

WELDING SAFETY

COURSE OUTLINE

- **Every day in this country more than half a million workers in various industries perform welding, cutting, brazing and soldering work as part of their jobs.**
 - These activities require knowledge, skill, and caution, because they can be dangerous.
- **Welders and anyone who works around welding and cutting need to understand the potential hazards that are associated with these activities, so they can protect themselves from them.**
- **Most welding and cutting hazards result from the immense amounts of energy that are involved.**
- **This work is performed at very high temperatures.**
 - Oxy-fuel cutting reaches over 6,000 degrees Fahrenheit.
 - Arc welding can reach over 10,000 degrees.
- **To reach these temperatures, some welding equipment burns oxygen with acetylene, hydrogen or other fuel gases.**
 - These substances can create fire and explosion hazards.
 - They are usually stored in pressurized cylinders, which can also explode.
 - These hazards can result in serious burns and other traumatic injuries.
- **Other welding and cutting equipment uses high-voltage electricity that can create:**
 - A shock hazard, and even result in electrocution.
 - Electric sparks from the equipment can also ignite fires and explosions.
- **Welding and cutting also create dangerous levels of glare, as well as infrared and ultraviolet (UV) radiation.**
 - This "radiant energy" can burn your skin, damage your eyes and cause other health problems.

- **"Welder's flash" is a painful temporary condition that results from looking at a welding flame or arc.**
 - Some eye damage can be permanent and even cause blindness.
 - Over the long term, UV radiation can also lead to cataracts and skin cancer.
- **High-temperature welding operations can cause metals, flux coatings, coverings and other materials to release hazardous fumes as well.**
- **The airborne contaminants generated by heated zinc, lead, beryllium, cadmium, fluorine compounds, mercury and even stainless steel can be especially dangerous.**
 - Limited exposure to them can lead to irritation to the eyes, nose, and throat, and illnesses such as "metal fume fever".
 - Breathing these fumes over many years can result in lung cancer and severe damage to the nervous system.
- **Welding and cutting can be done in many environments, even underwater.**
 - But they can't be performed safely "just anywhere".
- **To control hazards and prevent accidents and injuries, companies create "designated welding areas".**
 - They are isolated from other work areas and have had combustible or flammable materials removed from them.
 - Welding can be performed in these designated areas without other special precautions or the need for permits.
- **But many welding jobs must be done "where the need is", and can't be moved to designated areas.**
 - When welding has to be performed outside of designated areas, fire hazards are controlled through a "hot work permitting system".
- **This system requires a supervisor or other responsible person to inspect the proposed welding site, identify any hazards, and determine what needs to be done to make the area safe for welding activity.**
 - All of this information will be included in the Hot Work Permit that is issued for the job.
- **No welding or cutting will be allowed in a "permit-required" location until all safety requirements have been met, and the responsible person signs off on the permit.**

- **If you are going to be doing welding work, you need to make sure that the location has been authorized by management for welding activity, and that all required safety procedures are being followed, before you begin.**
- **Hot Work Permits are especially important when welding or cutting must be performed in "confined spaces".**
 - These are limited-access structures such as tanks, storage bins, vaults, manholes and tunnels.
- **Working safely in confined spaces is an important subject that OSHA addresses with standards for both general industry and construction.**
 - Confined spaces can contain dangerous machinery, toxic atmospheres, explosive gases and other hazards, and are involved in many worker deaths.
- **Welding in these types of spaces can involve additional hazards, including exceptionally high heat, exposure to high voltage electricity, as well as an increased risk of igniting a fire or explosion.**
 - Before performing welding or cutting in a confined space, you need to understand the special hazards that are involved and how to avoid them.
- **Anything that can burn, such as wood, paper or vapors from paints, solvents or other chemicals, is a potential a fire hazard if it is present where welding or cutting is being done.**
- **Wherever you weld, the area must be made "fire-safe" before you light a torch or strike an arc. To do this you should:**
 - Remove flammable materials from the location.
 - Or protect them from ignition sources, such as flying sparks.
- **High heat can start fires and even cause aerosol cans to rupture, but sparks are the main cause of welding-related fires and explosions.**
 - Sparks can fly a long distance, so when you are removing fire hazards from the area, you should use the "35-foot rule".
- **Combustible and flammable materials should be moved at least 35 feet away from where welding or cutting will take place.**
 - Any dust or litter that may be lying on the floor should be swept at least 35 feet away as well.

- **Any flammable or combustible materials that cannot be removed should be protected by welding screens and curtains, or "fire blankets" made of heat-resistant material.**
- **Screens and curtains can also protect other people who are in the area from welding glare and radiant energy hazards.**
 - You need to position these shields so they don't interfere with the air flow in the area.
- **One combustible material that can't be moved is a wooden floor.**
 - If there's one in your welding area, wet it down with water or cover it with damp sand or heat-resistant blankets before you begin to do your welding.
- **Fire prevention measures are important, but you also need to be prepared to deal with any fires that do start.**
 - Make sure you always have a fully-charged fire extinguisher handy, and post a "fire watch".
- **Fire watchers keep an eye out for any fire hazards, such as sparks, that get past your safety precautions.**
 - "Watchers" are trained to extinguish small fires.
 - They will also sound the alarm if a fire becomes too big to deal with single-handedly.
- **Fires don't always flare up right away, so the fire watcher should stay on duty for at least a half an hour after welding operations are finished.**
- **Welding and other hot work can release a number of types of hazardous fumes.**
 - Inhaling these airborne contaminants can often cause what is called "plume poisoning".
 - It's a health threat that you need to take very seriously.
- **If you ever accidentally inhale welding fumes:**
 - Move away from the "plume" immediately.
 - Go to where you can breathe fresh air.
 - Then call for medical assistance.
- **Plume poisoning can be prevented by using natural or mechanical ventilation to circulate fresh air through the welding area.**
 - You can create natural ventilation by opening doors or windows.

- **According to OSHA, natural ventilation will keep contaminants in the air at safe levels whenever:**
 - The work area contains at least 10,000 cubic feet of air per welder.
 - The ceiling is at least 16 feet high.
 - Curtains, screens or other barriers do not block air circulation.
 - The welding area is not in a "confined space".
- **Otherwise, OSHA requires that mechanical ventilation be used.**
 - This can include fans arranged around the work area, local air exhaust hoods or a building's HVAC system.
- **In some situations, even mechanical ventilation may not be able to reduce the airborne hazards to safe levels.**
 - Then you'll need to wear some type of "respirator" to remove contaminants from the air you breathe.
- **Any respirator that you plan to wear in a hazardous environment must be "fit tested" before you use it.**
 - This procedure ensures that it can keep bad air out and good air in.
- **Air-purifying respirators are the most commonly used respirators in welding situations.**
 - They can have various types of filters, each of which traps specific contaminants.
- **If your respirator uses filters, make sure that they are designed for the specific contaminants that are released by the type of welding you'll be doing.**
 - Wearing the wrong type of filter can be as dangerous as wearing no respirator at all.
 - Your supervisor can tell you what the right filters are for your job.
- **Respirators are just one type of personal protective equipment you will need to guard against welding hazards. You should also use:**
 - Goggles, helmets or hand-held shields.
 - Gloves, heat-resistant clothing and safety shoes.
- **Goggles keep sparks and slag from getting into your eyes.**
 - Helmets and "hand shields" can also protect your head and face from them.
 - A hand shield can provide similar protection to a helmet, but is held in front of the face by a handle.

- **Because they are equipped with specially tinted lenses and optical filters, goggles, helmets and hand shields will also protect your eyes from glare and infrared as well as ultraviolet radiation.**
 - They can prevent the skin of your face, neck and ears from being burned by this radiant energy too.
- **But different types of welding will expose you to different types and amounts of radiant energy.**
 - Goggles that provide good protection against the glare of oxyacetylene welding will not protect you from the more intense radiant energy of electrical welding.
- **Arc, MIG and TIG welding require you to wear a welding helmet or use a hand-held shield that is equipped with lenses that can handle greater infrared and ultraviolet radiation.**
- **The protective lenses that are made for different types of welding are identified by "shade numbers", to help you choose the right ones.**
- **When you're using a welding helmet or hand shield, it's also a good idea to wear a fire-resistant head covering under them.**
 - Wearing safety glasses will provide an extra margin of safety from both sparks and flying particles as well.
- **Remember that the radiant energy produced by welding also creates a hazard to people who are working nearby.**
 - You can help protect them by arranging welding screens or curtains around your work.
 - Make a habit of warning everyone in the area before you light your torch or strike an arc.
 - In some cases, you may need to arrange for coworkers to wear eye protection themselves.
- **Before you get "hands on" with any type of welding or cutting work, you're going to need a good, strong pair of leather gloves.**
 - Welding produces a lot of heat, so you should assume that work surfaces, clamps, pliers and other tools will get too hot to touch with your bare hands.

- **Welding gloves are built to handle these extreme temperatures.**
 - Many have extra leather sewn into the fingers and palms for additional protection.
 - Some have extended "cuffs" to protect your forearms.
- **Even with protective gloves, if you try to hold heated metal itself, it will probably burn right through them.**
 - You need to use pliers, clamps or other tools to handle this type of material.
- **Check your gloves for tears, holes or other damage before putting them on.**
 - If you find problems, don't wear them.
 - Be prepared to replace them regularly.
- **To shield the other parts of your body from heat, radiation, sparks and molten spatter, you should wear:**
 - High-topped boots, fully laced and tied.
 - Long pants, pulled down to cover the boot-tops.
 - A long-sleeved shirt buttoned at the neck and wrists.
- **Make sure the clothing you wear while welding is flame-resistant.**
- **For even more protection, you can wear a welding jacket or apron, and sleeves and leggings that are made of leather or other heat-resistant materials.**
 - You can even get protective coverings for your shoes.
- **Welding can be noisy work, and you often need to do it in noisy places.**
 - You can protect yourself against excessive noise with ear protection.
 - Ear plugs, ear muffs and canal caps can prevent sparks and welding debris from getting into your ear canals as well.
- **When you perform welding or cutting tasks on scaffolds, platforms or other elevated locations, you should also wear personal fall protection.**
 - If you have any questions about the types of PPE you need for a particular job, ask your supervisor.

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- **Welding hazards include:**
 - Very high temperatures.
 - Intense light and radiant energy.
 - Hazardous fumes.
 - Electric shock.
- **Welding and cutting should only be performed in authorized areas.**
- **Flammable and combustible materials should either be removed from welding areas or be protected from heat, sparks and other sources of ignition.**
- **You can reduce toxic fumes and other air contaminants to safe levels by using natural or mechanical ventilation.**
- **You should wear appropriate PPE to protect yourself from welding hazards.**
- **You'll always need to be "safety conscious" when you're doing hot work. But now that you understand its hazards as well as how to avoid them, you can help make sure that you go home safe at the end of every day!**