



Welcome to the safe@work Metals and Engineering Module.

Have you read the General Module, completed the test and printed your safe@work General Award of Attainment?

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 they can be controlled so that people at work are not exposed to risk.

The Metals and Engineering Module contains information on:

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

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

Your employer must provide safe work areas and equipment, information, instruction, training and supervision, and personal protective equipment when hazards cannot be eliminated or sufficiently reduced by other means.

Key Point

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

Mechanical Equipment

Employers 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.

Note: Students on work experience must not operate powered tools or mobile plant. This information is designed to give students an understanding of the hazard and some of its risk control measures.



Metal guillotines are used to cut sheets of metal. They usually have clamps 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 with out a guard or one that does not work properly.

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 back towards the operator. Kickback can result in severe cuts to hands, arms, head, torso and legs.

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 result in 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 as 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).

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

Your employer must:

- 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 employees to operate any item of mechanical equipment before they use it, and make sure appropriate supervision is provided. If employees are not sure how



to use any item, ask your supervisor for instruction, and

- provide the personal protective equipment you need, and instruct you in how to wear and use it correctly.

What you should do

When you are operating any equipment, you must follow safe work procedures as instructed by your employer or supervisor. These may include:

- wearing clothing that will not catch in moving parts
- wearing the personal protective equipment provided by your employer
- operating the machinery and equipment correctly and safely according to your training and agreed safe work procedures
- keeping all guards in place
- making sure guards removed during cleaning are replaced by an authorised person before you use the machine
- switching off machinery and equipment when not in use, and locking out and isolating machinery before any repair, adjustment, cleaning or maintenance is done
- concentrating on the job, as distractions can contribute to injuries, and
- keeping the area around the equipment or machinery clean.

Key Point

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

Current Department of Education & Training policy:

prohibits students undertaking tasks that include the use of machines such as:

- rip saw
- band saw
- buzzer
- thicknesser
- guillotine
- spindle moulder
- docking saw, and
- power wood shapers.

This is not an exhaustive list.

No student should be asked to perform work on any machine that may present significant risks in operation. Work experience activity in such cases must be limited to observing, under supervision, trained and experienced operators.

The health and safety information here is designed to give students an understanding of the hazards and of the measures by which risks are controlled in the metals and engineering industry.



Forklifts

Forklifts are often used in the metals and engineering industry to load, unload and move materials around work places. They can be dangerous if not driven and operated correctly. Since 1985, 48 Victorians have lost their lives in forklift incidents and hundreds more have been seriously injured (VWA June 2002).

Key Point

Under Victorian law, you must hold a Award of Attainment of Competency to operate a forklift truck or an order-picking forklift truck, unless you are working under the direct supervision of a competent person (someone with a Award of Attainment of Competency or equivalent qualification).

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

Welding

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

Note: Students on work experience must not operate powered tools. This information is designed to give students an understanding of the hazard and some of its risk control measures.

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 following inhalation of fumes from the surface coating on the material being welded or cut, or from breakdown of plastic or paint bonded to metals or from residual chemicals in drums, and
- fire and explosion caused by the arc, flame, sparks or spatter, or by electrical faults in combination with flammable materials, gases or liquids.

Your employer must:

- make sure all welding equipment is suitable for the work and is regularly checked and maintained in good working order
- provide safe work procedures

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- make sure you are properly trained and supervised for all welding work tasks, and
- provide personal protective equipment and clothing 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.

Hazardous Substances and Dangerous Goods

In the metals and engineering industry, you may work with hazardous substances and dangerous goods 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 and dangerous goods 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 include lifting or carrying items such as containers of chemical substances, tools and metal materials, or holding objects during grinding or buffing.

Your employer must assess and control manual handling tasks, and must provide instruction, training and supervision for manual handling activities that may present risk. Risk controls may include:

- re-organising the work to reduce the number of manual handling tasks involved
- providing mechanical lifting devices, such as trolleys and hoists where appropriate
- making sure employees do not work long shifts where manual handling is required, and
- making sure the work place layout allows employees enough space to move and work safely and comfortably.

Key Point

You must 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. 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.

Slips, Trips and Falls

Key Point

Slippery floors in the work place 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, good lighting and safe work procedures. In some work places, floor surfaces can be chemically treated to increase traction and ramps provided where floor levels change.

You must 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 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.

Note: Students on work experience must not undertake any task which may place them at risk from electrical sources. This information is designed to give students an understanding of the hazard and some of its risk control measures.

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 must 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 must follow instructions for using electrical equipment, which may require:

- switching off appliances at the power point before you pull out the plug

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- disconnecting broken appliances and not using frayed cords or broken power points
- not using too many appliances from the same power point, and
- always keeping electrical cords off the floor, to reduce the risk of damage from drag or contact with sharp objects.

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 lead to 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 or sufficiently reduced by other means, your employer must provide personal hearing protection (earmuffs or earplugs) in addition to other risk controls.

Key Point

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

Self-Assessment Questions

Now try the self-assessment questions. Before starting the questions, be sure to enter your name and the name of the school exactly as you want it to appear on your Award of Attainment. We ask you to provide these details so that you can be issued with the Award of Attainment.

There are 16 questions. If you get 12 or more correct you can print online a safe@work Award of Attainment. The Principal of your school will then sign the Award of Attainment and validate it with the school stamp.