

## Welcome to the Metals and Engineering Module

Have you read the General Module, completed the test and printed your WorkSafe Smart Move General certificate?

The Metals and Engineering Module should be done AFTER the General Module.

If it is some time since you have completed the General Module you should read the Review Module. The test for the Metals and Engineering Module contains some questions based on the Review Module.

There are common hazards that exist in the metals and engineering industry. It is important to learn about these hazards and how to work safely.

Within the metals and engineering industry you may be involved in a range of work activities such as cutting or pressing metal, welding, grinding, metal fabrication or casting metal.

The Metals and Engineering Module contains information on:

- Mechanical Equipment;
- Forklifts;
- Welding;
- Hazardous Substances;
- Manual Handling;
- Slips Trips and Falls;
- Electricity; and
- Noise.

Your employer should provide safe work areas and equipment, information, instruction, training and supervision and personal protective equipment when hazards in the workplace cannot be eliminated or to increase protection.

**Key Point** You should follow safety instructions and use equipment safely, not only for your own safety, but also the safety of others.

## Mechanical Equipment

You may use a wide range of mechanical equipment in the metals and engineering industry, including guillotines, power presses, brake presses and angle grinders. Mechanical equipment can be hazardous. It may cause sprains and strains, open wounds, fractures, amputations and even death.

**Metal guillotines** are used to cut sheets of metal. They usually have clamp fitted to hold the sheet of metal being cut, as well as a blade. The most common metal guillotine injuries are crushed or amputated fingers. Other injuries are from fingers jamming under the sheet of metal being cut, and strain injuries while handling large and awkward sheets of metal.

**Power presses** are large machines used to stamp, cut or form metal material. Power presses are fitted with a physical guard or a light beam guard to protect the operator's hands.

Serious injury such as amputated fingertips may result from a power press without a guard or one that does not work properly. The dangers of operating a power press are outlined in the case study *Young Worker Injured by Power Press* (Significant Incident Summary 22/2000), available from the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

**Angle grinders** are hand held tools with a rotating disc used for grinding metal. They are designed for grinding and not as a cutting tool. They can be dangerous if not kept in good order and if not used safely. If the disc is damaged or over tightened it can shatter or explode, sending pieces flying across the workshop.

Most angle grinder injuries are from metal particles lodging in the operator's eye. The most serious injuries are from kickback where the disc is thrust violently away from the object it is grinding and

## Mechanical Equipment

back towards the operator. Kickback can result in severe cuts to hands, arms, head, torso and legs. An example of the dangers of angle grinders is highlighted in the case study *Young Worker Using an Angle Grinder* (Significant Incidence Summary 20/1996), available from the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

### Common Injuries

The most common injuries from mechanical equipment are to hands and fingers, which may be cut, sprained, dislocated, broken, crushed or severed by machinery or tools. These injuries can cause lengthy periods of time off work and sometimes they can cause permanent disability.

Eye injuries caused by mechanical equipment accidents include being hit by an object (for example, small particles such as metal shavings as well large objects or pieces of equipment), heat, radiation, hitting an object and falls, trips and slips.



**Key Point** When mechanical equipment hazards cannot be eliminated to increase protection you may need to wear personal protective equipment (PPE).

PPE used in the metals and engineering industry includes items such as safety glasses or goggles, earplugs or earmuffs, protective gloves, overalls or other close fitting clothing, safety shoes or boots with steel toe-caps to protect your feet if any items are dropped.

## Mechanical Equipment

### Your employer should:

- have a maintenance program to make sure all equipment and machines are in safe working order;
- have a system in place for locking out and isolating machinery during maintenance, cleaning and repairs;
- train you to operate any item of mechanical equipment before you use it and make sure you are supervised when you use it - if you are still not sure how to use it ask questions; and
- provide the personal protective equipment you need to wear and tell you how to wear and use it correctly.



An example of the hazards associated with not locking out and tagging machinery during maintenance are outlined in the case study *The Hazardous Maintenance of Machinery* (Significant Incident Summary 3/1995), available on the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

## Mechanical Equipment

### What you should do

When you are operating any mechanical equipment you should follow safe work procedures as instructed by your employer or supervisor.

**Key Point** Keep all guards in place - they are fitted to protect you from moving parts.



### You should:

- wear clothing that will not catch in moving parts;
- wear the personal protective equipment provided by your employer;
- operate machinery and equipment correctly and safely;
- keep all guards in place;
- make sure guards removed during cleaning are replaced before you use the machine;
- switch off machinery and equipment when not in use and lock out and isolate machinery before any adjustment, cleaning or maintenance is done;
- concentrate on the job as distractions might cause injuries; and
- keep the area around the equipment or machinery clean.

## Forklifts

Forklifts are often used in the metals and engineering industry to load and unload and move materials around workplaces. They can be dangerous if not driven and operated correctly. In Western Australia there is on average one death and around 200 forklift injuries each year.

**Key Point** Under safety laws in Western Australia forklift drivers or operators must be at least 18 years of age.

Employers must make sure employees are properly trained to operate a forklift and to follow safe work procedures.



An example of the dangers of forklifts can be seen in the case study of a fatal accident - *Forklift Driver Dies in Forklift Accident* (Significant Incident Summary 26/2000), available from the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

## Welding



In the metals and engineering industry you may be involved in electric arc welding or cutting and gouging different types of metal.

Welding involves the use of oxy-fuel gas systems to generate high temperatures. Using the oxy-fuel gas also enriches the atmosphere with oxygen and emits fumes.

**Key Point** Welding can be a hazardous activity. Wherever possible welding should be done on a dry insulated floor in a well-ventilated area.

Welding processes may result in the following injuries or harm to health:

- electric shock through contact with electrically live parts;
- radiation burns to the eyes or body due to the welding arc;
- body burns to unprotected skin from hot metal surfaces, metal fragments and sparks;
- illness from inhalation of fumes from the surface coating on the material being welded or cut, from breakdown of plastic or paint bonded to metals or from residual chemicals in drums; and
- fire and explosion due to the arc, flame, sparks or spatter or electrical faults in combination with flammable materials, gases or liquids.

## Welding

### Your employer should:

- make sure all welding equipment is suitable for the work and is regularly checked and maintained in good working order;
- provide safe work procedures;
- make sure you are properly trained and supervised for all welding work tasks; and
- provide protective clothing and equipment such as a welding mask or helmet fitted with a suitable grade of filtered lens, fire resistant gloves, leather apron, overalls or trousers, a long sleeved shirt, boots and leather spats.

An example of fire hazards associated with welding is outlined in the case study *Welding On Site – A Real Fire Hazard* (Significant Incident Summary 11/1998), available on the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

## Hazardous Substances

In the manufacturing industry you may work with hazardous substances such as paint, glue, solvents, gases for welding, cleaning liquids and powders.

Hazardous substances may irritate or burn your skin, be absorbed through your skin or fumes and odours inhaled. Some chemicals, metal fumes and gases are flammable and exposure to a naked flame, cigarette or spark may result in a fire or explosion.

**Key Point** Your employer must make sure you use hazardous substances according to the manufacturer's written instructions provided on the material safety data sheet (MSDS) and the agreed safe work procedures.



### You should:

- always follow safety procedures;
- not use solvents to clean your hands;
- not enter confined spaces where fumes have collected;
- not smoke near solvents, paints or gases; and
- wear correct personal protective equipment provided, such as protective overalls, suitable gloves, a facemask or respirator and safety glasses.

## Manual Handling

Manual handling tasks in the metals and engineering industry you may have to do include lifting or carrying items such as containers of chemical substances, tools and metal materials or holding objects during grinding or buffing.

**Your employer should provide instruction, training and supervision for manual handling activities and assess and control manual handling tasks that are hazardous. This includes things such as:**

- re-organising the work tasks to reduce the manual handling involved.
- providing mechanical lifting devices such as trolleys and hoists.
- making sure employees do not work long shifts.
- making sure the workplace layout allows employees enough space to move and work safely.

You should follow safe working procedures for manual handling and speak to your supervisor if you are unsure about a manual handling task.

Handling metal materials is one of the major causes of work-related injuries and death in the metal industries in Western Australia. Steel comes in many forms including flat plate, coil, round bar and pipes. If not stored and restrained correctly, steel can roll, slip, slide or fall over. Solid steel bar, large diameter pipes and coiled steel can be very dangerous because they can roll easily if disturbed. Steel coils can weigh up to 15 tonnes.

The dangers of manual handling in the metals and engineering industry are highlighted in the case study *Lifting Aluminium Sheets* (Significant Incident Summary 1/1995), available from the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

## Slips, Trips and Falls

**Key Point** Slippery floors in the workplace are a serious hazard and can result in far more serious accidents than simply slipping and falling over.

A slip or fall can cause injury to the arms, legs, back, neck or head. Neck and head injuries can cause damage to the spinal cord and nervous system. Many employees have suffered permanent disabling injuries or death as a result of a fall.

Your employer can reduce the risk of slips, trips and falls by providing a suitable non-slip floor surface and good lighting and safe work procedures. In some workplaces floor surfaces can be chemically treated to increase traction and ramps provided where floor levels change.

You should follow instructions and safe work procedures provided by your employer, which may include:

- sweeping things like metal shavings up regularly;
- cleaning all spills immediately;
- making sure there are no trailing electrical cords on the floor; and
- keeping the floors and walkways free of materials, steel, boxes, tools, equipment and rubbish.

# Electricity

The machinery, equipment and tools you will use in the metals and engineering industry are usually operated by electricity.

Your employer must make sure all electrical machinery and equipment is kept in good working order, electrical plugs and switches are not damaged, cords are not split or frayed and are regularly checked for damage.

**Key Point** There should be a system in place for locking out and isolating electrical machinery during maintenance, cleaning and repairs to prevent it being accidentally turned on.

**You should follow instructions for using electrical equipment, which may include remembering to:**

- switch off appliances at the power point before you pull out the plug;
- disconnect broken appliances and not use frayed cords or broken power points;
- not use too many appliances from the same power point; and
- always keep electrical cords off the floor to reduce the risk of damage from drag or contact with sharp objects.

Generally employees should not work alone with machinery unless it has “deadman” switches. This is a type of switch often used on electrical vehicles or equipment operated by a hand or foot pedal or lever. It is designed so that if the operator releases the pressure on the switch, peddle or lever, owing to sudden illness or other causes, the current is cut off and the machine ceases to operate.

## Noise

Within the metals and engineering industry you may work with noisy power tools and machinery such as angle grinders, power presses, metal guillotines and cutting, buffing and punching tools. You may be exposed to noise levels exceeding 85 decibels or dB(A) that can cause permanent hearing loss.

Your employer can reduce noise levels by isolating noisy machinery from employees not involved in its operation, enclosing it in a sound absorbing box or erecting sound absorbing barriers and by keeping machinery and equipment in good order so it operates efficiently.

If the noise cannot be removed at the source your employer should provide personal hearing protectors ( earmuffs or earplugs) to increase protection or as a last resort, to reduce the risk of hearing loss.

**Key Point** Earpieces for portable radios and music devices do not provide protection from noise. Lost hearing is gone forever.

Now try the self-assessment questions on the Internet at [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

BEFORE you start the questions, it is important to type your name on the computer screen exactly as you want it to appear on your certificate.

There are 16 questions and if you get 12 or more correct you can print online a WorkSafe Smart Move Certificate signed by the Minister for Consumer and Employment Protection.