



Natural Resources Conservation and Development Level-IV



**Based on March 2018, Version 3 OS and September
2021, Version 1 Curriculum**

**Module Title: Monitoring and Evaluating Fire Potential and
Prevention Method**

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| LG #55 | LO #1 Prepare for fire |
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| Instruction sheet |
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying and compiling OHS
- Selecting and checking appropriate equipment
- Planning evaluation processes
- Establishing and maintaining communication

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify and compile OHS
- Select and check appropriate equipment
- Plan for evaluation processes
- Establish and maintain communication

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| Learning Instructions: |
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Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
5. If you earned a satisfactory evaluation proceed to “Operation sheets
6. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”



Information sheet 1. Identifying and compiling Occupational Health and safety

1.1 Introduction

Fire is an important land management tool, but careless or criminal use of fire may have catastrophic impacts. Wild fire can be major causes of ecosystem degradation and may result loss of human life, economic devastation, social disruption and environmental deterioration.

Specially, forest fire involves combustion of organic material (fuel) that releases a large quantity of energy. The combustion energy is transferred from the burning fuel to unburned fuels ahead of the fire front. This phenomenon ensures the fire spread. The fire start depends on the flammability of the vegetation. The fire spread depends on a number of variables, including fuel characteristics (size, moisture content and arrangement), weather and topography.

A fire needs three elements - heat, oxygen and fuel. Without heat, oxygen and fuel a fire will not start or spread. A key strategy to prevent fire is to remove one or more of heat, oxygen or fuel.

1.2. Identifying Occupational Health and Safety (OHS)

Occupational safety and health (OSH) is generally defined as the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers. It is a science that taking into account the possible impact on the surrounding communities and the general environment. This domain is necessarily vast, encompassing a large number of disciplines and numerous workplace and environmental hazards.

Occupational health and safety requirement on fire include:

- The use of PPE and clothing
- Safety equipment
- First aid equipment
- Firefighting equipment
- Hazard and risk control
- Elimination of hazardous materials and substances



- Manual handling including shifting, lifting and carrying
- Machine isolation and guarding
- Hot work permits to be issued by authorized personnel
- Protective shields for welding and grinding activities
- Written/displayed evacuation procedures

1.3. Compiling OHS

During fire work or firefighting OHS requirements are selecting and using. Suitable personal protective equipment (PPE) which is used to protect the safety of workers during firefighting or controlling is always the last control measures to be considered. There is still a potential risk to the individual because the effectiveness relies on wearing and using PPE properly. PPE provides no protection for other workers or by sanders. If you have controlled or eliminated the risk by some other method you may not need to wear PPE.

Legislative requirements

These include:

- Confidentiality and privacy
- Following OHS
- Environment protection
- Create equal opportunity for both male and female
- Anti-discrimination
- Heritage and traditional land owner issues

Organizational requirement

Some organizational requirements needed in OHS are:

- Following legal organizational and site guidelines
- Following appropriate policies and procedures
- Applying OHS requirements, emergency and evacuation
- Ethical standards
- Recording and reporting,
- Access and equity principles and practices
- Equipment use, maintenance and storage,



- Environmental management (waste disposal, recycling and re-use guidelines)

1.4. Core OHS principles

Certain basic principles of OHS identified, include:

Rights and duties of the workers

The responsibilities of governments, employers and workers should be seen as complementary and mutually reinforcing in the common task of promoting occupational safety and health to the greatest extent possible within the constraints of national conditions and practice.

I. All workers have rights: Workers, as well as employers and governments, must ensure that these rights are protected and must strive to establish and maintain decent working conditions and a decent working environment.

According to International labor organization (ILO, 1984) specifically:

- Work should take place in a safe and healthy working environment;
- Conditions of work should be consistent with workers' well-being and human dignity;
- Work should offer real possibilities for personal achievement, self fulfilment and service to society.

II. Employers' responsibilities: Because occupational hazards arise at the workplace, it is the responsibility of employers to ensure that the working environment is safe and healthy.

This means that they must prevent and protect workers from, occupational risks.

III. Governments' duties: Governments are responsible for drawing up occupational safety and health policies and making sure that they are implemented. Policies will be reflected in legislation and legislation must be enforced. But legislation cannot cover all workplace risks and it may also be advisable to address occupational safety and health issues by means of collective agreements reached between the social partners. Policies are more likely to be supported and implemented if employers and workers through their respective organizations, have had a hand in drawing them up. This is regardless of whether they are in the form of laws, regulations, codes or collective agreements.

General safety requirements of workers



- Employer to ensure lighting at a work site is sufficient to allow work to be done safely.
- Worker must take all reasonable steps to ensure the equipment or material is contained, restrained or protected to eliminate the potential danger
- Describes the requirements applicable to employers if firefighters are acting as designated sign alerts.
- Employers ensure firefighters providing traffic control wear highly
- Visible clothing and if dark, wear retro-reflective cloth

**Self-check 1****Written test****Test I: Choose the best answer (2 point)**

1. From the following one is PPE used during firefighting or controlling?

A. Overall (Tuta) B. First aid equipment C. Firefighting equipment D. All

2. Which one is/are basic principles of OHS (2 point)

A. Workers' rights B. Employers' responsibilities

C. Governments' duties D. All

Test II: Short Answer Questions

1. Define OHS (3points).
2. List general safety requirements of workers (3 point)
3. List and discuss core OSH principles (4 point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

Score = _____

Rating: _____

Note: Satisfactory rating - 14 points

Unsatisfactory - below 14 points



Information sheet.2.Evaluating types and potential of fire hazard and positive effect

2.1. Introduction

A forest fire involves combustion of organic material (fuel) that releases a large quantity of energy. The combustion energy is transferred from the burning fuel to unburned fuels ahead of the fire front. This phenomenon ensures the fire spread. The fire start depends on the flammability of the vegetation. The fire spread depends on a number of variables, including fuel characteristics (size, moisture content and arrangement), weather and topography. Fire threat for the people living inside or adjacent to the forest area. Each year thousands of people lose their homes due to wildfires, and hundreds of people die in these accidents; additionally tens of thousands of domestic animals perish. Fire destroys agricultural crops and leads to soil erosion, which in the long run is even more disastrous than the accidents described before. According to Jurvélius, Mike, 2011; it is estimated that every year:

- 10 to 15 million hectares of boreal or temperate forest burn.
- 20 to 40 million hectares of tropical rain forest burn.
- 500 to 1,000 million hectares of tropical and subtropical savannahs, woodlands and open forests burn.

More than 90% of all this burning is caused by human activity.

2.2. Evaluating types of fire potential

Fire is the rapid oxidation of any combustible material. It is a chemical reaction involving fuel, heat and oxygen. These three elements, commonly referred to as the fire triangle, in the right proportions, will always produce a fire. Remove any one side of the triangle and the fire will be extinguished. Scholars have also introduced a 4th element in the equation, known as the uninhibited chain reaction thereby giving the fire chemical reaction an additional side. This is referred to as the fire tetrahedron.

Fire occurred from:

- Wild fire
- Electrical Storm
- Induced Fires



- Arson
- Accidental Fires
- Electrical Fires and
- Mechanical Fires

2.3. Fire triangle

All fires are the result of a chemical processes that occurs when three essential elements fuel, heat and oxygen are brought together in the necessary combination to support composition. The combination of the three elements of fire is called “fire triangle”. If any one of these three elements can be eliminated, the fire can be put out. In forest fuels, the principal inflammable component is carbon. The reaction is very simply expressed as carbon plus oxygen gives carbon dioxide plus energy ($C + O_2 = CO_2 + \text{heat}$)

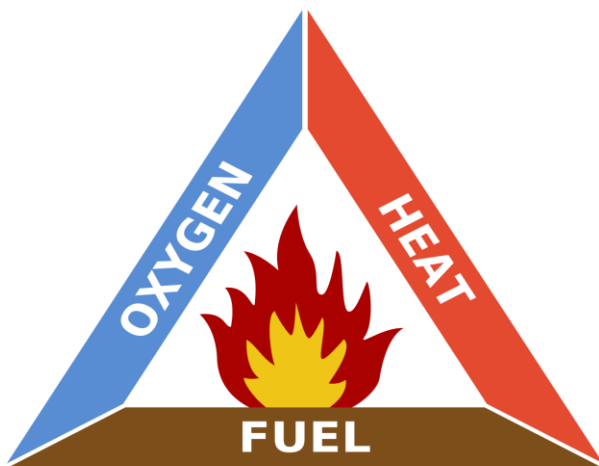


Fig 1. Fire triangle

2.3.1. Fuels (Forest fuels and characteristics)

a) Fuel Structure

This is the horizontal or vertical and spatial distribution. The horizontal and vertical structure can be continuous or discontinuous (e.g., distribution in small clusters or patches; lack of understory).

b) Fuel macro structure/size and arrangement

The spatial arrangement of the fine fuels (leaves, needles, and branches) influences the fire intensity: Loosely packed fine fuels have better contact with oxygen and ease the combustion process as compared to densely packed heavy fuels

c) Fuel chemical composition



A plant is composed of organic matter and water

Water content

A condition for the beginning of combustion is dehydration of the vegetation by evaporation of water, followed by thermal degradation (pyrolysis) and release of flammable gases. This physical mechanism requires a high amount of energy due to the high latent heat of the water. Thus, vegetation with high water content is not very flammable and combustible. The water content varies in function of the species, but also in function of the phenology, the physiological plant condition and the climatic influence.

Dry material

Dry material is composed of organic matter and minerals. Only the organic matter burns, releasing the necessary energy for the fire propagation. Thus, a plant with high mineral content has a reduced heat yield and is less combustible.

2.3.2. Combustive agent (oxygen)

In the case of forest fires oxygen is abundant in the atmosphere. Ignition and combustion depend strongly on this element. In order to ignite flammable gases (the product of pyrolysis) and maintain a flame, there has to be oxygen content of at least 15.75 % in the air; average oxygen content of the air is ca. 20 %. The wind plays an essential role for the fire spread because it supplies oxygen to the active fire.

2.3.3. Energy source/kindling temperature

The capacity of a fuel to catch fire depends on its characteristics, the energy source and the exposure time

- A weak energy supply allows the ignition of grass, whereas the energy supply has to be much higher for the ignition of wood.
- In order to ignite dry vegetation by a glowing ember the presence of wind is required.
- An electric arc cause by a broken power line or by lightning provides sufficient energy for ignition of dry Vegetation

2.4 Heat transfer and fire spread

The mechanisms of fire spread are distinguished in three phases:

- Combustion of vegetation material with heat emission;



- Heat transfer towards the fuel ahead of the fire front by conduction, thermal radiation and convection;
- Heat absorption by the plant before the flaming front and its ignition

2.5. Types of Fire Spread

Various types of fires are distinguished in accordance with the layers they are spreading:

a) Ground fires

- Burn in organic material of the soil layer (e.g. a peat fire) and usually do not produce a visible flame.
- They can penetrate in very deep organic deposits and smolder several decimeters under the surface.
- They are relatively rare in the Mediterranean region.

b) Surface fires

Burn the low and contiguous layers on the ground (litter, grass, undergrowth). They are the most common.

c) Crown Fires

Crown fires set ablaze the tree tops and spread quickly.

There are two types:

I. Independent crown fires: This spread in the crown independently from a surface fire.

II. Dependent crown fires: This spread in the tree tops only because of the heat released by the surface fire. They are «passive» if they contribute less to the propagation than the surface fire and «active» in the contrary case.

2.6. Phases of forest fire

During the development of a forest fire, one of three phases may surface:

I. Crawling fire

The fire spreads throughout lower level vegetation, including bushes.

II. Crown” Fire

When a fire “crowns,” the flames have spread to the top branches of trees and begin to travel at a rapid pace. Soon, the fire blankets the top of the forest. Whatever is caught underneath a crown fire is in serious danger, as the spreading of the fire may prove too



much for an individual to outrun. Windy conditions also make this type of fire especially hard to battle.

III. Jumping” or “Spotting” Fire

The power of the wind may carry burning branches and leaves over roads, rivers, and other objects, which creates distant fires.

IV. Smoldering Fire

Another type of forest fire centers on the slow combustion of surface fuels that do not create a flame, but instead spread slowly at a steady pace throughout the forest. Some smoldering fires stay around for days or weeks, and then disappear. Unfortunately, surrounding roots, seeds, and plant stems on the ground are greatly affected. This type of fire also produces a large amount of emissions, which threatens the atmosphere.



Figure 1. Wild fire risk and hazards

2.7. Classes of Fire

The classification of fire depends mainly upon the fuel involved.

There are five fire classes:

- Class A - fires involving solid materials such as wood, paper or textiles.
- Class B - fires involving flammable liquids such as petrol, diesel or oils.
- Class C - fires involving gases.
- Class D - fires involving metals.



- Class K - fires involving live electrical apparatus.

CLASS "A": These fires are fueled by ordinary combustible materials, such as wood, cloth, paper and many plastics. This type of fire burns with an ember, leaves an ash, and is best extinguished by removing the heat side of the triangle. Extinguishers suitable for Class "A" fires should be identified by a triangle containing the letter "A"; if color-coded the triangle will be green.*



CLASS "B": These fires are fueled by flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols and flammable gases. This type of fire burns on the surface of the fuels, and is best extinguished by a blanketing or smothering action. A fire of this type is fast-spreading and capable of engulfing a large area in a very short time. Extinguishers suitable for Class "B" fires should be identified by a square containing the letter "B". If color-coded, the square is red.*



CLASS "C": These fires occur in energized electrical equipment, where the electrical non- conductivity of the extinguishing media is of importance. Blanketing or smothering this type of fire with a non-conducting extinguishing agent is of prime importance. Water, or solutions containing water, is never to be used on a Class "C" fire. Extinguishers suitable for Class "C" fires should be identified by a circle containing the letter "C"; if color-coded the circle is blue.



NOTE: If possible, shut off the source of electricity as soon as possible.

Extinguishers suitable for more than one of the three classes of fire defined above may be identified by multiple symbols (ABC).

Generally the extinguishing agent is referred to as DRY CHEMICAL.

CLASS “D”: These fires involve combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium. Generally the extinguishing agent is referred to as DRY POWDER. These extinguishers should be identified by a star containing the letter “D”, if color-coded the star is yellow.



CLASS “K”: These are fires in cooking appliances that involve combustible cooking media such as vegetable or animal oils and fats. The extinguishing agent is referred to as WET CHEMICAL. These extinguishers should be identified by the letter “K.”



2.8. Types and operations of extinguishers

I. Pressurized Water Extinguishers, 2 ½ Gallon

- For use on: class "A" fires
- To operate:
 - ✓ Pull out the pin or push the lever on top of the extinguisher handle to the rear.
 - ✓ Grasp the hose, squeeze the handles together and direct the stream at the base of the fire.



- ✓ Turn on or off at will by squeezing or releasing the handles.

II. Carbon Dioxide Extinguishers

- For use on: class "B" and "C" fires
- To operate:
 - ✓ Carry the extinguisher to the fire.
 - ✓ Remove the safety pin or locking device, point the horn at the base of the fire and discharge by squeezing the handles together. Be sure not to place your hand on the horn when discharging the contents of the extinguisher or you could get a freezer burn.
 - ✓ Discharge at the base of the fire and move the horn from side to side at a moderate speed. Too rapid a movement will dissipate the vapor, and too slow a movement may discharge more than is needed at one time.
 - ✓ Continue to apply contents for a short time after the fire has been extinguished to prevent possible re-ignition.

IV. Wet Chemical

- For use on: Class "K" fires
- To operate:
 - ✓ Carry the extinguisher to the fire by its handle and operate according to the instructions on it (instructions usually read: remove safety pin or locking device, grasp nozzle and squeeze handles).
 - ✓ The agent is discharged as a fine spray, which reduces the possibility of splashing hot grease.
 - ✓ In addition to offering rapid-fire extinguishments, a thick foam blanket is formed to prevent re-ignition, while cooling both the appliance and the hot cooking oil.

V. Dry Chemical Extinguishers

- For use on: Class "A", "B", and "C" fires
- To operate:
 - ✓ Carry the extinguisher to the fire by its handle and operate according to the instructions on it (instructions usually read: remove safety pin or locking device, grasp nozzle and squeeze handles).



- ✓ To reduce the intensity of the flames, direct the stream at the base of the flames and move rapidly from side to side to gain full coverage.
- ✓ In small spill fires, where the entire width can be covered by the sweep of the dry chemical stream, attack the fire from the front. The stream will discharge over the entire spill area.
- ✓ Work with any wind or breeze at your back.

2.9. Potential of fire hazard

Fire hazards are anything that may create a fire. If you know the fire triangle, then it will be no surprise that fire hazards come into three categories:

- Sources of ignition/heat
- Sources of fuel
- Sources of oxygen

These are the 3 things needed for a fire. Fire Potential is defined as the likelihood that a wildland fire event will require mobilization of additional resources from outside the area in which the fire situation originates. During evaluation of fire potential and its effect, assessing environmental conditions and operating procedures for any possible aspects which may cause fire is crucial.

2.9.1. Ignition fire hazards

The majority of fires need an ignition source to start. Identifying ignition sources in your workplace is important so that you can remove them or control them. Not all ignition sources can be removed. But, where they can't be removed, they can be separated from combustible materials and other fuel sources.

Some ignition fire hazards include: Smoking materials

- Overheating machinery
- Radiated heat
- Cooking equipment
- Sparks from equipment
- Friction
- Hot surfaces
- Electrical equipment
- Boilers



- Welding equipment
- Naked flames it's important to consider the use and location of ignition sources. Electrical equipment might be perfectly safe for everyday use. But, take it into a flammable atmosphere, and the risk increases dramatically.

2.9.2. Fuel fire hazards

Fuel is needed to burn for a fire to start and to maintain the fire. When we talk about fuel as a fire hazard we don't just mean petrol and diesel the fuel you fill up your car with. Fire is not fussy and accepts a wide variety of fuel sources. Fuel for fire can come in the form of combustible materials, oils, flammable liquids and gases. Removing the fuel, reducing fuel, and separating the fuel from ignition sources are all ways to minimize fire risk.

So what types of fuel are present in your workplace? Here are some examples:

- Paper
- Cardboard
- Packaging
- Waste
- Furniture
- Textiles
- Metals
- Wood
- Plastics etc.

2.9.3. Sources of oxygen

Oxygen is everywhere. We need it to survive and luckily for us, it's in the air we breathe. Fires also need oxygen to survive. Knowing where oxygen is readily available and how it can be stopped can help prevent fire spread.

- Open windows
- Open doors
- Natural ventilation
- Air conditioning systems



Not all ventilation is bad. Sometimes, you might need good ventilation to reduce the risk of fire. For example when storing or using flammable liquids good ventilation can prevent the build-up of vapor and the creation of a flammable atmosphere.

2.10. Positive effects of fire

Fire is often associated with negative impacts on the environment. We usually think of the damage and devastation fire causes to wildlife and vegetation, but a fire event can also be beneficial for our plants and animals.

For example fire:

- Cracking seed coats and triggering germination
- Triggers woody seed pods held in the canopy to open, releasing seed onto a fresh and fertile ash bed
- Clears thick understory reducing competition for seedlings
- Encourages new growth that provides food for many animals
- Creates hollows in logs and trees that can be used by animals for nesting and shelter.
- Burning controls the age of the forest by interrupting and altering succession. Periodic fire limits the number of saplings that survive and hence the number of trees per hectare.
- Fire influences nutrient cycling and flow. It converts organic matter to ash and increases levels of available phosphorous, potassium, calcium and magnesium. However it favor the germination of seed.
- Fire impacts on habitats, stimulating fruiting and flowering of species and increasing the availability seeds and berries. The quantity and quality of browse increase after fire and the population of wood boring insects increase. This is important to quail and woodpeckers.
- Control weed and used for land clearing

Benefits of fire in wild land

Fire in the wildlands does not have to be a villain. Fire that is low in intensity and does not grow out of control benefits our wild lands and is actually vital to the survival of several species.

Some benefits of fire in wildland:

Cleaning the forest floor



Fire removes low-growing underbrush cleans the forest floor of debris, opens it up to sunlight and nourishes the soil. Reducing this competition for nutrients allows established trees to grow stronger and healthier. History teaches us that hundreds of years ago forests had fewer, yet larger, healthier trees. Forests today have more trees than in the past but they are not as large or healthy. Established trees have to compete with undergrowth for nutrients and space. Fire clears the weaker trees and debris and returns health to the forest. Clearing brush from the forest floor with low intensity flames can help prevent large damaging wildfires that spread out of control and completely destroy forests.

Providing habitat

Wildlands provide habitat and shelter to forest animals and birds. Fire clears wildlands of heavy brush, leaving room for new grasses, herbs and regenerated shrubs that provide food and habitat for many wildlife species. When fire removes a thick stand of shrubs, the water supply is increased. With fewer plants absorbing water, streams are fuller, benefiting other types of plants and animals.

Killing disease

Fire kills diseases and insects that prey on trees and provides valuable nutrients that enrich the soil. More trees die each year from insect infestation and disease than from fire. Many forests struggle against diseases such as pitch canker and bark beetle infestations – pests that destroy the part of the tree that delivers nutrients to the roots, leaves and needles. Fire kills pests and keeps the forest healthy. Vegetation that is burned by fire provides a rich source of nutrients that nourish remaining trees.

New generations

Change is important to a healthy forest. Some species of trees and plants are actually fire dependent. Some trees have fire resistant bark and cones that require heat to open and release seeds for regeneration. Chaparral plants, including manzanita, chamise and scrub oak, also require intense heat for seed germination. These plants actually encourage fire by having leaves that are covered with flammable resins. Without fire, these trees and plants would eventually succumb to old age with no new generations to carry on their legacy.



| | |
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| Self-check 2 | Written test |
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Test I: Choose the best answer (2 point)

1. From the following one is type of fires class that involving solid materials such as wood and paper

- A. Class A fire B. Class B fire C. Class C fire D. Class D fire

2. Which one is source of potential of fire hazard?

- A. Sources of ignition/heat B. Sources of fuel
C. Sources of oxygen D. All

Test II: Short Answer Questions

1. Write the step to operate pressurized fire extinguishers (2 point).
2. List the positive and negative effects of fire (3 point)
3. Write type of fire depend on its spread (3)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 12 points Unsatisfactory - below 12 points



Information sheet 3. Selecting and checking appropriate equipment

3.1. Introduction

Firefighting equipment is equipment designed to extinguish fires or protect the user from fire. It may be used by trained fire fighters, untrained users at the scene of a fire or built into a building's infrastructure (such as a sprinkler system). Firefighting equipment includes not only fire hoses and fire extinguishers but also fire-resistant protective clothing, fire-resistant gloves, respirators and communication equipment.

Firefighting equipment is generally comprised of hundreds of different pieces of equipment and technology.

3.2. Firefighting equipment

Terrestrial or aerial forest fire suppression requires equipment adapted to the:

- Fire type: surface or ground fire
- Development phase: ignition, large uncontrolled fire
- Environmental conditions: access, topography

3.2.1. Terrestrial equipment

I. Standard equipment

These are shovels, hoe-rakes (Pulaski), fire beaters, pickaxes, which are only used during the initial attack, but seldom after the ignition, when a fire is still small or fires of low intensity or for mop-up. Those hand tools are used in France in zones difficult to access, for example by crews transported by helicopters.

II. Backpack sprayers

These are also reserved for low intensity fires or first intervention, because the water reserve is small and the range of sprayers is limited to 5 m.

III. Initial attack vehicles

Used for prevention surveillance, these cross country vehicles are provided with a water tank allowing an immediate first intervention on starting fires.

Taking into account this double function, the characteristics of this type of equipment is a compromise between:



- Mobility allowing an effective surveillance and a fast access on the spot of ignition.
- Sufficient water capacity to suppress fires with a first intervention or to slow down them in waiting for reinforcements.

IV. Water tankers

These are cross-country vehicles specifically equipped for fire suppression, equipped with pumps, lances and high capacity water tanks. The tanks are variable in size according to the type of equipment, the whole set-up has to reconcile, as for the vehicles for initial attack, mobility to reach fire, functionality during the firefighting activities, and an optimal water tank size.

- On one hand, the higher the water capacity, the more the mobility of the vehicle is reduced. Thus, it is necessary to choose the water capacity adapted to the access conditions of the forest area.
- On the other hand, a water lance can only fight approximately ten meters fire line.

V. Fire Extinguisher

Fire extinguisher portable or movable apparatus used to put out a small fire by directing onto it a substance that cools the burning material, deprives the flame of oxygen, or interferes with the chemical reactions occurring in the flame. It can use water, dry chemical powder, foam, carbon dioxide or other substance.

Portable fire extinguisher safety

A portable fire extinguisher by definition is an item of equipment for the purpose of extinguishing a fire. The reality is however that a portable fire extinguisher is effective only for the type and size of a fire that it is rated for.

Portable fire extinguishers are generally provided as "first attack" units in firefighting and should be used only in early stages of fire before the fire grows to a stage that is beyond the capacity of the extinguisher.

Parts of portable fire extinguisher include:

- Storage Vessel
- Extinguishing Agent
- Propellant (Or Expellant)
- A Valve and



- A Directional Nozzle (discharge hose)



Figure 2. Portable fire extinguisher

Operating a fire Extinguisher

To operate a fire extinguisher, there are a few things you need to remember. First, the wrong kind of extinguisher can make the fire worse. Identify the right type of fire extinguisher based on its fire class. Second, all portable fire extinguishers are operated the same way. There are four easy steps, called the P-A-S-S, or “**Pass**” technique:

1. Pull the extinguisher’s pin
2. Aim the extinguisher’s nozzle at the base of the fire
3. Squeeze the handle
4. Sweep spray across the base of the fire



Figure 3. Parts of Fire extinguisher and operation step

Fire fighter's gear: Fire resistant outer suit, inner lining suit, inner and outer gloves, woolen socks, fire resistant shoes, helmet (with or without headlight), communication system and breathing apparatus

Installed firefighting system: Main water supply network, hydrant, sprinkler (automatic or manual), emergency fuel and electric cut off system, portable generators and portable pumps

Communication equipment: Walkie-talkie, radio, broadcasts, landline telephone, sound powered telephone, cell or mobile phone and voice pipe

Fire detection and alarm systems: Smoke, flame, spark detectors, local, centralized automatic, semi-automatic and manual fire alarm systems

Other accessories: Water and sand bucket, shovel, hammer, fire axe, cutters, hooks, fire blanket, emergency lifesaving apparatus and emergency lights.

3.2.2. Aerial equipment

Type of equipment in use

- Helicopters and
- Airplanes are very useful for fire suppression, like for the tactical support of fire crews on the ground or when the access conditions to the fire are difficult on the ground.

A. Helicopters

They can be used for personnel transport or active fighting such as dropping water (in French so-called “water bomber helicopters” or HBE1).

There are several back-up systems for water re-filling:

I. Bucket suspended on a winch below the helicopter

The filling is done by immersion in water. The bucket is difficult to fill and to handle and, during transport, under the effect of swinging, much from water is lost.

II. A plastic bag fixed beneath the helicopter, filled with a hose, connected to a tanker or of a fixed water point.

III. Combination of the two preceding techniques. A bucket is fixed on a reinforced chassis and is equipped with a pump and a filling hose. This system allows to carry until 5,000 l.

Having a great flexibility, helicopters have the advantage of being able to operate independently of an airport for the water supply, which can be carried out by aspiration in hovering above a water point, when the water reserve is located under the flight engine. Their capacity is, however, reduced, if compared to planes.



Figure 4. Kenyan firefighter helicopter throwing water over a huge blaze on Simien Mountains National Park

Source: BBC NEWS Africa

B. Airplanes

Fixed-wing airplanes are used for surveillance, for example as reconnaissance plane which is equipped with water tanks and for active fire suppression. Faster than helicopters, they also have a much bigger water reserve (3,000 to 6,000 l), which allows increasing their intervention capacity on a fire. With the exception of amphibious planes



(Canadair), airplanes are strongly dependent of an airport for the refilling of their water tanks.



Figure 5. Rotary-wing aircraft are being used to fight wildfires in Europe, the US and Canada.

Terrestrial or aerial forest fire suppression requires equipment adapted to the:

- Fire type: surface or ground fire
- Development phase: ignition, large uncontrolled fire

Environmental conditions: access, topography



| | |
|---------------------|---------------------|
| Self-check 3 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

Terrestrial or aerial forest fire suppression requires equipment adapted to the:

- 1. Terrestrial or aerial forest fire suppression equipment depend on
 - A. Fire type
 - B. Fire Development phase
 - C. Environmental conditions
 - D. All
- 2. From the following which one is not terrestrial firefighting equipment?
 - A.. Standard equipment
 - B. Backpack sprayers
 - C. Initial attack vehicles
 - D. Helicopter

Test II: Short Answer Questions

- 1. List parts of portable fire extinguisher (4 point)
- You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 8 points Unsatisfactory - below 8 points



Information sheet 4. Planning evaluation processes

4.1. Introduction

All activities in establishing infrastructures to support fire forecasting, prevention and firefighting, will inevitably lead to failure if not properly planned.

Fire Management Plan is a document for a specific forest that:

- Defines and plans actions and infrastructures required to meet the firefighting strategy and the particular requirements of the forest owner;
- Assures coherence between these activities and the general management plan of the territory.
- The regional fire management plan is based on the analysis of the variables of the natural environment (climate, topography, vegetation) and
- Anthropogenic components (settlements, attitudes, stereotypical behavior, land use).

A fire management plan for the territory requires a good knowledge of the environment and an analysis of its ecological (climate, relief, type of vegetation) and socio-economic (uses of the forest, occupation of the ground, etc.) components. The study of historic fires allows determining the forest fires risk.

It provide decision support to aid managers in making informed decisions on the management of wild land fires.

There needs to be a Fire Management Plan for every area that could potentially have wild fire on it.

Fire Management Plan (FMP) main parts are:

- Introduction
- Policy
- Resource management planning
- Fire management area description
- Operational guidance
 - ✓ Unplanned ignitions preparedness
 - ✓ Planned fuels treatments



- ✓ Prevention, mitigation and education

A. Introduction

Provide a general description of location of the area covered by the forest owner with vicinity map and agencies involved.

- Identify areas of different management designations (e.g. wilderness, timber harvest areas, research natural areas, cultural/religious areas, habitat management areas)
- Identify areas of different management designations (e.g. wilderness, timber harvest areas, research natural areas, cultural/religious areas, habitat management areas)

B. Resource management planning

Describe fire management related goals, objectives, standards, guidelines and/or desired future conditions that apply across the entire area

Examples of these goals, objectives, standards, guidelines and desired conditions are:

- Firefighter and public safety,
- Using fire to maintain pastoral health,
- Desired plant community composition and structure

C. Area description

- Physical and biological description (e.g. topographic features, fuel types, special conditions that may result in extreme fire behavior, access, Fire Regime , high value concerns, special areas), Jurisdictional boundaries (e.g. adjacent or intermingled federal, private, tribal, state, county ownership),
- Communities and other values at risk to include: Threatened & Endangered species, cultural concerns, areas of special concern, water quality, invasive species, and infrastructure (power lines, fences, etc.)
- Fire behavior and weather descriptions, past fire behavior and perimeter histories, control problems
- Areas within the plan can be further divided into smaller areas if there is enough of a difference in how that land is affected by fire and actions you would take on that land would be different.
- Smaller areas within a Fire Management Plan, Fire Management Units.



D. Preparedness

- Preparedness (including training, qualifications, readiness),
- Cooperative or mutual aid fire management agreements,
- Size up, initial response and extended response procedures,
- Early Warning procedures
- Records management,
- Water sources

E. Communication Plan

- Available Resources
 - ✓ Equipment
 - ✓ Personnel
- Available Maps
- Access Routes
- Detection plan
 - ✓ Use of Satellite Technology
 - ✓ Use of Local Community
 - ✓ Use of Patrols
 - ✓ Detection can be a part of Early Warning
 - ✓ Use of aircraft
 - ✓ Others?



| | |
|---------------------|---------------------|
| Self-check 4 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

1. Which one is included under fire management plan

A. Available Resources B. Available Maps C. Detection plan D. All

2. Area description in fire management plan contain

A. Physical and biological description

B. Communities and other values at risk

C. Fire behavior and weather descriptions

D. All

Test II: Short Answer Questions

1. Define Fire Management Plan (4 point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

Score = _____

Rating: _____

Note: Satisfactory rating - 8 points

Unsatisfactory - below 8 points



Information sheet 5. Establishing and maintaining communication

5.1. Introduction

An effective high quality communications network allows a good communication and coordination between the various actors of fire prevention and suppression. If well organized, it allows to reduce delay times until initial attack. The transmissions system for information generally used for forest fire protection is the radio operator system. However, a particular telephone network is sometimes also used. In any transmission network, the quality of the procedures and their precise definition are essential, so that only information circulates that is necessary, clear, precise, and concise.

5.2. Communication equipment for fire protection

The different activities of fire control require different types of communication system and equipment. These are include:

- Radio operator system
- Telephone network
- Visual or sound signals
- Messenger

A. Radio-telephone

Stationary radios

In general stationary and powerful equipment is linked to offices, (with an antenna on the roof of the building), they are the main points of the exploitation of the network.

Mobile radios: with a power of 10 to 15 Watts, these mobile stations can be installed in a vehicle and be fed by the battery of this one. Portable radios: they have the advantage of being light and easily to operate, therefore they are very practical on the ground; their principal weakness is the power limitation (2 to 5 Watts), which makes them much less powerful than from mobile stations. Provided with an autonomous battery, they cannot function more than 24 hours.

Radio-telephone networks can work on:

- I. **LF-Frequency:** these radio-telephones can be used only over very short distance, for instance between section and crew leaders on the fire line.



II. HF-Frequency: these radio telephones can be used over a long distance, for instance between district headquarters and the alarm center.

III. VHF- Frequency: these radio telephones can be used over a short distance, but are very useful in many different forest fire control activities, such as patrolling and fire suppression.

B. Telephone or Mobile phones

This mode of communication is increasingly used by persons in charge of forest fire protection. However, it does not ensure a total coverage of the territory. Moreover, the operational standard can sometimes be saturated at the time of a fire occurrence.

C. Visual or sound signals

These are used mainly during fire suppression operation and for reporting fire alarms to the people of the village. If visual or sound signals are used they must be clear and direct, in order to be fully understood by both parties.

D. Messenger

Messengers can be used on the fire line for instance. The bicycle and the moped are suitable vehicles for the messengers because they can be used on forest paths.

5.3. Public campaign for fire protection and controlling

Many vectors can be used to carry out a public Relation campaign.

Some of them are:

- Posters
- Patrols on foot, horse...
- Conferences
- Exhibits
- Written documents (booklets, books for children, specialized reviews...)
- Audio-visual documents

The responsibility to inform, communicate and train is in the hands of forest fires experts and decision makers.

An effective communication program must answer the three following questions:

- Who is the target group?
- What message is to be passed?
- Which media should be used



| | |
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| Self-check 5 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

- 1. Which one is included under communication equipment for fire protection?
A. Radio B. Telephone C. Visual or sound signals D. All
- 2. From the following which one is/are used to carry out a public relation campaign?
A. Posters B. Patrols on foot, horse... C. Conferences D. All

Test II: Short Answer Questions

- 1. Write some communication equipment used for fire protection (4 point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 8 points Unsatisfactory - below 8 points

**Operation Sheet 1****Prepare for fires**

Objective: To identify types and potential of fire hazard

To demonstrate laboratory or work shop in your compound and natural forest or wilderness near you area.

Materials, tools and equipment required:

- PPE and clothing
- First aid equipment
- Binoculars
- Compass
- Paper
- Pen
- Note pad

Procedure:

- ✓ Wear safety cloths
- ✓ Collect all tools, materials and equipment used for identifying types and potential of fire hazard
- ✓ Observe the area and collect data required.
- ✓ Identify types of fire and potential hazard
- ✓ List type hazards and prevention methods



| | |
|-------------------|--------------------------------|
| LAP Test 1 | Practical demonstration |
|-------------------|--------------------------------|

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task 1- Identify potential fire hazards in the selected area

Task 2- Identify fire hazards and prevention methods

Task 3- Apply potential fire hazards prevent techniques



| | |
|---|--------------------------------------|
| LG#56 | LO #2. Assess fire prevention |
| Instruction sheet | |
| <p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none">• Monitoring and reporting Weather conditions• Monitoring equipment conditions• Monitoring hazardous and flammable substances <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none">• Monitor and report Weather conditions• Monitor equipment conditions• Monitor hazardous and flammable substances | |
| Learning Instructions: | |
| <p>Read the specific objectives of this Learning Guide.</p> <ol style="list-style-type: none">1. Follow the instructions described below.2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.3. Accomplish the “Self-checks” which are placed following all information sheets.4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks). | |



Information sheet 1. Monitoring and reporting Weather condition

1.1. Introduction

The first step of any fire risk assessment is to identify fire hazards. Fire hazards in your workplace are anything that may create a fire. If you know the fire triangle, then it will be no surprise that fire hazards come into three categories: ignition, fuel and oxygen.

1.2. Monitoring weather condition

The types of weather that create favorable conditions for the start and spread of wildfires are collectively referred to as fire weather. Some types of weather condition that causes fire spread and enhance fire potential include:

- Temperature
- Wind condition
- Relative humidity
- Atmospheric instability etc.

a. Temperature

Air temperature has a direct influence on fire behavior. The warmer the air temperature, the more the fuel sources (leaves, grass, branches, logs, etc.) are already heated by the sun, and the less additional heat is needed to ignite a spark.

b. Wind

There's a reason for the expression "Don't fan the flames." Wind increases the supply of oxygen which causes a fire to burn hotter. As it blows over a surface, it also removes moisture/increases evaporation, which dries the fuel source out even more. Finally, wind can increase the spread of fire by blowing hot embers to new areas outside of the parent fire.

c. Relative humidity

Recall that relative humidity tells us how much moisture (in the form of water vapor) is in the air versus how much moisture the air could hold at its current temperature. The lower the RH, the quicker the moisture will leave a fuel source and the more readily a fire will start and burn.

d. Atmospheric instability



Atmospheric stability describes the atmosphere's tendency to either resist or encourage vertical motion. If the atmosphere is unstable, air easily moves upward. This type of environment increases fire activity because the vertical movement and mixing of air (updrafts) and increases the potential for gusty surface winds.

Other weather conditions and events that can impact fires, and even cause them; include lack of recent rainfall, drought conditions, electrical storms, and excessive heat and lightning strikes.

1.3. Reporting weather condition (potential of fire)

A fire hazard is generally considered to be an unsafe condition that could potentially cause a fire such as overgrown, dead brush, improperly stored flammable/combustible liquids or use of fireworks. To report a fire hazard call central fire protection district's community risk reduction division at free call number or submit a report through our online fire hazard report form for investigation and follow up.

Some typical expressions used in a weather report are:

- Sunny
- Cloudy
- Showers
- Thunderstorm
- Foggy
- Snow

Table 1. Weather report format

| Date | Day of the week | Weather condition | High temperature | Low temperature | Av. temperature | Rainfall amount | Sunrise | Sunset |
|------|-----------------|-------------------|------------------|-----------------|-----------------|-----------------|---------|--------|
| | | | | | | | | |
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| Self-check 1 | Written test |
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Test I: Choose the best answer (2 point)

1. Which is types of weather condition that causes fire spread and enhance fire potential

- A. Wind B. Humidity C. atmospheric stability D. All

Test II: Short Answer Questions

1. How temperature affect fire risk and fire hazards (4 point)

2. Some typical expressions used in a weather report (4)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

Score = _____

Rating: _____

Note: Satisfactory rating - 10 points

Unsatisfactory - below 10 points



Information sheet 2. Monitoring equipment conditions

Monitoring equipment condition that because fire ignition is very important to reduce fire risk happened. Electrical equipment and machinery can overheat and start a fire. Keeping combustible materials nearby creates even more of risk. Loose wires, Overloaded plugs and faulty connection can all result in dangerous electrical fires.

2.1. Electrical over heating

There are three main independent modes of electrical overheating that lead to electrical fires:

- Excessive current
- Poor connections and
- Insulation breakdown.

I. Excessive current: Excessive current is rare because circuit breakers and fuses (if sized correctly) typically protect against this occurrence.

II. Poor connections: Poor connections can be very efficient at overheating, because they can generate a high wattage over a small area for a long period of time. If the watt density is high enough, the connection will glow.

III. Insulation breakdown: One of the more misunderstood modes of overheating is insulation breakdown. On one hand, we know how frayed cords can cause overheating when the insulation is defeated, and strands of the hot wire touch strands of the neutral or ground wire. This causes a parallel short circuit and arc and sparks may be ejected/can ignite nearby fine combustibles, such as paper. However, there are other ways for an overheating occurrence to ignite into flaming combustion, one of which is called arc tracking.

With wet arc tracking, a conductive liquid makes contact with an electrical circuit. Leakage current across an insulator can begin and grow to arc tracking, which can glow and be hot enough to ignite combustibles. Some examples of this are salt water on aquarium electrical devices or the rinse aid in a dishwasher leaking onto internal wiring. If this liquid bridges between energized and no energized conductors, current can flow through the liquid and heat plastic insulation supporting the conductors.



Over time, this current can degrade the plastic, turning a hydrocarbon into elemental carbon, which is semi-conductive. This carbon itself can then conduct increasing amounts of leakage current, which can then glow and ignite combustible gases coming off the plastic material.

Improve electrical safety

2.2. Improve electrical safety

Common requirements requirement for electrical safety improvements include:

- Install ground-fault circuit interrupter (GFCIs) indoors, if possible, so they don't get wet. GFCIs can overheat and become a fire hazard or fail to operate and become a shock hazard if they are wet.
- Think critically about hazardous or marginal applications and locations (saw mills, dusty areas, pool pump rooms) and consider upgrading from an indoor to a hazardous-rated enclosure.
- Avoid the poor wiring practices as noted in Potential Problem Areas.

Some commonly known defective wiring practices that can lead to electrical fires include:

- Loose connections.
- Aluminum and copper conductors spliced together with an incorrect connector. Aluminum oxide causes overheating.
- Some insulation piercing connectors when applied incorrectly can make poor connections due to insufficient contact area or pressure.

To reduce the effect of fire risk and hazards caused from electrical and other equipment, every workers know and used:

- Proper use of fire extinguisher
- Fire alarm system
- Fire exit sign
- Emergency lighting
- Fire blankets and
- Using first aid kit



| | |
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| Self-check 2 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

1. Effective, portable fire extinguishers must be
 - A. Approved by a recognized testing laboratory
 - B. Used for proper type for the class of fire expected
 - C. Located where they are readily accessible
 - D. All
2. Proper fire risk and hazards control every workers
 - A. Proper use of fire extinguisher
 - B. Fire alarm system
 - c. Fire exit sign
 - D. All

Workers used effective equipment reduce the effect of fire risk and hazards

- A. Wind
- B. Humidity
- C. atmospheric stability
- D. All

Test II: Short Answer Questions

1. Write the criteria of effective portable fire extinguishers (3 point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

Score = _____

Rating: _____

Note: Satisfactory rating - 7 points

Unsatisfactory - below 7 points



Information sheet 3. Monitoring hazardous and flammable substances

3.1. Introduction

Flammable substances are substances that will ignite and continue to burn when they are brought into contact with an ignition source. Flammable substances can exist in a solid, liquid or gaseous state. Most flammable liquids are volatile and they give off vapors that mix with air to form a flammable mixture that will ignite in the presence of an ignition source. There are 3 main types of flammable substance that causes fire hazard.

These include:

- Flammable Gases
- Flammable Liquids and
- Flammable Solids

3.2. •Flammable Gases

A gas is considered flammable if it has the potential to explode or ignite when mixed with oxygen. In other words, if a certain level of flammable gas were to leak into the air, it could result in a fire. The most popular flammable gases are ammonia, butane, carbon monoxide, hydrogen, methane, and propane.

Types of flammable gases

Gases can be classified into three groups:

- Oxidizers
- Inert gases
- Flammable gases.

Oxidizers, such as oxygen and chlorine, are not flammable on their own but will act as an oxidant and aid combustion.

Inert gases are not combustible at all and are sometimes used in fire suppression systems. Carbon dioxide and helium are examples of inert gases.

Flammable gases can be explosive when mixed with air in the right proportions.

Flammable gases includes:

- Hydrogen
- Butane



- Methane and
- Ethylene are examples of flammable gases.

3.3. Flammable Liquids

Here are seven flammable liquids that may be lying around your home.

- Nail polish remover.
- Rubbing alcohol
- Gasoline, paint thinner and turpentine
- Lighter fluid
- Aerosol cans
- Linseed oil
- Nail polish remover.

3.4. Flammable solids

Flammable solids can be divided into three broad groups according to their hazard or material type. These groups are:

- Flammable metals
- Intense burning solids that are hard to extinguish
- Flash point solids

Flammable metals require an ignition source, and their reactivity and ignitability is influenced by particle size and shape. Intense burning solids are chemicals containing nitrogen and oxygen, which contribute to their propensity to burn intensely and be difficult to extinguish. Flash point solids are a small group of materials that can change into a vapor without passing through a liquid state and as a result, ignite in a manner similar to combustible liquids. Ignition at flash point causes them to melt and flow similar to a liquid.



| | |
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| Self-check 3 | Written test |
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Test I: Choose the best answer (2 point)

1. From the following which one is types of flammable substance?

- A. Flammable Gases B. Flammable Liquids and
- C. Flammable Solids D. All

2. Which is types of flammable gases

- A. Oxidizers B. Inert gases C. Flammable gases D. All

3. from the following which type of flammable solid

- A. Flammable metals
- B. Intense burning solids
- C. Flash point solids
- D. All

Test II: Short Answer Questions

1. Write at least 5 flammable liquids that may be lying around your home (4 point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points



LG#57

LO #3. Evaluate fire prevention

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Controlling and monitoring fire risks and hazards
- Checking equipment regularly
- Handling hazardous or flammable substances

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Control and monitor fire risks and hazards
- Check equipment regularly
- Handle hazardous or flammable substances

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
5. If you earned a satisfactory evaluation proceed to “Operation sheets
6. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



Information sheet 1. Controlling and monitoring fire risks and hazards

1.1. Introduction

We call prevention all actions aiming at preventing any fire occurrence. The fire ignition proves the failure of the prevention activities. It is all preliminary actions carried out to prevent fire occurrence as well as to reduce fire consequences.

Overcoming fire risk is the obligation of all stakeholders' fire prevention and controlling activities. The activities are emphasized in pre-fire activities include:

- Monitoring,
- Preparedness,
- Early Warning,
- Early Detection,
- Respond/fire suppression
- Post Fire Management and
- Readiness to decrease or lessen the impact caused by forest fire

Two of the most common terms that come across in fire safety assessments forms and regulations are:

- Fire hazard and
- Fire risk.

1.3. Fire hazard

Fire hazard is something that could give rise to a fire or smoke. For example, this could be a room full of electronics or badly managed combustible or flammable materials.

List of common fire hazards includes:

- Arson
- Cooking
- Smoking materials
- Open flame (i.e., candles/incense)
- Electrical (wiring, appliances and equipment) hazards
- Accumulation of combustible materials
- Improper handling and storage of combustible/flammable liquids
- Hot work hazards (i.e., cutting, welding)



1.3.1. Identifying fire hazards

A knowledge of the fire tetrahedron and the most common causes of fire will assist you in identifying potential fire situations. For a fire to occur it needs a source of:

- Ignition (heat or flame)
- Potential source of fuel and
- Oxygen.

If the ignition sources and fuel can be kept apart removed, eliminated or reduced, then the risks to people and your business is minimized. In order to do this you must first identify possible sources of ignition, fuel and oxygen in your workplace.

A. Possible sources of ignition

Possible sources of ignition are:-

- Defective electrical fittings and defective or misuse of electrical apparatus – light bulbs and fluorescent tubes too close to combustible materials, misuse or defective electrical extension leads and adapters, faulty or damaged wiring.
- Lighters, candles and smoking materials.
- Flame or sparks from a work process such as welding, cutting, grinding or the use of a hot air gun.
- Sources of frictional heat.
- Electrostatic discharges.
- Ovens, kilns, open hearths, furnaces or incinerators.
- Boilers, engines and other oil burning equipment.
- Portable heaters.
- Cooking equipment, including deep fat fryers.
- The threat of arson must not be overlooked and the malicious firing of combustible materials.

B. Potential sources of fuel and unsafe situations

Potential sources of fuel and unsafe situations include:-

I. Any combustibles: These can be divided into two main groups; combustible fuels such as paper, wood, cardboard, etc.; and highly combustible fuels such as thinners, solvents, polyurethane foam, etc.



II. Any unsafe procedures or acts: Persons undertaking unsafe acts such as smoking next to combustible materials.

C. Oxygen

These are hazards that may assist a fire to spread in your workplace, e.g. if there are large areas of hardboard or polystyrene tiles etc., or open stairs that can cause a fire to spread quickly, trapping people and involving the whole building. One hazard that is often overlooked is bad housekeeping and is the easiest to correct. It is responsible for many small fires either starting or certainly spreading and involving far more of the premises than was necessary.

Checklist used for identification of fire-sensitive areas

Table 2. Checklist for identification of fire-sensitive areas

| No | Question | Response | Remark |
|----|---|----------|--------|
| 1 | Why do fires frequently occur? | | |
| 2 | Where do the fires happen? | | |
| 3 | What activities are done? | | |
| 4 | Where the activities are done? | | |
| 5 | How often the activities are done? | | |
| 6 | What anthropogenic factors caused fire? | | |
| 6 | What natural factors caused the fires? | | |
| 7 | When do the fires usually happen? | | |
| 8 | What months do dry season usually take place? | | |

1.4. Fire risk

Fire risk is the level of risk posed by a fire hazard and assessment of the likelihood of harm, firstly to people, but also to property and business continuity.

The aims of monitoring a fire risk and hazards are:

- To identify hazards and to reduce the risk of those hazards causing harm to as low as is reasonably practicable; and



- To determine what fire safety measures and management policies are necessary to ensure the safety of people in the building should fire occur.

Controlling and monitoring of fire hazard and risk includes:

- Controlling vegetation (such as grass, heath, scrub and forest undergrowth)
- Cutting of firebreaks (including clearing areas which are slashed or ploughed and clear of any combustible material, wide enough to prevent fires jumping the break),
- Stored flammable liquids appropriately
- Checking the fire doors regularly for correct operation

To monitoring or conducting fire risk, fire crew must consider dangerous substances and explosive atmospheres regulations 2002 (DSEAR) and fire precautions.

These regulation identifies:

I. Identify any staff or persons who are especially at risk

Consider the risk to any persons who may be present. In many instances and particularly for small workplaces most people could be considered a normal risk, and special measures for persons in this category will not be required. There will, however, be some occasions when certain people may be especially at risk from the fire, because of their specific role, location or the workplace activity. You need to consider matters carefully if:

- Sleeping accommodation is provided
- Persons are challenged e.g. physically, visually, mentally, etc.,
- People unable to react quickly

II. Identify people at risk.

Evaluate the risks and decide whether existing precautions are adequate or more needs to be done. Having identified the hazards, you need to reduce the chance of a fire, both occurring and spreading, thereby minimizing or removing the chance of harm to persons in the workplace.

The risk of fire should be reduced to an acceptable level by: –

- Removing the hazard altogether
- Reducing the hazard to the point where there is little or no risk
- Replacing the existing hazard with a safer alternative



- Segregating the hazard from the workplace
- Developing a Fire Safety Policy and culture to ensure hazards do not occur in the workplace
- Attempt to classify each area as either:
 - ✓ High risk
 - ✓ Normal or
 - ✓ Low risk.

Table 3. Fire Risk Evaluation Guide

| Severity | Likelihood | Fire Risk Rating |
|---|----------------------------|--|
| H – A major fire occurring involving loss of life | H- Certain or near certain | 3 = High Risk – immediate action required |
| M – A fire involving a danger to persons | M – reasonable likely | 2 =Medium risk – Action required unless good reason |
| L – A fire | L – Very seldom or never | 1 = Low risk – No direct action required but consider improvements |

Low risk: Low risk areas are those where there is little in the way of heat/flame or fire ignition sources, e.g. a stonemasons workshop where typically there is not much to burn and should a fire occur then people would be able to react in plenty of time.

Normal risk: Normal risk areas will account for nearly all parts of most premises.

High risk: High risk areas where the available time needed to evacuate the area is reduced by the speed of development of a fire, e.g. paint spraying with highly flammable paints, also where reaction time to the fire alarm is slower because of the type of person present or the activity in the premises, e.g. the infirm and elderly or persons sleeping in the premises.



Likelihood

| | | High | Medium | Low |
|----------|--------|------|--------|-----|
| Severity | High | 3 | 2 | 1 |
| | Medium | 3 | 2 | 1 |
| | Low | 2 | 1 | 1 |

Table 4. Summary table for Fire risk assessment

1.5. Monitoring fire prevention approach

There are two types of fire prevention approaches

I. Measures preparing fire suppression

This approaches includes:

- Controlling the fire at its initial stage by rapid initial attack; and
- Containing the spread of the fire which could not be suppressed by initial attack.

II. Taking pre-suppression measures by fuel management (fuel reduction, fuel break construction).

In practice, these two approaches are closely interdependent.

1.6. Identification techniques of forest fire-sensitive areas

Definition: Forest fire-sensitive areas are areas where elements and factors causing fires are available in a sufficient amount to start fire.

Characteristics of these areas are:

- Availability of potential fuel
- Human activities using fires
- Long drought



Figure 6. Fire potential sensitive area

Actions of fire prevention

Actions of prevention include:

- Fire-cause investigation
- Education and sensitizing of the public: since fire origins are mainly related to human activities, it is necessary to inform and sensitize the various population groups who can generate fires, such as farmers, forest workers, local inhabitants, tourists, industrial companies, and small enterprises
- Inspection of buildings and facilities likely to cause fire ignition (power lines, lanes, garbage dumps...)
- Fire law enforcement: dissuasive surveillance, definition of a dissuasive and repressive legislative framework
- Forest access regulations
- Actions of education and sensitizing allow an awareness rising for the fire hazard and a better knowledge of the fire danger.
- It is necessary to aim well at the target groups and to choose diligent means and actions to be implemented.
- A legal framework - preventive and repressive - is the essential complement of the preceding actions. According to the existing fire risk and available economic resources for financing prevention activities and fire suppression, various strategies can be adopted:



- Avoid all ignitions and protect all zones threatened by fire.
- Develop a strategy of the “acceptable minimum”, realizing the technical and financial impossibility of protecting the entire territory against fire.



| | |
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| Self-check 1 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

1. Which one is common fire hazards

A. Arson B. Cooking C. Smoking materials D. All

2. Two of the most common terms that come across in fire safety assessments, forms and regulations are:

A. Fire hazard B. Fire risk. C. A and B

Test II: Short Answer Questions

1. List the steps of forest fire prevention methods (4 point)

2. What are the possible sources of ignition (3point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 10 points

Unsatisfactory - below 10 points



Information sheet 2. Checking equipment regularly

2.1. Introduction

Checking of chemical based fires environmental, weather and equipment conditions is very important for workers safety and good fire working activities. One of the most important aspects of health and safety within any work activity is the equipment used in the fight against fire. These includes all deterrent, detection, warning and firefighting components, such as: smoke detectors, fire alarm systems, fire extinguishers and more. Fire equipment maintenance falls under the duties of the responsible person and checking for any necessary maintenance and upkeep will need to become a part of the fire risk assessment.

2.2. Purpose of monitoring equipment condition

The purpose of monitoring equipment condition is to ensure the adequate provision and operability of fire protection systems. They cover design and construction review, maintenance, and inspection. They apply to workers and supervisors, building and area managers, facilities and operations and the local fire department.

The requirement to monitoring equipment condition to protect or control Active fire or Passive fire.

I. Active fire protection equipment

Active fire protection systems include:

- Automatic fire suppression systems (such as sprinkler, clean agent, carbon dioxide, and dry chemical systems)
- Fire hydrants and standpipe outlets

II. Passive fire protection

Passive fire protection systems include

- Fire and smoke barrier walls and penetrations
- Fire and smoke doors and dampers

2.3. Regular check of equipment

With a mix of passive and active fire protection equipment present on site, you will have to consider each component's role carefully to determine how regularly they will need to be inspected. Here are a few basic ones to get you started remember: be sure to make



a note of all checks in your log book. Fire protection equipment checked daily, weekly, monthly, annually and within five or more years.

Daily: Emergency lighting checks that all fire doors are to an acceptable operational standard, that they close firmly and that they can be opened easily. Remove any obstructions throughout the evacuation route immediately. If possible, test emergency lighting for faults and ensure that all signage is clearly visible.

Weekly: Manually test all fire alarm equipment and that batteries are still operational in all smoke detectors. Checking alarms at the same time every week will avoid panic among staff as they will be expecting it.

Monthly: Perform a thorough check of all emergency lighting systems for sufficient illumination, logging any findings. Carry out a more detailed check of fire doors, making sure that the intumescent seals and frames are in good condition.

Annually: All fire protection equipment, including alarms detectors, lighting, sprinklers, extinguishers and fire doors should be thoroughly inspected by a qualified and accredited technician. Fire extinguisher checks should be carried out throughout the year also, as detailed below.

2.3.1. Monitoring fire extinguisher

Fire extinguishers should be manually inspected when initially placed in service. Fire extinguishers inspected either manually or by means of an electronic monitoring device/system at a minimum of 30-day intervals.

- Visual Inspection—Once Per Month
- Fire Extinguisher Servicing—Yearly
- Internal Maintenance and Inspection—Every Six Years

All employers and owners of buildings to conduct a visual inspection of all fire extinguishers at their disposal at least once per month. Monthly inspection is important as it helps ensure that the extinguisher is fully charged and operational; no obstructions are blocking the equipment; no damage has occurred to the equipment, and the device is still in its intended position.

In fire extinguisher inspection procedure the inspector must check:

- The last date of professional inspection.
- The condition and availability of the pull-pin.



- The pressure gauge to ensure it is in the operating range.
- Obvious signs of physical damage

Effective portable fire extinguishers must be:

- Approved by a recognized testing laboratory, extinguishers manufactured
- The proper type for the class of fire expected.
- Located where they are readily accessible for immediate use and in sufficient quantity and size to deal with the expected class of fire
- Kept in good operating condition and inspected and maintained on a regular basis
- Operated by trained personnel

2.3.2 Fire alarm

A fire alarm system warns people when smoke, fire, carbon monoxide or other fire-related emergencies are detected. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations

Make sure to review your smoke detector's user manual. You may need to check more often if any of the following apply:

- The detector often gives false alarms.
- The alarm emits short beeps regularly without anyone touching it.
- Frequent kitchen smoke has caused it to activate often, which may wear it out faster.

There are two main types of smoke detectors according to the United States department of agriculture (USFA):

- Battery powered
- Hardwired

I. Battery-powered: This type can be susceptible to defective or worn-out batteries. Monthly testing is critical. Never put old batteries into your smoke detectors and fire alarms.

II. Hardwired: These detectors are powered by your home's electrical system, but they usually have backup batteries so the device can remain operational in a power outage.



Hardwired smoke detectors still require monthly testing to help ensure that both batteries and parts are functioning properly.

How do you test Fire alarm?

You should always check the manufacturer's instructions for the proper method of testing your smoke detector and fire alarm. But, in general, the USFA states most battery-powered and hardwired smoke detectors can be tested in the following way:

Step 1. Alert family members that you will be testing the alarm. Smoke detectors have a high-pitched alarm that may frighten small children, so you'll want to let everyone know you plan to test the alarms to help avoid scaring anyone.

Step 2. Station a family member at the furthest point away from the alarm in your home. This can be critical to help make sure the alarm can be heard everywhere in your home. You may want to install extra detectors in areas where the alarm's sound is low, muffled or weak.

Step 3. Press and hold the test button on the smoke detector. It can take a few seconds to begin, but a loud, ear-piercing siren should emanate from the smoke detector while the button is pressed. If the sound is weak or nonexistent, replace your batteries. If it has been more than six months since you last replaced the batteries (whether your detector is battery-powered or hardwired), change them now regardless of the test result, and test the new batteries one final time to help ensure proper functioning. You should also look at your smoke detector to make sure there's no dust or other substance blocking its grates, which may prevent it from working even if the batteries are new.

Remember, smoke detectors have a normal life span of 10 years, according to the USFA. Even if you've performed regular maintenance, and your device is still functional, you should replace a smoke detector after the 10-year period or earlier, depending on the manufacturer's instructions.

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| Self-check 2 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

1. Fire protection equipment can be checked
 - a. Daily
 - B. Weekly
 - C. Monthly
 - D. All
2. You may need to check fire alarm detectors if,
 - A. The detector often gives false alarms.
 - B. The alarm emits short beeps regularly without anyone touching it.
 - C. Frequent kitchen smoke has caused it to activate often

Test II: Short Answer Questions

1. Why firefighting equipment checked regularly (4 point)
2. Write step following to test Fire alarm (3point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points



Information sheet 3. Handling Hazardous or Flammable Substances

2.1. Introduction

It is believed that fire prevention is better than fire suppression, it is not that easy to prevent forest fires, especially those that are being deliberately made by people. In addition, there is no straightforward and universal mechanism that can help to prevent forest fires. The Dangerous Substances and Explosive Atmospheres Regulations known by the acronym DSEAR, aim to protect people from the risks from fires, explosions and other similar events that may occur as a result of the presence or use of dangerous substances in the workplace.

Some examples of activities to which DSEAR applies to handle hazardous and flammable substance are:

- Storage of petrol and LPG as a fuel for cars, boats, horticultural machinery etc.;
- Handling and storage of waste dusts in woodworking shops;
- Handling and storage of flammable wastes including fuel oils;
- Hot work on tanks or drums that have contained flammable material;
- Use of flammable solvents in laboratories
- Storage of flammable goods, such as paints, solvents, reagents;
- Storage, use and handling of flammable gases, including LPG;
- Transport of flammable liquids in containers around the workplace;

2.2. Fire hazards preventive

A. Control of human activities

The agricultural, pastoral, or forest activities in the forest or in the vicinity must be controlled, even prohibited when the fire danger is high.

B. Land use

The cutting of the territory into properties (land register) must be consigned on official documents and be demarcated clearly on the ground, particularly when there are state forests. This allows discouraging any attempt at land appropriation (real estate speculation, clearings for the extension of agricultural zones.). To constraint the scattering of constructions in the forest (dwellings, tourist residences.), it is essential to



regulate the use of land, in particular by prohibiting building in zones with a high fire hazard.

C. Vegetation clearing

Vegetation clearance and including maintenance can be made compulsory in zones with a high fire hazard: around dwellings or constructions, garbage dumps, along roads and tracks, railroad tracks, power lines.

E.g., in Morocco, dwellings, buildings, or building sites located in the forest or at less than 200 m of the forest limit must be surrounded by a fire break of 25 m without vegetation.

D. Repressive legislation

Enforcement aims at deterrence: persons responsible for fire starts must be identified, judged, and convicted. The sentence is variable according to the degree of the responsibility of the culprit and the damage generated: it can go from a fine to prison.

E. Law enforcement

The existence of a legal framework allowing regulating human activities in the forest or its periphery is not enough. In practice, it is necessary that laws are applied, and a control is necessary to take care of this enforcement. It can be carried out by a forestry police (Syria), by forest district guards (Tunisia), or by surveillance teams (committees for vigilance and immediate suppression in Morocco).

2.3. Fire hazard prevention in Ethiopia

Various fire prevention measures that have been suggested by different authors

Some are

2.3.1. Awareness Creation

It is very essential to create awareness about the important roles that forests play and the impact of fire on these resources at all levels, from the grassroots through schools to policy makers. Awareness creation is a pre-requisite for preventing human-made forest fires.

2.3.2. Use availability Water

Water is one of the best media with which fire spread can be prevented and fire can be extinguished. It reduces the temperature, decreases the oxygen availability and, therefore, makes ignition more difficult. It is to maintain artificial water stores within the



forest. One of the major constraints in the fight against the recent forest fires, both on the ground and from the air, in the Bale and Borena Zones had been lack of water sources.

2.3.3. Road Construction

A well-developed road system is always a precondition for proper forest management and is, therefore, also the basis for effective fire prevention and suppression. The majority of forests in Ethiopia have no roads, and the roads that have been constructed in very few forests are generally characterized by a low density (number of running meters per ha), very sharp curve and steep slopes and narrowness. These characteristics are not favorable for effective fire prevention, since only high-quality terrain vehicles have access to the forest.

2.3.4. Fire and Fuel Breaks

Fire breaks are constructed barriers where strips of exposed mineral soil keep the fire from spreading in the unburned parts of the forest. Although fire breaks can be kept relatively small, they are expensive to construct since a lot of vegetative material has to be removed either manually or mechanically. Other disadvantages include the need for clearing them at least once a year and their inability to provide a very effective barrier against a full or spotting fire.

Another option is the use of fuel breaks, in which the vegetation type on the break is permanently converted to a cover of low fuel volume and/or low flammability. Here, no attempt is made to maintain a mineral soil line. Fuel breaks are much wider than fire breaks since permanent type conversion requires sufficient separation. Measures required to construct fuel breaks include heavy thinning, more extensive than elsewhere in the forest, pruning of the stem up to 4 m height and the removal of all inflammable lower story materials. Only a low grass or herb cover will be left. Maintenance of these fuel breaks is important, and can be done with machines (not feasible in Ethiopia), manually, with herbicides, by prescribed burning or controlled grazing. A third possibility in creating a barrier against fire is the artificial replacement of parts of the forest with strips planted with less inflammable species, having for example special chemical composition of their wood (with high percentage of specific salts) or high water content.



2.3.5. Controlled Burning

Controlled or prescribed burning has become a useful tool in fuel management in many countries. The amount of fuels can be decreased by burning to such an extent that fires do not form a serious hazard anymore and can be suppressed easily. However, prescribed burning requires trained personnel, extensive knowledge about the expected fire behavior, and insight in the moisture content of the vegetation at that particular moment, the weather expectation, etc.



Table 5. Controlled burning practice

2.3.6. Controlled Grazing

Controlled grazing is another method aimed at fuel reduction within the forest or fuel breaks. Despite its advantage in fuel reduction, damage can also occur to the forest in the form of trampling the soil, which might lead to soil compaction by the grazing animals and subsequent erosion and browsing, which if done excessively would damage the trees and their increment. This method should be tested on a large scale under a number of different conditions, and requires the presence of trained guards, exclusion of goats and avoidance of very steep slopes.

2.3.7. Forest Management

Proper forest management practices can help to prevent occurrence or hazard of fire. These might include:



- Proper tree species selection to avoid mortality of inadaptable trees leading to inflammable fuel accumulation (e.g. *Cupressus lusitanica* stands established on heavily eroded sites);
- Selection of species with a fast early growth and the ability of reaching stand closure quickly to suppress grasses and weeds;
- Timely clean weeding and pruning operations;
- Planting trees in narrower spacing along road and forest boundaries in order to prevent the building up of fuels there and removal of grasses and shrubs if
 - They develop (alternatively, allowing a "cut and carry" system for the local people);
- Subdividing the forests into compartments;
- Systematic and continuous removal of fallen leaves, twigs, bark strips, etc.

2.3.8. Fire Detection

The early detection of forest fires, an exact determination of location of the fire, a reliable assessment of its direction and speed of travel, a fast giving of alarm to the responsible persons and the immediate organization of suppressing crews are the main conditions for a successful fighting of forest fires. The sooner suppression crews reach the fire, the smaller the burning area and the simpler its suppression.

2.4. Fire management plan

A fire safety management plan outlines your arrangements for implementing, controlling, monitoring, and reviewing fire safety standards as well as ensuring that the standards are maintained. The plan provides a description of the arrangements for managing fire safety effectively to prevent the occurrence of fire, and if fire breaks out, to protect both property and people. The fire plan needs to specify:

- Organization
- Planning
- Monitoring
- Control, and
- Review of the fire safety measures and provisions in the premises.

2.4.1. Planning

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Adequate planning may include:

- How the person responsible suggests the fire safety risk assessment should be conducted and determines priorities in the elimination of hazards as well as reducing risks to individuals.
- The adoption of a systematic approach to the completion of risk assessments to decide on the priorities and setting objectives to either reduce or eliminate risks.
- The selection of appropriate measures for keeping risk under control.
- The establishment of performance standards and the implementation of protective and preventative measures.

2.4.2. Organization

It needs to detail how the organization is structured and may include:

- How the health and safety information is communicated to employees.
- The involvement of employees in ensuring compliance with all aspects of the fire safety risk assessment.
- The person that will be making decisions regarding the protective and preventative measures as well as those involved in their implementation.
- Effective systems of communication to employees, other employers, or other responsible individuals.
- The securing of competence by having adequate instruction, information, and training.
- Details of protected areas/fire doors.
- Maintenance plans.
- The prevention of arson.
- Fire prevention and housekeeping measures.
- Details of practice sessions and fire drills.
- Evacuation/emergency plan.
- Fire safety risk assessment.

2.4.3. Control



Identify the individuals at each level that may be responsible for carrying out fire safety issues throughout the premises. Established measures of control should:

- Ensure that there's sufficient supervision.
- Set specific and measurable standards for judging performance.
- Ensure that the people tasked with certain responsibilities understand them.
- Clarify the health, safety, and fire safety responsibilities.

2.4.4. Monitoring

Identify how the person responsible will be measuring the success of the fire safety policy. It needs to include regular checks of fire precautions, investigations into the causes of accidents, and recording of other important information:

- Record all monitoring processes and activities.
- Ensure that all accidents are investigated to ensure that lessons are learnt and procedures are altered if need be.
- Have a plan and have routine inspections to ensure that measures are in place and maintained.

2.4.5. Review

Identify a regular procedure for review that includes any identified deficiencies as well as a process by which they can be corrected. The review should:

- Have a system that ensures that the remedial work not done is given top priority and completed.
- Have mechanisms in place for ensuring that remedial work is completed.
- Review the systems of management to make sure that they stay active.



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| Self-check 3 | Written test |
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Test II: Short Answer Questions

1. List some examples of activities to which DSEAR applies to handle hazardous and flammable substance. (5 point)
2. Write fire hazards preventive according to DSEAR regulation (3point)
3. Write at least 5 fire prevention measures (5)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

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|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 13 points

Unsatisfactory - below 13 points



Operation Sheet 2

Evaluate fire prevention

Objective: To monitor fire risks and hazards

To demonstrate fire risk potential area (natural forest, wilderness, park, urban, rural).

Materials, tools and equipment required:

- PPE and clothing
- First aid equipment
- Binoculars
- Compass
- Paper
- Pen
- Note pad

Procedure:

- ✓ Wear safety cloths
- ✓ Collect all tools, materials and equipment used for identifying types and potential of fire hazard
- ✓ Observe the area and collect data required.
- ✓ Identify fire risk sensitive areas
- ✓ List the severity of fire risk(high, medium, low)



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| LAP Test 2 | Practical demonstration |
|-------------------|--------------------------------|

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- hour.

Task 1- Identify fire risk sensitive areas

Task 2- Identify hazardous or flammable substances

**LG#58****LO #4. Record and report information of fire potential****Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Reporting potential of fire
- Recognizing signs of fire potential and alarms
- Recording and reporting fire potential and prevention

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Report potential of fire
- Recognize signs of fire potential and alarms
- Record and report fire potential and prevention

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).



Information sheet 1. Reporting potential of fire

1.1. Report Combustive agent (oxygen)

A fire hazard is generally considered to be an unsafe condition that could potentially cause a fire such as overgrown, dead brush, improperly stored flammable/combustible liquids, or use of fireworks.

All fires are the result of a chemical processes that occurs when three essential elements fuel, heat and oxygen are brought together in the necessary combination to support composition. The combination of the three elements of fire is called “fire triangle”. If any one of these three elements can be eliminated, the fire can be put out. In forest fuels, the principal inflammable component is carbon.

The capacity of a fuel to catch fire depends on its characteristics, the energy source and the exposure time:

- A weak energy supply allows the ignition of grass, whereas the energy supply has to be much higher for the ignition of wood.
- In order to ignite dry vegetation by a glowing ember the presence of wind is required.
- An electric arc cause by a broken power line or by lightning provides sufficient energy for ignition of dry Vegetation

1.2. Report heat transfer and fire spread

The mechanisms of fire spread are distinguished in three phases:

- Combustion of vegetation material with heat emission;
- Heat transfer towards the fuel ahead of the fire front by conduction, thermal radiation and convection;
- Heat absorption by the plant before the flaming front and its ignition

In general reporting potential of fire may include:

- Date (if different than dispatch date).
- Time in 24 hour clock time (time that fire investigation unit arrives on scene).
- Address (corrected when applicable).
- Fire out or still in progress.
- Describe physical characteristics of what burned (structure, vehicle identification).



- Report a fire hazard

1.3. Reportable events

- Fuels (compostable matter)
 - ✓ Fuel Structure
 - ✓ Fuel macro structure/size and arrangement
 - ✓ Fuel chemical composition
- **Types of fire spread**
 - ✓ Ground fires
 - ✓ Surface fires
 - ✓ Crown Fires
 - ❖ Independent crown fires
 - ❖ Dependent crown fires

Fires are reportable if there is extensive smoke or heat damage and a fire department's assistance is required to clear the smoke.

Examples include:

- Outdoor dumpster fires
- Fires that were extinguished before the fire department arrived, as firefighters will check for hotspots, determine the cause of the fire and report it
- Unattended fires including backyard, camp, and beach fires
- Grass, landscape and bark mulch fires: And any other type of outdoor fire that has spread or gone out of control whether it is attended or unattended.

1.4. Events that don't need to be reported

Events are not reportable if there is smoke but no fire and there is little or no damage to property.

Examples include:

- False alarm
- Off-season yard burning when attended by the owner or occupier
- Illegal bonfires or campfires when they are attended
- Bylaw infractions or burning complaints when they are attended by the owner or occupier



- Explosions of ammunition, steam boilers, hot water tanks or other pressure vessels due to internal pressure not internal combustion



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| Self-check 1 | Written test |
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Test I: Choose the best answer (2 point)

- 1 From the following which one is potential cause of forest fire?
A. Improperly stored flammable B. Illegal fireworks C. Died bush D. All
2. In potential of fire, which one is to be considered?
A. Date (if different than dispatch date).
B. Address (corrected when applicable).
C. Fire out or still in progress.
D. All

Test II: Short Answer Questions

1. List reportable and non-reportable event in during fire reporting (4 point)
2. How fire occurred (3point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

| |
|---------------|
| Score = _____ |
| Rating: _____ |

Note: Satisfactory rating - 10 points Unsatisfactory - below 10 points



Information sheet 2. Recognizing signs of fire potential and alarms

2.1. Introduction

No one knows when a fire will start – it is a danger to us all even in this day and age. If you become trapped you might panic, but if you notice a fire early enough then there will be more time to get out of the building and help others to do so too.

Sign of fire potential includes:

- Lightning strikes
- High winds
- Smoke
- Flames
- Storms
- Equipment overheating
- Flammable liquid spills and
- Electrical Ignition has started in your work area, house or building.

2.2. Early Signs of a fire

Alarms and detectors

The first sign you might have if there is a fire elsewhere in the building, a fire alarm or detector going off. Often, you might even be able to catch a fire before it spreads and put it out, saving both your life and your home but even if you're too late to stop the fire you will probably have enough time to get out of the building. It's imperative then that you test your detectors and fire alarms regularly and change batteries for any depleted units.

Smoke

An obvious sign of fire is smoke. There's no smoke without fire. If you know the fire is outside your door then get wet towels to block the gaps around the edge and protect yourself from the smoke while you wait for rescue or make an escape. Smoke rises, so if you have to pass through a smoky room then stays as close to the ground as possible.

Smell



Even if you can't see a fire, you might smell it. Smoke has a distinct taste and smell, but so does whatever is burning, and if you smell it before you see it then you'll stand a better chance of escaping. Incidentally, your pets may smell a fire before you. Dogs have a much better sense of smell, so pay attention to their behavior and learn to recognize when they might be warning you of danger.

Loud noises

If you're a heavy sleeper, then even this may not rouse you, but loud noises such as people shouting, sirens or the collapse of parts of a building are a big sign that danger is present. Check out of your window to see whether the sirens and shouts are from a nearby building, as if you live in a terraced street you may have to evacuate even if the fire is a few doors down.

Hot door and door handle

Most people will have heard of carefully feeling your door to gauge how bad a fire is outside. If you rest your hand and it is hot, then there is a good chance the fire is outside your door. The same goes for a door handle; always use the back of your hand to check that the metal isn't going to cause you scalding burns – if you burn your hand you might have a hard time climbing and escaping from your building.

Good fire practice and the upkeep of fire alarms, detectors and training is imperative to give you, your family or anyone present in your building a better chance of surviving a blaze. City Fire can give you more information about all the aspects of fire safety so get in touch today if you have any questions or queries.



Fig 2. Fire potential and its risk



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| Self-check 2 | Written test |
|---------------------|---------------------|

Test I: Choose the best answer (2 point)

1 From the following which one sign of fire potential?

A. Lightning strikes

B. High winds

C. Smoke

D. All

Test II: Short Answer Questions

1. What is sign of fire potential (4 point)

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Name: _____

Score = _____

Rating: _____

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points



Information sheet 3. Recording and reporting fire potential and prevention

The amount of information recorded is likely to be influenced by the life risk in the premises; the complexity of the premises; the activities undertaken; and the existing fire safety measures. For example, the records required for premises such as a Care Home providing sleeping accommodation for vulnerable persons should be much greater than that required for a small office.

Recording and reporting contains:

- Environmental care and fire prevention
- Procedures such as risk, hazards, incidents or equipment
- Malfunctions
- Record and report may be:
 - ✓ Manual
 - ✓ Using a computer-based system or
 - ✓ Another appropriate organizational communication system

Steps followed to record and report fire potential.

Step1. Identify hazards and how people could be harmed

Example by being overcome or trapped by fire or smoke, burned, unable to escape due to locked fire exit doors, etc.

Step2. Who could be harmed?

Consider the risk to people, particularly any vulnerable groups such as young persons, the elderly or visitors unfamiliar with the premises.

Step3. What existing fire safety measures are provided?

Compare existing fire safety measures against standards contained in the sector-specific premises guidance documents, available on website and decide whether your existing fire safety measures for the premises are adequate or are additional measures necessary.

Step 4 Record the significant findings of your fire risk assessment.

Prepare an action plan, priorities actions and allocate deadlines and responsibilities for implementation.

Step 5 Make arrangements for regular review of the fire risk assessment.

**Self-check 3****Written test****Test II: Short Answer Questions**

1. List the step followed to record and report fire potential and prevention (4 point)

You can ask your teacher for the copy of the correct answers.

Answer Sheet

Name: _____

Score = _____

Rating: _____

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points



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