

# **Module 8 Safety**

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## **Unit 8.1 Workshop Equipment**

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# Introduction

## About this unit

Welcome to Unit 8.1 on workshop equipment.

This unit teaches you about hazards and working with machinery in the workshop. You will be given information on safety in the workshop and how to avoid accidents.

Examples of hazards to be aware of and procedures to keep you and your students safe are included. This unit also has information about fires and the type of fire extinguishers to use.

## How to use this book

Additional to the information about workshop safety, this book also contains exercises.

These exercises don't play a part in your assessment for this unit, but they are there to help you find out how much you have learned.

Read the information and then answer the questions as you work through the book.

Answers and examples are provided for you to check your progress.

Your tutor will give you assessment tasks to check what you have learned about workshop equipment.

These tasks will determine your competence in this unit.

## How you will be assessed

To be assessed for this unit you will be given some tasks.

These tasks will be done by you when you have finished certain parts of the work in the book.

Your tutor will help you to understand what you need to do for the tasks – ask your tutor straightaway to explain anything you don't understand.

## Finding your way

As you work through the text you'll see symbols in the left margin of some pages. These symbols or “icons” guide you through the content.



Read



Important- take note!



Self-checking question/activity



Assessment task



Things to do



Things not to do



## Competency

The content of this training programme for Technical and Vocational teachers is based on the skills that you need to develop. The skills for each unit are set out as things that you must have learned or are able to do.

The assessment by your tutor will test what you have learned and your level of skill.

Each unit sets out the skills needed. If you already think you know enough about the unit to show that you have the skills needed, you may be able to get your tutor to test you without studying the unit.

## Learning outcomes

When you have finished this unit you should be able to:

- Identify safety hazards related to workshops
- State the precautions to be observed in relation to each identified hazard
- Identify electrical outlets of different voltages
- State the effect of incorrect electrical supply connection
- Identify possible dangers to personal safety from electrical machines and portable equipment
- Determine appropriate locations for electrical/main switches and safety cut-off buttons
- Identify the classes of fires and the appropriate controls and extinguishers for each class
- State the method of operating turnover and trigger type fire extinguishers.

## **Assessment criteria**

Your tutor will assess what you have learned by getting you to:

- Identify without error six (6) safety hazards related to the workshop
- State without error the precautions to be observed relevant to each identified hazard
- Identify without error electrical outlets of different voltages and nominate the voltage at each outlet
- State without error five (5) possible effects of incorrect electrical supply connection
- Identify three (3) possible dangers to personal safety from electrical machines and portable equipment
- Locate without error all electrical/main and safety cut-off switches in a specified workshop
- List without error the five (5) classes of fires
- State, in accordance with provided information, the appropriate controls for each class of fire
- State, in accordance with provided information, the appropriate extinguishers for each class of fire
- Describe, in accordance with given information, the methods of operating turnover and trigger type fire extinguishers

## **Assessment methods**

Your tutor may test your skills by:

- Giving you an oral or written test
- Giving you an assignment
- Getting you to perform a practical task or demonstration

Your instructor may also use the points contained in the learning activities as a guide in assessing your performance.



## **Other resources you will find useful**

### ***Occupational Safety Management and Engineering 4th ed.***

Author: Willie Hammer

ISBN: 0-13-629379-4

Publisher: Prentice Hall

### ***Occupational Safety and Health: for Technologist, Engineers, and Managers***

3rd ed.

Author: David L. Goetsch

ISBN: 0-13-924085-3

Publisher: Prentice Hall

Web page address: - **[www.safetyinfo.com](http://www.safetyinfo.com)**



# Section 1



## Hazards in the workshop

A **hazard** is something that could cause harm to a person or property. Hazards can be classed into four groups. These are shown, with some examples, in the table below.

| Hazard group  | Examples   | What could happen  |
|---------------|--|--|
| Physical      | Poor electrical wiring<br>Badly stacked materials<br>Unsecured gas cylinders<br>Untidy workshops<br>Tools not put away properly<br>Electrical leads lying across the floor<br>Guards not on machines<br>Smoking in the workshop<br>Noisy machinery | Electric shock or fire<br>People could trip, materials could fall onto people<br>Cylinders could roll onto people<br>People could trip<br>People could accidentally put hands on sharp objects<br>People could trip, wires could be damaged and cause electric shock or short circuit<br>People could be caught in moving machinery or pieces could fly out from machine and cause injury<br>Burning cigarettes could start a fire<br>Hearing could be damaged |
| Chemical      | Unlabelled containers<br>Chemicals in the wrong type of container  | The wrong material could be used for a job<br>Chemicals could leak or spill<br>People could inhale fumes or vapours  |
| Biological    | Dirty machine cutting/cooling oils or fluids   | Sprays of oil can be inhaled and bacteria can cause breathing problems   |
| Psychological | Inappropriate behaviour<br>Stress  | People could be distracted, or could be injured by machinery and tools<br>Inattention to job and injuries can result   |



# Causes of accidents and precautions to be observed

## What is an accident?

An **accident** is something that happens by chance and is not planned.

There are two main causes of accidents. These causes are:

- unsafe acts
- unsafe conditions

**Unsafe acts** may include:

- not using protective equipment or clothing such as safety footwear or eye protection
- not following safety procedures
- not maintaining tools and machinery
- not electrically isolating a machine before working on the electrical wiring
- not using safety guards or interlocks on machines
- not using the proper tool for the task
- not reporting things that are wrong with machines or tools
- not tidying the workshop
- not reporting inappropriate behaviour
- not storing materials or tools in the appropriate places
- running or playing games in the workshop
- using machinery or tools when under the influence of alcohol or drugs
- continuing to use tools or machinery that are not working properly
- leaving untrained students to work unsupervised on machinery
- unsupervised heating of liquids, particularly frying oils

**Unsafe conditions** sometimes occur because of an unsafe act.

Examples of unsafe conditions are:

- guards missing from machines
- damaged or faulty machines or tools

- strobe effects of fluorescent lights that make it appear as if machines have stopped rotating
- wrongly wired electrical circuits
- lack of proper storage facilities
- poor lighting on machines
- tripping or slip hazards on the floor of the workshop
- not enough space around machines
- faulty gas ovens

You will see that:

- hazard + unsafe acts can cause an accident
- hazard + unsafe conditions can cause an accident
- hazard + unsafe act + unsafe conditions can cause an accident

Now you know what

- a hazard is
- an accident is
- an unsafe act is
- unsafe conditions are.

So, you are in a position to decide what precautions must be taken to improve safety.

Using examples, the safety precautions that must be observed can be set out.

**Example 1:**

If wood is stored by leaning it against a wall or piece of machinery, then it could slide and either hit somebody or become entangled in moving machinery, or both.

Several things could happen because of this:

- The person could be injured directly from the wood hitting him/her.
- When the wood becomes tangled in the machine, pieces from the machine or the wood could fly out and hit and injure a person.
- When the wood becomes tangled in the machine, it could cause damage.

The precautions to prevent this happening are:

- Wood must be stored away from machinery.
- Wood must be stored flat, preferably in racks.
- If wood has to be stored on its end then suitable racks should be used to prevent the wood from sliding.
- Small off-cuts of wood should not be stored above moving machinery, but stored in a bin. Even if the off-cut was too small to directly cause injury if it fell, it might hit a rotating part and a piece might break off and cause an injury.

The above example could be a result of:

an **unsafe act** – somebody failing to use the proper storage facilities

or

**unsafe conditions** – lack of proper storage facilities.

#### **Example 2:**

A student is working on a metalwork lathe. The machine has not been maintained properly and a guard falls off. The student continues to use the machine.

As a result of this, there are several things that could happen which depend on what the guard was for:

- The person could be injured by something flying out of the machine.
- The person could become entangled in the machine and be injured.

The precautions to prevent this happening are:

- Machinery must be regularly inspected and maintained.
- Machinery must not be used if it is faulty.
- Faults must be reported immediately.

The above example is a result of **unsafe acts**.

As well as some of the obvious precautions that you can take, this last example shows that there should be a system in place to:

- do some basic safety checks before using the machine
- prevent the machine from being started if a fault is found

- label the machine as out of order
- fix the machine
- return the machine to service

The requirements for such a system are as follows.

| What needs to be done                                      | Type of system    | How to make it happen  |
|--|-------------------|--|
| Do some basic safety checks before using the machine       | Safety inspection | Make a safety checklist<br>Train the students to use the checklist   |
| Prevent the machine from being started if a fault is found | Lock out          | Use power switches that can be locked in the OFF position<br>Have a procedure to unlock the machine only if the safety checklist can be completed                    |
| Label the machine as out of order                          | Tag               | Have suitable labels available<br>Train the students to use the label system   |
| Fix the machine  | Maintenance       | Have a request form that can be sent to the person who is responsible for maintaining the machine<br>Train students to complete the request form                     |
| Return the machine to service                              | Re-commission     | Use the request form to show that the maintenance has been carried out<br>Get the person who fixed the machine to remove the label when the machine is OK to be used |

The system described above can also be used for other equipment such as portable power tools. Adhering to the following five basic safety rules can prevent all the hazards involved in the use of hand and power tools:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job.
- Examine each tool for damage before use and report tool deficiencies and malfunctions.
- Operate according to the manufacturer's instruction.
- Provide and use proper protective equipment

As a teacher you are responsible to ensure that students are adequately trained in the safe and correct use of tools and equipment.



### Activity 1

This exercise checks your understanding of hazard conditions that might cause personal injuries in a workshop.

1. List the four hazard groups.

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2. Are the following unsafe acts or unsafe conditions?  
Circle your answer.

|   |            |                   |
|---|------------|-------------------|
| You find students running between the machines in a workshop.                                       | Unsafe act | Unsafe conditions |
| A student tells you that a safety guard is missing from the woodwork machine they are going to use. | Unsafe act | Unsafe conditions |
| You see a student using a machine and they are not wearing safety glasses.                          | Unsafe act | Unsafe conditions |
| You find a student using a wood chisel to unscrew a panel on a machine.                             | Unsafe act | Unsafe conditions |
| You find a spill of lubricating oil on the floor of the workshop.                                   | Unsafe act | Unsafe conditions |

3. Using the examples in question 2, explain some simple precautions you would take to make the situation safe immediately and for the future.

a) You find students running between the machines in a workshop.



- b) A student tells you that a safety guard is missing from the woodwork machine they are going to use.
- c) You see a student using a machine and they are not wearing safety glasses.
- d) You find a student using a wood chisel to unscrew a panel on a machine.
- e) You find a spill of lubricating oil on the floor of the workshop.



## Activity 1 Answers

1. List the four hazard groups:

- *Physical*
- *Chemical*
- *Biological*
- *Psychological.*

2. Are the following unsafe acts or unsafe conditions? Circle your answer.

|   |            |                   |
|---|------------|-------------------|
| You find students running between the machines in a workshop.                                       | Unsafe act |                   |
| A student tells you that a safety guard is missing from the woodwork machine they are going to use. |            | Unsafe conditions |
| You see a student using a machine and they are not wearing safety glasses.                          | Unsafe act |                   |
| You find a student using a wood chisel to unscrew a panel on a machine.                             | Unsafe act |                   |
| You find a spill of lubricating oil on the floor of the workshop.                                   |            | Unsafe conditions |

3. Using the examples in question 2, explain some simple precautions you would take to make the situation safe immediately and for the future.

a) You find students running between the machines in a workshop.

- *In a loud voice call for the students to stop running.*
- *Ask a student if he/she has been told about safety in the workshop.*
- *Ask another student why running in a workshop is dangerous.*
- *Tell the students again about the safety rules in the workshop.*

- b) A student tells you that a safety guard is missing from the woodwork machine they are going to use.
- *Praise the student for coming and telling you.*
  - *Make sure that the machine is switched off.*
  - *Get the student to make sure the machine can't be switched on (lock out).*
  - *Get the student to label the machine as "out of service".*
  - *Get the student to fill in a service request form to fix the guard.*
  - *At the end of the class inform the student about the missing guard and what was done.*
- c) You see a student using a machine and she is not wearing safety glasses.
- *Immediately switch off the power to the machine.*
  - *Tell the student why you have switched off the machine.*
  - *Ask all the other students to stop working.*
  - *Remind all the students about the need to use safety equipment.*
  - *Get all the students to start working again with appropriate safety equipment where necessary.*
- d) You find a student using a wood chisel to unscrew a panel on a machine.
- *Ask the student to stop what they are doing.*
  - *Ask all the other students to stop working.*
  - *Remind all the students about the need to use the correct tools for the job. If the panel was not supposed to be unscrewed by students remind them of the appropriate safety rules.*
  - *Get all the students to start working again.*
- (e) You find a spill of lubricating oil on the floor of the workshop.
- *Ask all the students to stop working.*
  - *Ask all the students to check around them for other spills.*
  - *Ask the students to clean up any spills they find.*
  - *Remind all the students about the need to clear up spills to prevent people from slipping.*
  - *Get all the students to start working again.*



## Section 2



### Electrical hazards

#### Types of electrical supply and applications

Machinery and other equipment that use electricity must be connected to the correct supply outlet. If this is not done, the machinery or equipment might:

- not operate correctly
- become dangerous
- be damaged

Electrical supplies and outlets can be:

- 415 volts, 220/240 volts, 110 volts or low voltage (for example 32 volts)
- Single phase or three phase
- Alternating current (AC) or Direct Current (DC).

The table below shows the type of supply and gives examples of machinery or equipment that would be connected to the supply.

| Type of supply             | Examples of equipment   |
|----------------------------|---|
| 410 volts 3 phase          | Workshop machinery such as lathes, milling machines, circular saws, routers |
| 220/240 volts single phase | Bench top grinding wheels, soldering irons, glue guns, portable drills      |
| 110 volts single phase     | Portable tools, drills, angle grinders, masonry cutters                     |
| AC                         | All of the above  |
| DC                         | MIG & TIG portable welding units, battery operated tools                    |
| Low voltage                | Intrinsically safe lamps, rechargeable battery tools                        |

### ***Recognition of power supply***

Most equipment will be marked or labelled with the required supply voltage, and whether it is AC or DC current.

This information will also be found in the maintenance manuals and instruction manuals supplied with the equipment.

You should check with your qualified electrician or electricity supplier to confirm the exact nature of the electricity outlets.

Power outlets can be different from country to country and with the age of the equipment or building. For this reason you should check your local conditions with a qualified person however, the following are examples of outlets commonly found.

| Type of supply             | Examples of equipment  |
|----------------------------|--|
| 410 volts 3 phase          | Machinery permanently wired into power supply. Wiring may come from power supply to machine along cable trays. No evidence of a socket or removable plug.  |
| 220/240 volts single phase | Usually 3-pin plug and matching socket. Sockets and plugs may be colour coded blue. Connecting wiring usually will be to the international colour coding system for the wires. See Colour code for earthed systems below this table. |
| 110 volts single phase     | Usually a 3-pin plug and matching socket. Sockets and plugs may be colour coded blue. Portable power tools may be connected to a 240 – 110V step down transformer.   |
| AC                         | Sometimes marked AC on electrical information plate fixed to machinery or equipment.   |
| DC                         | Sometimes marked DC on electrical information plate fixed to machinery or equipment.   |
| Low voltage                | Sometimes marked in volts on the equipment.  |

### ***Colour code for earthed systems***

Neutral – blue lead

Live – brown lead

Earth – green and yellow lead.

***Fuses, circuit breakers, machine cut-off switches, isolating switches***

The table below gives you some information about each item to help you recognise them as well as some information about where you might find them.

| Item   | Where you might find it  |
|--|--|
| <b>Fuse</b><br>This device will open a circuit when an excess of current flows. It may be the rewirable type or may have a wire embedded in insulating powder inside a cartridge case. The cartridge fuse is generally more satisfactory.  | Usually on or near where the power supply comes into the building. You may find several fuses together, sometimes in a separate fuse box.<br><br>Sometimes individual pieces of equipment are fitted with fuses.                             |
| <b>Circuit breaker</b><br>This form of switch opens automatically if the circuit it controls is overloaded: it may operate on either a temperature or magnetic principle. It is essential to select the correct rating of fuse or circuit breaker for any particular current.  | Found in similar places to fuses.  |
| <b>Machine cut-off switches</b><br>This switches off the power to the machine or group of machines. Usually a large red button.  | Usually fixed to an individual machine in a place where it is easily reached.<br><br>Sometimes found in several places in workshops where they can be easily reached. In this case they often switch off all machines or groups of machines. |
| <b>Isolation switches</b><br>A method of disconnecting cables or apparatus from the source of supply to permit repairs or maintenance should be designed so that they can be locked into the open position so that no-one can switch on while the apparatus is being worked on, and they should be located as near to the controller or starter as possible.<br><b>They must never be locked in the "on" position.</b> | Usually found fitted to individual machines or sometimes on the main switchboard.  |

## **Effects of incorrect supply connection**

Machines or equipment could be connected to the wrong power supply if:

- they are directly wired into the wrong supply
- fitted with the wrong plug.

If a connection is wrongly made to a higher voltage then it is likely that the equipment will become dangerous or damaged. The machine or equipment will almost certainly develop some or all of the following faults:

### ***Overheating***

Wiring would be overloaded and overheat and the insulation will be damaged. This can lead to a short circuit at some point in the length of the wiring, or more likely, at connection points.

### ***Short circuits***

A short circuit is formed when the electricity finds a path from the outward (live) wire to the return wire (neutral) other than through the equipment to which it is connected. Arcing often occurs at the contact between the wires and insulation can be burned and catch fire. If the short circuit is in the equipment itself the arcing can make parts of the equipment hot as well.

### ***Sparks***

A spark arises from a sudden discharge of electricity through the air. If explosive gases or vapours are present, or highly flammable material come into contact with spark, a fire or explosion could result.

### ***Arcs***

An arc is a large discharge of electricity where the current flow may be hundreds of amps. It usually arises when a circuit is broken or when a conductor melts or fractures leaving a gap across which current continues to flow. When an arc is established, electricity can flow through the air to nearby metal parts. Any flammable material near to the arc could catch fire.



### ***Damage to equipment***

Even if the equipment does not appear to be damaged because of a wrong connection, serious faults may develop over a long period of use.

### ***Personal injury***

The damage to the equipment discussed above can lead to the equipment becoming “live” or not “earthed” properly. The person using the equipment could get an electric shock from the equipment.

If a connection is wrongly made to a lower voltage then it is unlikely that the equipment will work, but there is still a danger because of a wrong connection.

### **Dangers to personal safety from electrical machines and portable equipment**

The dangers from electrical machines and portable equipment arise from two main sources:

1. the electricity
2. the moving parts of the machine or tool.

Most electrical accidents occur because people work with or near equipment that is:

- thought to be dead but which is actually live
- known to be live but those working on the equipment are not properly trained, or are without proper equipment, or they have not taken proper precautions

**Caution:** Treat all electrical circuits as "live" until they have been tagged and locked out.

### **1. Dangers from the electricity**

Electricity has long been recognized as a serious workshop hazard exposing persons to such dangers as electric shocks, electrocution fires and explosions.

#### ***Electric shock***

Shock is caused by electricity passing through the body. This usually happens because the victim touches a part which is “live” or charged with electricity so that their body completes the electrical circuit.

In general, pulsating or alternating currents (AC), which are used for main electricity supplies, will affect the heart more than direct current (DC).

With high voltages actual contact is not necessary for a current to flow as the electricity can jump big distances. Electric shock can cause:

- muscles to go tight and cause movements which you can't control
- your hold to tighten on the object that has given you the shock
- your heart to miss beats and even stop
- the part of your brain that controls breathing to stop working
- burns to your body
- death

How badly a person is injured depends on:

- how close the shock passes to the vital organs
- the voltage involved
- how long the shock lasts
- the path the electricity takes through the body.

Because of these things, it is not easy to predict exactly how badly injured a person might be. The main thing to remember is that the higher the voltage, the more likely it is that the person will be seriously injured.

As an example (mA = megaAmp):

- mA for any length of time is barely felt and causes no damage. This could come from contact with a 240 V source if the victim were standing on a dry rubber mat.
- 30-50 mA for a few seconds to minutes causes heart problems and muscles to go into spasms. This could come from contact with 240 V if the victim were standing on a wood floor.
- Shocks of less than 30 mA might not be dangerous to life but may be painful and injuries may come from other causes such as falls.

### ***Burns***

These are caused by the electricity passing through the body or by the person touching a piece of equipment that has become hot because of a short circuit.

The burns can be serious enough to need medical attention.

Sometimes injuries can occur because a fault with the electrical system causes a fire or explosion. Eye injuries are common from this sort of accident.

## **2. Dangers from the moving parts**

A person could come into contact with a moving part of the machinery or equipment. Clothing or long hair can get caught in the moving parts of machinery, such as a metal working lathe, and people have been killed because their heads were hit by the spinning chuck or their clothing was wrapped tight around their neck. The types of injuries that could occur are:

- serious cuts to the body
- broken bones, usually of the hands or arms
- fingers, hands and sometimes arms chopped off (amputation)

Ensure that you and your students:

- Wear suitable clothing — stout shoes to protect the feet. Sandals or open-toed footwear are dangerous. They do not protect the wearer from dropped tools and can cause the wearer to trip.
- Don't wear loose sleeves or a flapping tie or scarf. These can get caught up in machinery.
- Wear safety gear — such as safety glasses or shield, hearing protection and gloves. Accidents to the eyes, hands and ears can cause lifelong damage.
- Keep long hair tied back or covered. Long hair can make it difficult to see properly and can get caught in machinery.
- Do not wear rings, bracelets or neck chains. They can get caught in machinery too.



## Activity 2

Here are some questions about electrical hazards.

1. List the common voltages found at electrical outlets.

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2. Are the following the effects of an incorrect connection to a power supply? Circle Yes or No.

|  |     |    |
|--|-----|----|
| Overheating and short circuits         | Yes | No |
| A noisy machine                        | Yes | No |
| Personal injury                        | Yes | No |
| Sparks or fire come out of the machine | Yes | No |
| The machine or tool does not work      | Yes | No |

3. There are two sources of danger from electrical machines and portable equipment. List both of them.

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4. List the possible dangers to personal safety from electrical machines and portable equipment.

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5. Where would you expect to find machine cut-off switches?

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## Activity 2 Answers

1. List the common voltages found at electrical outlets  
*410 volts, 220/240 volts, 110 volts, and low voltage systems*
2. Are the following the effects of an incorrect connection to a power supply? Circle Yes or No.

|  |     |    |
|--|-----|----|
| Overheating and short circuits         | Yes |    |
| A noisy machine                        |     | No |
| Personal injury                        | Yes |    |
| Sparks or fire come out of the machine | Yes |    |
| The machine or tool does not work      | Yes |    |

3. List the two causes of danger from electrical machines and portable equipment.  
*The electricity.*  
*The moving parts of the machine or tool*
4. List the possible dangers to personal safety from electrical machines and portable equipment.  
*Electric shock, burns, fire or explosion, cuts, broken bones, amputation, death.*
5. Where would you expect to find machine cut-off switches?  
*Fixed to the machine in a place that is easy to reach or around the workshop in places that are easy to reach.*



## Section 3



### Causes of fire

The main causes of fire are

- open flames
- hot surfaces
- electrical overheating
- electrical arcing and sparking
- sparks from tools
- friction
- spontaneous heating (for example mixing the wrong chemicals together)
- sparks from welding and cutting
- carelessly discarded smoking materials or matches
- static electricity and explosions

### Extinguishing agents and classification of fires

Before a fire can occur three things are necessary: fuel, heat and oxygen.

These three factors are often referred to as the **triangle of combustion**. If you remove one factor, the triangle collapses and there can be no fire. See figure 1.

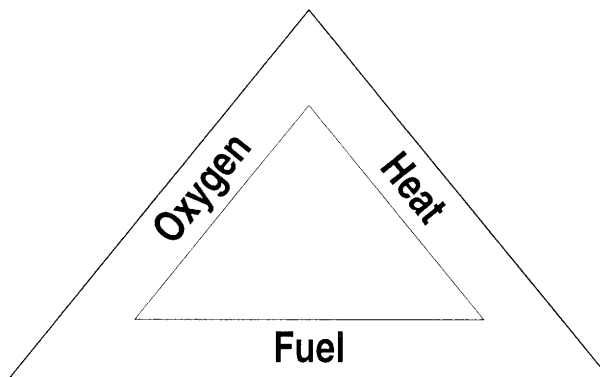


Figure 1: Triangle of combustion

Fires are classified into five categories according to the fuel type and the means of extinguishing.

| <b>Class of fire</b> | <b>What's burning</b>                                  | <b>Simple control</b>                                     | <b>Extinguisher type to use</b>   |
|----------------------|--|---|---|
| A                    | Wood, paper, cloth, rubber, plastics                   | Remove heat by cooling what is burning.                   | Class A extinguisher<br>Water<br>Dry chemicals<br>Aqueous film-forming foam                                     |
| B                    | Flammable liquids: solvents, oils, grease              | Starve the fire of oxygen                                 | Class B extinguisher<br>Dry chemicals<br>Carbon Dioxide<br>Halocarbons  |
| C                    | Gas and liquefied gas: methane, propane, butane.       | Isolate the fuel and starve of oxygen                     | Class C extinguisher<br>Aqueous film forming foam<br>Dry chemical<br>Use water to cool<br>Gas container         |
| D                    | Flammable metals: Magnesium, Aluminium, Zinc, Titanium | Starve of oxygen  | Class D extinguisher<br>Dry powders such as talc, soda ash, limestone, dry sand                                 |
| E                    | Electrical fires                                       | First isolate the electricity — starve the fire of oxygen | Class B extinguisher<br>Dry chemical<br>Carbon dioxide<br>The use of these agents minimises damage to equipment |





## Using a fire extinguisher

All fire extinguishers should be checked regularly to make sure that they work correctly.

Fire extinguishers should be marked to show the date it was last checked and the date for the next check.

There should be a system to make sure that the fire extinguishers are checked regularly.

If you are going to use a fire extinguisher, make sure:

- everyone has left or is leaving, the building
- the fire department has been notified by dialling the emergency number
- the fire is confined to a small area and that it is not spreading beyond the immediate area.
- you have an unobstructed escape route to which the fire will not spread.
- you know how to use the extinguisher

### *Handle and trigger extinguishers*

Most fire extinguishers are of the handle and trigger type. These extinguishers have a pin in the trigger to prevent it from being accidentally discharged. This pin must be removed before operating the fire extinguisher.

Remember the PASS method when using a fire extinguisher

**PULL:** the pin from the handle

**AIM:** the nozzle at the base of the fire

**SQUEEZE:** the handle to activate the extinguisher

**SWEEP:** the base of the fire from side to side.

### ***Turnover extinguishers***

This type of extinguisher has a knob at the top of the extinguisher that has to be pressed down hard.

When this knob is pressed it breaks a small container (usually glass) of chemical inside the extinguisher. This chemical builds up a pressure inside the extinguisher, which then has to be turned upside down to release the contents of the extinguisher.

For this type of extinguisher:

**PRESS:** the knob on the top of the extinguisher

**TURN:** the extinguisher upside down

**AIM:** the nozzle at the base of the fire

**SWEEP:** the base of the fire from side to side

**DO NOT USE** (or continue to use) any extinguisher if:

- the fire is spreading
- you need to use a second extinguisher
- the extinguisher does not seem to have any effect
- it takes longer than 30 seconds to put out the fire



### **Activity 3**

Here are some questions about fires and fire extinguishers.

1. Put a circle around the class of fire that is described.

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| Fire where aluminium dust is burning is Class   | A | B | C | D | E |
| A carelessly discarded cigarette has set fire to some paper and wood shavings in a rubbish bin. This is Class | A | B | C | D | E |
| The acetylene gas bottle has got a leak in the hose and this catches fire. This type of fire is Class         | A | B | C | D | E |
| There is a short circuit in the wiring of a lathe. The plastic insulation catches fire. This is Class         | A | B | C | D | E |

|  |   |   |   |   |   |
|--|---|---|---|---|---|
| A bottle of flammable liquid spills on the floor and a spark from some welding sets fire to it. This is Class  | A | B | C | D | E |
| A part of a woodworking machine has got very hot and wood dust begins to catch fire. The fire is in a part of the machine where there is electrical wiring. This fire is Class | A | B | C | D | E |

2. What are the controls for the fires described below?

(a) A part of a woodworking machine has got very hot and wood dust begins to catch fire. The fire is in a part of the machine where there is electrical wiring.

(b) The acetylene gas bottle has got a leak in the hose and this catches fire.

3. Explain how you operate the two types of fire extinguishers.

(a) handle and trigger

(b) turnover

### Answers to Activity 3

1. Put a circle around the class of fire that is described to you.

|  |   |   |  |   |   |
|--|---|---|--|---|---|
| Fire where aluminium dust is burning is Class  |   |   |  | D |   |
| A carelessly discarded cigarette has set fire to some paper and wood shavings in a rubbish bin. This is Class  | A |   |  |   |   |
| The acetylene gas bottle has got a leak in the hose and this catches fire. This type of fire is Class  |   | B |  |   |   |
| There is a short circuit in the wiring of a lathe. The plastic insulation catches fire. This is Class  |   |   |  |   | E |
| A bottle of flammable liquid spills on the floor and a spark from some welding sets fire to it. This is Class  |   | B |  |   |   |
| A part of a woodworking machine has got very hot and wood dust begins to catch fire. The fire is in a part of the machine where there is electrical wiring. This fire is Class |   |   |  |   | E |

2. What are the controls for the fires described below?

- (a) A part of a woodworking machine has got very hot and wood dust begins to catch fire. The fire is in a part of the machine where there is electrical wiring.

*Turn off the power supply if possible.*

*Use a Class C extinguisher to starve the fire of oxygen if the power cannot be turned off.*

*Use a Class A extinguisher to cool the burning wood dust if the power is turned off.*

- (b) The acetylene gas bottle has got a leak in the hose and this catches fire.

*Turn off the gas if possible.*

*Use a Class B extinguisher.*

3. Explain how you operate the two types of fire extinguishers.

(a) Handle and trigger

*PULL: the pin from the handle*

*AIM: the nozzle at the base of the fire*

*SQUEEZE: the handle to activate the extinguisher*

*SWEEP: the base of the fire from side to side*

(b) Turnover

*PRESS: the knob on the top of the extinguisher*

*TURN: the extinguisher upside down*

*AIM: the nozzle at the base of the fire*

*SWEEP: the base of the fire from side to side*



# Assignment No. 8.1-1

## Unit 8.1 Workshop equipment

You are now required to do the Assignment 8.1 – 1 that will be found at the end of this unit or distributed by your tutor.



# Assignment No. 8.1-1

## Unit 8.1 Workshop equipment

To be completed and returned to your Tutor for assessment.

This is an Open Book assignment and you may refer to whatever resources you have at your disposal.

Question 7 is a practical exercise to be carried out in a workshop.

Name: \_\_\_\_\_ Due Date: \_\_\_\_\_

### Question 1

Name three groups of hazard that you might find in the workshop.

1.1 \_\_\_\_\_

1.2 \_\_\_\_\_

1.3 \_\_\_\_\_

### Question 2

Name four hazards in your workshop and write the precautions you should take for each.

|     | Hazard | Precaution |
|-----|--------|------------|
| 2.1 | _____  | _____      |
| 2.2 | _____  | _____      |
| 2.3 | _____  | _____      |
| 2.4 | _____  | _____      |

**Question 3**

Give five examples of unsafe acts or unsafe conditions that could happen in your workshop.

3.1 \_\_\_\_\_

3.2 \_\_\_\_\_

3.2 \_\_\_\_\_

3.4 \_\_\_\_\_

3.5 \_\_\_\_\_

**Question 4****Electrical hazards**

Answer true or false to the following statements:

4.1 \_\_\_\_\_ Overheating could happen when you overload a connection point.

4.2 \_\_\_\_\_ A spark is the same as an arc.

4.3 \_\_\_\_\_ An arc can fly through the air to nearby metal objects.

4.4 \_\_\_\_\_ A person cannot suffer burns from getting an electric shock.

4.5 \_\_\_\_\_ A person may skip a heart beat if they get an electric shock.

4.6 \_\_\_\_\_ Loose clothing can be a hazard when standing near moving metal machinery.



**Question 5**

Fill in the gaps in the following statements.

- 5.1 \_\_\_\_\_ A Class \_\_\_\_ fire is where plastic, rubber, wood, paper, cloth is burning.
- 5.2 \_\_\_\_\_ A Class \_\_\_\_ fire extinguisher should be used for flammable liquid fires.
- 5.3 \_\_\_\_\_ The first thing you should do to put out an electrical fire is \_\_\_\_ the power.
- 5.4 \_\_\_\_\_ A Class \_\_\_\_ fire extinguisher should be used for flammable reactive metal fires.
- 5.5 \_\_\_\_\_ Special \_\_\_\_\_ can be used to put out oil fires.
- 5.6 \_\_\_\_\_ The three basic element of a fire are\_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

**Question 6**

Explain what PASS stands for when using a handle and trigger-type fire extinguisher.

- 6.1 P \_\_\_\_\_
- 6.2 A \_\_\_\_\_
- 6.3 S \_\_\_\_\_
- 6.4 S \_\_\_\_\_

**Question 7**

Your supervisor will check that you can correctly identify the following in your workshop:

- electrical outlets
- all main switches
- all safety cut-off switches

**Supervisor's Certificate**

On \_\_\_\_ / \_\_\_\_ / \_\_\_\_, I observed \_\_\_\_  
(Date) (Student name)

in the workshop and they

- correctly identified each electrical outlet and stated the voltage at each outlet
- located all main switches in the workshop
- located all safety cut-off switches in the workshop.

Signed \_\_\_\_\_  
(Supervisor)

Supervisor's name \_\_\_\_\_  
(Print)

***10 marks***

***Total: 60 marks***