

# BURN NOTICE

WELDING CAN POSE A WIDE RANGE OF HAZARDS TO INDIVIDUALS AND SCRAPYARDS ALIKE, BUT A GOOD CHOICE OF EQUIPMENT AND SOLID PLAN OF ACTION CAN MAKE ALL THE DIFFERENCE. BY EMILIE SHUMWAY

When Jason Maslin, an insurance counselor for Bradley & Parker (Melville, N.Y.), stopped by a scrapyard recently for a quick hello, he was stunned by what he saw in its welding operation. "There was no designated area for welding, the welder wasn't wearing gloves or full boots, there were sparks flying everywhere," he says. If they're going to cut corners like that, he wondered, how else are they cutting corners?

The need for welding can vary from scrapyard to scrapyard, and it's typically less of a focus for environment, health, and safety professionals than its spiritual cousin, torchcutting. Though it achieves the opposite goal—reconstructing rather than deconstructing—welding falls into the same category of "hot work" and introduces many of the same risks to both the worker and the yard. But because it's an act of predictive maintenance that yards might undertake on an irregular basis, depending on the size of the yard, attention to safe welding can fall down the list of priorities, as Maslin witnessed. Such neglect could be costly, however, EHS professionals and welding equipment producers warn.

#### WELDING SAFETY RESOURCES

These resources can help you develop or improve your hot-work management program.

■ OSHA Guidelines for Welding, Cutting, and Brazing. First thing's first—make sure you're following OSHA's standard (1910.252) for welding. OSHA also provides a small-business checklist for welding. Visit www.osha.gov/laws-regs/regulations/standardnumber/1910 or www.osha.gov/Publications/small-business/small-business.html#weld.

■ American Welding Society safety guide. AWS' voluntary welding safety and health standards document, first developed in 1944 and last revised in 2012, is free to download. Visit www.aws.org/standards/page/ansi-z491.

■ Equipment manufacturer safety guides. Welding equipment manufacturers are the place to go for the latest advancements in welding safety. In addition to selling a range of PPE—including helmets and masks, gloves, jackets, respirators, and fume extractors—most provide detailed safety instructions and even welding safety videos for free on their websites. Visit www. millerwelds.com/safety or www.lincolnelectric.com/en-us/education-center/ welding-safety.

■ National Fire Protection Association Hot Work Safety Certificate Program. NFPA's two-hour hot work safety certificate program highlights the hazards of hot work and the proper safeguards workers should put in place. The website also provides a sample hot work permit for download. Visit www.nfpa.org/ training-and-events/by-topic/hot-work.

#### WEAR APPROPRIATE PPE

Welders can avoid almost every type of welding injury with the right personal protective equipment and its proper use. Starting from the top, a welding mask or helmet is essential, especially for arc welding. Shielded metal arc welding, or stick welding—in which a welder uses a consumable electrode covered with flux to lay the weld—is the most common type of welding in a scrapyard, says Tony Smith, ISRI's safety outreach director. Depending on the welders' experience and the type of work being done, they might also do metal inert gas (MIG) or tungsten inert gas (TIG) welding. All carry the risk of flash or arc burns.

A quarter of all welders' injury claims are eye-related, according to a safety guide released by Miller Electric Manufacturing Co. (Appleton, Wis.), and 90% of those could be prevented with the proper eyewear. "Depending on what welding process you're doing, you'd want to use between a shade 9 and a shade 12 welding lens," says Jerry Sjogren, safety director of E.L. Harvey & Sons (Westborough, Mass.), who used to be a welder at a power plant. "If you're using an argon or a helium shielding gas [typical of TIG welding], that tends to put out a stronger arc flash, and a stronger arc, so you'd want to wear a darker lens." In addition to choosing the right lens filter, welders should ensure they inspect their mask or helmet for any holes or cracks. Arc rays give off ultraviolet and infrared radiation, which can cause photokeratosis, or welder's eye, if workers don't use the proper eye protection. "That is one of the most painful things you can imagine," Sjogren says. "It's like somebody throwing acid or sand in your eyes."

Sjogren recommends that in addition to their wearing a mask or helmet, welders wear a welding cap to protect their hair and ear protection to protect themselves from both hearing damage and metal slag or sparks entering the ear canal.

Moving downward, welders should wear shirts made from nonflammable or flame-resistant material, such as leather or heavy cotton, and keep the shirts buttoned up tightly. Insulated gloves are also a must, Sjogren says, and a leather apron across the chest is also a good idea. Pants should be cuffless, according to Miller Electric. Sjogren recommends boots with metatarsal guarding and preferably leather shoelaces. "As a young welder, I burned my feet a few times because I didn't take the time to lace my work boots up tight," he says.

#### **CONSIDER AIRBORNE HAZARDS**

Welding can expose workers to hazardous airborne metal and gas fumes in addition to burns from slag and sparks. The Occupational Safety and Health Administration recommends that outdoor welders position themselves upwind to avoid breathing in fumes, and it suggests indoor welding be done with the use of local exhaust ventilation systems. Equipment manufacturers also offer respiratory devices, although their use hasn't yet caught on widely. "Very seldom do you see a welder wearing respiratory protection," says Dave Coffaro, president of Multimedia Training Systems (Pittsburgh).

Sierra Recycling and Demolition may be an exception. The company has taken a proactive approach to the risk of fumes, Safety Manager Felipe Guerra says. Sierra has several dedicated welders on staff to rebuild and resurface equipment in the mechanic shop at its Bakersfield, Calif., facility. During its hiring process, after testing interviewees and before orientation, Sierra requires each new prospective welder to weld with a respirator, and it won't hire anyone who can't manage the task. "A lot of welders are not there yet," Guerra says, noting the company is strict about the rule, no matter how talented the welder. Because facial stubble can cause some respirators to leak, Guerra says Sierra's welders currently also must commit to shaving their faces and necks regularly.

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Institute of Scrap Recycling Industries, Inc. While shaving and wearing a respirator may seem like a lot of trouble to go through, welders at Sierra learn the value of the requirements the first time Guerra replaces one of the carbon filters. "We take the mask apart and take the filter out, and they're shocked when they see how dark [the filters] are," he says. Sierra recently invested in a supply of powered-air-purifying respirators, which pull air through filters or cartridges to purify the inside of a headpiece breathing tube. Guerra says these devices will free their weldbefore an employee or contract welder can work in a given space. A permit should specify the type of work and where it is being done, and it might include a questionnaire or checklist to ensure the workers have taken the proper precautions before they begin work. Some cities, regions, or states may have their own hot work permitting requirements, Curran says. Boston, for example, began requiring permits and initiated a hot work certification program in 2016 in response to a 2014 fire started by welding, which caused

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ers to grow facial hair again.

In addition to requiring respirators, Sierra requires its welders to get a blood test every six months to evaluate zinc and lead levels. Though the results generally have been good, the evaluation allows Sierra to keep an eye out for any potential issues. "If we find somebody with high zinc levels, that's a red flag," Guerra says. If an underlying medical issue like anemia cannot explain the blood work, the results provide a trigger for Guerra to review the safety process with the welder and inspect the equipment for defects.

#### **ISOLATE AND PROTECT THE AREA**

Welding can present safety hazards even for those not involved in it. Facilities should have a designated hot work area, says Dan Curran, senior vice president and underwriting officer of AmWINS Program Underwriters, which underwrites RecycleGuard (Portsmouth, N.H.). Developing a hot work management program—standards for where and how welding can take place and who can weld—helps the company establish a firm set of guidelines for employees. Through the program, employers can require that their companies issue a hot work permit the deaths of two firefighters.

In general, a hot work-designated area should be at least 35 feet from flammable and combustible material (15 feet vertically) and should have a dedicated heating, ventilation, and air conditioning system in place, including noncombustible ductwork and insulation and the required particulate filtration; welding curtains or blankets closing off the space; and automatic sprinkler protection or fire extinguishers within reach, Curran says. Guerra says Sierra uses welding curtains whenever possible, but it has also trained all employees on the hazards of arc burn and instructed them to never stare at light coming from welding work.

That training for the entire staff is essential because not all welding can be done in a closed-off space. Large, stationary recycling equipment may require welding on site. When that's needed, make sure other workers in the yard know what's happening, and find ways to block the area off from visitors. Make signage around the area clear to prevent customers and other visitors from wandering into the welding work area, says Susan Diecidue, underwriting manager at RecycleGuard.

Keep weather in mind when welders

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are set to work outdoors. While all workers are vulnerable to heatstroke and heat exhaustion, welders may face a higher risk due to their heavy, protective clothing and proximity to hot work. Sierra tries to limit hot work to the early morning hours on hot days, Guerra says, before the day's peak temperatures. The company also provides welders with a portable cooler, ensures they're well hydrated, and gives them additional breaks.

#### **PREVENT SHOCK**

Electric shock is one of the most common injuries caused by arc welding, says Maslin. When an individual isn't creating a closed circuit through welding, open circuit voltages can range from 20 volts to 100 volts, according to a welding safety guide from Lincoln Electric (Cleveland). Inside the welding equipment, the voltage is much higher-from 120 volts to 575 volts. A shock can happen when the welder closes the loop with his or her own body and becomes part of the circuit. Often, this occurs when the welder touches a lead or other hot component inside the welder while a hand or other body part is touching the welder case or other grounded metal, Lincoln Electric's safety guide states. "I hit myself in the wrist with an electrode while sitting on a piece of steel," Sjogren says of a shocking slip-up he once had. "The current went right through me."

The welder should avoid touching the live electrical parts of equipment and, ideally, work on a nonmetal surface. Maslin suggests concrete, but rubber or plywood work as well. It's also essential to ground the case of the arc welder, says Lincoln Electric. Grounding ensures that if a problem develops inside the welder, a fuse will blow and disconnect the power.

For experienced welders, neglected or worn equipment can lead to electric shock as often as careless or uninformed practice. "Electrode holders need to be inspected on a regular



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basis," Coffaro says. "If there's a crack or a broken electrode holder, that can create conductivity." The same risk applies if gloves and other insulated clothing has holes. Coffaro and Sjogren both note that damp conditions also increase conductivity. "Rain can be a potential issue," says Sjogren of outdoor welding. "Make sure you're not standing in a puddle, make sure your gear is dry." He recommends postponing any outdoor welding work until wet weather has cleared.

#### **KEEP FIRES AT BAY**

According to a report the National Fire Protection Association published in August, welding torches ranked first among types of hot work equipment involved in fires, and 42% of such fires were a result of workers welding too close to combustible materials. In scrapyards, which might have combustible dust and other flammable materials, welders need to be especially careful. "Make sure the area where you're welding doesn't have any flammable fumes, like gas," says Chip Barletto, a welder and the owner of CBS Metal Consultants (New Castle, Pa.). It may be worth safeguarding the space with a gas fume detector, he suggests.

"Housekeeping is the No. 1 thing you can do to avoid fires," Guerra says. He notes facility cleanliness is deeply ingrained in company culture at Sierra. "We have embedded it into our employees that they have to clean before they go on break, before they go to lunch, and before they leave," he says.

While the sparks and slag the welding process produces can cause

welding fires, damaged equipment can also increase the risk of fire. Welding leads, for example, are usually coated in rubber. If you drag a damaged lead along the ground, Sjogren says, it could hit a piece of metal and cause a spark that could result in a fire.

A responsible hot-work management program must also include a plan for ensuring safety after the welder is finished, Curran says. Embers or hot slag in the hot-work area could remain long after the work stops. "The key [procedure] people don't follow is the fire watch," he says, referring to the term for constantly monitoring the facility or yard following hot work. "The vast majority of welding and cutting fires happen within 60 minutes after the work is complete." Curran recommends three hours of fire watch after welding—one hour of continuous



watch in person, and two hours of close attention using either a remote fire alarm system or a security guard walking through the area at least once every 15 minutes. Some jurisdictions also require the fire department be involved as a condition of the hot work permit, Curran says.

Welders should always know exactly what type of metal they're working on, as well as what's inside or on it. Companies can develop a policy for ensuring this when drawing up their hot-work plan. Guerra says Sierra avoids welding on stainless steel to reduce its welders' exposure to hexavalent chromium, a material that can be a health hazard if released in the welding process. Coffaro points out that base metals may have oil residue or chemical coatings on them, and that lead paint can release lead

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fumes. Pipes, tanks, drums, and other closed containers are an explosion risk, says Miller Electric. Welders should ensure the containers they are welding on have never held combustibles, unless, as OSHA puts it, they "have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which, when subjected to heat, might produce flammable or toxic vapors."

#### **CONSIDER NECESSITY**

Legally, Smith says, no official certification or training is necessary to do welding. Make sure your company's welders are properly trained in and aware of the facility's safety procedures. For more complicated jobs—like for welds on fall protection equipment, which require certification of their structural integrity—bring in a properly certified welder if one isn't already on staff, Sjogren says.

Finally, try to find a way to create a fuse without hot work if possible, Curran says. Cold-work alternatives, like bolting, may be an equally viable option without the hazards of welding. "The best way to manage the risk is to completely avoid the risk," he says.

For cases when you can't avoid welding, treat it with the same caution as torchcutting. "It's possible to be a welder and be safe," Sjogren says. "But you need to think about what you're doing and make sure you're creating a workspace that is going to protect you and everyone around you."

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