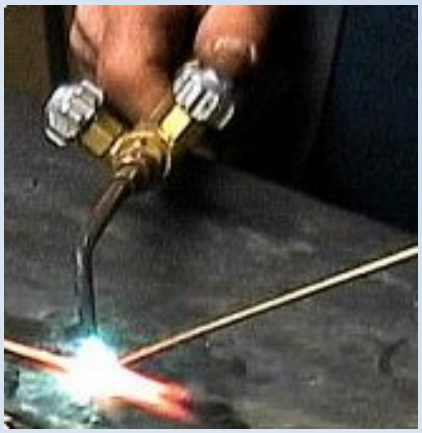
# MEM05004C

Perform routine oxy acetylene welding



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**Manufacturing Skills Australia Courses**

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## Aims of the Competency Unit:

This unit covers preparing materials and performing routine oxy acetylene welding.

## Unit Hours:

18 Hours

## Prerequisites:

None.

## Elements and Performance Criteria

| | | | |
|---|---|---|---|
| 1. | Identify weld requirements. | 1.1 | Weld requirements are identified from job instructions. |
| | | 1.2 | Location of welds is identified in accordance with standard operating procedures and job specifications. |
| 2. | Prepare materials for welding. | 2.1 | Materials are cleaned and prepared ready for welding. |
| 3. | Prepare equipment for welding. | 3.1 | Welding equipment is set up correctly. |
| | | 3.2 | Settings and consumables are selected. |
| 4. | Perform routine welding using oxy acetylene. | 4.1 | Safe welding practices are applied. |
| | | 4.2 | Materials are welded to job requirements. |
| | | 4.3 | Welds are cleaned in accordance with standard operating procedures. |

## Required Skills and Knowledge

***Required skills include:***

- preparing materials
- setting up welding equipment
- welding with oxy acetylene fuel gas
- reading and interpreting routine information on written job instructions, specifications and standard operating procedures
- following oral instructions
- using measurement skills for joint preparation and routine oxy acetylene welding

***Required knowledge includes:***

- preparatory requirements
- materials and consumables properties and characteristics
- equipment and equipment settings
- fuel gas properties and applications
- post welding treatments
- weld characteristics
- any applicable industry standards, NOHSC guides, State/Territory regulatory codes of practice/standards
- safe work practices and procedures
- safe welding practices
- use and application of personal protective equipment for routine oxy acetylene welding

## Lesson Program:

The course can be delivered to the following program.

| Topic | Skill Practice Exercise |
|---|---|
| Topic 1 – P.P.E. & Safe Working Practices: | MEM05004-RQ-01 |
| Topic 2 – Oxy-Acetylene Basics: | MEM05004-RQ-02 |
| Topic 3 – Equipment for Oxy-Acetylene Welding: | MEM05004-RQ-03 |
| Topic 4 – Oxy-Acetylene Gas Cylinders: | MEM05004-RQ-04 |
| Topic 5 – Welding Cast Iron: | MEM05004-SP-0501 |
| Topic 6 – Additional Ferrous Metal Welding: | MEM05004-SP-0601 & MEM05004-SP-0602 |
| Topic 7 – Welding Non-Ferrous Metals: | MEM05004-SP-0701 & MEM05004-SP-0702 |
| Topic 8 – Brazing & Soldering: | MEM05004-SP-0801 & MEM05004-SP-0802 |

## Contents:

# Topic 1 – P.P.E. & Safe Working Practices:

## Required Skills:

- List ALL Personal Protection Equipment required by an operator when using oxy-acetylene equipment.
- Specify the safe work practices that must be followed when using oxy-acetylene equipment

## Required Knowledge:

- Work Health Safety standards in the workplace.
- Safe welding and work practices and procedures.
- Use and application of personal protective equipment for routine oxy acetylene welding.

## 1.1 Personal Protection Equipment (PPE):

Personal Protection Equipment or PPE is anything used or worn by a person to minimise a risk to the person's health or safety. Protective equipment may be worn for job-related occupational safety and health purposes. PPE is not restricted to the workplace situations, many people wear gloves while washing dishes at home, a football player would not dream of taking the field without a mouthguard, or a cricketer a protective box. All PPE's are designed to save life and protect us from harm.

Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and a myriad of other potentially dangerous situations. The Work Health and Safety (WHS) Act requires that employers protect their employees from workplace hazards that can cause injury.

Controlling a hazard at its source is the best way to protect employees. Depending on the hazard or workplace conditions, WHS recommends the use of engineering or work practice controls to manage or eliminate hazards to the greatest extent possible. For example, building a barrier between the hazard and the employees is an engineering control; changing the way in which employees perform their work is a work practice control.

When engineering, work practice and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment (PPE) to their employees and ensure its use. Personal protective equipment is equipment worn to minimize exposure to a variety of hazards. PPE can be categorized by the area of the body protected and includes:

- Eye protection for example, goggles, glasses and face shields.
- Hearing protection for example, ear plugs and ear muffs.
- Respiratory protection for example, filter respirators, air line respirators and scba.
- Foot protection for example, safety shoes and boots, spats and rubber gum boots.
- Head protection for example, hard hats, helmets and broad brimmed hats.
- Body protection for example, aprons, overalls, gloves and high visibility clothing.
- Any substance used to protect health, for example, sunscreen.

### 1.1.1 Eye Protection:

Typical hazards might include flying particles, dust, splashing substances, harmful gases, vapours, aerosols, and high intensity radiation from welding operations, lasers, trans-illuminators and strong heat sources. Consideration must be given to the need for protecting people who are working nearby or passing close to hazardous areas. It is essential that the maximum degree of eye protection is provided.

The following general eye protectors are available:

- Goggles - An eye protector fitting the contour of the face and held in position by an adjustable headband.
- Wide-Vision Goggles - An eye protector in which the lens or lenses extend over the full width of the face affording a large field of vision.
- Welding Helmet - A rigid eye protector which is worn by the operator to shield the eyes, face, forehead and front of the neck.
- Welding Hand Shield - A rigid eye protector which is held in the hand to shield the eyes, face, forehead and front of the neck.
- Face Shield - A device which includes a transparent visor, supported in front of the face to shield the eyes.
- Safety Spectacles - An eye protector with protective lenses mounted in spectacle-type frames, or integrally moulded into the frames with or without side shields, and held in position by the side arms.
- Tinted Safety Spectacles/Goggles - provided to employees who require eye protection and who are generally required to work outdoors.

*Figure 1.1*
*Goggles*

*Figure 1.2*
*Safety Spectacles*

*Figure 1.3*
*Wrap Around Safety Spectacles*

*Figure 1.4*
*Welding Helmet*

*Figure 1.5*
*Welding Hand Shield*

*Figure 1.6*
*Face Shield*

### 1.1.2 Hearing Protection:

Hearing protectors are devices designed to prevent Noise-Induced Hearing Loss (NIHL) and include Earplugs and Earmuffs.

Earplugs are manufactured from silicon rubber or memory foam and are inserted into ear canal.

Earmuffs are items designed to cover a person's ears for protection and consist of a thermoplastic or metal head-band that fits over the top or back of the head, and a pad at each end, to cover the external ears.

*Figure 1.7 - Earplugs*

*Figure 1.8 - Earmuffs*

### 1.1.3 Respiratory Protection:

Respirators protect the user in two basic ways. The first is by the removal of contaminants from the air; respirators of this type include particulate respirators, which

filter out airborne particles, and air-purifying respirators with cartridges/canisters which filter out chemicals and gases. Other respirators protect by supplying clean rebreathable air from another source. Respirators that fall into this category include airline respirators, which use compressed air from a remote source, and self-contained breathing apparatus (SCBA), which include their own air supply.

*Figure 1.9*

*Figure 1.10*

*Figure 1.11*

*Figure 1.12*

Figure 1.9 and Figure 1.10 are very similar respirators; the only difference is the inbuilt face mask in Figure 1.9. Figure 1.11 shows a fire-fighter using a rebreathable system which protects the fire-fighter from smoke and toxic gasses. The respirator in Figure 1.12 should only be used for light sanding and 'hobby' jobs.

### 1.1.4 Foot Protection:

Protective footware should be selected to avoid injuries to the feet including contact with falling, rolling or cutting objects, penetration through soles or uppers, delamination of the skin, anti-static and electrical hazards, contact with chemicals, heat and molten metals and slipping.

*Figure 1.13*

*Figure 1.14*

*Figure 1.15*

*Figure 1.16*

Figure 1.13 shows a men's safety shoe, notice the foot is fully enclosed for maximum safety. Figure 1.14 is a safety boot which provides more stability around the ankle than a shoe. A woman's dress shoe is shown in Figure 1.15; fashion should never be more important than safety however in an office and light engineering environment, safety and fashion can still coexist. Figure 1.16 shows the construction that goes into quality footwear, in this case a boot.

### 1.1.5 Head Protection:

Head protection consists of safety helmets which provide protection against falling objects, bumps and electrical hazards and hats which provide protection from the sun and rain.

Hard hats and safety helmets can also come with attached accessories such as hearing protectors, eye protectors, face shields, neck protectors and head bands. Depending on the work environment hard hats may need to have thermal considerations, for example fire fighters.

*Figure 1.17 – Safety Helmet*

*Figure 1.18 – Sun Hat*

People who work outdoors are normally provided with a hat which affords maximum protection from the sun and rain. The selected hat should reflect the nature of the work, duration of exposure, and other personal protective equipment required, such as goggles or earmuffs. Sun hats should have a suitable brim, peak or neck flap as appropriate.

### 1.1.6 Hand Protection:

Hand injuries account for 80 percent of all occupational injuries; this is because the hands are engaged in almost all activities on the job. Hands are so important because of their utility and provide the dexterity needed to perform most daily activities. Hands as tools, are so versatile and can perform many intricate functions more than any single known tool developed by man.

There are many dangerous conditions on the job to which the hand is always exposed. Sharp edges, pinch points, protruding objects, splinters, exposed blades on unguarded machinery and many more; these conditions may not always be too obvious to the working person. Pinch points are basically traps for the hand especially; doors may pinch fingers when they are caught in the jam. Paying attention and being aware of their existence helps us to avoid pinch points. We also need to take the proper precautions to avoid being pinched. A necessary precaution to take is to wear approved work gloves. Not all gloves give protection from all hand injuries. Check the appropriateness of the glove for the task before using them. Precautions must still be taken to reduce the level of danger before handling very dangerous material; locking machinery and power before reaching into them can reduce injury without having to rely on the gloves.

*Figure 1.19*

*Figure 1.20*

*Figure 1.21*

*Figure 1.22*

Figure 1.19 are gloves made especially for working with corrosive materials while Figure 1.20 shows common gardening gloves to protect the hands from dirt and thorns. Welding gloves are shown in Figure 1.21 and must be of sufficient thickness to prevent burns from the welding arc and sparks. Butchers require special mesh gloves as shown in Figure 1.22 to prevent accidental cuts.

### 1.1.7 Body Protection:

The type and classification of body protection is dependent on the industry; welders require non-flammable overalls and aprons; spray painters require coveralls with boot and glove covers; racing car drivers have fire-retardant suits and neck braces and professional football players use ankle, knee, back, elbow, wrist, thigh and neck braces while a special mouthguard is worn in the mouth.

*Figure 1.23*
*Welders Overall*

*Figure 1.24*
*Carpenter's Overall*

*Figure 1.25*
*Spray Painter's Coverall*

## 1.2 Safe Working Practices:

*Definition – Safe work practices are generally written methods outlining how to perform a task with minimum risk to people, equipment, materials, environment, and processes.*

### 1.2.1 Responsibility for Managing Work Health & Safety Risks.

The WHS Act states that everyone is responsible for health and safety in the workplace. Management is responsible for providing workers with the necessary tools, training and protective equipment to perform the work safely, and with the time and direction to do so. The worker is responsible for following the safety rules and using the appropriate controls and protective equipment to work safely. There are regulatory boards that enforce health and safety in the workplace and would have to depend on the location of the workplace and the industry or nature of the business.

Since employers have the most control over the conditions of work and how it is done, they have the greatest degree of responsibility for the health and safety of workers and must:

- Provide a safe and healthy workplace;
- Establish Occupational Health Committees or representatives and consult and cooperate with them in resolving health and safety concerns;
- Ensure workers are not exposed to harassment;
- Comply with the Occupational Health and Safety Act and Regulations;
- Provide required safe work procedures;

- Ensure equipment is provided and maintained;
- Ensure workers are trained; and
- Ensure supervisors are competent.

Supervisors are critical to safe workplaces because they are closest to the actual work being done and can address and resolve worker concerns. They must:

- Understand the Act and Regulations
- Understand their company's safety program
- Understand the need for and safe use of personal protective equipment
- Understand emergency procedures required under the legislation
- Comply with the Act and Regulations
- Ensure workers they supervise understand and comply with the Act and Regulations
- Support and cooperate with the Occupational Health Committee or Representative

Workers also have an important role in making the workplace safe. They must:

- Take reasonable care to protect their health and safety and the health and safety of other workers
- Not harass other workers
- Comply with the Act and Regulations
- Use the orientation and training provided to them
- Follow safe work practices
- Use protective equipment provided to them.
- Support and cooperate with the Occupational Health Committee or Representative

As previously stated ALL employers, supervisors and employees are responsible for looking after safety and health in the workplace and is known as "*Duty of Care*".

### 1.2.2 Managing Risks:

Effective risk management starts with a commitment to health and safety from those who operate and manage the business or undertaking. The involvement and cooperation of all workers is needed; by one employee showing other employees that they are serious about health and safety they are more likely to follow managing risks.

To demonstrate commitment, employees should:

- Get involved in health and safety issues.
- Invest time and money in health and safety.
- Ensure health and safety responsibilities are clearly understood.

A reasonably practicable process called "*Risk Management*" must be implemented to promote a safe and healthy workplace and involves four steps:

1. Identify hazards – find out what could cause harm.
2. Assess risks if necessary – understand the nature of the harm that could be caused by the hazard, how serious the harm could be and the likelihood of it happening.
3. Control risks – implement the most effective control measure that is reasonably practicable in the circumstances.
4. Review control measures to ensure they are working as planned.

#### *1.2.2.1 Identify Hazards:*

A hazard is anything that could be harmful to any person. Some hazards will be obvious because they may be common to a particular industry, but others can by more difficult to identify.

First step is to determine how people could be harmed. When working in a place every day, it is easy to overlook some hazards. The following tips should help in identifying the important points:

- A walk around the workplace and look at what could reasonably be expected to cause harm.
- Ask the employees or their representatives what they think; they may have noticed things that are not immediately obvious to others.

- Visit the Safe Work Australia website which publishes practical guidance on where hazards occur and how they can be controlled.
- Contact trade associations as many produce very helpful guidance sheets.
- Check manufacturers' instructions or data sheets for chemicals and equipment as they can be very helpful in spelling out the hazards and putting them in their true perspective.
- Review past accidents and ill-health records – these often help to identify the less obvious hazards.
- Remember to think about long-term hazards to health (e.g. high levels of noise or exposure to harmful substances) as well as safety hazards.

#### *1.2.2.2 Assess the Risks:*

A risk assessment involves considering what could happen if someone is exposed to a hazard and the likelihood of it happening. A risk assessment can help to determine:

- How severe a risk is.
- Whether any existing control measures are effective.
- What action you should take to control the risk.
- How urgently the action needs to be taken.

A risk assessment can be undertaken with varying degrees of detail depending on the type of hazards and the information, data and resources that you have available. It can be as simple as a discussion with the workers or involve specific risk analysis tools and techniques recommended by safety professionals. A risk assessment should be done when:

- There is uncertainty about how a hazard may result in injury or illness.
- The work activity involves a number of different hazards and there is a lack of understanding about how the hazards may interact with each other to produce new or greater risks.
- Changes at the workplace occur that may impact on the effectiveness of control measures.

The culture of the workplace is ever changing therefore assessing risks must take into account:

- Workers with particular requirements, e.g. new and young workers, migrant workers, new or expectant mothers and people with disabilities may be at particular risk. Extra thought will be needed for some hazards;
- Cleaners, visitors, contractors, maintenance workers etc., who may not be in the workplace all the time;
- Members of the public, if they could be hurt by the workplace activities, e.g. grinding or welding near public thoroughfares.
- The workplace may be shared by other firms; think about how the work affects others present, as well as how their work affects your staff.
- Ask the employees to review the findings.

#### *1.2.2.3 Control Risks:*

Risk Control involves deciding what needs to be done to eliminate or control the risks to health and safety. Where possible, you should always try to remove or eliminate the problem from the workplace, for example by using a different process, or changing the way a job is done.

If it is not possible to eliminate the hazard, the Hierarchy of Risk Control must be used to determine the most effective measures to minimise the risks.

Hierarchy of risk control is:

1. Design or reorganise to eliminate the hazard from the workplace: try to ensure that hazards are designed out when new materials, equipment and work systems are being planned for the workplace.
2. Remove or substitute the hazard: where possible remove the hazard or substitute with less hazardous materials, equipment or substances.

3. Enclose or isolate the hazard: this can be done through the use of barriers, introducing a strict work area, enclosing a noisy process from a person.
4. Minimise through engineering controls: this can be done through the use of machine guards, effective ventilation systems etc.
5. Minimise the risk by adopting administrative controls: establish appropriate procedures and safe work practices such as job rotation to reduce exposure time or boredom; timing the work so that fewer employees are exposed; routine maintenance and housekeeping procedures; training on hazards and correct work methods.
6. Personal Protective Equipment: provide suitable and properly maintained personal protective equipment and ensure employees are trained in its proper use (examples include gloves, earplugs etc.).

If no single control is appropriate, a combination of the above controls needs to be taken to minimise the risk to the lowest level that is reasonably practicable.

#### *1.2.2.4 Review Risk Controls:*

Periodic reviews of control measures and risk assessments should be conducted to ensure the control measures implemented are appropriate and effective and the risk assessments are still valid. This can be achieved through safety audits, regular workplace inspections, consultation with employees and review of incident investigations. Risk management should be built into all workplace activities that can give rise to safety issues.

Any issues identified through the monitoring process should be addressed as soon as possible. This helps ensure that the risk control action plan remains effective. One person or a committee of people should have clear responsibility for addressing these issues.

The monitoring process should be documented on a Monitoring of Risk Controls sheet. This sheet should include detail about:

- The hazard.
- The controls in place.
- Dates of monitoring.
- How the monitoring was done.
- Who was consulted and when.
- What documentation was consulted and the dates on the documentation.
- Outcome of the monitoring process.
- How this outcome was determined.
- Recommendations.
- Who has responsibility for any future action.
- Name of the person conducting the monitoring process.
- The date the monitoring of risk controls sheet has been completed.

## Skill Practice Exercise:

*Review Questions MEM05004-RQ-01*

Select the correct answer to the following multiple choice and short answer questions; explain your multiple choice answer.

1. Which footwear would not be worn while using oxy-acetylene equipment?

A.

B.

C.

D.

2. Which respirator would not be worn while using oxy-acetylene equipment?

3. Who is responsible for health and safety in the workplace?
   A. The employer.
   B. The Employee.
   C. The Work Health & Safety Committee.
   D. Everybody.

4. Which is the best head protection that would be worn if working on an outside construction site?

A

B

C

D

5. List the points that can help to determine a risk assessment?

6. Which glove does not appear to be used when welding?

7. Define a hazard.

8. Which protective clothing would be the more appropriate to wear when using oxy-acetylene equipment?

A

B


C

D

9. Which set of goggles/spectacles would NOT be worn when using oxy-acetylene equipment?

A

B


C

D