

## Fire Precautions for Welding

**Safety and health professionals must be familiar with the various types of fire extinguishing equipment and be able to specify the proper selection.**

*by Kris Bancroft*

As is the case with all hot work tasks, fire prevention is among the foremost safety and health issues for welders. It is the first of the potential hazards listed in the OSHA General Industry standards, cited in 29 CFR 1910.252 paragraph (a), and is subdivided into four parts.

### **Basic Precautions**

Welding and cutting operations produce smoke, spark and slag. Often, the showers of sparks will be punctuated with miniature explosions, causing droplets of molten metal and slag to be hurled considerable distances from their point of origin. This phenomenon is not entirely preventable and is generally caused by one of four factors:

- 1) There is insufficient oxygen being delivered to the cutting or welding torch and the acetylene is pre-igniting inside the burner tip.
- 2) The material being welded or cut is contaminated with rust or scale that is being burned off.
- 3) Two dissimilar metals are being cut simultaneously, and the difference in oxidation rates is causing a reaction.

4) The arc amperage of the welder or cutter is not sufficient for the length of the arc. The basic precautions cited in subparagraph (a)(1) are derived from the *Standard for Fire Prevention in Use of Cutting and Welding Processes* (NFPA Standard 51B, most recently updated in 1999). The basic precautions are managed by one of four methods, two of which are discussed in the first of three discrete options:

- 1) Move the object to be welded away from objects that could explode, combust, or ignite when exposed to the heat of the welding process.
- 2) Move all objects that are prone to explode, combust, or ignite away from the object being welded.
- 3) Place devices that are designed to shield potentially explosive, combustible, or ignitable materials from open flames, sparks, or hot slag if they cannot be moved from the immovable object that is being welded.

If these three items cannot be satisfied, welding or cutting shall not be permitted.

### **Special Precautions**

The special precautions cited in subparagraph (a)(2) are applicable if guarding devices as defined in 29 CFR 1910.252 (a)(1)(ii) are required.

There are 15 discrete considerations that are listed as special precautions. These shall apply when welding or cutting operations must take place proximate to materials that are prone to explode, combust, or ignite in the presence of welding or cutting byproducts.

### **Combustible Materials**

Welding and cutting tasks often are performed near pits that contain combustible materials; at locations where openings occur in floors, ceilings, and walls; and on elevated surfaces where the falling showers of sparks and hot slag could potentially cause damage to persons and materials below. The provisions cited in subparagraph (a)(2)(i) require these areas to be shielded with fire guards.

The nature of the materials selected for these purposes are diverse and often innovative. By way of example, if a valve head were being cut from, or welded to, a pipe at a point close to a wall, the welder may pack the opening with a fire retardant material or a material to which a fire retardant agent has been applied. The selection of such a material is based on the type, duration, and degree of heat that is generated during the time of exposure.

It may not be unrealistic or inappropriate to see a welder tasked with cutting operation as described above and equipped with an oxy-gas cutting rig, to use a screwdriver, or some such tool, to stuff a liberally wetted rag in the interstitial spaces between the pipe and the wall. But it is unadvisable.

A crude shielding device, such as a rag soaked in water and stuffed into a narrow opening, would be inappropriate if the cutting task could potentially require more time than it would take for the wet rag to dry out and ignite, or if the cut were being made with a plasma cutter that could potentially produce an electric shock as a result of current passing through wet material. For these cutting operations, and likewise for welding operations, the welder may select or devise a collar that would fit snugly around the pipe yet be wide enough to cover the opening.

Another method of fire prevention in this example may be to fill the interstitial spaces with strips of fire blanket material, clay, or putty. Obviously, the use of collars, fire blanket strips, or some other fire-resistant material is the better, if not most expedient, choice.

Welding and cutting operations accomplished on elevated surfaces typically employ steel plates or fire blankets as a means of protecting persons and objects below. Often, sheets of plywood are used to prevent the spread of sparks and hot slag. Welding and cutting tasks near pits typically are accomplished after pits or floor grates are covered with steel plate or plywood, or after portable curtains have been placed between the hot work operation and the pit opening.

Untreated plywood is, of course, a combustible material, and prudence should accompany its use as a shielding material; however, its use may be justified by the following rationale: Welding or cutting is not a process that occurs uninterrupted for extended periods of time. The welder has to make many and frequent adjustments in the equipment in order to obtain the desired results. The welder must lift the welding hood to make these evaluations and is trained to observe surrounding conditions during this brief respite. One of the conditions foremost in the mind of the welder is the potential for fire or explosion.

### **Fire Extinguishers**

Requirements for fire extinguishing equipment are expressed in subparagraph (a)(2)(ii) and state that suitable fire extinguishing equipment shall be maintained in a state of readiness for instant use.

Water buckets, hoses, and liquid-filled fire extinguishers are mentioned in the cited examples of adequate extinguishing devices, but they would scarcely be appropriate for extinguishing fires near electrical arc welding and cutting operations unless all personnel in the area were fitted with non-conductive footwear. Because that is not likely to be the case, safety and health professionals must be familiar with the various types of firefighting equipment and be able to specify the proper selection.

There are four basic types of fire extinguishers in common use today and classified by the National Fire Protection Association with respect to the type of fire they are capable of extinguishing. Correct symbology, as illustrated below, must be present and legible on all fire extinguishers.

#### *\* Type A*

Type A fire extinguishers are used for combustible solids (articles that burn) such as paper, wood, and cloth. The symbol for a Type A fire extinguisher is a GREEN Triangle with the letter A in the center.

#### *\* Type B*

These extinguishers are used for combustible liquids such as oil, grease, and paint thinner. The symbol for a Type B extinguisher is a RED Square with the letter B in the center.

#### *\* Type C*

These extinguishers are for use on electrical fires involving items such as fuse boxes, electric motors, and welding machines. The symbol for a Type C extinguisher is a BLUE Circle with the letter C in the center.

#### *\* Type D*

These extinguishers are used on fires involving combustible metals such as zinc, titanium, and magnesium. The symbol for a Type D extinguisher is a YELLOW Star with the letter D in the center.

Many fire extinguishers are suitable for extinguishing more than one kind of fire, and will therefore carry more than one use designation. The safety and health professional is responsible for ensuring that the welding shop is equipped with an adequate quantity of fire extinguishers suitable for all firefighting contingencies.

### **Fire Watchers**

Most experts consider the zone of potential ignition by sparks and slag generated in welding and cutting processes to be approximately 35 feet; therefore, special scrutiny is given to this immediate area, and beyond, when appreciable quantities of combustibles are imperiled by the welding or cutting operation.

When the conditions described above exist, or when welding or cutting operations are undertaken proximate to bulkheads or walls and combustible materials are located adjacent to the opposite side of the wall, the provisions for a Fire Watch, as described in subparagraph (a)(2)(iii), shall be observed. Fire Watchers are tasked with constant vigilance over the imperiled area and are required to be furnished with firefighting equipment, and to have been trained on its use. Additionally, the Fire Watcher shall be versed in the location(s) and operation of fire alarm sounding equipment.

Once assigned, the Fire Watcher shall continue to observe the potentially endangered area for a minimum of one-half hour after all welding and cutting operations have ceased.

### **Authorization and 'Hot Work' Permits**

While subparagraph (a)(2)(iv) requires that a designated individual shall both convey permission for "hot work" such as welding or cutting to proceed, and that this individual shall establish the parameters under which such work shall be accomplished, it is noteworthy to mention that written permission for such operations is not specifically required. Reference to established company policy must be made when evaluating the workplace with respect to this section of the standard.

### **Floors**

The 35-foot hazard requiring Fire Watchers for welding and cutting near combustible materials, subparagraph (a)(2)(iii), reappears in subparagraph (a)(2)(v) and requires that floors shall be swept free of materials such as paper, wood shavings, and textile fibers, or that the combustible materials shall be wetted (with water), while welding and cutting operations are accomplished.

If the floors are constructed of combustible materials, they shall be wetted, covered with wet sand, or covered with fire-resistant shields. The concerns of persons engaged in electrical arc welding and cutting are addressed, and the standard requires

that personnel shall be protected from electrical shock if a wet operation is undertaken.

As noted above, non-conductive footwear is probably the most expedient method of preventing electrical shock in this circumstance. [OHS endbug]

*Kris Bancroft, a safety consultant based in Dayton, Tenn., specializes in auditing, training, and compliance services to small and medium-sized companies. He has served on the American Welding Society's Safety Committee for eight years and holds degrees in Welding Technology, Hazardous Materials Management, and Geology. This article is excerpted from "Guidelines for Evaluating Welding Safety," published in his book "Welding Safety," now in its fourth edition.*

Pull quotes:

When welding and cutting tasks must be performed in certain locations, such as near pits that contain combustible materials, the areas must be shielded with fire guards.

One of the conditions foremost in a welder's mind is the potential for fire or explosion.

Most experts consider the zone of potential ignition by sparks and slag generated in welding and cutting processes to be approximately 35 feet.