LEARNER MANUAL

FIRE SAFETY

13961 Demonstrate knowledge and use of hand operated fire fighting equipment 13961 NQF Level 2 4 Credits

Sakhisisizwe Training

UNIT STANDARD

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

REGISTERED UNIT STANDARD:

Demonstrate Knowledge and Use of Hand Operated Fire Fighting Equipment

SAQA US ID	UNIT STANDARD TITLE			
13961	Demonstrate Knowledge and Use of Hand Operated Fire Fighting Equipment			
ORIGINATOR		**ORIGINATING PROVIDER**		
SGB Power Plant Operations				
QUALITY ASSURING BODY				
FIELD			**SUBFIELD**	
Field 06 - Manufacturing, Engineering and Technology			Manufacturing and Assembly	
ABET BAND	**UNIT STANDARD TYPE**	**PRE-2009 NQF LEVEL**	**NQF LEVEL**	**CREDITS**
Undefined	Regular	Level 2	NQF Level 02	4
REGISTRATION STATUS		**REGISTRATION START DATE**	**REGISTRATION END DATE**	**SAQA DECISION NUMBER**
Reregistered		2012-07-01	2015-06-30	SAQA 0695/12
LAST DATE FOR ENROLMENT		**LAST DATE FOR ACHIEVEMENT**		
2016-06-30		2019-06-30		

In all of the tables in this document, both the pre-2009 NQF Level and the NQF Level is shown. In the text (purpose statements, qualification rules, etc), any references to NQF Levels are to the pre-2009 levels unless specifically stated otherwise.

This unit standard does not replace any other unit standard and is not replaced by any other unit standard.

PURPOSE OF THE UNIT STANDARD

Persons credited with this unit standard are able to practically demonstrate knowledge of fire and repellents, knowledge of the application, construction and operation of hand operated fire fighting equipment.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

1. Knowledge of the specific use of the various types of fire equipment.
2. Knowledge of characteristics of fire.

UNIT STANDARD RANGE

- Hand operated fire equipment, including, all types of hand operated fire extinguishers, fixed hose reels, wheeled movile fire units, fire blankets and sand buckets.
- Hand operated fire extinguishers include, Co2 types, foam, powder and gas type extinguishers.

Element guide and record:
The candidate will be provided with:
- Plant equipment to carry out each assessment task.

The candidate will be permitted to refer to the following documents:
- Modules.
- Maufacturer`s manuals.

The candidate will be required to:
- Wear personal protective equipment.
- Orally, or by other methods of communication, answer questions put by the assessor.
- Perform the tasks described by this guide within a time frame established between the candidate`s pervisor/instructor and the assessor prior to undertaking this assessment.

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1

Demonstrate knowledge of fire and repellents.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. Components required to sustain combustion are identified and related to fires.

SSESSMENT CRITERION 2

2. Repellents used in controlling combustion are identified and related to extinguishing fires.

ASSESSMENT CRITERION 3

3. Types of extinguishant used in fire extinguishers are identified and are related to types of fire.

ASSESSMENT CRITERION RANGE

Fire types - flammable liquids, gases, greases, energised electrical equipment.

ASSESSMENT CRITERION 4

4. Personal safety requirements are identified and related to fires and the use of repellents.

SPECIFIC OUTCOME 2

Demonstrate the use of the various types of fire extinguishers.

OUTCOME RANGE

Dry powder extinguisher, CO2 extinguisher, water extinguisher, chemical extinguisher, chemical fire, wood, paper, plastic fire, electrical fire.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. The different types of extinguishers are demonstrated.

ASSESSMENT CRITERION 2

2. The right type of extinguisher for each type of fire is demonstrated.

ASSESSMENT CRITERION 3

3. Methods of extinguishing a fire are described in terms of the removal of fire factors.

ASSESSMENT CRITERION 4

4. The correct and safe procedure of the practical use of the different types of extinguishers are explained and demonstrated.

SPECIFIC OUTCOME 3

Demonstrate the use of fixed hose reels and ancilliary extinguishing equipment.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1

1. The various types of fires that can be extinguished with hose reels. fire blankets and sand buckets are explained.

ASSESSMENT CRITERION 2

2. The systematic check on the hose reel, fire blanket and sand bucket is demonstrated.

ASSESSMENT CRITERION 3

3. The application of water and sand at the base of a fire is practically demonstrated.

ASSESSMENT CRITERION RANGE

Hose reels, Hoses, Nozzles, Valves, Sand, Blanket.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS

Evaluation of documentation by SAQA.
Moderation: Locally based external moderation sytem. Providers are to refer to the moderation action plan for requirements.

UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE

Use of mobile fire and rescue equipment.

Critical Cross-field Outcomes (CCFO):

UNIT STANDARD CCFO IDENTIFYING

Identifying & solving problems in which responses display that responsible decisions using critical and creative thinking have been made.

UNIT STANDARD CCFO WORKING

Working effectively with others as a member of a team, group, organization, and community.

UNIT STANDARD CCFO ORGANISING

Organising and managing oneself and one`s activities responsibly and effectively.

UNIT STANDARD CCFO COLLECTING

Collecting, analysing, organizing and critically evaluating information.

UNIT STANDARD CCFO COMMUNICATING

Communicating effectively using visual, mathematical and/or language skills in the modes of oral and/or written persuasion.

UNIT STANDARD CCFO SCIENCE

Using science and technology effectively and critically, showing responsibility towards the environment and health of others.

UNIT STANDARD CCFO DEMONSTRATING

Demonstrating an understanding of the world as a set of related systems by recognizing that problem-solving contexts do not exist in isolation.

UNIT STANDARD CCFO CONTRIBUTING

Contributing to the full personal development of each learner and the social and economic development of the society at large, by making it the underlying intention of any programme of learning to make an individual aware of the importance of:
a. Reflecting on and exploring a variety of strategies to learn more effectively.
b. Participating as responsible citizens in the life of local, national and global communities.
c. Being culturally and aesthetically sensitive across a range of social contexts.
d. Exploring education and career opportunities.
e. Developing entrepreneurial opportunities.

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By the end of this module, you should be able to:

1. Explain how a fire starts and what a fire is
2. Classify the different fires according to the fuel
3. Explain how to prevent a fire from starting
4. Explain the general working of a fire extinguisher
5. Explain the types of fire extinguishers and their uses
6. Demonstrate the use of the fire extinguisher
7. Explain the maintenance and inspection of the fire extinguisher
8. Explain the application of fire extinguishers in the workplace
9. Explain and demonstrate the applications of other extinguishing agents
10. Explain the rules for fighting fires
11. Describe the application of a workplace fire escape plan and reporting procedures
12. Explain the use of fire prevention equipment
13. Interpret fire safety signs in the workplace
14. Identify and use fire safety equipment

UNIT 1: FIRES AND FIRE PREVENTION

1.1 How do things catch fire? What is fire?

It's red, yellow or orange. It's hot, bright and wants to burns everything it touches. It also gives light, warmth and cooks your food.
Everybody knows about fire, but what starts it?

Simply put, fire is a chemical reaction resulting from something getting too hot in the presence of oxygen.

Typically, this **chemical reaction** is between oxygen in the atmosphere and some sort of fuel (wood or gasoline, for example). Of course, wood and gasoline don't catch on fire on their own just because they're surrounded by oxygen. For the combustion reaction to happen, the fuel needs to reach its ignition temperature.

Now the ignition temperature of any material is the point at which it will catch fire. Let's try to understand this with an example of wood catching fire:

- Wood gets heated to a very high temperature. The heating can come from different sources - a lit match, focused light, friction, lightning or even something else burning nearby.
- When the wood reaches about 300 degrees Fahrenheit (150 degrees Celsius), the heat decomposes some of the cellulose material that makes up the wood.
- Some of the decomposed material is released as volatile gases. We know these gases as 'smoke'.
- When these volatile gases are hot enough (about 500 degrees F (260 degrees C) for wood), the compound molecules break apart, and the atoms recombine with the oxygen to form water, carbon dioxide and other products. In other words, they burn.

And it keeps on burning because

What sustains a fire is the fact that the chemical reactions in a fire generate a lot of new heat. The heat of the flame itself keeps the fuel at the ignition temperature, so it continues to burn as long as there is fuel and oxygen around it. The flame heats any surrounding fuel so it releases gases as well. When the flame ignites the gases, the fire spreads.

A fuel's heat production depends on how much energy the gases release in the combustion reaction and how quickly the fuel burns. Even the fuel's shape affects burning speed. Thin or sharp pieces of fuel burn more quickly than larger pieces because a larger proportion of their mass is exposed to oxygen.

In this way, fires from different fuels are like different species of animals - they all behave a little differently. Experts can often figure out how a fire started by observing how it affected the surrounding areas. A fire from a fast-burning fuel that produces a lot of heat will inflict a different sort of damage than a slow-burning, low-heat fire

Typically, fire comes from a chemical reaction between oxygen in the atmosphere and some sort of fuel (wood or petrol, for example). Of course, wood and petrol don’t spontaneously catch on fire just because they are surrounded by oxygen. For the combustion reaction to hap

pen, you have to heat the fuel to its ignition temperature.

Three things must be present at the same time to produce fire:

1. **Enough OXYGEN to sustain combustion**
2. **Enough HEAT to reach ignition temperature**
3. **Some FUEL or combustible material**

Together, they produce the CHEMICAL REACTION that is fire

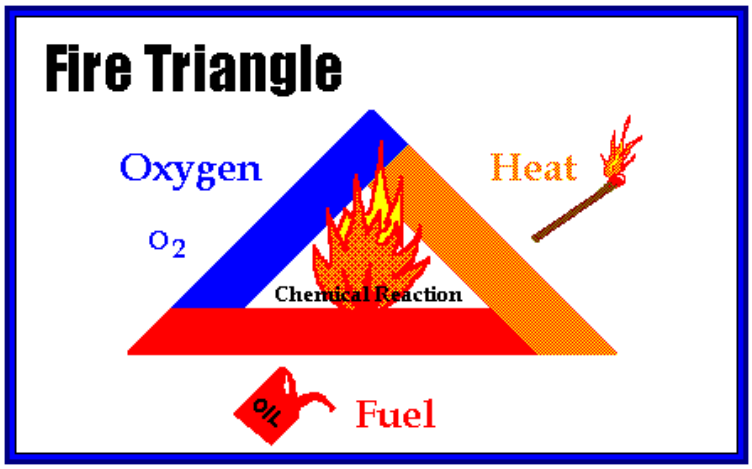


Figure 1: The Fire Triangle

You probably understand the definition at the beginning of this unit a little better by now, but the following definition of fire is easier to understand:

"Fire is the rapid combination of oxygen with fuel in the presence of heat." [1]

1.1.1 How does a fire start?

Here is how a typical wood fire starts:

The wood is heated to a very high temperature. This could be caused by any of a range of elements which can produce heat, such as focused light, friction, something else that is already burning.

When the wood reaches about 260º C, the heat decomposes (breaks up) some of the cellulose material that makes up the wood. Decomposed material is released as volatile gases (that can burn), typically made up of hydrogen, carbon and oxygen.

When the gas is hot enough, the compound molecules break apart, and the atoms recombine with the oxygen to form water, carbon dioxide and other products.

The gases, which rise through the air, make up the flame. Carbon atoms rising in the flame emit light as they heat up.

The heat of the flame keeps the fuel at burning temperature, so it continues to burn as long as fuel and oxygen are present.

As you can see, there are three essential elements involved in this process:

- Extreme heat
- Oxygen (or similar gas)
- Fuel

Activity 1 – This Activity must be completed in your Portfolio of Evidence

What are the two most common ways of controlling fires?

This Activity is aligned to **Specific Outcome 1, Assessment Criteria 2**

Controlling Combustion

Fire can really cause havoc, and it is very difficult to control it. Over the years, fire-fighters have studied fire in practical environments as well as in laboratories. Based on their studies, they've suggested new procedures for preventing, fighting, and extinguishing fires. These studies have also formed basis for framing building construction codesBasically, fire accidents occur in the presence of oxygen, fuel, and heat. Apart from these there can be some chemical reactions due to which fires can start. By isolating these items it is possible to control fire. This is the technique employed in all **fire suppression systems.**

Traditionally, **water** has been used to douse fire. Though water is effective in controlling fire, it is not always the best option. There are certain types of fire, where water may succeed in dousing the fire, but it can become a good conductor and electrocute people. So using other ways like switching off the mains is also a way to control fire. **Carbon dioxide** is another compound that has proved to be effective in controlling many types of industrial fires. So, there are **fire suppression systems** that use this compound. Such systems are also available in smaller sizes so that they may be kept in kitchens, or carried in cars. These help in controlling small fires in time. MORE ABOUT THIS LATER…..

1.2 Fire prevention

We can prevent unplanned fires from starting by removing the possible causes.

The main causes of unplanned fires are:

- Piles of rubbish lying around unattended that may start burning, e.g. paper and carton
- Flammable materials left open and on floors, e.g. open drums of diesel
- Electrical fittings and connections that may cause a spark
- Incorrectly stored chemicals
- Heated areas that are poorly ventilated

- Static electricity
- Lit cigarette butts and matches that are incorrectly thrown away

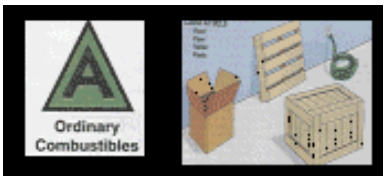
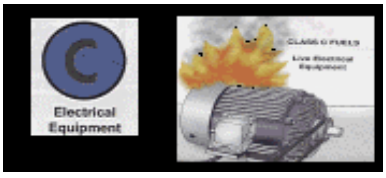
Did you know a home fire can double in size every 30 seconds? That means what started as a pot of oil catching fire on your stove can burn out of control in under 3 minutes. In fact, it only takes 5 to 10 minutes for a two-story home to go up in flames.

Having a fire extinguisher within easy reach can make all the difference!

Activity 2 – This Activity must be completed in your Portfolio of Evidence
Find out what the different types of fires are and the causes.
This Activity is aligned to **Specific Outcome 1, Assessment Criteria 3**

1.3 Types of fires

Fires are classified according to the type of fuel that is burning. If you use the wrong type of extinguisher on the wrong class of fire, you might make matters worse. It is very important to understand the five different fire classifications:

Classification of fires			
Symbol	**Class**		**Type of fuel**
	**A**		Wood, paper, cloth, rubbish, plastics, i.e. solids that are not metals
	**B**		Flammable liquids: petrol, diesel, oil, grease, acetone. Includes flammable gases, such as propane and butane.
	**C**		Electrical: energized electrical equipment. As long as it is “plugged in”
	**D**		Metals: potassium, sodium, aluminium, magnesium. Requires Metal-X, foam, and other special extinguishing agents

K

K

Kitchen fires: cooking fats and oil in commercial cooking.

Often a misconception is that fire burns the actual chair or piece of wood. It is the gasses given off by an object that burns. Heat causes objects to give off these flammable gasses.

When the gasses reach their ignition temperature you see the light given off during the oxidation known as fire. Fire itself generates more heat to the object and thus an endless cycle begins until all of the gasses have been exhausted from an object. Then the remaining particles or ash are what is left.

TYPES OF FIRE

Type	Details	Icon
Class A	Ordinary Combustible: Wood, paper, cloth, trash and other ordinary materials	
Class B	Flammable Liquids and Gases Gasoline, oils, paint lacquer and tar	
Class C	Fires Involving Live Electrical Equipment	
Class D	Combustible Metals or Combustible Metal Alloys	
Class F	Fires in Cooking That Involve Combustible Cooking Media Vegetable or animal oils and fats	

Most fire extinguishers will have a pictograph label telling you which types of fire the extinguisher is designed to fight.

For example, a simple water extinguisher might have a label like this, which means it should only be used on Class A fires. The other pictographs are crossed out with a red line.

COMMON CAUSES OF FIRE

Monitoring the trends related to the common causes of fire provides invaluable information that helps focus fire prevention efforts.

Historically, many fires occurred in government buildings due to the careless disposal of smoking material into wastepaper baskets. As a result of the no-smoking ban inside government buildings and in fact most office buildings, such fires have become very uncommon.

However, in today's world of electronic office equipment, we are seeing an increase in fire incidents due to faulty electrical equipment and power distribution systems.

Many common causes of fire can be related to some of the following:

The main causes of unplanned fires are:

Piles of rubbish lying around unattended that may start burning, e.g. paper and carton

Flammable materials left open and on floors, e.g. open drums of diesel

Electrical fittings and connections that may cause a spark

Incorrectly stored chemicals

Heated areas that are poorly ventilated

Static electricity

Lit cigarette butts and matches that are incorrectly thrown away

- **Open Flames –** Examples of such unsafe conditions are as follows:
    - Negligence in conducting hot work, such as welding, cutting or grinding
    - Improper handling of flammable or combustible liquids or flammable gases in near to potential ignition sources; and
    - Matches and cigarettes that are improperly disposed of, or left unattended near combustibles
- **Electrical –** Examples of such unsafe conditions are as follows:
    - Damaged electrical conductors, plug wires or extension cords
    - Use of faulty, modified or unapproved electrical equipment
    - Insufficient space or clearance between electrical heating equipment and combustibles
    - Short or overloaded circuits
    - Loose electrical connections; and
    - Lighting

1. Do not use electrical equipment that is in poor repair or that has a damaged cord.
2. Do not overload circuits or extension cords
3. Use approved power bars instead of circuit splitters
4. Keep electrical heating appliances at a safe distance from combustibles

Examples of possible unsafe conditions in relation to cooking are as follows:

1. Deep frying in pots or pans on stove tops
2. Unattended cooking appliances; and
3. Combustibles located dangerously close to cooking equipment

In order to avoid cooking hazards, many offices have mini-kitchens where staff may prepare their own food. Toasters and microwave ovens should not be located in general office areas. It is preferable that these appliances be placed in kitchen areas only.

Avoid deep fat frying. If you typically deep fry your food, use a thermostats controlled appliance and never leave it unattended. Keep all combustible materials, such as paper towels and cloths, at a safe distance.

Spontaneous Ignition and the Ignition of Waste Materials

Examples of such unsafe conditions are as follows:

- ✪ Improper disposal of materials susceptible to spontaneous combustion, such as oily rags from wood finishing or polishing
- ✪ Accumulation of organic materials, such as green hay, grain or woodchips; and
- ✪ Accumulation of waste combustible materials near potential sources of ignition

Liquified Petroleum Gas

Liquefied petroleum gas or Propane, is commonly used as a fuel for forklifts, man lifts, certain types of heaters and lighting. When pressurised and/or chilled, the propane gas contained within a cylinder turns into a liquid state. A liquefied gas is much more concentrated than has which is simply compressed. The primary dangers created by liquefied petroleum gas are fire / explosion, carbon monoxide poisoning, asphyxiation and extreme cold.

If a gas is liquefied, the pressure can increase rapidly when the gas is heated. Heating can come about from purely natural sources, such as the sun. Under normal circumstances, a relief valve on the cylinder will release the gas in a controlled manner to prevent the cylinder from exploding due to over-pressurisation. However if the cylinder and valve are not properly maintained and / or the pressure build up is very rapid, such as when the cylinder may be directly exposed to fire, a cylinder failure and subsequent explosion can occur.

There are several ways to prevent this. Always make sure the cylinder and relief valves are not damaged in any way. Damaged cylinders should never be used. Store cylinders out of the direct sun and away from other heat sources. A properly filled cylinder will not be full of liquid-some

space should remain to accommodate gas that may be driven off due to heating. In this case, the gas will be retained in the cylinder rather than being released into the atmosphere where it could create a hazard.

Wind

Wind is a common cause for fire to spread, especially in brush and wild fires. Wind can push fire from one burning structure to another by carrying ashes, smoke, heat and flames. It is important to remember to never start a camp fire in heavy winds where ash and sparks can fly into surrounding brush.

Chemicals, Combustibles and Accelerants

If chemicals are present in a neighboring structure or room of a burning structure, fire can quickly spread towards those accelerants. Chemicals can include laboratory chemicals, cleansers and even paints. A combustible is an item in a structure that can trap in flames and smoke and allow the fire to reach higher temperatures and burn at a faster rate. Some common combustibles in a home fire are mattresses and sofa furniture.

Open Space

Open space provides air and free movement to flames in a fire. An open building with no doors can allow a fire to spread more quickly throughout the structure's surface than a building with doors shut. A closed door can trap a fire and prevent smoke from spreading. Buildings equipped with fire doors can also burn slower due to specialty doors that withstand the high temperatures and damage of a fire.

Construction and Ventilation Systems

The construction of a structure can cause a fire to spread. Buildings with extensive ventilation systems will burn faster because flame and smoke can travel through the ventilation to other areas of the building faster. Doors, walls and ceilings with poor insulation can allow fire to burn through them more quickly and spread to other areas of the structure as well. The materials a structure is built from can also determine how fast it will burn. According to a newsletter by Vincent Dunn of the FDNY, there are five classifications of building construction within the United States -- Fire Resistive, Non-Combustible, Ordinary, Heavy Timber and Wood Frame. Buildings constructed from wood frame and heavy timbers are more likely to allow fire to spread quickly than structures made from fire resistive or non-combustible materials.

Water

Water is not always the best option for putting out a fire and can actually cause a fire to spread further. A kitchen fire, for example, should be put out with a special fire extinguisher or baking soda rather than water. Water can make grease in a kitchen fire splatter and spread, but baking soda or a chemical fire extinguisher can suffocate the fire and prevent it from spreading.

UNIT 2: FIRE SAFETY

Fire safety, at its most basic, is based upon the principle of keeping things that can burn (fuel sources) and things that can start fires (ignition sources) separate. Together, they produce the chemical reaction that is fire. Take away any of these things and the fire will be extinguished.

In the previous section, we saw that there are three essential elements involved in producing fire - heat, oxygen and fuel. To put a fire out, you need to remove one of these elements.

The best way to remove **heat** is to wet the fire with water. This cools the fuel to below the ignition point and so kills the fire. To remove **oxygen**, you can smother the fire so it is not exposed to air.

One way to smother a small fire is to cover it with a heavy blanket. Another way is to dump non-flammable material, such as sand or baking soda on top of it.

Removing the **fuel** is the most difficult approach for most fires. In a house fire, for example, the house itself is potential fuel. The fuel will only be removed once the fire has burned all of it up.

The best type of fire safety is to prevent a fire from starting. Unfortunately accidental fires do occur even though excellent fire safety rules are applied in the workplace. The first line of defence against a workplace fire is usually the hand held fire extinguisher. In this section we will see how a fire extinguisher works and the different types of fire extinguishers available.

Activity 3 – This Activity must be completed in your Portfolio of Evidence
Identify the types of extinguishers that are available in your workplace and describe which fires they can be used for. This Activity is aligned to **Specific Outcome 1, Assessment Criteria 3**

2.1 How fire extinguishers work

Fire extinguishers are sturdy metal cylinders filled with water or a smothering material. When you press down on a lever at the top of the cylinder, the material is expelled (forced out) by high pressure, similar to the way material is forced out of an **aerosol can.**

Figure 2: The fire extinguisher

2.1.1 The pressure gauge

Most dry-chemical fire extinguishers have a built-in pressure gauge. If the gauge indicator is pointing to "recharge," the pressure in the extinguisher may be too low to expel the contents. It is recommended that dry extinguishers are inspected every year, even if the gauge indicates the correct pressure. When the handle of an extinguisher is compressed, it opens an inner canister of high-pressure gas that forces the extinguishing agent (dry or wet powder or foam) from the main cylinder through a siphon tube and out of the nozzle. A fire extinguisher works on the same principle as a can of hairspray.

Figure 3: Fire extinguisher gauge

2.1.2 The safety pin

To use the extinguisher, you pull out the safety pin and depress the operating lever. The lever pushes on an actuating rod, which presses the spring-mounted valve down to open up the passage to the nozzle. The bottom of the actuating rod has a sharp point, which pierces the gas cylinder release valve.

Figure 4: Safety pin

The metal safety pin prevents the operating lever from closing accidentally.

2.1.3 The actuating rod

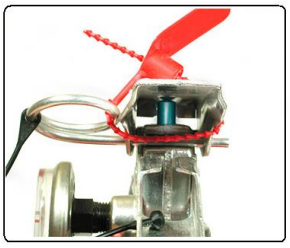


Figure 5: Actuating rod

The operating lever pushes down on an actuating rod (the blue piece).

The compressed gas escapes, applying downward pressure on the fire-suppressant material. This drives the material up the siphon and out of the nozzle with considerable force. The proper way to use the extinguisher is to aim it directly at the fuel, rather than the flames themselves, and to move the stream with a sweeping motion.

2.2 Types of fire extinguishers

Different types of fire extinguishers are designed to fight different classes of fire. It is important that you know which type of extinguisher to use for which class/type of fire.

Water is the most familiar extinguishing material, and it is one of the most effective. But it can be dangerous in the wrong situation. A water extinguisher can put out things like burning wood, paper or cardboard, but it does not work well on electrical fires or fires involving inflammable liquids. In an electrical fire, the water may conduct the current, which can electrocute you. Water will only spread out an inflammable liquid, which will most likely make the fire worse.

Using the wrong type of extinguisher could have the following results:

- Using water on a flammable liquid fire could cause the fire to spread.
- Using water on an electrical fire increases the risk of electrocution.

There are four common types of fire extinguishers found in most industrial and technical environments. Many extinguishers available today in the workplace can be used for different types of fires and these extinguishers will be labelled accordingly.

All fire extinguishers are labelled with a pictograph to show the class of fire it should be used on.

The following pictographs or a combination of them may be found on fire extinguishers.

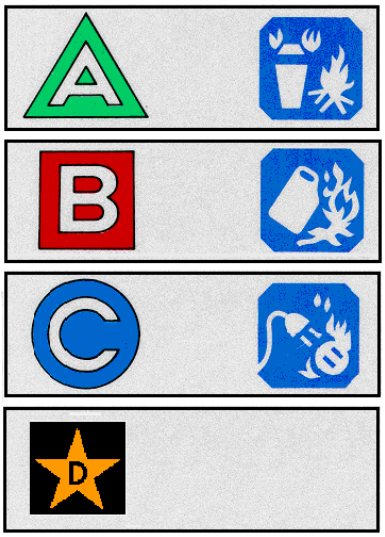


Figure 6: Pictographs to label a fire extinguisher

Class D doesn't have a pictograph which denotes it, because these fires (found in a chemical environment) can result from many different metallic sources and each one requires a different extinguishing agent. (This will be discussed in more detail in a later section)

A band of colour around the top part of the fire extinguisher can also be used to identify the type of fire extinguisher.

Figure 7: Types of fire extinguishers

The Wet Chemical fire extinguisher (not shown in this figure) has a purple band. Each of these types of fire extinguishers will be discussed in the next section.

2.2.1 Air Pressurised Water (APW) fire extinguishers

As these fire extinguishers are filled with ordinary tap water and pressurised air, they are essentially large squirt guns. They are suitable **only** for extinguishing Class A fires (wood, paper, cloth).

An APW fire extinguisher puts out the fire by taking away the "Heat" element of the Fire Triangle. It works by quickly cooling down the fire so that not enough heat remains to sustain the burning and continuous ignition stops. Water is a fast and efficient means of extinguishing Class A fires, but it is not suitable for electric type fires.

If you have no choice but to use an APW on an electrical fire, make sure the electrical equipment is unplugged.

APWs are found in older buildings, particularly in public hallways, as well as in older blocks of flats.

The colour code of the APW fire extinguisher is a red extinguisher body and red band/label.

Pictograph found on the APW fire extinguisher:

2.2.2 Dry Chemical fire extinguishers

This is the type of hand held fire extinguisher which is most commonly found, because dry chemical extinguishers are used for

class ABC fires and are the best all around choice. They can have either a long narrow hose or no hose (just a short nozzle).

These extinguishers are used on fires involving combustible or flammable liquids such as grease, petrol, diesel, oil, paraffin and many other chemical agents including gases such as propane and butane. Dry chemical fire extinguishers are also a good choice for electrical fires.

Dry chemical extinguishers put out fire by coating the fuel with a thin layer of dust. This causes the fire to die from a lack of oxygen. The powder also interrupts the chemical reaction of fire. These extinguishers are very effective at putting out fires.

They have an advantage over CO_2 extinguishers in that they leave a blanket of non-flammable material on the extinguished material which reduces the likelihood of the fire restarting. They also make a terrible mess - but if the choice is a fire or a mess, take the mess!

Dry chemical extinguishers are filled with a fine, yellow powder. This powder is mostly composed of mono-ammonium phosphate. The extinguishers are pressurised with nitrogen.

Dry chemical extinguishers come in a variety of types. You may see them labelled:

- ABC (can be used on Class A, B, or C fires)
- BC (designed for use on Class B and C fires)

Dry chemical extinguishers with powder designed for Class B and C fires ("BC" extinguishers) may be found in places such as commercial kitchens and areas working

with flammable liquids, such as petrol stations. Be very careful that you don't mistakenly use a "BC" extinguisher on a Class A fire thinking that it was an "ABC" extinguisher.

Class D extinguishers also fall in this category. They are also known as Special Dry Chemical Powder extinguishers. The powder interferes with the combustion process and quickly extinguishes a fire. These extinguishers are designed for use on flammable metals and are often designed specifically for the type of metal in question. The problem with Class D fires is that the burning metal gives off oxygen that feeds the fire and it burns at a very high temperature which makes it difficult to extinguish with a normal fire extinguisher.

	The colour code of the Dry Chemical fire extinguisher is a **red** extinguisher body and **blue** band/label. Pictograph found on the dry chemical fire extinguisher: 

2.2.3 Wet Chemical fire extinguishers

Wet Chemical extinguishers are designed for extinguishing grease and oil fires in a commercial kitchen, i.e. the new Class K fires (restaurant kitchen hazards). The recent trend to more efficient cooking appliances and use of unsaturated cooking oils dictates the use of a hand portable fire extinguisher with greater fire fighting capacity and cooling effect to combat these very hot and difficult fires. The superior fire fighting capability of the Wet Chemical agent is placed exactly where you aim it with no chemical residue to clean up.

	The colour code of the Wet Chemical fire extinguisher is a **red** extinguisher body and **purple** band/label. Pictograph found on the wet chemical fire extinguisher: 

2.2.4 Carbon Dioxide (CO_2) fire extinguishers

The CO_2 fire extinguishers are designed for Class B and C (flammable liquids and electrical sources) fires only! They don't work very well on Class A fires because the material usually reignites.

Carbon dioxide is a non-flammable gas that takes away the oxygen element of the Fire Triangle. CO_2 is very cold as it comes out of the extinguisher, so it cools the fuel as well. Avoid hitting people with the CO_2 jet, as it causes freeze wounds

The CO_2 fire extinguisher can easily be identified from the shape of the large "tapered" nozzle (horn). CO_2 cylinders do not have a pressure gauge - they must be weighed to determine the amount of contents. Some CO_2 cylinders are so heavy that they are mounted on a cart to be moved around.

Be careful not to drop a CO_2 cylinder; if it is damaged it can punch a hole through the nearest wall(s) and end up on the other side of the town! The pressure in a CO_2 extinguisher is so big, bits of dry ice might shoot out of the horn!

The advantage a CO_2 extinguisher has over a dry chemical extinguisher is that it leaves behind no harmful residue. That makes carbon dioxide a good choice for an electrical fire involving a computer or other delicate instruments.

A CO_2 extinguisher is a bad choice for a flammable metal fire such as Grignard reagents, alkyllithiums and sodium metal because CO_2 reacts with these materials. CO_2 extinguishers should not be used Class D fires!

CO_2's will frequently be found in laboratories, mechanical rooms, kitchens, and flammable liquid storage areas.

The colour code of the CO_2 fire extinguisher is a red extinguisher body and black band/label.

Pictograph found on the CO_2 fire extinguisher:

2.2.5 Foam fire extinguishers

The Foam extinguisher is a multi purpose extinguisher and is ideal where both Class A (combustible materials) and Class B (flammable liquid risks) are most likely to be found. Class B fires also include oils, spirits, greases, fats and certain plastics.

The foam spray quickly extinguishes the fire and prevents the fire from restarting by covering the surface of the fuel and the fire with foam.

The colour code of the foam fire extinguisher is a red extinguisher body and cream band/label.

UNIT 3: THE USE OF THE FIRE EXTINGUISHER

The background knowledge you have gained about fires and fire extinguishers in the previous two units serves as preparation to be effective in using the fire extinguisher in the workplace and wherever else this knowledge is needed. The fire extinguisher is only as effective as the person using it!

3.1 Preparation

In an emergency it is important to know where all the fire extinguishers are located, as well as how to use them.

Always read the instructions on the side of the extinguisher in advance, and make sure that you know where it is and how to use it.

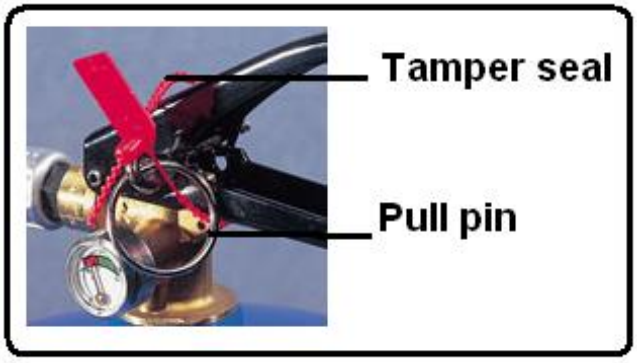
3.1.1 The appearance of different types of extinguishers

Generally, you can tell with a glance which type an extinguisher is hanging on the wall, or in the cabinet, just by looking at its shape. Check the labels of the extinguishers in your area and note the colour and shape/size of the extinguisher. This may help if someone runs in to help you fight a fire with the wrong extinguisher (i.e. water on an electrical fire) - you can stop them before they are injured or make matters worse!

3.2 Correct use of fire extinguishers

All Fire Extinguishers are basically operated in the same way.

When you break the seal on the extinguisher it is very important that you take a firm grip on the hose or pipe, because when you squeeze the trigger this pipe can injure you.



Most extinguishers require a safety pin or clip to be removed before the trigger can be operated.

Aim the extinguisher at the base of the fire, keeping yourself low, and work the extinguisher in a sweeping motion from left to right.

Don't start too close to the fire (most extinguishers are designed to be operated from about 2 - 3 metres away).

To operate **pull** out the pin at the top of the extinguisher, this is the pin that normally prevents the extinguisher from accidental activation if the extinguisher is picked up by the handle.

You must then **aim** the nozzle or hose towards the base of the fire.

It is important that you stand at least 2 to 3 meters away from the fire, **squeeze** the handle to discharge the extinguisher. When you release the handle the extinguisher will stop.

It is very important that you use the **sweep** action with the nozzle moving from side to side ensuring that you cover the entire surface of the fire. When you see that the fire has been extinguished move away from the fire facing the area at all times. It is important that you never turn your back on the fire because it could re-ignite and catch you off guard.

Recharge all extinguishers immediately after use regardless of how much they were used.

3.3 Steps to put out a fire: PASS

It is easy to remember how to use a fire extinguisher if you remember the acronym, “PASS.”

Pull

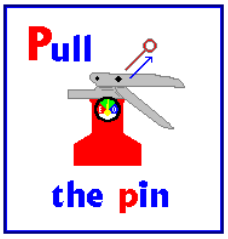
Aim

Squeeze

Sweep

Pull the pin

This will release the handle.



Aim at the base of the fire

Don’t aim at the flames, the extinguishing agent will pass right through and do no good.

Squeeze the top handle

This depresses a button that releases the pressurised extinguishing agent.

Sweep from side-to-side until the fire is completely out.

Start using the extinguisher from a safe distance away and then slowly move forward. Once the fire is out, keep an eye on the area in case it re-ignites.

3.4 How to inspect your fire extinguishers

Be aware of the condition of your area's extinguishers by visual inspection on a frequent basis to ensure you have a working extinguisher there when you need one. Know the locations of the fire

extinguishers in your work area and make sure the class of the extinguisher is safe to use on fires likely to occur in the immediate area.

At least once a month (more often in severe environments) the following inspection should be carried out:

- Check the plastic seal holding the pin in the extinguisher handle. Has the extinguisher been tampered with or used before? Report any broken/missing seals/pins to your supervisor. Make sure the pin, nozzle and nameplate are intact.
- Look at the gauge and feel the weight. Is the extinguisher full? Does it need to be recharged? Water, some foam, and dry chemical extinguishers have gauges indicating the pressure inside the extinguisher. The pressure needle should be in the "green" area (generally 45 – 70 kg., depending on the type of agent).
- CO_2 (carbon dioxide) extinguishers are high pressure cylinders under extremely high pressure. These extinguishers do not have gauges and must be weighed by staff to determine the amount of contents remaining.
- Ensure that the extinguisher is not blocked by equipment, coats or other objects that could interfere with access in an emergency. Ensure that the nozzle or other parts are not obstructed.
- Some manufacturers recommend shaking your dry chemical extinguishers once a month to prevent the powder from settling/packing
- Ensure that there are no dents, leaks, rust, chemical deposits and other signs of abuse/wear. Wipe off any corrosive chemicals, oil, gunk etc. that may have landed on the extinguisher.
- Report any missing, empty or damaged fire extinguishers to your supervisor whenever you notice any discrepancies.

3.5 After using the fire extinguisher

While CO_2 extinguishers will generally hold their pressure after a slight discharge, BC and ABC rated dry chemical extinguishers will usually not hold a charge after partial use. This is true for all your personal home and vehicle dry chemical extinguishers, too!

While the gauge may hold steady in the green immediately after a slight use, check it the next day and you'll find the gauge on empty! This is because upon use the dry powder gets inside the seals and allows the nitrogen carrier to escape over a period of time.

After **any** use a BC or ABC extinguisher **must** be serviced and recharged. This is very important for home extinguishers also; you must have the extinguisher refilled after any use. If you discharge an extinguisher (even just a tiny bit) or pull the pin for any reason, inform your supervisor.

3.6 Care and maintenance of fire extinguishers

To operate safely and effectively, extinguishers should be subject to regular maintenance by a competent person and most countries in the world require this maintenance as part of fire safety legislation.

Lack of maintenance can lead to an extinguisher not discharging when required, or worse still, rupturing (bursting) when pressurised. Deaths have occurred, even in recent times, from corroded (rusty) extinguishers exploding.

The label similar to the one on the right should be attached to every fire extinguisher. It contains a record of the maintenance and service of the fire extinguisher.

Three types of maintenance are required:

3.6.1 Basic Service

All types of extinguishers require a basic inspection annually to check weight, correct pressure (using a special tool, not just looking at the gauge) and for signs of damage or corrosion.

3.6.2 Extended Service

Every five years Water, Wet Chemical, Foam and Powder extinguishers require a more detailed examination including a test discharge of the extinguisher and recharging if satisfactorily. Fire extinguishers should be pressure tested (a process called hydrostatic testing) after a number of years to ensure that the cylinder is safe to use. Consult your owner's manual, extinguisher label or the manufacturer to see when yours may need such testing.

3.6.3 Overhaul

CO_2 extinguishers, due to their high operating pressure, are subject to pressure vessel safety legislation and must be hydraulic pressure tested and date stamped every 10 years.

3.7 Summary of fire extinguishers and classes of fires

3.7.1 Class A fires

Extinguish ordinary combustibles by cooling the material below its ignition temperature and soaking the fibres to prevent re-ignition.

Use pressurized water, foam or multi-purpose *(ABC-rated)* dry chemical extinguishers. **Do not use** carbon dioxide (CO_2)) or ordinary *(BC-rated)* dry chemical extinguishers on Class A fires.

3.7.2 Class B fires

Extinguish flammable liquids, greases or gases by removing the oxygen, preventing the vapours from reaching the ignition source or inhibiting the chemical chain reaction. Foam, carbon dioxide, ordinary *(BC-rated)* dry chemical and multi-purpose dry chemical, extinguishers may be used to fight Class B fires.

3.7.3 Class C fires

Extinguish energized electrical equipment by using an extinguishing agent that is not capable of conducting electrical currents. Carbon dioxide, ordinary *(BC-rated)* dry chemical, multi-purpose dry chemical fire extinguishers may be used to fight Class C fires. Do not use water extinguishers on energized electrical equipment.

3.7.4 Class D fires

Extinguish combustible metals such as magnesium, titanium, potassium and sodium with dry powder extinguishing agents specially designated for the material involved. In most cases, they absorb the heat from the material, cooling it below its ignition temperature.

NOTE: Multipurpose *(ABC-rated)*chemical extinguishers leave a residue that can harm sensitive equipment, such as computers and other electronic equipment. Because of this, carbon dioxide extinguishers are preferred in these instances because they leave very little residue.

ABC dry powder residue is mildly corrosive to many metals. For example, residue left over from the use of an ABC dry powder extinguisher in the same room with a piano can seriously corrode piano wires.

Types of Fire Extinguishers

Water and Foam

Water and Foam fire extinguishers extinguish the fire by taking away the **heat** element of the fire triangle. Foam agents also separate the **oxygen** element from the other elements.

Water extinguishers are for Class A fires only - they should not be used on Class B or C fires. The discharge stream could spread the flammable liquid in a Class B fire or could create a shock hazard on a Class C fire.

Carbon Dioxide

Carbon Dioxide fire extinguishers extinguish fire by taking away the **oxygen** element of the fire triangle and also be removing the **heat** with a very cold discharge.

Carbon dioxide can be used on Class B & C fires. They are usually ineffective on Class A fires.

Dry Chemical

Dry Chemical fire extinguishers extinguish the fire primarily by interrupting the**chemical reaction** of the fire triangle.

Today's most widely used type of fire extinguisher is the multipurpose dry chemical that is effective on Class A, B, and C fires. This agent also works by creating a barrier between the **oxygen** element and the **fuel** element on Class A fires.

Ordinary dry chemical is for Class B & C fires only. It is important to use the correct extinguisher for the type of fuel! Using the incorrect agent can allow the fire to re-ignite after apparently being extinguished succesfully.

Wet Chemical

Wet Chemical is a new agent that extinguishes the fire by removing the heat of the fire triangle and prevents re-ignition by creating a barrier between the **oxygen** and **fuel**elements.

Wet chemical of Class K extinguishers were developed for modern, high efficiency deep fat fryers in commercial cooking operations. Some may also be used on Class A fires in commercial kitchens.

Clean Agent

Halogenated or **Clean Agent** extinguishers include the halon agents as well as the newer and less ozone depleting halocarbon agents. They extinguish the fire by interrupting the **chemical reaction** of the fire triangle.

Clean agent extinguishers are primarily for Class B & C fires. Some larger clean agent extinguishers can be used on Class A, B, and C fires.

Dry Powder

Dry Powder extinguishers are similar to dry chemical except that they extinguish the fire by separating the **fuel** from the **oxygen** element or by removing the **heat** element of the fire triangle.

However, dry powder extinguishers are for Class D or combustible metal fires, only. They are ineffective on all other classes of fires.

Water Mist

Water Mist extinguishers are a recent development that extinguish the fire by taking away the **heat** element of the fire triangle. They are an alternative to the clean agent extinguishers where contamination is a concern.

Water mist extinguishers are primarily for Class A fires, although they are safe for use on Class C fires as well.

Cartridge Operated Dry Chemical

Cartridge Operated Dry Chemical fire extinguishers extinguish the fire primarily by interrupting the **chemical reaction** of the fire triangle.

Like the stored pressure dry chemical extinguishers, the multipurpose dry chemical is effective on Class A, B, and C fires. This agent also works by creating a barrier between the oxygen element and the fuel element on Class A fires.

Ordinary dry chemical is for Class B & C fires only. It is important to use the correct extinguisher for the type of fuel! Using the incorrect agent can allow the fire to re-ignite after apparently being extinguished successfully.

UNIT 4: WORKPLACE FIRE SAFETY

Activity 4 – This Activity must be completed in your Portfolio of Evidence
What safety precautions are in place in your own workplace in relation to employees and customers.
This Activity is aligned to **Specific Outcome 1, Assessment Criteria 4**

A fire is the most common type of emergency for which small businesses must plan. A critical decision when planning is whether or not employees should fight a small fire with a portable fire extinguisher or simply evacuate. Small fires can often be put out quickly by a well-trained employee with a portable fire extinguisher. However, to do this safely, the employee must understand the use and limitation of a portable fire extinguisher and the hazards associated with fighting fires. Evacuation plans that designate or require some or all of the employees to fight fires with portable fire extinguishers increase the level of complexity of the plan and the level of training that must be provided employees.

Fire safety is important business. Many unnecessary deaths have resulted from fires in workplaces.

One of the worst workplace fire tragedies was the fire at the Triangle Shirtwaist Factory in New York City in 1911 in which nearly 150 women and young girls died because of locked fire exits and inadequate fire extinguishing systems.

In South Africa history has repeated itself in the November 2000 fire at the Esschem Floor Polish factory in Lenasia. The whole staff of 11 night shift workers burnt to death when the building caught fire and they couldn't escape because of exits being locked from the outside.

In South Africa the Occupational Health and Safety Act governs health and safety in the workplace. All workplaces have to undergo a safety inspection before employees can be allowed to work on the premises. During the inspection the workplace is checked to see whether employers are complying with OHS standards for fire safety.

OHS standards require employers to provide proper exits, fire fighting equipment, emergency plans, and employee training to prevent fire deaths and injuries in the workplace.

Portable Fire Extinguishers

Each workplace building must have a full range of the proper type of fire extinguisher for the fire hazards present.

Employees expected or anticipated to use fire extinguishers must be instructed on the hazards of fighting fire, how to operate the fire extinguishers available, and what procedures to follow in alerting others to the fire emergency.

Only approved fire extinguishers are permitted to be used in workplaces, and they must be kept in good operating condition. Proper maintenance and inspection of this equipment is required of each employer.

Where the employer wishes to evacuate employees (i.e. get them to leave the building) instead of having them fight small fires there must be written emergency plans and employee training for proper evacuation.

4.1 Location of fire extinguishers

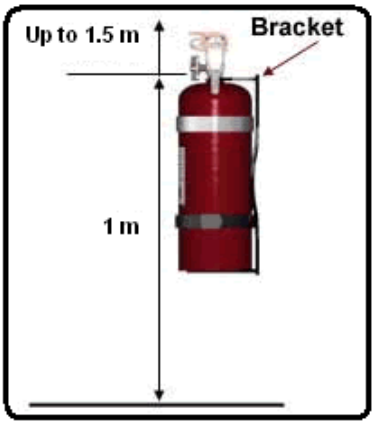
The correct location for your fire equipment is very important. The ideal location for them to be installed is where they can easily be seen, such as close to staircases, escape routes, exits and along corridors. When deciding on where to place portable extinguishers, always select a spot that will let you escape. In other words, you don't want the fire between you and an exit, so place the extinguisher where you will have a path out. The location of the fire extinguisher must be marked with a sign such as on the previous figure.

A good location for any fire equipment is next to fire break glass call points so that a user can easily pick up an extinguisher after activating the alarm.

Extinguishers for specific risks should be sited near to the risk but not in a situation where it could be affected by a fire caused by the risk as this could put the user in danger. For instance, in a kitchen, the extinguisher should be sited by the exit door rather than next to the stove.

Fire equipment locations should be in the same place on each floor, i.e. on each floor the extinguisher should be placed in the same spot and should be in a place where they can easily be seen so that they can easily be spotted when needed.

4.1.1 Height



To prevent fire extinguishers from being moved or damaged, they should be mounted on brackets or in wall cabinets with the carrying handle placed 1 to 1.5 m feet above the floor. They should be firmly fixed to the wall with brackets to ensure they are not accidentally dislodged and thereby cause injury.

ctivity 7 – This Activity must be completed in your Portfolio of Evidence

Establish what kind of fire you could use a fire hose reel, sand bucket and fire blanket for and explain why. This Activity is aligned to **Specific Outcome 3, Assessment Criteria 1**

4.2 Other extinguishing agents

There are various extinguishing agents, which will deal very efficiently with the different classes of fire.

4.2.1 Sand

A fire sand bucket or fire bucket is a bucket filled with sand which is used to put out fires. This agent, properly applied will "smother" the fire or create the "blanket" effect, thus removing the oxygen and the heat. The main use of sand is to cover sewers and spills. Sand is also used to build a barrier to dam up the flammable liquid and thus prevent it from flowing and spreading the fire.

They are often kept next to ovens, barbeques and other areas where fires can occur. Because oil-fires are resistant to water, a fire sand bucket is used to put out the fire. In order to put out the fire, the sand in the bucket is dumped on the fire to starve it of the oxygen it needs to stay alight.

4.2.1.1 Rules for use

- It is recommended that a steel bucket is used. If a plastic bucket is used, it may crack, warp or melt.
- The bucket should be well labelled so that, in case of emergency, it is easy to spot and use.
- The sand must also be cleaned of all flammable material. If the sand is collected from a beach, it could contain dried grass or plants which would hinder the effectiveness of the sand. Permission is normally required before taking sand from a public beach.

4.2.2 Fire blankets

These act as "smothering" agent by removing oxygen. This method is used especially when clothing catches fire. People that have caught fire can be wrapped while lying on the floor to smother the flames.

A fire blanket is also useful to protect the body in case you have to leave an area that is already burning. Wrapping yourself in a fire blanket will protect your clothes and body from heat and flames.

These blankets can also be useful to cover fires and cut oxygen supply, e.g. in a kitchen fire the blanket is carefully held by the corners to ensure that the users hands don't get burned and then spread out over the burning pot. It is important to leave the blanket in place until you are sure that all danger of the fire reigniting is over. In your workplace you should verify the location of the fire blankets.

4.2.3 Water

Water absorbs more heat by vaporisation than any other substance. Water is used as a cooling and smothering agent. It may be used either as a jet, a finely divided spray or as a fog that is not only a coolant, but since it is easily vaporised (changed into steam) will smother as well.

The use of water on hot metals can be very dangerous. Great care must be taken to ensure that the metal does not cool down to rapidly, because uneven contraction of the metal could cause structures to collapse. (Water will normally only be used to extinguish Class A fires, however, trained fire fighters would be able to control and extinguish pressure fed flammable liquid and gas fires).

4.2.4 Fire hydrant and fire hose

Figure 8: Fire hydrant

A fire hydrant is a source of municipal water found in most urban, suburban and rural areas for use by firefighters in extinguishing a fire.

When in use, a fire hose is attached to the fire hydrant, then the valve is opened to provide a powerful source of water, 350 kPa in some areas (possibly more in others), depending on various factors including the size and location of the attached water main. This hose can be further attached to a fire engine, which can then use a powerful pump to boost the water pressure and possibly split it into more than one stream.

You have probably seen the powerful stream of water coming out of the fire hose. Remember that handling a hose is difficult even before the line is filled with water under pressure. Sometimes the strength of more than one person is needed to control a hose.

When not in use the fire hose is collapsed and rolled up for storage as can be seen in the following figure.

Figure 9: Fire hose to be attached to a fire hydrant

Care should be taken not to open or close a fire hydrant too quickly, as this can create a water hammer which can damage nearby pipes and equipment. The high water pressure inside the hose causes it to be very heavy, stiff, and unable to make a tight turn while

pressurised. When a fire hydrant is unobstructed, this is not a problem, as there is enough room to position or move the hose.

Figure 10: Special wrench tool to open fire hydrant

To prevent casual use or misuse, the hydrant requires special tools to be opened, usually a large wrench with a pentagon-shaped socket.

Vandals sometimes waste water when they open hydrants. Such vandalism can also reduce municipal water pressure and hinder firefighters' efforts to extinguish fires. Sometimes people simply want to play in the water and remove the caps and open the valve, providing residents (especially children) a place to play and cool off in summer. However, this is usually discouraged as children have been struck by passing cars while playing in the street in the water spray.

Private hydrants are usually located on larger properties to adequately protect large buildings in case of a fire and in order to comply with the fire safety laws. Some companies are contracted out to inspect private fire hydrants unless the municipality has undertaken that task.

Fire Hydrant manufacturers recommend lubricating the head mechanism and restoring the head gaskets and o-rings annually in order that the fire hydrant performs the service expected of them.

Fire water from hydrants may not be used for any purpose other than fire fighting or fire training without the prior approval of the person in charge of the fire water system.

Fire fighting equipment must not be tampered with, anybody who contravenes this shall be guilty of an offence and in some of the Refineries / Plants this could lead to conviction and disciplinary action as well as a fine against you.

4.2.4.1 Fire hose nozzles

A fire hose on its own won't be very effective. Think of a normal hosepipe without a nozzle attached to the tip. The stream of water is weak and difficult to control. A nozzle is attached to the fire hose to control the stream of water and to give it more pressure to deliver the water to the fire. Various nozzles are capable of projecting solid, heavy streams of water, curtains of spray, or fog.

Nozzles can apply water in the form of streams, spray, or fog at rates of flow between 57 liters to more than 380 liters per minute. Fog nozzles may be used to disperse vapours from flammable liquids, although foam is generally used to extinguish fires in flammable liquids.

Straight streams of water have greater reach and penetration, i.e. can reach further and give more wetting power, but fog absorbs heat more quickly because the water droplets present a greater surface area and distribute the water more widely. The next two figures illustrate two different types of nozzles you should be familiar with:

Water fog

The fire hose nozzle has a strong handle attached to it to ensure that the firefighter can hold onto the hose firmly. This is because the water pressure causes the hose to be extremely difficult to control. You can see in the illustrations on the previous page that more than one person is needed to hold the hose.

Care should be taken that the fire hose is not dragged over sharp objects as this could damage the hose casing and lead to leaking and ultimately a puncture or burst in the hose.

4.2.5 A fire hose reel

Figure 11: A firehose

A fire hose reel is usually found inside a building. It is permanently attached to the building's standpipe or plumbing system.

The fire hose reel is meant for use on Class A Fires and should not be used on Class B, D or K fires.

It is normally contained behind doors marked "FIRE HOSE" or openly mounted in a hall or passage. It consists of a large reel with a black rubber hose with an attached nozzle.

The fire hose normally has a range of approximately 6 metres.

The nozzle is released by turning the hand wheel counter-clockwise. This action will fill the hose line with water. At the scene of the fire the water is turned on and off by turning the nozzle. Start with a stream of water from a distance and then turn to a spray approaching the fire as it comes under control.

The usual working pressure of a fire hose can vary between 8 Bar (0.8 MPa) - 20 bar (2.0 MPa), while its bursting pressure can be up to 63 bar (6.3Mpa). (This level of pressure emitted by the hose can actually break in a weaker brick wall.)

A fire hose should never be dragged over sharp objects and it should be stored away carefully after each use.

4.3 Fire protection and prevention devices

Fire protection is the prevention and reduction of the hazards associated with fires. By not having fire protection the safety plans of the organisation are not very effective. Fire protection in the organisation includes all the equipment and early warning systems to limit or prevent the damage caused by a fire.

4.3.1 Fire alarm

A fire alarm system is an active fire protection system that controls all the fire alarm components in a building. Protective

fire alarms and sprinkler systems are the most effective in protecting buildings and the lives of all people against fires.

A fire alarm pull station is an active fire protection device, usually wall-mounted, that, when activated, makes an alarm on a fire alarm system go off. In its simplest form, the user activates the alarm by pulling the handle down, which completes a circuit and locks the handle in the activated position, and sends an alarm to the fire alarm control panel. The fire alarm pull station is often reset using a key, which allows the handle to go back up to its normal position.

Many fire alarm pull stations are single action and only require the user to pull down the handle. Other fire alarm pull stations are dual-action, and as such require the user to perform a second task before pulling down, such as lifting up or pushing in a panel on the station, or shattering a glass panel.

4.3.2 Smoke alarm

Having a smoke alarm increases your chances of survival.

A smoke detector or smoke alarm is an active fire protection device that detects smoke in the air and causes an alarm to go off to warn people of the fire. Most smoke detectors work either by optical detection or by ionisation, but some of them use both detection methods to increase sensitivity to smoke. Smoke detectors may operate alone, be inter-connected to cause all detectors in the premises to sound an alarm if one is triggered, or be integrated into a fire alarm or security system. Smoke detectors with flashing lights are available for the deaf or hearing impaired.

4.3.2.1 Rules to remember:

Smoke alarm batteries need to be tested every month and replaced with new ones at least once a year. Also, consider replacing the entire smoke alarm every ten years, or as the manufacturer guidelines recommend.

4.3.3 Sprinkler system

A sprinkler system is a built-in system of underground and overhead piping, connected to the automatic water supply.

The system is usually activated by heat from a fire, and the sprinkler heads then spray water over the fire area. Sprinkler systems are nearly 100 percent effective in extinguishing fires. Many sprinkler systems are supervised electrically from a central station, and alarms are transmitted to a fire department whenever the sprinklers operate or when a valve in the sprinkler system closes for any reason. If a fire-fighting unit arriving at a fire finds that the sprinkler system is not receiving sufficient water and pressure, a pumper is connected to the sprinkler system to supply additional water.

Fire sprinkler systems for multi-storey buildings are usually equipped with a fire pump, and a jockey pump and are linked to the fire alarm system. Although historically only used in factories and large commercial buildings, it can also be very effective in small building and homes.

Figure 12: Sprinklers and pump systems

4.4 Building fire exits

Each workplace building must have at least two ways of escaping from a building in a fire emergency and they should be at opposite sides of the building.

Fire doors must not be blocked or locked to prevent emergency use when employees are within the buildings.

Delayed opening of fire doors is permitted when an approved alarm system is integrated into the fire door design.

Exit routes from buildings must be clear and free of obstructions and properly marked with signs designating exits from the building.

O 

The following very easily cause unnecessary situations, which **could lead to fires**.

- Untidiness.
- Poor Housekeeping.
- Disobeying Regulations.
- Using defective equipment.
- Using tools incorrectly.

✪ FIRE PREVENTION PROGRAMMES IN THE WORKPLACE

Workplaces should have fire safety plans in place, incorporated into their health and safety policies and procedures. Fire prevention measures reduce the incidence of fires by eliminating opportunities for ignition of flammable materials.

✪ Responsibilities

Management

- ✪ Ensure all fire prevention methods are established and enforced
- ✪ Ensure fire suppression systems such as sprinklers and extinguishers are periodically inspected and maintained to a high degree of working order
- ✪ Train supervisors to use fire extinguishers for incipient fires
- ✪ Train employees on evacuation routes and procedures

Supervisors

- ✪ Closely monitor the use of flammable materials and liquids

- ✪ Train assigned employees in the safe storage, use and handling of flammable materials
- ✪ Ensure flammable material storage areas are properly maintained

Employees

- ✪ Use, store and transfer flammable materials in accordance with provided training
- ✪ Do not mix flammable materials
- ✪ Immediately report violations of the Fire Safety Program

4.5 How to prevent fires

Fire prevention is an all-day, all-night concerted effort by all employees in an organisation. A cigarette butt tossed in the wrong direction can cause an explosion. In the same way an oily wiping rag or a sparking tool can be as dangerous as an open flame in a petrol depot.

By following the following simple guidelines the workplace can become safer and the possibility of unplanned fires starting can be limited.

4.5.1 Class A fires (Ordinary combustibles)

- ➢ Keep storage and working areas free of trash
- ➢ Place oily rags in covered containers.

4.5.2 Class B fires (Flammable liquids or gases)

- ➢ Don't refuel petrol of diesel-powered equipment in a confined space, especially in the presence of an open flame such as a furnace or gas water heater.
- ➢ Don't refuel petrol or diesel-powered equipment while it's hot.
- ➢ Keep flammable liquids stored in tightly closed, self-closing, spill-proof containers.
- ➢ Pour from storage drums only what you'll need.
- ➢ Store flammable liquids away from spark-producing sources.
- ➢ Use flammable liquids only in well-ventilated areas.

4.5.3 Class C fires (Electrical equipment)

- ➢ Look for old wiring, worn insulation and broken electrical fittings.
- ➢ Report any hazardous condition to your supervisor.
- ➢ Prevent motors from overheating by keeping them clean and in good working order.
- ➢ A spark from a rough-running motor can ignite the oil and dust in it.
- ➢ Utility lights should always have some type of wire guard over them.
- ➢ Heat from an uncovered light bulb can easily ignite ordinary combustibles.
- ➢ Don't misuse fuses. Never install a fuse rated higher than specified for the circuit.

- Investigate any appliance or electrical equipment that smells strange. Unusual odours can be the first sign of fire.
- Don't overload wall outlets. Two outlets should have no more than two plugs.

4.5.4 Class D fires (Flammable metals)

Flammable metals such as magnesium and titanium generally take a very hot heat source to ignite; however, once ignited are difficult to extinguish as the burning reaction produces sufficient oxygen to support combustion, even under water. In some cases, covering the burning metal with sand can help contain the heat and sparks from the reaction.

Pure metals such as potassium and sodium react violently (even explosively) with water and some other chemicals, and must be handled with care. Generally these metals are stored in sealed containers in a non-reactive liquid to prevent decay (surface oxidation) from contact with moisture in the air.

White phosphorus is air-reactive and will burn/explode on contact with room air. It must be kept in a sealed container with a non-reactive solution to prevent contact with air.

All these metals are generally only found in small quantities in specific laboratories and accidental fires/reactions can be controlled or avoided completely through knowledge of the properties of the metals and using good judgment and common sense.

4.5.5 Class K fires (Commercial cooking oils)

- This type of fire can be prevented by adhering to good hygiene practices in the kitchen.
- A build-up of an oily residue on equipment should be prevented as this is very flammable.
- Spattering of oil especially near an open flame should be prevented.
- A fire blanket to smother the flames from an open pot can prevent the fire from spreading.

UNIT 5: FIRE FIGHTING PROCEDURES

Fires can be very dangerous and you should always be certain that you will not endanger yourself or others when attempting to put out a fire. The workplace should provide training to ensure that all employees know exactly what to do in the case of a fire so that the damage to property and human life are limited. The most important component of workplace fire safety should be the fire escape plan which should be drilled regularly.

5.1 Workplace fire escape plan

Escape plans help you get out of a burning building quickly. In less than 30 seconds a small flame can get completely out of control and turn into a major fire. It only takes minutes to fill a building with thick black smoke and become engulfed in flames.

5.1.1 Rules for an escape plan

- Practise the escape plan every month
- Practise feeling your way out in the dark or with your eyes closed, because rooms fill up with smoke quickly and electricity might go out
- A few persons (at least two) should be designated (appointed) to help disabled persons to evacuate the building in case of an emergency
- Always have two escape routes, if one way is blocked by fire or smoke, you will need a second way out. It might be a window leading onto the roof or using a collapsible ladder
- Make sure that you will be able to open windows for an escape:
  - Screens in front of windows should be able to be removed quickly
  - Security bars should be removable from the inside
- Immediately leave the building:
  - Do not waste time saving personal belongings
  - Take the nearest, safest exit route

- If you must escape through smoke, remember to crawl low on the floor under the smoke (smoke rises up and the best air is on the ground) and keep your mouth covered (preferably with a wet handkerchief or cloth). The smoke contains toxic gases which can disorient you or at worst, cause you to lose consciousness.
- Never open doors that are hot to touch
  - Use the back of your hand to feel the top of the door, the doorknob, and the crack between the door and door frame to make sure that fire is not on the other side
  - If it feels hot, use your secondary escape route.
  - Even if the door feels cool, open it carefully
- Brace your shoulder against the door and open it slowly. If heat and smoke come in, close the door and make sure it is securely closed, use the alternative escape route
- Do not use lifts in case of a fire, use the stairs. Most enclosed stairwells in buildings over two stories are "rated" enclosures – this means that they have fire walls which protect you from fire - and will provide you a safe means of exit; don't panic, descend stairs slowly and carefully
- Stay calm
- Fire doors must not be blocked or locked to prevent emergency use when employees are within the buildings
- Exit routes from buildings must be clear and free of obstructions and properly marked with signs designating exits from the building

- Designate (choose) a meeting place outside and once there, take roll call to ensure that everyone is safe

- Once out, **stay out**
- Remember to escape first, then notify the fire department. Never go back into a burning building for any reason. If someone is missing, wait until firefighters arrive. They are equipped to perform rescues safely

5.1.1.1 Special considerations

Security bars may help to keep you safe, but they can also trap you in a deadly fire! Windows and doors with security bars must have quick release devices to allow them to be opened immediately in an emergency. Make sure everyone understands and practises how to operate and open locked or barred doors and windows.

5.2 Rules for fighting fires

Fire extinguishers should only be used in the following circumstances:

- When everyone has been evacuated and accounted for at a safe meeting place.
- When the fire service has been called.
- When it is safe to do so considering the size and location of the fire.
- Access to the fire is unrestricted and a safe escape is possible at all times.
- Remember life is more important than property, don't put yourself or others at risk.
- Only when everyone is outside and the fire service has been called, should you attempt to put the fire out, and only if it is contained and you can safely escape.

5.2.1 First step

- Assist any person in immediate danger to safety, if it can be accomplished without risk to yourself.
- Call 10111 or activate the building fire alarm. The fire alarm will notify the fire department as well as other building occupants and shut off the air conditioning system to prevent the spread of smoke.

5.2.2 Second step

If the fire is small you may attempt to use an extinguisher to put it out.

When you use a fire extinguisher to fight a fire you must always approach the fire from an upwind position. If the wind changes and blows the fire towards you, immediately change your position to the other side of the fire with the wind at your back.

Whenever possible, use the "Buddy System" to have someone back you up when using a fire extinguisher. If you have any doubt about your personal safety, or if you cannot extinguish a fire, leave immediately and close off the area (close the doors, but do not lock them). Leave the building, but contact a firefighter to give whatever information you have about the fire.

Do not walk on an area that you have "extinguished" in case the fire reignites or the extinguisher runs out! Remember: any fire extinguisher is only functional for 10 full seconds or even less if the extinguisher was not properly maintained or partially discharged.

	**Remember:** **Should your path of escape be threatened...** **Should the extinguisher run out of agent...** **Should the extinguisher prove to be ineffective...** **Should you no longer be able to safely fight the fire...** **... leave the area immediately!**

5.3 Things to know before fighting a fire

However, before deciding to fight the fire, keep these things in mind:

- Know **what** is burning. If you don't know what is burning, you won't know what kind of extinguisher to use.
- Even if you have an ABC fire extinguisher, there might be something in the fire that is going to **explode** or produce **toxic** fumes.
- Chances are you will know what is burning, or at least have a pretty good idea, but if you don't, let the fire department handle it.
- Is the fire spreading rapidly beyond the point where it started? The time to use an extinguisher is at the **beginning** stages of the fire.
- If the fire is already spreading quickly, it is best to simply **evacuate** the building.
- The final rule is to always position yourself with an **exit** or means of escape at your back before you attempt to use an extinguisher to put out a fire. In case the extinguisher malfunctions, or something unexpected happens, you need to be able to get out quickly. You don't want to become trapped.
- If your clothing is on fire (and the floor is not), **stop, drop and roll** on the ground to extinguish the flames. If you are very near a safety shower or a fire blanket, you can use these instead, but do not try to make it "just down the passage" if you are on fire. If one of your co-workers catches fire and runs down the hallway in panic, tackle them and extinguish their clothing.

As you evacuate a building, close doors and windows behind you as you leave. This will help to slow the spread of smoke and fire. Don't lock the doors as this will make it more difficult for the fire brigade to enter the building.

5.3.1 Do not fight the fire if:

- **You don't have adequate or appropriate equipment**: If you don't have the correct type or large enough extinguisher, it is best not to try fighting the fire.
- **You might inhale toxic smoke:** When synthetic materials such as the nylon in carpeting or foam padding in a sofa burn, they can produce hydrogen cyanide, acrolein, and ammonia in addition to carbon monoxide. These gases can be fatal in very small amounts.
- **Your instincts tell you not to:** If you are uncomfortable with the situation for any reason, just let the fire department do their job.
- **The final rule** is to always position yourself with an exit or means of escape at your back before you attempt to use an extinguisher to put out a fire. In case the extinguisher malfunctions, or something unexpected happens, you need to be able to get out quickly. You don't want to become trapped.

5.4 Important rules to remember

5.4.1 Most fires start small

Except for explosions, fires can usually by brought under control if they are attacked correctly with the right type and size of extinguisher within the first two minutes!

5.4.2 Label and listing of fire extinguisher

A fire extinguisher should be "listed and labelled" by an independent testing laboratory. The higher the rating number on an A or B or C extinguisher, the more fire it can put out. Be careful, high-rated units are often heavier models. Make sure you can hold and operate the model you are buying.

5.4.3 A portable fire extinguisher can save lives and property

A portable fire extinguisher can save lives and property by putting out a small fire or containing it until the fire department arrives. Before attempting to fight a small fire be sure everyone is out of the building. It is important to have someone call the fire department. If the fire starts to spread or threatens your escape path, get out immediately!

Activity 5 – This Activity must be completed in your Portfolio of Evidence

Demonstrate the use of fire extinguishers available in your workplace.
note their observations and findings on how you have used the extinguishers.
This Activity is aligned to **Specific Outcome 2, Assessment Criteria 1**

Activity 6 – This Activity must be completed in your Portfolio of Evidence

Describe the safe practice policy at your workplace when putting out small fires. This Activity is aligned to **Specific Outcome 2, Assessment Criteria 4**

5.4.4 Know how to use the fire extinguisher

The operator must know how to use the extinguisher quickly, without taking time to read directions during an emergency. Remember that the extinguishers need care and must be recharged after every use.

If you fight a fire, remember the word PASS:...Pull...Aim...Squeeze...Sweep...

5.4.5 Pull

Pull the pin. Some extinguishers require breaking a seal, releasing a lock latch, pressing a puncture lever or other motion.

5.4.6 Aim

Aim low, pointing the extinguisher nozzle at the base of the fire.

5.4.7 Squeeze

Squeeze the handle. This releases the extinguishing agent.

5.4.8 Sweep

Sweep from side to side at the base of the fire until it appears to be out. Watch the fire area in case fire breaks out again, and repeat use of extinguisher if necessary.

5.4.9 Read instructions in advance

Most portable extinguishers work according to these directions. But some do not. Read and follow the directions on your extinguisher. If you have the slightest doubt about whether or not to fight a fire - **don't**! Get out and close the door behind you.

5.5 Dangers of fighting a fire

Temperatures within a burning building can go higher than 815° C. Brightly burning fires are very hot, but smouldering fires (not producing flames) are equally dangerous because they can produce

gases that can explode when enough oxygen is present. The hazards which fire fighters and occupants of a burning building are exposed to include:

- the breathing of very hot air which can burn the lungs
- poisonous smoke and gases
- air that doesn't contain enough oxygen
- burns
- injuries from jumping or falling
- broken glass
- falling objects
- collapsing structures.

5.6 What to do if someone catches on fire

If you should catch on fire:

STOP - where you are

DROP - to the floor

ROLL - around on the floor

This will smother the flames, possibly saving your life.

Just remember to **STOP, DROP** and **ROLL**.

If a co-worker catches on fire, smother flames by grabbing a blanket or rug and wrapping them up in it. That could save them from serious burns or even death.

	**Fire fighting terminology:** **Flashover - burst of sustained fire in a room** **Backdraft - explosion caused by sudden inlet of oxygen in a burning room**

5.7 Workplace reports

5.7.1 Report after discharging a fire extinguisher

Whenever a fire extinguisher has been used, even if only one squirt has been given, this has to be reported to the supervisor or department head. Workplaces have different types of reports that have to be completed: it could be an oral report or a written report. The workplace will instruct you in the type of report that is expected after the use of a fire extinguisher.

5.7.2 Incident report after a fire

Every workplace has a specific type of report that has to be completed after a fire or any other type of accident. This is called an incident report. This report usually has to be completed irrespective of whether someone was injured or not; irrespective of whether there was damage to property or not. Incident reporting ensures that the employer has a record on file to identify and eliminate hazards.

A report must to be completed as soon as possible when an occupational illness or incident occurred. If an employee is injured or develops a job-related illness as a result of their employment, they must complete and submit a report. If the employee is unable to complete the form, the supervisor must complete it on their behalf.

Copies of the incident or accident forms are usually available from the industrial nurse who will usually also complete the details of the injuries sustained by the worker. In cases where there is no clinic or industrial nurse on the site, the report will be completed by the production supervisor.

As workplaces have different rules and regulations, you will be informed of the specific rules in the workplace when you start working. Most workplaces have a designated safety officer who will inform you of the safety drills and requirements and who will arrange the safety meetings with the safety representatives.

UNIT 6: FIRE SAFETY SIGNS AND EQUIPMENT

Prevent fires and minimise damage to property and human life by making sure your workplace is prepared for any fire-related emergency. You may have all the necessary safety equipment available in the workplace, but if the employees are not trained in their use they serve no purpose at all apart from gathering dust and being the everyone's way. Apart from being a legal requirement under the Health and Safety regulations, safety signs are absolutely necessary to ensure everyone's safety in a fire emergency. It is a fact that when people panic they can't think logically and the fire safety signs will assist them to remember when the fire equipment, safety equipment and exits are.

6.1 Safety signs

Safety signs convey information or instructions by their shape, colour, and appropriate symbols/pictograms about specific objects, activities, or situations relevant to health and safety at work. There must be enough light for signboards to be visible inside a building.

Employers must ensure employees receive training on the meanings of appropriate safety signs. In addition, employees must also receive instruction and training in the actions that need to be taken in connection with those signs.

Safety signs must be properly designed, sufficient in number, correctly positioned, well maintained (including cleaning), in a good state of repair, and replaced when necessary.

The following safety signs should be posted in the workplace to help employees fight a fire quickly and safely.

According to safety regulations all fire safety signs must be red with a white pictogram on them. All safety signs must be green with a white pictogram on them.

Sign	Meaning and use
	A **fire extinguisher** safety sign should be hung directly above the extinguishers so employees know exactly where to go in a fire emergency.
	A **fire hose** safety sign should be hung next to the fire hose to draw attention to it.
	The **fire exit** safety sign should be hung directly above all the fire exits in the building. There should be at least two fire exits on opposite sides of the building.
	All **fire exit signs** or **emergency escape route signs** must have a sign with the pictogram of the 'man walking quickly', showing the direction of the fire exit.
	This is a combination **fire safety** sign. The red arrow shows the direction of the **fire escape route**. The pictogram of the 'man walking quickly' shows that this is a fire exit sign.
	This signs shows the position of the **fire alarm.** This alarm is activated in case of a fire.
	The **fire blanket sign** should be hung next to the location of the fire blanket which is usually inside a container.
	The **sprinkler stop valve** controls the operation of the sprinkler system that automatically starts when smoke or fire is detected by the fire alarm system.
	The **fire hydrant** sign shows the location of the fire hydrant that is connected to the main water supply of the building.
	The **fire bucket** sign shows the location of buckets of sand to be used as extinguishing agents.

	This safety signs provides information on what to do to **activate the fire alarm**.
	The **fire assembly point** shows the direction to take to reach the assembly point as has been included in the emergency escape plan of the workplace
	This safety sign shows a pictogram of how to use a **fire blanket** to extinguish a fire.

The various classes of fire designate the hazards involved and the most effective method of fighting the flames. In both commercial and residential buildings, different classes of fire are encountered and each requires specific knowledge on how it started and how to properly go about putting it out. Class C fires burn combustibles, but are distinct because they involve electrical components or equipment with the potential to be energized.

What happens when electrical equipment is energized?

Generally it is not dangerous to energize electrical components, gadgets, devices and equipment. They do not present a hazard unless they are handled incorrectly or have the potential to alter into something that presents a danger.

When a fire starts from a short circuit or another type of electrical problem, and the source of energy is still live, the situation is highly dangerous and a class C fire can typically occur. Note that this type of fire is designated as class E in the Australian standards.

Some examples of potential sources of class C fires include:

- Overloaded electrical outlets
- Incorrectly wired plugs, outlets and switches
- Short-circuits

If the flames have been designated as class C, the electrical supply needs to be identified and cut off. Electricity, when flowing freely, can serve as a constant source of ignition, allowing the combustibles to continue burning. All of the other elements of the fire tetrahedron are also present – oxygen, chemical reaction and fuel. In the case of class C, the electricity provides the ignition or spark.

Fighting Class C Fires

The most important thing to remember is that a class C fire cannot be fought with water; you must use non-conductive substances. Carbon dioxide fire extinguishers, and those loaded with a dry chemical like PKP, are effective.

Conductive substances such as water or foam can put the fire fighter at risk. When the source of electricity has not been cut off and water is sprayed into the flames, it can cause those electrical charges to spread and potentially create electrocution. If the electricity finds a path from the flames, through the water, to the fire fighter's body, and into the ground, serious injury usually occurs; in fact, that kind of charge can be fatal.

Firefighting Equipment
The first step in fighting class C fires is to cut off the source of power, basically transforming the flames into a standard class A fire. Standard fire extinguishing methods can then be used to douse the flames.

Most often firefighters wear footwear with rubber soles (approved footwear often has the Omega symbol). Such boots cut off the path of electricity, protecting the wearer from electrocution even if conductive materials are in the air, such as water or foam

6.1.1 Benefits of good safety signs

- Safety signs that are posted very visibly in the workplace illustrate how seriously the workplace regards the safety of workers and visitors to the workplace.
- Signs serve as a constant reminder of steps to be taken in an emergency.
- Support formal fire safety training and instruction.

6.2 Fire protection and safety equipment

Figure 13: Fire fighting equipment

The proper use of fire safety equipment in the event of a fire can mean the difference between life and death. All workers have to be properly trained in the use of Personal Protective Equipment (PPE) and Fire Protection Equipment.

✪ PRECAUTIONS IN THE CASE OF A FIRE

- ✪ Keep all doors and windows of the building closed until the firemen arrive.
- ✪ Put a wet cloth over the mouth and get down on all fours in a smoky room.
- ✪ Open the upper part of the window to get the smoke out
- ✪ Descend ladders with a regular step to prevent vibration
- ✪ Sprinkle sand instead of sawdust on floors of oil stores, keep shavings and kindling-wood away from steam boilers and greasy rags from lofts, cupboards, boxes, etc
- ✪ See that all lights and fires are out before retiring or leaving place of business
- ✪ Keep matches in metal or earthen vessels

6.2.1 Self Contained Breathing Apparatus

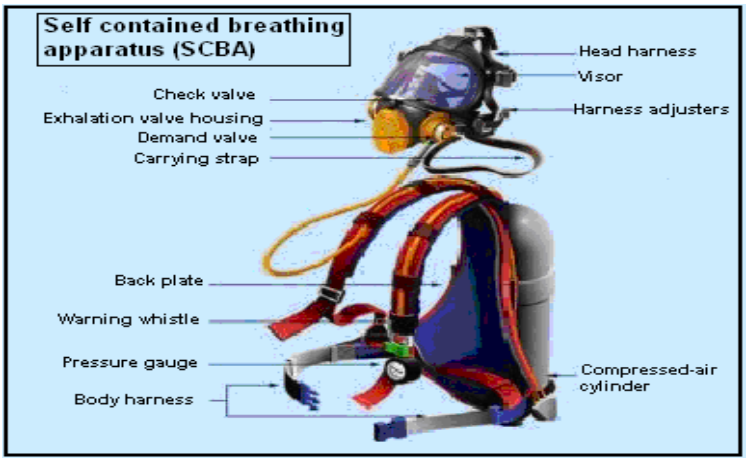


Figure 14: Self contained breathing apparatus

All workers in the chemical and related industries should be trained in the use of the Self Contained Breathing Apparatus (SCBA). Chemical and fire emergencies are to be prevented at all times, but in the event of an emergency the wearing of SCBA protective equipment ensures that the wearer can at least breath in oxygen.

The unit's main components consist of a harness, high pressure bottle, pressure regulator and full-face mask. High-pressure air cylinders are filled with compressed air and then stored until needed. The cylinders are rechargeable.

Once the cylinder valve has been turned on, it provides a continuous air supply to the system regulator via the high pressure hose. The pressure is reduced by the regulator for use by the wearer, and the low-pressure hose carries the breathable air into the facepiece. The air supply to the mask is just strong enough to prevent any toxic fumes from entering the wearer's mask and interfering with the breathing.

The time each cylinder lasts will be determined by a number of factors. The main factors will be the physical condition and size of the wearer and the work to be done. Generally, each bottle will last approximately 30 minutes from the time it is activated.

6.2.2 Fire fighting accessories

- Axe
- Flashlight
- Ropes

6.2.3 Fire fighting protective clothing

Figure 15: Fire fighter suit with SCBA

The previous figure illustrates the protective clothing to be worn when fighting a fire:

- Helmet with Face Shield
- Firefighter’s jacket and pants made from special fire retardant material
- SCBA
- Firefighter's Gloves
- *Firefighter's Boots*