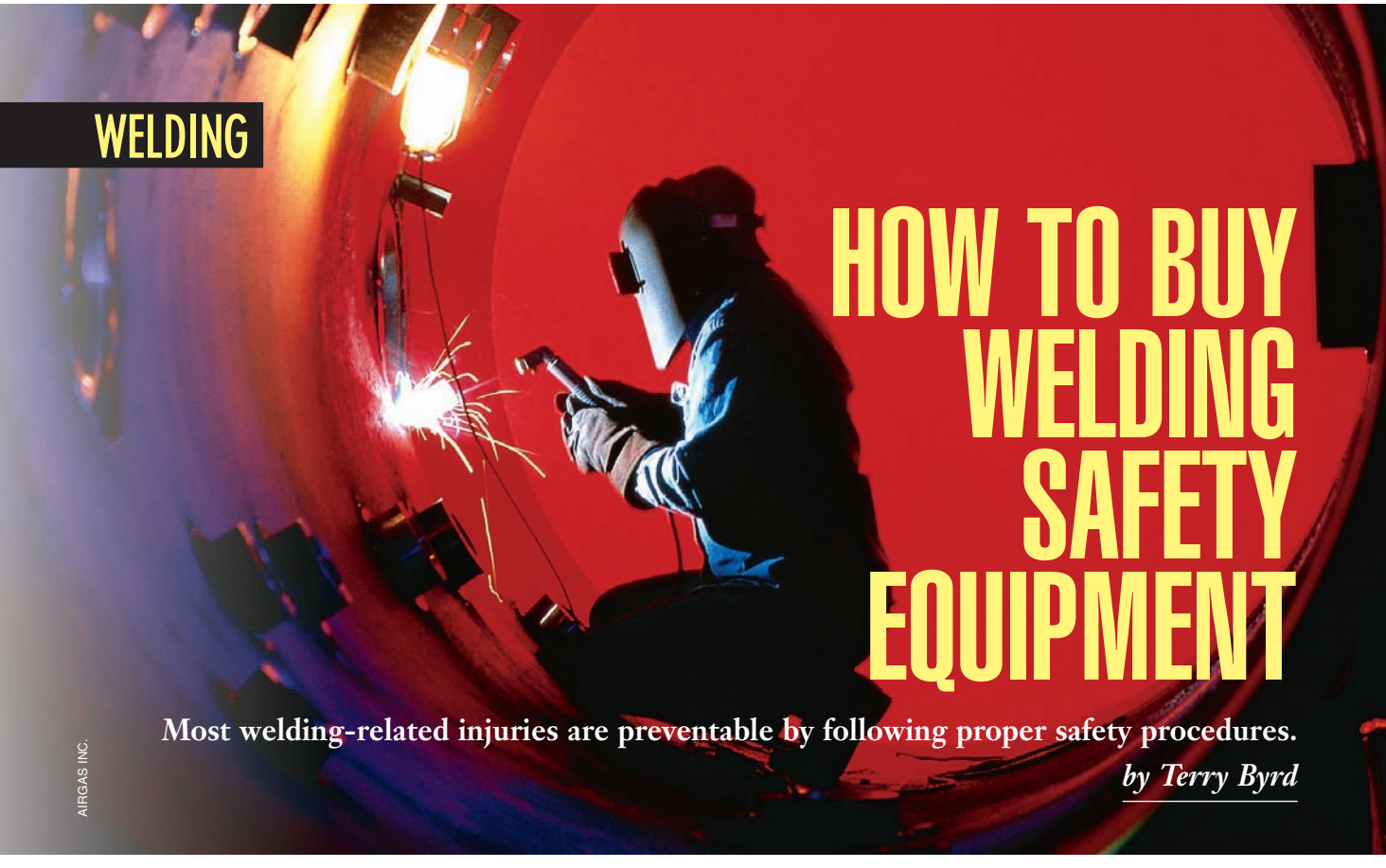
March 2006

Occupational Health & Safety

Volume 75, Number 3 www.ohsonline.com



WELDING

HOW TO BUY WELDING SAFETY EQUIPMENT

Most welding-related injuries are preventable by following proper safety procedures.

by Terry Byrd

AIRGAS INC.

Safety is a concern to all welding and cutting operations. Yet, for small to medium-sized welding facilities, managing the safety and health of workers can be a particular challenge. Unhealthy work environments can be costly to a welding shop. Decreased productivity, absenteeism, increased medical expenses, and difficulty obtaining adequate insurance can result from an unsafe shop. The following article provides some practical advice to help owners and managers address these issues and protect workers.

Common Welding Hazards

Take a good look at your next welding job in action, and you'll understand why the majority of workplace injuries stem from four specific hazards. These include arc rays, welding fumes, electric shock, and gas handling accidents. The following sections discuss these in greater detail.

Arc rays

Arc rays produce intense, high-energy visible, ultraviolet, and infrared rays. These rays can burn the eyes and skin.

Because the weld can be hard to see through the glare and smoke, workers tend to position their heads close to or within the arc, increasing the risk of injury. Remind workers to keep their heads a safe distance from the arc. Workers can use "cheaters"—magnifiers—to help better gauge distances.

Workers are required to wear a faceshield with an approved filter and cover plate and safety glasses with sideshields under the faceshield or helmet. This applies to those observing the work as well as those doing the welding.

The level of darkness needed on faceshields and safety glasses varies with the intensity of the arc. This will also vary with the amperage being used and the type of welding being conducted.

Darkened lenses can restrict vision, so workers and managers need to be alert to hazards such as slipping and falling or walking into operating equipment. Machinery needs to have the proper guards, potential obstacles need to be limited as much as possible, and the floor needs to be kept free of grease and oil.

A useful strategy is to use welding helmets with auto-darkening faceshields. The shade on these adjusts according to the intensity of the arc. This provides workers with protection when welding and less restriction of vision. Using these helmets also reduces the need for larger inventories of helmets with varying shade levels.

Another danger from the arc ray is spatter (hot metal) and sparks coming from the weld. These can burn skin and ignite clothing. Wear durable, oil-free clothing made of wool or heavy cotton. Also, wear leather aprons, capes, or jackets and dry, undamaged insulating gloves. Synthetic fibers should be avoided because they can melt. Avoid open shirt collars, open front pockets, and cuffs. Clothing needs to be free of tears, holes, or frayed edges.

Fumes

Welding and cutting generates fumes that can be hazardous if inhaled. The fumes are comprised of vaporized metal from rods, wires, coatings, and fluxes. These can be hard to detect, so it is important to provide workers with proper protection from overexposure.

The term "overexposure" means any exposure that may pose a health risk and exceeds the permissible limits specified by OSHA, the American Conference of Governmental Industrial Hygienists, or other recognized authorities such as the National Institute for Occupational Safety and Health.

Different materials produce different fumes. For example, welding carbon steel can produce iron oxide and manganese particulates. Alternately, stainless steel can produce fumes with chromium and nickel; plated, galvanized, or painted metals may produce fumes containing cadmium, zinc oxide, or lead. Welding also produces waste gases, including carbon monoxide, nitrogen dioxide, and ozone, which can be toxic if inhaled.

As was previously mentioned, the difficulty of seeing the weld causes many workers to position their heads within the plume. The helmet and faceshield will not protect the worker from the fumes.

It is important to provide proper ventilation under any circumstance. In general, when welding in a large room or outdoors, natural ventilation from a draft or fan can be adequate. However, if natural ventilation is not adequate, mechanical exchange is necessary.

Smoke extractors such as hoods or "elephant trunk" suction devices placed near the work area are common means of removing fumes and gases from the area. Often, these are used in conjunction with exhaust fans to keep fumes away from people in the shop area. Smoke extractor guns are also available, but these are not widely used because they are heavy and can be awkward in some circumstances.

Under certain conditions, it is necessary to use an approved respirator. Make sure the respirator is comfortable and does not hamper the use of other face-shielding equipment. Remember, a standard air-purifying respirator alone will not guarantee an adequate supply of breathable air. Therefore, in locations where ventilation is poor, particularly in confined spaces such as pipes, storage tanks, and boilers, it may be necessary to provide an air pack or supplied air respirator system.

Each shop should have its air quality assessed to determine the ventilation needs. If the adequacy of ventilation is uncertain, the exposure levels should be measured and compared to the Permissible Exposure Limit (PEL) on the material safety data sheet (MSDS). Most suppliers can recommend a reputable monitoring company that can provide an air quality analysis. Shops should consider establishing a relationship with a qualified safety consultant.

Electric shock

Currents of approximately six milliamperes (mA) can be enough to cause death in some instances. Most welding and cutting machines run on much more than this. Therefore, following proper precautions regarding equipment is vital.

To limit the risk, make sure equipment is properly maintained and grounded with no loose fittings or exposed live parts. Welders should use dry, undamaged insulating gloves designed specifically for welding. Never touch the electrode or welding wire with bare hands when the power is on.

Welding when wet increases the risk of shock, so workers should "weld dry." This means avoiding standing in water and using dry rubber mats, wood, plywood, or other insulating material to prevent being the grounding source for the electricity. Also, perspiration can reduce the skin's resistance to electricity. Change clothing frequently and wear dry welding gloves.

It is also important to avoid using cables that are too small, damaged, or poorly spliced. Also, don't get wrapped in electric cables because this increases the risk of electric shock and can prevent escape in the event of emergency. As a general rule, remind workers to turn equipment off when not in use.

Gas cylinders

All compressed gas cylinders are considered hazardous simply because they are under pressure. It is common for

cylinders to contain gas under 2,500 psig (pounds per square inch gauge) or more. If damaged, the cylinder can explode, sending shrapnel flying much like the fragments of an exploded artillery shell. Or, if the valve is broken or damaged, the cylinder can take off like an unguided missile, literally crashing through walls.

Anyone using cylinders needs to know how to read the markings on the cylinder and must have access to the MSDS for the contents. Also, protect the cylinder from excessive heat; mechanical shocks, such as being hit by forklift vehicles; slag; open flames; sparks; and the electric arcs. Make sure cylinders are insulated and never grounded or part of an electrical circuit.

Cylinders also should be checked regularly for leaks or other damage. Cylinders, valves, and fittings must be kept free of oil or lubricants because these can cause explosions under pressure. Additionally, users always should securely apply protective valve caps on cylinders when they are idle and during transport.

In addition, most compressed gases have properties that can be hazardous to users. Even oxygen can be dangerous. Oxygen has a normal atmospheric concentration of approximately 21 percent. However, if the atmospheric concentration rises above 23.5 percent, it increases the risk of fire when an ignition source is present. Oxygen also will cause fires to be more volatile and burn more rapidly, violently, and intensely.

If the oxygen concentration falls below 19.5 percent, asphyxiation becomes a danger. Certain shielding gases such as argon or helium will displace oxygen and can create this oxygen-poor environment. Therefore, never allow any gas to be released into an enclosed space or room. This is another reason that proper ventilation and air monitoring are necessary: to ensure the atmosphere in confined spaces is safe.

Movement and Storage

Handling cylinders requires special attention to safety. Standing 4.5 feet tall and weighing 200 pounds, a falling cylinder can injure workers or result in a broken valve. Therefore, make sure the cylinder is secured properly at all times.

When moving a cylinder, close the valves, remove all regulators, and replace the valve cap. Never lift it by the valve cap; the threads are not designed to handle the load. Never use slings or magnets. The proper way to move a cylinder is by a gas cart. Make sure the cylinder is attached to the cart by a chain or cylinder bracket.

The cylinder also needs to be secured during use. This can be done by leaving it on the cart or by using a cylinder rack attached to the station. If there is no rack, the cylinder can be chained to the station or to a wall bracket.

Alternate Supply Modes

Depending on the facility's volume needs, onsite blending can be a more efficient mode of supplying shielding gas. With onsite blending, shielding gas is supplied in bulk and blended on site using a gas blender.

There are three common modes of delivering gases: liquid cylinders, microbulk tanks, and bulk tanks. As a general rule, facilities using 15 or more compressed cylinders a month are good candidates for onsite blending. Liquid cylinders are an entry point into onsite blending. Because the gas is liquefied, a single cylinder holds much more gas than a compressed cylinder.

Companies using larger volumes of gas—at least 30 cylinders per month—should consider microbulk or bulk systems. Using one of these modes will eliminate or reduce the amount of touch labor, improve storage, and reduce potential hazards.

Using microbulk or bulk will require adding an internal or external tank, blender, and manifold. It also may require adding a piping system to the individual stations. Working with a supplier who understands gas delivery systems can be helpful in selecting a mode that meets supply needs and improves safety.

Facilities also can look at the blend of shielding gas they use to improve safety. For example, controlling the concentration of CO_2 can reduce spatter, lowering the risk of burns or fire.

Conclusion

Small and medium-sized welding shops need to pay special attention to safety. Most welding-related injuries are preventable by following proper safety procedures. Employers and managers need to take an active role in stressing safety and in modeling safety procedures. Staff will tend to follow this lead and make safety a priority for themselves and their co-workers.

Employers also should make use of their suppliers for safety resources. Working with suppliers who understand welding can help to target the right resources and reveal safety issues before they become hazards. Ultimately, it's about providing a workplace where employees are motivated and capable of doing their jobs effectively and efficiently. Addressing these common hazards can be an important step in that direction. ■

Terry Byrd is a welding product manager for Airgas Inc. (www.airgas.com), a Radnor, Pa.-based distributor of industrial, medical and specialty gases, welding, safety, and related products.
The American Welding Society (AWS) and Lincoln Electric provided significant information for this article.

Airgas®

You'll find it with us.℠

For more information visit: www.airgas.com