

CREATING SAFETY IN WELDING OPERATIONS

INTRODUCTION

Welders take pride in their work; after all, their welds are visible for all to see. To avoid injury, welders must also take pride in their safety and make sure safety is also visible for all to see. Every day, welders are confronted with many hazards that can cause serious injury and property damage. Hot metal, intense light, noxious fumes and heavy equipment are only a few potential dangers these employees can encounter. It is imperative that workers who weld be able to recognize all the hazards of their jobs and know how to control or eliminate them. In this program, welders are provided an overview of safety issues related to welding operations and what actions they must take to avoid injury to themselves and their co-workers.

Topics include safe work practices, fire prevention, permits, housekeeping, ventilation, respirator use and working in close proximity to other welders.

PROGRAM OUTLINE:

PREVENTING FIRES DURING HOT WORK OPERATIONS

- Many facilities have a permanent location known as a designated hot work area where welding can be safely conducted without any special precautions; however, many maintenance and other welding jobs must be performed on objects that must be left in place outside the designated area.
- If this is the case, a hot work permit will be required. The permit will outline the special precautions that must be taken to ensure the operation is conducted safely.
- The person issuing the permit must verify the conditions listed on it have been achieved before allowing work to begin.
- Some of the precautions that must be taken prior to a hot work operation include sweeping up ignitable debris within a 35-foot radius of the worksite, wetting down the floor or covering it in sand or with fire-resistant blankets if the floor is made of ignitable material, removing all materials within a 35 foot-radius that could ignite and shielding or covering ignitable items that cannot be moved with approved welding curtains, pads or blankets.
- Fully charged and operable fire extinguishers rated for the class of any potential fire must also be readily available.
- If anything more than a minor fire could develop or there is an abundance of combustible material in the 35-foot zone, a fire watch is required. This person is responsible for making sure the work area is maintained in a fire safe condition throughout and after the operation and may stop the hot work if unsafe conditions are observed.
- The fire watch should remain for 30 minutes after the hot work is completed.

PERSONAL PROTECTIVE EQUIPMENT & CLOTHING

Clothing

- Another category of precautions that must be taken before welding is donning your personal protective equipment and appropriate clothing.
- This is perhaps the most important measure you must take prior to beginning work because your personal protective equipment and clothing is your last line of defense against injury. Welding produces sparks and slag while also emitting harmful light and rays that can severely damage the eyes and skin.
- Shorts, short-sleeve shirts or shirts with open collars should not be worn while welding. Also, clothing made of synthetic fabrics should never be worn while welding as it can catch fire easily and melt into your skin as it burns.
- Fire-resistant or FR clothing is recommended for welding with all cuffs and pockets buttoned to prevent them from catching sparks. At a bare minimum, welders should wear 100 percent cotton shirts and denim jeans that can be protected with fire-resistant welding jackets, aprons and leggings.

Footwear

- High-top leather safety boots offer the best foot protection while welding. Pants should be pulled over the top of the

boot.

- Low-cut, athletic or casual shoes should not be worn as they can easily catch sparks and their components can melt into your skin.
- For welders who have to place their bodies in positions where the tops of their boot may catch sparks, spatter guards, commonly called spats, may be worn to protect the instep and the ankle.

Gloves

- There are many types of welding gloves available. Modern welding gloves provide better dexterity while offering similar protection as compared to traditional heavy leather welding gloves.
- Be sure to choose a glove that is suitable for your type of welding, fits comfortably and allows ample movement of your hands and fingers.
- Keep in mind that extremely hot materials will burn through welding gloves no matter which ones you choose. These items should be handled with specially designed holders or clamps.

Head & Eye Protection

- Protecting your head and eyes is of utmost importance while welding.
- First, always wear safety glasses with side shields, even under your welding helmet. Safety glasses which protect against infrared radiation or “IR glasses” are recommended because they will help shield your eyes from the radiant light from other welding operations when your welding hood is up. IR glasses come in a variety of shades.
- Keep in mind that many eye injuries occur when welders with soiled gloves or hands wipe the sweat from their brow or face. This can allow metal particles, dirt and other debris from the welding process to enter the eye, causing irritation or damage.
- Resist the urge to wipe your brow until you remove your gloves and clean your hands. Consider keeping a clean towel or wipes handy for this purpose.
- Before welding, long hair should be secured and jewelry should be removed.
- Putting on a welding bandana or cap under your helmet can help protect the top of your head from sparks. This is especially important when welding overhead.
- Exposed skin is subject to being burned by UV radiation from your welding or the welding of others.
- These burns can be prevented by applying sunscreen to these areas. Applying a coat of 30 SPF twice a day is recommended.
- Keep in mind that your welding helmet must be worn anytime your eyes are exposed to a welding arc to prevent arc eye, also known as a flash burn. Repeatedly staring at an ultraviolet light with unshielded eyes has a cumulative effect.
- Do not look directly at a welding arc, even from across the room.
- Sufferers of flash burn have described the feeling as like having sand in the eyes or your eyeballs being sunburnt. Rubbing them makes it worse.
- If the exposures are not stopped, permanent damage to your eyes can occur.
- If you use a standard fixed shade helmet, choose one that has a lens shade appropriate for your welding application. This information can be found in Table 1 of the ANSI Standard Z49.1, Safety in Welding, Cutting & Allied Processes.
- A good rule of thumb is to select the darkest shade that still allows you to view the work clearly while welding.

- Many workers are now choosing to use auto-darkening helmets, which must meet or exceed the ANSI/ISEA Standard for eye and face protection, Z.87.1. When an arc triggers the sensors on one of these hoods, the lens darkens in a fraction of a second.
- Most models have adjustable sensitivity and delays for adjusting responsiveness. It's a good practice to turn on your shield and hold it up to a light before each use to make sure it is working properly. Batteries should be changed periodically.
- Improper adjustment of auto-darkening lenses may lead to an unintended exposure to an arc. Make sure you read, understand and follow all of the manufacturer's instructions for your welding helmet and auto darkening lens.

GOOD HOUSEKEEPING

- Another critical safe work practice for welders is good housekeeping. Good housekeeping not only helps prevent injury, but also makes the work easier and more efficient.
- Remove rags, paper and other possible fuels for fires from the immediate area.
- Make sure you only have the number of cables and hoses you need in the work area and arrange them so that they aren't a tripping hazard. Neatly wind up excess hose to prevent kinks and tangles.
- Clear excess materials and debris from the work area as soon as possible.
- Many facilities with fixed welding operations run their cables and hoses overhead to avoid creating tripping hazards.
- Before welding, think ahead about how the flow of work will proceed and organize materials, tools and equipment in locations that won't hinder the operation or create hazards.
- Keep in mind that part of good housekeeping is returning supplies and equipment to their proper storage area when the job is complete.

VENTILATION

- In addition to fire prevention, proper personal protection and housekeeping, there is another concern that welders must address before they begin their work and that is ventilation. You must make sure you have adequate ventilation for every welding task.
- Ventilation refers to the altering of the air in the room when necessary to prevent welders from breathing unhealthy levels of airborne contaminants in the form of fumes and gases.
- Adequate ventilation depends on several factors, including the volume and configuration of the welding space, number and types of processes that are generating contaminants, natural air flow in the area and location of workers breathing zones in relation to the contaminants and their sources.
- Air sampling of a given work area is necessary to verify the concentration levels of toxic fumes and gases.
- Proper ventilation is generally achieved either through natural ventilation or mechanical ventilation.
- Natural ventilation is sufficient if the work area meets all of these requirements: a space of more than 10,000 square feet is provided per welder, a ceiling height of more than 16 feet, the welding is not being performed in a confined space and the space does not contain structures that obstruct cross ventilation.
- Should any of these requirements not be met, mechanical ventilation must be used.
- When air sampling indicates that levels of air contaminants cannot be lowered through ventilation below the exposure limits set by OSHA and other safety authorities, your organization must establish and maintain a respiratory protection program.

RESPIRATOR USE

- There are three primary types of respirators that are used for welding applications: the half-mask respirator, the Powered Air-Purifying Respirator or PAPR and the Supplied-Air Respirator or SAR.
- Half-mask respirators fit underneath a welding hood without obstructing the welder's field of vision. Units with an assigned protection factor of 10 with oil-proof particulate filters and a 100 percent filter efficiency are recommended for welders.
- Powered air-purifying respirators, commonly called PAPRs, use a blower to force ambient air through an air-purifying element and a hose to the user's helmet. Offering an assigned protection of 25, these provide better protection than half-mask respirators.
- Some systems integrate flip-up welding lenses to reveal grinding shields that allow users to perform both welding and grinding tasks without removing their helmet and head seal.
- Supplied-air respirators connect to a belt-mounted unit from the welder's helmet which is then connected to an air-purification system with an air hose. These units also offer an assigned protection factor of 25 and allow the welder to regulate the air flow while also heating or cooling the air entering his or her helmet.

WORKING IN CLOSE PROXIMITY TO OTHERS

- While welders face many hazards that can cause severe injuries, their co-workers are often the victims of these hazards. One of your biggest responsibilities as a professional welder is to take the appropriate precautions and practice the safe work practices that will keep your co-workers safe.
- If you need to weld in close proximity of others, warn them to keep their distance by placing cones or barricades around the area.
- Welding screens and curtains should be used to shield co-workers who must work close by from harmful light and sparks. Remind people who are working in or just passing through the area not to look at the arc.
- Before cutting and grinding, look around and make sure no one is in the area where your sparks will fly.
- Welders in welding shops often work in close quarters or in tandem with a partner. Often, there is little room for error and care must be taken to prevent one or the other from suffering an injury.
- When working in tight quarters, work and move a little slower than normal. Allow an extra moment to look before making a sudden movement, extending the welder or pulling a hose.
- When an abnormal condition develops, be sure to alert nearby co-workers, especially if it means you will have to deviate from the normal routine.
- Always maintain awareness and control of the welding handle and trigger. After welding, place the welding handle in a place it won't be contacted by others.
- Inadvertent contact by you or a coworker with the hot wire after a weld can cause serious injury. Known as a "wire poke," the hot, sharp wire can easily penetrate a glove or sleeve and enter the skin. The dirt and contaminants on the wire can cause a serious infection if proper first aid is not received.
- You should never approach a co-worker from behind during a weld. This is the cause of many injuries, as the welder often loses his concentration and makes a movement that results in you or him suffering a severe burn.

GENERAL WELDING SAFETY TIPS

- Before using the welding machine, make sure it is properly grounded and in good working order.

- Also, inspect the handle or holder for cracks or other defects. Check for damaged insulation or bare conductors on all electric cables. Should you find any defective cables, replace them.
- Keep any exposed metal parts of the welder, handle, holder or electrode away from wet hands, gloves and clothing. Never change electrodes with bare hands or while wearing wet gloves.
- The compressed gas cylinders used with welding and cutting operations also present hazards. Always follow your organization's policies for transporting, securing and storing fuel cylinders. For example, cylinders should have the safety caps in place and be securely chained during transport.
- The most common injury suffered by welders are burns. Take time to think through the weld you intend to perform, including your body position and where the slag will fall, and then don the appropriate protective clothes and coverings to protect yourself.
- Another common welding injury occurs when heavy materials fall and strike a person while welding or cutting. Always secure materials prior to welding or cutting and make sure you understand which way material will fall after it is cut.
- Like all workers, welders are susceptible to injury from trips and falls. Prior to welding, plan your movements and remove any tripping hazards which may be in your intended path.

CONCLUSION

- As a welder, you take great pride in your ability to perform each weld with quality and efficiency. After all, the results of your hard work are there for everyone to see.
- Take the same amount of pride in your commitment to safety, which is also on display for all to see. After all, your family and co-workers are counting on you to make sure everyone makes it home safe and sound at the end of the day.

PREPARE FOR THE SAFETY MEETING

Review each section of this Leader's Guide as well as the program. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Copy the review questions included in this Leader's Guide and ask each participant to complete them.

Make an attendance record and have each participant sign the form. Maintain the attendance record and each participant's test paper as written documentation of the training performed.

Here are some suggestions for preparing your video equipment and the room or area you use:

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the program.

CONDUCTING THE PRESENTATION

Begin the meeting by welcoming the participants. Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is to provide welders with an overview of safety issues related to welding operations and what actions they must take to avoid injury to themselves and their co-workers.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Lead discussions about specific welding hazards that can be found at your facility and what welders should do to control or eliminate them.

After watching the program, the viewer should be able to explain the following:

- How to prevent fires when conducting welding operations;
- What personal protective equipment and protective clothing should be worn by welders;
- How ventilation is used to help welders avoid breathing in unhealthy fumes and gases;
- What types of respirators are used for welding applications;
- How to protect co-workers from injury while welding.

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REVIEW QUIZ

Name _____ Date _____

Please provide answers to the following to show how well you understand the information presented during this program.

1. Welding jobs that must be performed on objects outside the designated area require a hot work permit.
 - a. true
 - b. false

2. Prior to a hot work operation, all ignitable debris within a _____ radius of the worksite should be swept up.
 - a. 10 feet
 - b. 15 feet
 - c. 35 feet

3. High-top leather safety boots offer the best foot protection while welding.
 - a. true
 - b. false

4. Most welding gloves are effective in preventing burns when handling extremely hot materials.
 - a. true
 - b. false

5. Safety glasses with side shields should always be worn under your welding helmet.
 - a. true
 - b. false

6. Part of good housekeeping is returning supplies and equipment to their proper storage area when the job is complete.
 - a. true
 - b. false

7. You only need to make sure you have adequate ventilation when welding in confined areas where fumes may accumulate.
 - a. true
 - b. false

8. Which type of respirator connects to a belt-mounted unit from the welder's helmet which is then connected to an air-purification system with an air hose?
 - a. half-mask respirators
 - b. powered-air purifying respirators
 - c. supplied-air respirators

9. When working in tight quarters, you should work and move a little _____ than normal.
 - a. faster
 - b. slower

10. Before using the welding machine, you should make sure it is properly grounded and in good working order.
 - a. true
 - b. false

ANSWERS TO THE REVIEW QUESTIONS

1. a

2. c

3. a

4. b

5. a

6. a

7. b

8. c

9. b

10. a