Welding Safety

You are responsible for the safety of yourself and everyone working in your shop. Take the necessary steps to use safety equipment and avoid potentially hazardous situations. If you spot a peer engaged in an unsafe practice, bring the unsafe practice to their attention.

The following pages are an outline of some of the safety hazards, and preventative measures that go along with them.

REMEMBER! STOP AND REFUSE TO WORK IF:

- **YOU** HAVE NOT BEEN PROPERLY TRAINED HOW TO USE THE EQUIPMENT OR TOOLS
- **YOU** FEEL UNSAFE OR UNCERTAIN HOW TO SAFELY USE THE EQUIPMENT
- **YOU** FEEL UNSAFE WITH YOUR SURROUNDINGS OR OTHERS WORKING AROUND YOU

ONLY WORK WHEN YOU FEEL SAFE AND COMFORTABLE WITH THE EQUIPMENT AND YOUR SURROUNDINGS!

Harmful Rays

Some of the most serious arc welding hazards are harmful light rays emitted from the arc and the oxy-fuel flame. You must guard your body against these harmful light rays by wearing proper personal protective equipment (PPE). This equipment also helps protect you from grinding sparks, flying slag and weld spatter. You must put up screens when arc welding, cutting or grinding. Both visible and invisible light rays are given off by the oxy-fuel torch and the electric arc. This radiant energy can be divided into three types:

Visible Light Rays

Visible light rays are those that you can see. They may come from the source or they may be reflected off shiny surfaces. Intense rays of this light can cause eye strain or in extreme cases, temporary or permanent blindness.

Ultraviolet Rays

Ultraviolet rays are invisible. They cause burns to exposed skin and blistering of the eyeballs and is more common with electric arc welding. *Arc flash* (*welding flash* or *arc eye*) is the term commonly used to describe eyes burned by ultraviolet rays. When you experience arc flash, your eyeballs are covered with small water blisters causing extreme pain when you open them or when you blink. Symptoms of arc flash are profuse watering of the eyes and a feeling of sand in the eyes usually hours after the actual flash has occurred.

DANGER
See an eye specialist as soon as possible after an arc flash to ensure that the pain is not being caused by a foreign object lodged in your eyes.

Exposure of your skin to the intense ultraviolet rays of the arc is comparable to direct exposure to the sun. If you compare the distance you are from the sun, to the distance you are from the arc, the ultraviolet ray intensity of the electric arc is said to be **ten times** that of the sun. This implies that exposed skin can be burned in one-tenth the time required for a sunburn of the same degree to occur. With GMAW ultraviolet radiation intensity may be greater because of higher arc energy and less fumes to shroud the arc. Overexposure to ultraviolet radiation can lead to skin cancer. N**ever arc weld with short sleeves** and make sure your shirt or jacket is buttoned up at your neck.

Infrared Rays

Infrared heat rays are also invisible. They penetrate deeply and can cause temperature increases and burns to exposed skin. These rays may also penetrate the interior of the eye and can cause retina damage. Over a long period of time, infrared rays can cause cataracts.

X-Rays and Gamma Rays

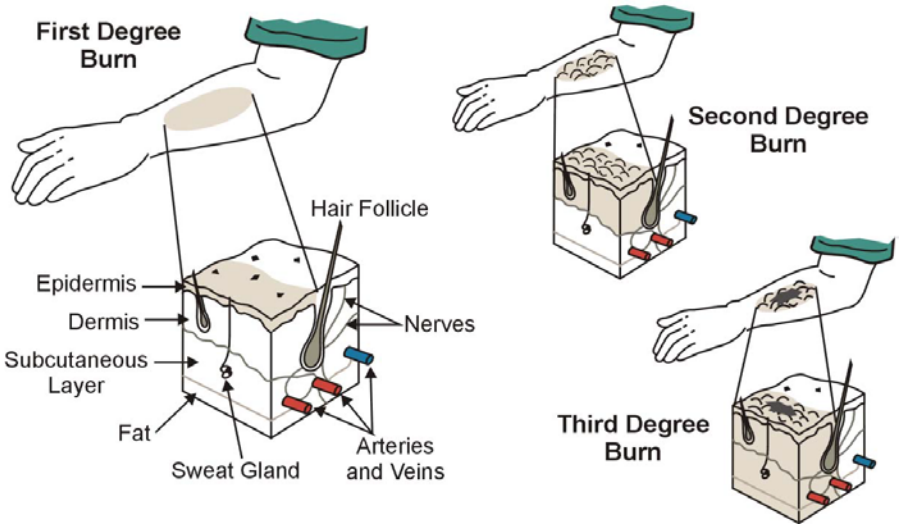
X-ray and gamma rays are produced from non-destructive testing (weld inspecting) of welds and exposure may result in cancer or damage to body tissues.

Burns

Burns that result in injury from contact with hot metal, flames, hot slag or sparks fall into two basic types:

With *surface* or *minor burns* (first degree burns), only the outer layers of the skin are damaged. The burned area may be red in colour and may blister.

Major burns (second or third degree burns) are deep burns with all layers of the skin destroyed and underlying fat and muscle damaged to varying depths.



When you receive a burn, immediately cool the burned area by immersing the burned part in cool, still water until the pain is relieved. If immersing is not possible, you should gently pour cool water over the burned area or apply a clean cloth soaked in cool water. **Cooling a burn reduces the temperature of the burned area and prevents further tissue damage**. It also reduces swelling and blistering and relieves pain.

When the pain has lessened, cover the burned area loosely with a clean, sterile material; secure the dressing, ensuring that the tape does not touch the burned area; and immediately obtain professional medical assistance. Cut clothing away from burned areas carefully, but do not attempt to remove cloth that adheres to the burn. Cut around it. Deep burns are often caused by metal at temperatures lower than red-hot. Before you realize the metal is hot, the burn has penetrated beyond your skin and into the flesh. In other cases, the metal or slag may be trapped against the skin by worn or improper gloves, worn clothing or open-top boots. This type of burn takes longer to heal and care should be taken to prevent infection.

REMEMBER! If it's **BLACK** it **STICKS**, if it's **RED** it **SLIDES**

In welding shops, all metal surfaces should be considered burning hot. Use caution! Whenever you set a hot object aside where others might be burned, mark it **hot** with soapstone. Safety conscious welders always consider others and take every precaution to protect others as well as themselves. If your clothing catches fire, remember to stop, drop and roll (SDR):

- **STOP** moving; do not run,
- **DROP** to the ground and
- **ROLL** several times to put the flames out.

Noise Hazards

Noise is defined as unwanted sound and is one of the most common workplace hazards. Excessive noise may cause tiredness, irritability, headaches, a rise in blood pressure, a loss of concentration, a drop in productivity, accidents, hearing problems and deafness. The harmful effects are not always immediate, but permanent damage can and usually does result. Hazardous noise conditions that are considered major contributors to hearing loss are:

- Work site overall noise level,
- Frequency distribution of the noise,
- Duration of the noise exposure during the work day,
- Time distribution of the noise exposure and
- Susceptibility of the individual to noise-induced hearing loss.

Welding and cutting operations such as air arc gouging, pneumatic chipping and grinding produce very high noise levels. Earmuffs and earplugs help to protect against hearing loss and sparks and slag from entering your ears. The following warning signs should alert you to high noise levels and remind you to wear hearing protection if:

- You have to raise your voice to a person who is a metre or less away from you or
- You develop a ringing or buzzing sound in your ears.

Noise Intensity and Exposure Limits

The intensity of noise or sound is measured in units called decibels (dBA). Table 1 lists some dBA levels created from different sources.

SOUND			
Common Noise Levels & Causes		**Permitted Time Per Day Vs. Sound Level**	
Cause	**Noise Level (dBA)**	**Sound Level (dBA)**	**Max (Time per day)**
Jet plane	140	82	16 hrs
Gunshot blast	140	83	12 hrs and 41 min
Riveting a steel tank	130	84	10 hrs and 4 min
Air arc cutting	120	85	8 hrs
Sandblasting	112	88	4 hrs
Drilling rig motors	90-100	91	2 hrs
Punch press	100	94	1 hr
Pneumatic drill	100	97	30 min
Boiler shop	100	100	15 min
Hydraulic press	100	103	8 min
Average factory	80-90	106	4 min
Noisy restaurant	80	109	2 min
Conversational speech	65	112	56 seconds
Quiet office	40	115 and greater	0
Soft whisper	30		

As you can see, if you work in an average factory, you need hearing protection. The maximum permitted sound level for an eight-hour day is 85 dBA and hearing protection should be worn if the sound level is above 85 dBA. Most of the time someone will be grinding, gouging or drilling, so you should be using hearing protection at all times. **USE YOUR EARPLUGS!!!**

Personal Protective Equipment (PPE)

***Head Protection*:** You should wear a beanie, hat or bandana to protect your head and hair.

Safety Glasses

You should always wear safety glasses in a welding environment to protect you from arc flash, sparks and flying particles. They should have side shields and be shatter resistant. Prescription safety glasses are available and many styles have side shields that can be clipped on when you work in the shop. Safety glasses should fit under all face protection equipment.

Full-Face Visor

Your entire face can be protected by a *full-face visor* and should be used along with safety glasses when performing operations such as grinding or chipping. It should fit over your safety glasses. If you are wearing clear safety glasses and are using a face shield for oxy-fuel welding or cutting, it should have a #4 or #5 shade.

Clear Goggles

Tight-fitting, high-impact *clear goggles* can be worn over safety glasses to provide extra protection for your eyes from flying debris caused by grinding, chipping or splashing liquids.

Welding Goggles

Welding goggles are worn when oxy-fuel welding or cutting to filter out the harmful light rays and to prevent slag and sparks from entering the eyes. Filter plates are available in various shades depending on the intensity of the light radiation in the welding or cutting environment. Usually, a shade #4 or #5 is adequate for light cutting and welding. The goggles fit over safety glasses and provide full-face contact around the eyes. Some goggles of this type also have a flip front or may be fitted with a magnifying lens if required.

As a general rule, if after cutting or welding for a few minutes, you lift your goggles or helmet and see light spots; your lens is probably too light. If you see dark spots, your lens is likely too dark. Everyone's eyes have a different level of sensitivity to light. Therefore, the shade filter plate to use is ultimately up to you.

Safety Glasses **Full Face Shield** **Welding Goggles**

Welding Helmets

Welding Helmets and Filter Plates

A welding helmet must be worn when welding to protect your eyes and face from harmful rays and flying particles. The helmet protects your face from light, heat, spatter and slag. Helmets are available with flip fronts, fixed fronts or photoelectric filter systems. The flip front or photoelectric type is best because it provides continuous protection while you inspect the weld and chip the slag with your helmet in front of your face.

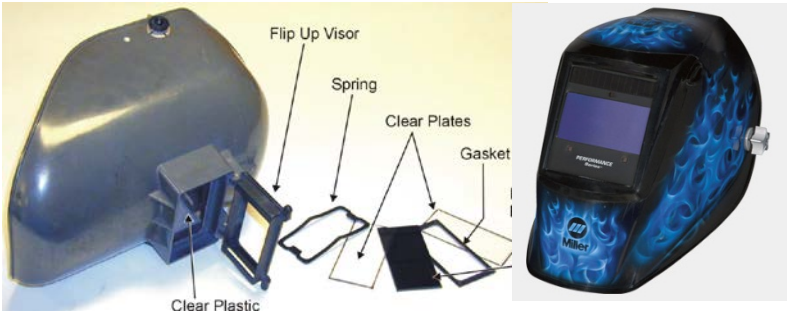
Special *filter plates* (*filter lenses*) for welding are available in shades ranging from #1 (lightest) to #14 (darkest). The filter plate absorbs most of the harmful ultraviolet and infrared rays, as well as a large amount of visible light. Select a shade that eliminates glare but allows you to see the work distinctly. No one shade of filter plate will suit all types of welding and cutting. Both the American Welding Society (AWS) and the Canadian Standards Association (CSA) have guidelines for filter plates for most welding and cutting operations.

Shade Number	Usage
Shade #4 or #5	Oxy-Fuel Cutting and Welding
Shade #8	Low Amperage Plasma Arc Cutting (PAC)
Shade #9	Low Amperage SMAW, GTAW, PAC
Shade #10	Low to Medium Amperage SMAW, GTAW, PAC
Shade #11	Medium Amperage SMAW, GMAW, GTAW, PAC
Shade #12	Medium to High Amperage SMAW, GMAW, GTAW, PAC, CAC-A
Shade #14	High Amperage SMAW, GMAW, GTAW, PAC, CAC-A

Whether you have a helmet with a flip front or a fixed front, you should place a clear plastic plate in the helmet next to your face. The plastic plate protects your face when you are chipping slag or inspecting welds. Mount the coloured plate between two plastic plates in the helmet visor to protect the filter plate from weld spatter. A gasket should be placed between the outer plastic and the filter plate. This provides an air space between the two plates which helps prevent heat cracking of the filter plate and also separates the plates so moisture build-up does not cloud your vision.

Photoelectric Welding Helmets

Photoelectric helmets start at a low number shade, between #3 and #5. When you strike an arc, they automatically darken to your pre-set shade number. These can range from shade #8 - #14. Some also have a sensitivity control that affects how much light the filter in the helmet will absorb before it automatically turns dark. Different welding processes require different settings and again it is up to you to adjust your helmet so you have the best all-around protection.



Protective Clothing

White-hot sparks and slag are a normal part of welding. Slag gathers heat from the arc and molten metal and may be propelled toward the welder by exploding off the weld bead or during chipping. Flying sparks and slag endanger exposed parts of the body and can cause burns and eye injuries. An accumulation of hot slag or excessive heat on concrete floors can cause the concrete surface to explode, creating a personal injury hazard.

The best clothing materials for welding and cutting are leather, wool and denim (cotton) because they repel sparks and slag. Leather offers the best protection against sparks and molten slag and is a very durable material, but leather clothing may lead to overheating in warm weather. The same protective quality can be achieved by wearing leather aprons, capes or sleeves that allow body heat to escape. Wool is more desirable for cold temperatures and less flammable than cotton. Denim, a tightly woven form of cotton, is a very popular type of clothing worn for most indoor and outdoor welding operations. Make sure it is 100% cotton. Welders often wear heavy-weave cotton work wear along with leather sleeves for added protection. Denim will burn slowly if exposed to extreme sparks or slag, especially if any of the material has become frayed. Keep your work clothing clean and in good condition.

Extra considerations:

- Shirt or coat pockets should have flaps, sleeves should be rolled down and collars should be buttoned up.
- Do not keep matches or disposable lighters in the pockets of your clothing.
- Pant legs should cover the top of your footwear and not have cuffs.

DANGER
Avoid wearing synthetics, like polyester and nylon, because they have a tendency to melt where sparks land, allowing those sparks to penetrate to your skin. Some synthetics tend to flare rapidly and engulf the wearer in flames or the material can melt into the flesh.

Welding Gloves

Welders' leather gauntlet style gloves provide the best protection because they cover up your wrists. Welding gloves are usually dry-tanned (no oil). They can be purchased with a lined back for extra heat protection or as a thinner, tighter-fitting glove if you don't need the extra heat protection (such as for TIG welding). Aluminized gloves have an aluminized fabric sewn on the back of the gloves and are designed to insulate your hands from intense heat. Leather exposed to extreme heat, even for a short time, will shrink, stiffen up and become useless because it has lost its flexibility.

Footwear

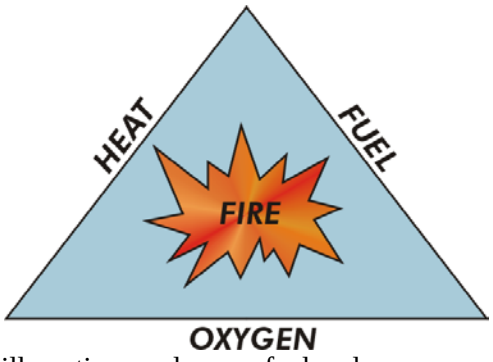
High-top leather steel-toed safety boots that are fully laced and worn under your pants offer the best protection against hot sparks and slag. Footwear should have electrically non-conductive soles. Most safety boots are designed to meet CSA standard Z195-M92 – *Protective Footwear*. In wet conditions, rubber boots and dry socks provide the best protection from electrical shock hazard. Rubber boots also prevent chemicals from coming in contact with your feet.

Identify Fire Hazards and Methods of Fire Prevention

The threat of fire is always present in the welding environment. High-temperature flames are essential to cutting, heating and brazing processes. Three requisites are necessary for a fire or explosion to occur:

- F*uel*, as in a combustible material such as wood, gasoline, paper or cloth
- H*eat* (source of ignition) sufficient to raise the fuel to its *ignition temperature*
- O*xygen*, usually in the form of air, to support combustion.

When the three components combine, the result is rapid combustion or fire as illustrated in the fire triangle below. Keeping the three components separated prevents a fire from occurring.



A fire creates its own heat and will continue as long as fuel and oxygen are available. Atmospheric air is comprised of about 21% oxygen and can be the sole source of oxygen for a fire. If a flammable combination of fuel and oxygen exists, flames, sparks, spatter, lit cigarettes, static discharges and even small sparks in electrical equipment such as relays and thermostats, could ignite a fire. A fire can be extinguished by removing any one of the three components.

Check your Surroundings

Welding and cutting sparks can travel through cracks or ducts. Sparks can land on flammable substances or on electrical wiring and equipment. You must be alert to the possible effects of your work over a large area where there is a potential for fire.

- Always have an approved type of fire extinguisher ready for immediate use. Become familiar with fire extinguisher locations, how they work and what class of fire they will extinguish.
- Move combustibles to a safe place or shield them with fireproof blankets or barriers.
- Wet down combustible floors or cover them with a protective material, such as wet sand or sheet metal.
- Do not cut or heat if a possibility of danger exists and the job cannot be moved to a safe place.
- Do not cut over unprotected concrete floors. Hot slag can damage concrete floors by causing small explosions as the slag hits the floor.
- Be aware that when using oxy-fuel equipment, goggles may limit your vision and a significant fire could be burning without you being aware of it.
- When using oxy-fuel equipment, always ensure that the flame is directed away from the equipment itself (cylinders, regulators, hoses).
- In the event of an oxy-fuel equipment fire, you must first stop the flow of oxygen from the source, then stop the flow of fuel gas, then extinguish the flame.

Classes of Fires & Suppression Methods

Class of Fire	Combustible Material
Class A	Wood and Paper
Class B	Flammable Liquids
Class C	Electrical Equipment
Class D	Combustible Metals
Class K	Combustible Cooking Media

It is very important that you choose the correct fire extinguisher. See below to determine which fire extinguisher to use on a particular class of fire.

FIRE SUPPRESSION						
Extinguishing Agents	**Suppression Methods**	Class A Fires 	Class B Fires 	Class C Fires 	Class D Fires 	Class K Fires 
Water	Cools the Fire	YES	NO	NO	NO	NO
Foam	Excludes Oxygen and Cools Fire	YES	YES	NO	NO	NO
CO_2 Carbon Dioxide	Displaces Oxygen	NO	YES	YES	NO	NO
Regular Dry Chemical Sodium Bicarbonate Base	Smothers Flames	NO	YES	YES	NO	NO
Purple K Dry Chemical Potassium Bicarbonate Base	Smothers Flames	NO	YES	YES	NO	NO
Multi-Purpose Dry Chemical Ammonium Phosphate Base	Smothers Flames	YES	YES	YES	NO	NO
Dry Powder	Exclude Oxygen and/or Cools Fire	NO	NO	NO	YES	NO
Wet Chemical Potassium Acetate Base	Smothers Flames and Cools Fire	NO	NO	NO	NO	YES

Fumes and Gases

Fumes are small, condensed particles of metal or other substance that vaporize during welding and cutting operations. They may or may not be visible, depending upon their size and concentration. These small particles stay suspended in the vapour or the gas and may enter your body with the air you breathe. Welding smoke is an example of a fume. Dust masks and air respirators are a quick, on the spot solution.

A *gas* is one of the fundamental states of matter, with freely moving particles that mix readily with air and tend to expand out of an open container or expand because of the use of the gas in a particular welding process. Gases such as argon, helium or carbon dioxide are non-toxic, but inhalation of large quantities of these gases can cause suffocation.

DANGER

Gases created during welding, such as ozone, carbon monoxide or nitrogen dioxide are extremely toxic (poisonous). In high enough concentrations, these gases can be fatal. Some harmful gases cause cancer and are called *carcinogens*.

Metal fume fever produces flu-like symptoms from inhaling fumes of certain metal oxides. Zinc oxides from welding galvanized steel or from braze welding (copper and zinc) are major causes of metal fume fever. Although exposure to fumes and gases is unavoidable, it should be kept to a minimum. You should know where fumes and gases come from, their effects on your body and how you can reduce or eliminate the risk of injury. Fumes and gases are created from the melting of base metals and fillers or they may be created from base metal coverings such as coatings, residues and plating or they may be created from fluxes.

Metal	Source	Result of Inhalation
Aluminum	Component of some alloys. Base metal of applications.	Irritation of respiratory system.
Chromium	Most stainless steels. Used as a plating material	Risk of lung cancer. Some forms are carcinogens.
Copper	Alloys in brass and bronze. Alloys in Monel.	Irritation of respiratory system and eyes. Can cause metal fume fever.
Iron	Major element in carbon steels.	Irritation of nose and lungs, usually non-permanent. Effects tend to disappear over time, once exposure is reduced or stopped unless your lungs have already been damaged.
Lead	Alloy in solder, brass, and bronze.	Toxic vapours affect the nervous, digestive systems and kidneys. **Lead poisoning can be fatal**.
Nickel	Alloy in stainless steels, Inconel, Monel, Hastelloy.	Irritation of the respiratory system. Can cause metal fume fever. Fumes can cause cancer.
Zinc	Galvanized metal Alloy in brasses.	Irritation of the respiratory system. Major cause of metal fume fever.

Fumes from Base Metal Coatings and Welding Fluxes

Coating	Harmful Substance	Result of Inhalation of Fume/Gas
Rust inhibitors	Phosphine gas formed by reaction with welding radiation.	Irritation of eyes and respiratory system. Can damage kidneys and other organs.
Chlorinated-Hydrocarbon Degreasers	Phosgene gas and hydrochloric acid produced by ultraviolet light acting upon the vapours.	Irritation of eyes and the respiratory system. **Poisonous, may be fatal**.
Paint	Iron oxide. Zinc. Mercury or lead.	Irritation of the nose and lungs. Can cause metal fume fever. **Poisoning could be fatal**.
Plastics	Ethylene dichloride gas, used in manufacturing plastics.	**Poisonous gas may be fatal**.
Fluoride	Common electrode coating.	Irritation of eyes, nose and throat. Long term effect is fluid in the lungs.
Borates	Used in soldering flux.	Irritation of the skin, eyes and respiratory system.

Welding Gases and Gases Produced by Welding

Gas	Source	Result of Inhalation
Shielding Gases:		
- Argon - Helium - Carbon Dioxide	Used during welding processes (GMAW, GTAW).	These gases are non-toxic. **Inhaling concentrated amounts can lead to suffocation.**
Gases Produced by Welding:		
	Formed in the arc as CO_2 is reduced to CO by heat.	Absorbs readily in the bloodstream and decreases the oxygen-carrying ability. **High concentrations can cause death.**
- Carbon Monoxide	Formed as oxygen reacts with ultraviolet light from welding.	Low concentrations cause headaches and irritation of the nose and throat. **Death or permanent lung damage can result from prolonged exposure**.
- Nitrogen Dioxide	Rapid cooling of air.	Coughing bronchial irritation, chest pain and fluid in the lungs. **Death can occur in 24 hours**, in severe cases.

As gases enter your body with the air you breathe, different gases affect you in different ways. A healthy body can rid itself of some gases without lasting effects. *Occupational exposure limits* (OELs) are the maximum concentrations of a hazardous substance that a healthy person can be exposed to without suffering adverse health effects. There may be increased risks for persons with health problems such as asthma or allergies or for those who smoke. The three different values of the OEL that are used are:

- a limit based on a normal eight hour working day,
- a limit based on a fifteen minute short-term exposure and
- a limit based on a ceiling that must never be exceeded.

Normally, gases and fumes created by welding on clean carbon steels do not cause immediate health problems. However, over the years, if you breathe in gases and fumes that exceed the OELs, you will probably suffer health problems.

Ventilation Methods

Keep Your Head Out of the Plume

A safe practice is to place your head so the smoke coming from the welding plume is not in your breathing zone. Although this does not remove the fumes, it does reduce the exposure to them if you are not welding in a confined space.

Natural General Ventilation

An unlimited fresh air supply should eliminate any potential fume hazards unless particularly toxic materials are involved. However, your first line of defence against fumes and gases is to **weld outside, where fumes and gases are not confined** and keeping your head out of the plume.

Head over plume.

Head away from plume

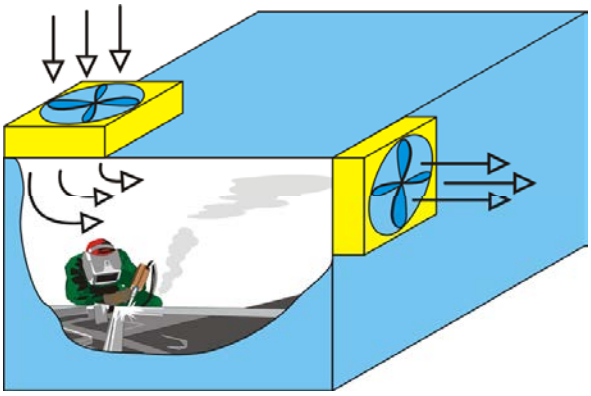
Natural Ventilation

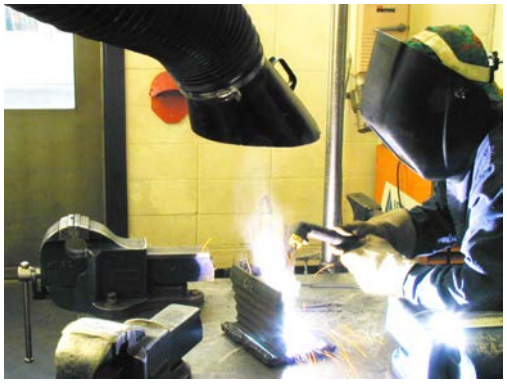
Mechanical General Ventilation

Mechanical general ventilation occurs when air is pumped into the shop, passes through and is vented outdoors through ductwork, doors and windows. As a general rule, if the visible fume clears in about thirty seconds, then ventilation is probably adequate. In most welding shops, the ventilation system should give four complete changes of air per hour.

Local Ventilation

Exhaust fans capture fumes at their source and exhausts them outdoors. Also known as *source extraction*, local ventilation systems can have either fixed or flexible ducting systems. A flexible ducting system allows you to place the extraction hood in the most effective position to remove fumes. In either case, the plume should not rise up into your breathing space.





Electric Shock Hazard

As a welder, you must take every precaution to protect yourself and others from electrical shock. The voltages used for manual arc welding are relatively low and do not usually cause electrical shock. Conditions such as high temperatures, high humidity, sweaty clothing and working in wet conditions greatly increase the possibility of electric shock. Some of the factors affecting the severity of electric shock are listed below.

Equipment	Precautions
ground fault circuit interrupter (GFCI)	Electrical shock is experienced when current finds a path through the body to the ground. The GFCI senses that current flow and breaks the circuit in about 1/40 of a second while the flow is still at a low level (example 5 mA). GFCIs are available to protect people or equipment. GFCIs that protect people open the circuit at a lower level of current flow.
clothing	Damp skin and sweaty or wet clothing can decrease the body's resistance. Dry clothing is the first line of defense. In wet conditions, wear rubber boots with dry liners and dry socks. Avoid boots with nailed soles and gloves with rivets.
electrode holders	Never allow their metal parts to touch your skin or wet clothing. Never hold them under your arm so you can have both hands free. Never cool them in water.
cables	Never loop cables around your body. Use only approved connectors to join lengths of cable. Never use cables that have damaged insulation without repairing them first.
power sources	Power sources must be connected by a qualified electrician to ensure they are properly grounded. Have a readily accessible means of disconnecting the power. When changing or repairing any power source, lock out the power feeding it.
lights and tools	Use low voltage electric lighting. Insulate electrical tools with heavy-duty leads. Use pneumatic tools wherever possible.

Rescue Procedures for Electric Shock Victims

Electrical shock can cause cardiac arrest, *ventricular fibrillation* (uncoordinated heart activity), damage to the nervous system or dangerously high body temperatures. Violent convulsions can cause broken bones and torn tissues. If you suspect someone has been subjected to electrical shock, be aware of the following before attempting a rescue.

- Alert the proper authorities about the location and type of accident.
- Act quickly. One second can make the difference between life and death, but do not become another victim.
- Do not touch a victim who is still in contact with the conductor. Switch off the electrical supply or pull the plug.
- Use adequate insulation if the conductor must be moved. Wear dry, rubber gloves and use a dry cloth or dry timber. Considerable force may be needed.
- Be careful that victims who are at heights do not fall when they are released.
- Remember: in a confined space, the walls or floor may be conducting electricity.

If you have rescued a victim or happen upon a victim of electrical shock, follow the steps listed below to provide first aid.

- Preferably, a qualified person should perform first aid.
- Begin artificial respiration if breathing has stopped.
- Give four quick breaths to the victim and then check for pulse.
- If no pulse, start CPR (cardiopulmonary resuscitation).

- Get the victim to a doctor as soon as possible.

References

Miller helmet:
http://www.google.ca/imgres?q=miller+welding+helmets&um=1&hl=en&sa=N&tbo=d&biw=1152&bih=727&tbm=isch&tbnid=vr0eMJBhPgMP7M:&imgrefurl=http://weldfabulous.blogspot.com/2009/06/miller-blue-rage-auto-darkening-welding.html&docid=pxQ6k0sskmpFwM&imgurl=http://3.bp.blogspot.com/_S-2s-tvNZfQ/SjqmGXUdFtI/AAAAAAAAAE0/UpNTpIMp8P0/s400/MI241458.jpg&w=350&h=380&ei=PeG2UIXwF5H2igK_ioGACg&zoom=1&iact=hc&vpx=4&vpy=106&dur=456&hovh=234&hovw=215&tx=72&ty=168&sig=104510697216724724699&page=1&tbnh=137&tbnw=134&start=0&ndsp=29&ved=1t:429,r:0,s:0,i:84