means of cable lugs, they shall be securely fastened together to give good electrical contact, and the exposed metal parts of the lugs shall be completely insulated.
  - (d) Cables in need of repair shall not be used.
- (3) Ground returns and machine grounding.
- (a) A ground return cable shall have a safe current-carrying capacity equal to or exceeding the specified maximum output capacity of the ARC welding or cutting unit which it services. When a single ground return cable services more than one unit, the safe current-carrying capacity shall equal or exceed the total specified maximum output capacities of all the units which it services.
  - (b) Pipelines containing gases or flammable liquids or conduits containing electrical circuits, shall not be used as a ground return.
  - (c) When a structure or pipeline is employed as a ground return circuit, it shall be determined that the required electrical contact exists at all joints. The generation of an ARC, sparks, or heat at any point shall cause rejection of the structures as a ground circuit.
  - (d) When a structure or pipeline is continuously employed as a ground return circuit, all joints shall be bonded, and periodic inspections shall be conducted to ensure that no condition of electrolysis or fire hazard exists by virtue of such use.
  - (e) The frames of all arc welding and cutting machines shall be grounded either through a third wire in the cable containing the circuit conductor or through a separate wire which is grounded at the source of the current. Grounding circuits, other than by means of the structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.
  - (f) All ground connections shall be inspected to ensure that they are mechanically secure and electrically adequate for the required current.
- (4) **Operating instructions.**  
Employers shall instruct employees in the safe means of arc welding and cutting as follows:
- (a) When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects.
  - (b) Hot electrode holders shall not be dipped in water.

- (c) When the arc welder or cutter has occasion to leave work or to stop work for any appreciable length of time, or when the arc welding or cutting unit is to be moved, the power supply switch to the equipment shall be opened.
- (5) Shielding.  
Arc welding and cutting operations shall be shielded by noncombustible or flameproof screens which will protect employees working in the vicinity from the direct rays of the arc.
- (6) Overcurrent protection.  
All welding machines shall be protected by an overcurrent device.
- (7) Disconnecting means.
  - (a) A disconnecting means shall be provided in the supply for each alternating-current transformer and direct-current rectifier arc welder which is not equipped with a disconnect mounted as an integral part of the welder.
  - (b) The disconnecting means shall be a switch or circuit breaker, and its rating shall be no less than that necessary to accommodate overcurrent protection.

(G) Welding or cutting of containers.

No welding, cutting, or work utilizing a torch shall be performed on used drums, barrels, tanks, or other containers until they have been cleaned and purged of materials which when subjected to heat might produce flammable or toxic vapors.

(H) Eye and ear protection.

See rule 4121:1-3-03 of the Administrative Code, "Personal protective equipment".

(I) Protection from sparks or falling objects.

- (1) Cutting or welding shall be permitted only in areas that are or have been made fire safe.
- (2) Screens or shields shall be provided for the protection of employees or combustible materials exposed to falling objects or sparks.

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