

---

This module will outline the safety requirements for welding, cutting, and heating operations for the construction industry. The student will become familiar with the following OSHA Standards that apply to welding, cutting, and heating.

Welding plays a vital role in the construction industry and is often used in the construction of buildings, bridges, and other structures. Welding, cutting, and braising are all very dangerous, and proper work practices must be followed to avoid injuries, fires, and explosions.

### **WHAT IS WELDING?**

Welding is the process of joining two different objects by melting their surfaces together. This is done by heating the materials until a molten puddle is formed. Usually, more metal is added to the mix by means of a welding rod or filler rod. Welds are mostly done on like metals. If done properly, the weld will be as strong as the metal being joined.

### **WHAT IS BRAISING?**

Braising is the process of joining two different metal objects with the use of a third dissimilar filler metal. The two objects are bonded together by completely wetting the surfaces with molten filler metal and held together until the bond solidifies. The bond is only as strong as the filler material but can still be very strong.

### **WHAT IS CUTTING?**

Cutting means just what the term implies cutting metal. Instead of bonding the two separate metal objects together, the welder removes or centers a piece of metal into different pieces.

### **HOT WORK PERMIT**

Welding is called Hot work in construction and some industrial settings. Often a Hot Work Permit is required prior to performing welding activities. The safety and wellbeing of workers involved in welding, cutting, or braising is the motivation behind OSHA's regulations covering these activities.

If you need to have a hot work permit, make sure you obtain the permit before beginning welding work. Welding activities naturally produce sparks, slag, molten metal and hot work surfaces. Sparks are the main cause of fires and explosions. They can travel great lengths carried by wind and are even more hazardous when they fall from upper levels.

### **GAS WELDING AND CUTTING**

There are many methods of welding which use a variety of energy sources to perform the task. Two of the more common types of welding are gas welding and metal arc welding. Oxyfuel welding, is one of the oldest and still more popular methods of welding. It involves the use of fuel combined with oxygen to produce a very hot flame. The most common fuel used is acetylene.

Gas welding is the process of using heat that's being generated from burning a fuel gas (like acetylene) to cut and or join metals together. Gas welding is one of the most important types of welding because of its scope of application.

The reason Gas Welding is so popular is because of its ease of use and low-cost nature. Carrying out a welding process with gas welding is relatively easy.

When a fuel such as acetylene is used, the flame can reach temperatures of just over 57,000 degrees Fahrenheit.

Other gases used are propylene, map gas, natural gas, hydrogen, liquefied petroleum, and propane. The gases are stored in gas cylinders, regulated, and combined in a torch, which is lit by means of a spark tool.

## GAS CYLINDERS

Before Transporting, moving, and storing compressed gas cylinders, the valve protection cap must be in place and secured.

When cylinders are hoisted, they must always be secured on a cradle, sling board, or pallet. It's prohibited to hoist or transport cylinders with magnets or choker slings.

To move a cylinder, you must first tilt and then roll cylinders on their bottom edges. It's important, and a requirement to ensure the cylinder doesn't get dropped or struck another cylinder.

When cylinders are transported by powered vehicles, they shall be secured in a vertical position. Cylinders typically get transported by a suitable vehicle, such as a hand truck. The cylinder must be secured in an upright position in the back of the truck to prevent cylinder damage, especially the valve stem, during transport.

### *Valve Protection Caps*

Valve-protection caps shall always be installed on cylinders when not in use. Cylinders should never be dropped, rolled, or carried in a horizontal position. Cylinders should never be used as rollers for moving equipment.

Valve protection caps must never be used to lift cylinders from one vertical position to another. for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen.

### *Moving Cylinders*

Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators must be removed and check to ensure the valve protection caps are still firmly in place before the cylinder is moved.

A suitable cylinder truck, chain, or other steadying device must be used to ensure cylinders don't get knocked over while they're in use.

When work is finished, when cylinders are empty, or when cylinders are moved at any time, the cylinder valve must be closed.

Compressed gas cylinders shall be always secured in an upright position except, if necessary, for short periods of time while cylinders are being hoisted or carried.

The reason for this is because compressed gas cylinders contain varying pressures of inert, toxic, flammable, oxidizing, corrosive, or combinations of gases. Care in using, handling, and storing compressed gas cylinders is required due to the high potential for severe incident.

## STORAGE

Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

Inside of buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet from highly combustible materials such as oil or excelsior. Cylinders should be stored in assigned places away from elevators, stairs, or gangways.

Assigned storage places must be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. And they should never be stored in unventilated enclosures such as lockers and cupboards.

Cylinders must be kept far enough away from the actual welding operation, so sparks, hot slag, or flame won't reach them.

When this is impractical, fire-resistant shields must be provided.

Cylinders must always be placed where they cannot become part of an electrical circuit.

Only the gas supplier can mix gasses in a cylinder and only the cylinder owner can refill a cylinder. It's worth noting, if a cylinder is damaged or defective in any way, it must be taken out of service immediately.

---

### *Use of fuel gas*

The Employer is responsible for training and instructing employees in the safe use of fuel gas.

Before a regulator to a cylinder valve is connected, the valve must be opened slightly and closed immediately. The person opening the valve must stand to one side of the outlet, not in front of it.

Don't open the valve if gas could reach welding work, sparks, or flames, and "Quick closing" valves on fuel gas cylinders must not be opened more than 1 and a half turns.

### **VALVES, LEAKS, & LOCKOUTS**

Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed, and the gas released from the regulator.

If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed, and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it must be properly tagged and removed from the work area.

If fuel gas should leak from the cylinder valve, rather than from the valve stem, and the gas cannot be shut off, the cylinder must be properly tagged and removed from the work area.

If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder does not need to be removed from the work area.

Fuel gas and oxygen manifolds must list the name of the substance they contain in letters, at least 1-inch high, which must be either painted on the manifold or on a sign permanently attached to it.

Fuel gas and oxygen manifolds must be placed in safe, well ventilated, and accessible locations. They must not be located within enclosed spaces.

### *Manifold Hose Connections*

Manifold hose connections, including both ends of the supply hose that led to the manifold, shall be such that the hose cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Adapters shall not be used to permit the interchange of hose. Hose connections shall be kept free of grease and oil.

When not in use, manifold and header hose connections shall be capped. Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

---

### *Fuel Gas Hose*

Fuel gas hose and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.

### INSPECTION

All hose in use, carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or be harmful to employees, must be inspected at the beginning of each shift. Defective hose must be removed from service. Hose which has been subject to flashback, severe wear, or damage, must be tested to twice the normal pressure to which it is subject, but in no case less than 300 p.s.i. Always take defective hose out of service immediately. Hose couplings must be ones that cannot be unlocked or disconnected without turning. Hoses, cables, and other equipment must be clear of passageways, ladders, and stairs.

Clogged torch tip openings must be cleaned with suitable cleaning wires, drills, or other devices designed for such purpose.

Torches in use shall be inspected at the beginning of each shift for leaking shutoff valves, hose couplings, and tip connections.

Defective torches must never be used. And always light the torch by a friction lighter or other approved device. **Never by matches or from hot work.**

### REGULATORS AND GAUGES

Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

### OIL AND GREASE HAZARDS

Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves. Oxygen shall not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.

### ARC WELDING

Oxygen cutting, is the process of heating metal to its kindling temperature by gas flame, and then cutting it with a high-pressure stream of oxygen. Arc cutting, on the other hand, is the process of melting or cutting metal using intense heat generated from an electric arc.

Shielded metal arc welding joins two metals together by producing an electric arc between the metals to be joined, and a flux-coated electrode rod.

Flux is a chemical cleaning agent, flowing agent, or purifying agent. As the weld is laid, the flux coating disintegrates, giving off vapors, which serves as a shielding gas.

The flux also provides a layer of slag. Slag protects the weld area from atmospheric contamination.

### *Manual Electrode Holders*

Only manual electrode holders, which are specifically designed for arc welding and cutting, can be used.

Any current-carrying parts passing through the portion of the holder that the arc welder grips in his hand, and the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground. All arc welding and cutting cables shall be completely insulated, flexible, and capable of handling the maximum current requirements of the work in progress, considering the duty cycle under which the arc welder is working.

### *Cable Requirements*

Only cable free from repair or splices and at 10 feet or more from the cable end can be used.

The exception would be cables with standard insulated connectors with an insulating quality equal to the line. In that case, they would be permitted as well.

When it's necessary to splice lengths of cable to one another, substantially insulated connectors with a capacity that's at least equivalent to that of the cable must be used.

Suppose connections are affected by cable lugs. In that case, they need to be fastened together securely to give good electrical contact, and the exposed metal parts of the lugs must be completely insulated.

### *Cable Protection*

When a cable, other than the cable led, becomes worn so badly that bare conductors are exposed, the exposed portion must be protected by rubber and friction tape.

Or other insulation that's equivalent, or better can be used.

### *Ground Returns*

A ground return cable must have a safe current-carrying capacity that's equal to or exceeds the maximum output capacity of the arc welding or cutting unit.

Also, if a single ground return cable services more than one unit, its safe current-carrying capacity must equal or exceed the total specified maximum output capacities of all the combined units.

### *Pipelines*

---

When a structure or pipeline is being used as a ground return circuit, it must first be determined if the required electrical contact exists at all the joints.

If there is an arc, sparks, or heat, at any point, this means it's rejecting the structures as a ground circuit.

Also, when a structure or pipeline is used continuously as a ground return circuit, all the joints must be bonded.

Periodic safety inspections must also be conducted just to ensure there are no conditions of electrolysis or fire hazard.

### *Grounding Circuit*

The frames of all arc welding and cutting machines must be grounded through a third wire in the cable which contains the circuit conductor. Or through a separate wire that's been grounded at the source of the current. All ground connections must be inspected to ensure they're mechanically robust and electrically adequate for the required current.

### *Operating Instructions*

Employers must instruct employees on safe arc welding and cutting. This includes electrode holders. When electrode holders are left unattended, the electrodes must be removed. The holders must also be protected so they cannot make electrical contact with employees or conducting objects. Hot electrode holders must never be dipped in water as this could expose the arc welder to electric shock.

When the arc welder stops working for an appreciable length of time, or when the welding machine needs to be moved, the power supply switch to the equipment must be opened. Upon opening, if any defective equipment is found, it must be reported to the supervisor.

### *Shielding*

Combustible walls must be protected with fire-resistant shields. But, when welding on noncombustible walls, items on the opposite side of the wall need to be kept safe from igniting. The preferable protection would be to relocate those materials. However, a fire watch will be required if they can't be moved.

Also, if welding occurs 6-feet or above, welders and helpers must be protected from falling with fall protection. And, just like electrical cord safety, keep welding cables and other equipment clear of passageways, ladders, and stairways.

## **FIRE PREVENTION**

When it's practical, move any objects that will be welded, cut, or heated to a designated safe location. But, if they can't be moved, all movable fire hazards in the area must be taken to a safe place.

---

Fire hazards include combustible materials like wood, clothing, paper, chemicals, liquids, and fuels.

Guards must be used if the object is being welded, or if all fire hazards can't be moved. If all fire hazards can't be moved and guards are not feasible, then welding should not be performed.

Welding, cutting, or heating cannot be done where the application of flammable paints, the presence of other flammable compounds, or heavy dust concentrations create a hazard.

## **FIRE EXTINGUISHERS**

Suitable fire extinguishing equipment must be immediately available in the work area and maintained in a state of readiness for instant use.

## **FIRE WATCH**

When the welding, cutting, or heating operation is such that standard fire prevention precautions are insufficient, additional personnel must be assigned to guard against fire while the actual welding, cutting, or heating operation is being performed. These personnel must stay for an adequate period after completion of the work to ensure that no possibility of fire exists. Such personnel shall be instructed on the specific anticipated fire hazards and how the firefighting equipment is to be used.

## **DIRECT PENETRATION**

When welding, cutting, or heating is performed on walls, floors, and ceilings, since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area, the same precautions must be taken on the opposite side as are taken on the side on which the welding is being performed.

## **FIRE IN ENCLOSED SPACES**

To eliminate all possible fires resulting from gas escaping through leaking or improperly closed torch valves, the gas supply to the torch must be shut off outside of the enclosed space whenever the torch is left unattended for a substantial period, such as during a lunch break. Overnight and at the change of shifts, the torch and hose must always be removed from the confined space. Open-end fuel gas and oxygen hoses also need to be removed immediately after they are disconnected from the torch or any device which uses gas.

## **CONTROL THE HAZARD**

Many of these hazards can be significantly reduced with administrative controls, engineering controls, proper work practices, and personal protective equipment.

One of the most important safety aspects of being a welder is recognizing the dangers of producing fires and knowing how to prevent them. Always survey the area you are about to weld.



---

And when welding is performed in confined spaces, specific OSHA requirements regarding the confined space must also be considered and followed. One thing that should always be considered is ventilation.

## CONFINED SPACES

Confined spaces must be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies to the welder, helpers, and other personnel in the immediate vicinity.

- If adequate ventilation isn't possible, airline respirators must be used.
- A self-contained breathing apparatus must be used in areas designated as immediately dangerous to life.
- Oxygen should never be used for ventilation.
- Gas cylinders and welding machines must be left outside the confined space.

When a welder must enter a confined space through a manhole or other small opening, a lifeline must be provided for quickly removing the welder in an emergency. The welder is the entrant and must wear a full-body harness with a lifeline attached to the harness.

Welding is performed in many environments, including confined spaces, open air, underwater, underground, and even in space. Welding can be dangerous and includes hazards like fires, confined spaces, eye damage, inhalation of poisonous gases and fumes, shocks, cuts, and exposure to intense ultraviolet radiation.

---

## ARC WELDING SAFETY

When arc welding is to be suspended for a substantial period, such as during lunch or overnight, all electrodes must be removed from the holders, and the holders relocated to prevent accidental contact. Additionally, the machine must be disconnected from the power source to eliminate the possibility of gas escaping through leaks or improperly closed valves.

Torch valves must be closed, and the gas supply shut off at the cylinder. Permanently shut off your equipment during lunch breaks and after your shift. And never leave it unattended in a ready-to-use condition.

- Never smoke around welding cylinders.
- Always inspect the area and your equipment prior to welding.
- If the equipment needs to be repaired, it should be only performed by qualified individuals.
- Only weld in areas approved by management.
- Move combustible items at least 35 feet away from the work site or provide protection from the welding work.
- Always wear the appropriate protective clothing and PPE.

## GENERAL WELDING SAFETY GUIDELINES

- Inspect the PPE before using.
- Do not use worn or defective PPE.
- Never breathe in the fumes or gases emitted from welding.
- Position yourself to keep your head out of the danger zone.
- Always provide correct ventilation methods.
- If you must use a respirator, make sure you have been trained on its use, are medically capable, and passed a fit test.
- If you are welding in a confined space, additional training is necessary to ensure your safety. Remember, welding is an important and rewarding job and it's up to you to do it safely.

## CONTAINERS

Except when the contents are being removed or transferred, drums, pails, and other containers containing flammable liquids must be kept closed. And empty containers must be moved to a safe area, away from hot work operations or open flames. Drums, containers, or hollow structures which have contained toxic or flammable substances must be cleaned thoroughly before welding, cutting, or heating operations. And after cleaning, they need to be ventilated and tested for dangerous residue.

---

### *Ventilation*

Ventilation is necessary to protect the welder and other workers from hazardous fumes, gases, and dust. Proper ventilation can be obtained through natural or mechanical means. Natural ventilation utilizes the natural flow of air through open doors and windows. Mechanical ventilation manipulates the airflow with devices like a fan, exhaust, hood, or both to keep contaminants below the permissible exposure limit. If welding is performed and screens are used on all four sides, they must be arranged so as not to restrict ventilation.

Mechanical ventilation uses either general mechanical ventilation systems or local exhaust systems. It's best to mount the screens about 2 feet above the ground unless this would create a glare hazard for nearby workers.

Toxic fumes, gases, and dust must be kept below the maximum PEL through exhaust or general ventilation systems.

Natural ventilation is sufficient as long as the welding area contains at least 100 cubic feet per welder, the ceiling height is at least 16 feet high, there are no barriers to block cross ventilation, and the welding space is not a confined space.

If any of these requirements are not met, then mechanical ventilation is required and must exhaust at least 20 cubic feet of air per minute per welder unless an airline respirator is used or local exhaust, hoods, or booths are used.

If local exhaust, hoods, or booths are used, they must provide airflow of at least 100 linear feet per minute.

Specific materials which require mechanical ventilation measures include fluorine compounds, zinc, lead, beryllium, cadmium, mercury, cleaning compounds, and stainless steel.

Oxygen must never be used for ventilation purposes, comfort cooling, blowing dust from clothing, or cleaning the work area.

---

## TOXIC METALS

Welding, cutting, or heating in any enclosed spaces involving zinc-bearing base or filler metals, metals coated with zinc-bearing materials, lead-based metals, cadmium-bearing filler materials, or chromium-bearing metals Must be performed with either general mechanical or local exhaust ventilation.

### *Inert Gas Metal Arc Welding*

Since inert-gas metal-arc welding involves the ultra-violet radiation with intensities of 5 to 30 times than those produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultraviolet rays, and toxic fumes and gases, employees are not permitted to be engaged in — or exposed to — the process until the following precautions have been taken:

The use of chlorinated solvents shall be kept at least 200 feet away, unless shielded, from the exposed arc, and surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted.

### *Protection*

Filter lenses shall protect employees in the area not protected from the arc by screening. When two or more welders are exposed to each other's arc, filter lens goggles must be worn under welding helmets.

Hand shields to protect the welder against flashes and radiant energy must be used when the helmet is lifted, or the shield is removed.

Welders and other employees exposed to radiation must be protected so the skin is completely covered to prevent burns and further damage by ultraviolet rays.

Welding helmets and hand shields must always be free of leaks, holes, and highly reflective surfaces.

Welding, cutting, and heating, can normally be done without mechanical ventilation or respiratory protective equipment. But, because of unusual physical or atmospheric conditions, if an unsafe accumulation of contaminants exists, suitable mechanical ventilation or respiratory protective equipment must be provided.

Employees performing any type of welding, cutting, or heating shall be protected by suitable eye protection equipment.

---

### *Preserving Coatings*

Before welding, cutting, or heating begins on any surface covered by a preservative coating whose flammability is not known, a test must be made by a competent person to determine its flammability.

Preservative coatings must be considered highly flammable if scrapings burn extremely fast. For this reason, we must take precautions to prevent the ignition of highly volatile, hardened preservative coatings.

When coatings are highly flammable, they must be stripped from the area to be heated, which will prevent ignition.

In enclosed spaces, all surfaces covered with toxic preservatives must be stripped of all toxic coatings for a distance of at least 4 inches from the heated area, or the employees must wear airline respirators. In the open air, employees must always be protected by a respirator.

The preservative coatings must be removed being careful to stay a sufficient distance from the area to be heated, This will help ensure that the temperature of the unstripped metal will not be raised. If necessary, artificial cooling of the metal surrounding the heating area can be used to limit the size of the area required to be cleaned.

It appears that Chromium VI is not only found in paints and coatings but also in certain types of welding fumes. This means that the health risks could be much greater than previously thought.

In the last few years, more and more information about the dangers of hexavalent chromium have been learned. Chromium VI in welding fumes has surfaced. It targets the respiratory system, liver, kidneys, skin, nose, and eyes, and is known to cause cancer and COPD.

Chromium metal is used in many steel alloys to harden the material and make it more resistant to corrosion. Chromium metal is not very dangerous, but the metal is oxidized to hazardous hexavalent chromium during welding or grinding. This substance is also used in certain paints and coatings for its corrosion protection.

The employer must ensure no employee is exposed to an airborne concentration of chromium 6 over 5 micrograms per cubic meter of air, calculated as an 8-hour time-weighted average

### **Monitoring for Chromium VI**

The employer will need to perform initial monitoring to determine each employee's 8-hour time-weighted average exposure. This would be done based on sufficient personal breathing zone air samples. This practice helps accurately determine total exposure for each shift, job classification, and work area. Suppose the employer chooses to do representative sampling instead of sampling all employees to meet this requirement. In that case, the employer must test the employees expected to have the highest Chromium VI.

If initial monitoring indicates that employee exposures are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

If monitoring reveals employee exposures to be at or above the action level, the employer shall perform periodic monitoring at least every six months.

If monitoring reveals employee exposures to be above the PEL, the employer will have to perform periodic monitoring at least every three months.

If periodic monitoring indicates that employee exposures are below the action level, and the result is confirmed by the result of another monitoring taken at least seven days later, the employer may discontinue the monitoring for those employees whose exposures are represented by such monitoring.

The employer must perform additional monitoring when there is a change in the production process, raw materials, equipment, personnel, work practices, or control methods.

These changes could result in new or additional exposures to Chromium VI.

Within five workdays after making an exposure determination, the employer must individually notify each affected employee, in writing, of the results of the conclusion.

This information can also be posted in an appropriate location accessible to all affected employees.

Whenever the exposure determination indicates that employee exposure is above the PEL, the employer shall describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

The employer must use engineering and work practice controls to reduce and maintain employee exposure to Chromium VI unless they can demonstrate that such controls are not feasible.

Wherever feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, the employer must require the use of specific respiratory protection.

Where respirator use is required, the employer shall institute a respiratory protection program in accordance with OSHA. This plan must cover each employee required to use a respirator.

Where a hazard is present or likely to be present from skin or eye contact with Chromium VI, the employer must provide appropriate personal protective clothing and equipment at no cost to employees and ensure that employees use the clothing and equipment.

The employer must clean, launder, repair and replace all protective clothing and equipment to maintain effectiveness. The employer must also prohibit the removal of Chromium VI from protective clothing and equipment by blowing, shaking, or any other means that disperses chromium into the air or onto an employee's body. The employer must let the person who launders or cleans the PPE or equipment of the potentially harmful effects of exposure to Chromium VI and that the clothing and equipment should be laundered or cleaned in a manner that minimizes skin or eye contact and prevents the release of airborne Chromium VI above the PEL.

The employer must provide changing rooms where protective clothing and equipment are required. And, where skin contact with Chromium VI occurs, the employer must provide washing facilities.

The change rooms must have separate storage facilities for protective clothing and equipment and street clothes. This storage must be in a way to prevent cross-contamination.

The Washing facilities must be capable of removing Chromium VI from the skin, And the employees must use these facilities when necessary.

If employees have skin contact with Chromium VI, they must wash their hands and faces at the end of the work shift before eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

Whenever the employer allows employees to consume food or beverages at a worksite where Chromium VI is present, the eating and drinking areas must be as free from Chromium VI as much as practicable of Chromium VI.

The employer must ensure employees do not enter eating and drinking areas with protective work clothing or equipment unless surface Chromium VI has been removed from the clothing and equipment by methods that do not disperse Chromium VI into the air or onto an employee's body.

The employer must make medical surveillance available at no cost to the employee, and at a reasonable time and place, for all employees who may be exposed to Chromium VI.

The employer must ensure all medical examinations and procedures required by this section are performed by or under the supervision of a PLHCP.

The employer must provide a medical examination within 30 days after the initial assignment unless the employee has received a Chromium VI -related medical review within the last twelve months

The employer shall include Chromium VI in the program established to comply with the Hazard Communication Standard. The employer must ensure that each employee has access to labels

---

on containers of chromium and safety data sheets and is adequately trained. The employer must provide information to employees on at least cancer, eye irritation, and skin sensitization.

### **GUARDS**

When the nature of the work requires guards, then certain additional precautions may be necessary. Whenever floor openings or cracks cannot be closed, precautions must be taken to protect readily combustible materials from sparks dropping through the floor. The same precautions must be taken for holes and cracks in walls, open doorways, and open or broken windows. Appropriate fire extinguishing equipment must be maintained and ready for instant use. A fire watch must be maintained for at least 30 minutes after completing the welding job.

### **FIRE WATCH**

Being a fire watch is an essential and critical job. The person responsible for welding operations must inspect the area and determine necessary precautions to be followed, preferably in a written permit. Floors should be swept clean of combustible materials for a radius of 35 feet away from the work area.

The employer is obliged to the employees to keep them safe. Always follow company rules and regulations when moving gas cylinders. Ensure they have the protective caps on them and are secured to a cart. Always keep welding cylinders upright and secure to a cart or other method to secure them. Welding should not be performed on used drums, barrels, tanks, or other containers until they have been thoroughly cleaned and it is certain there are no flammable substances still present.