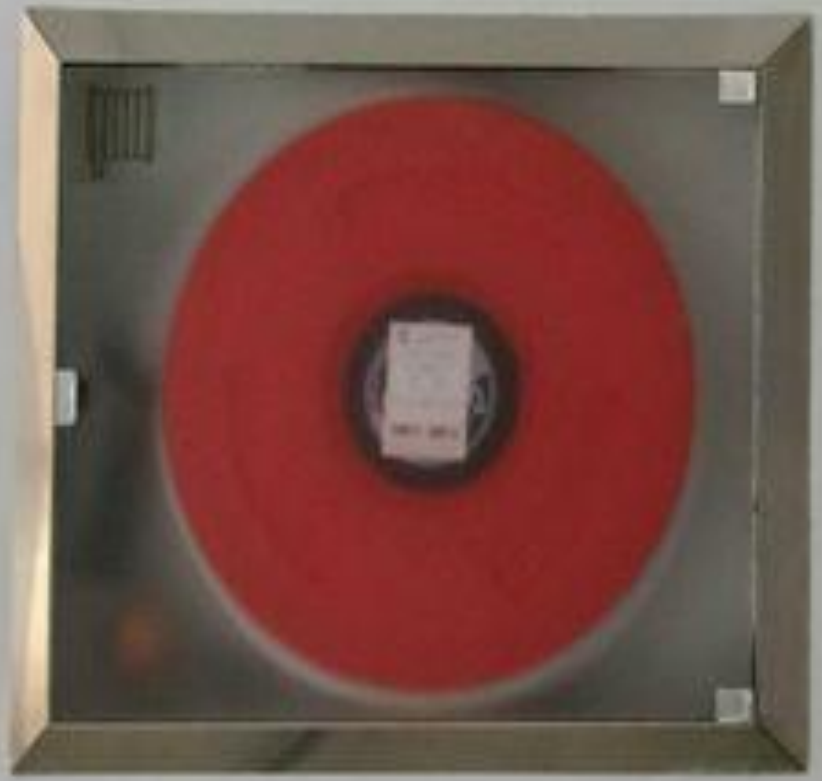
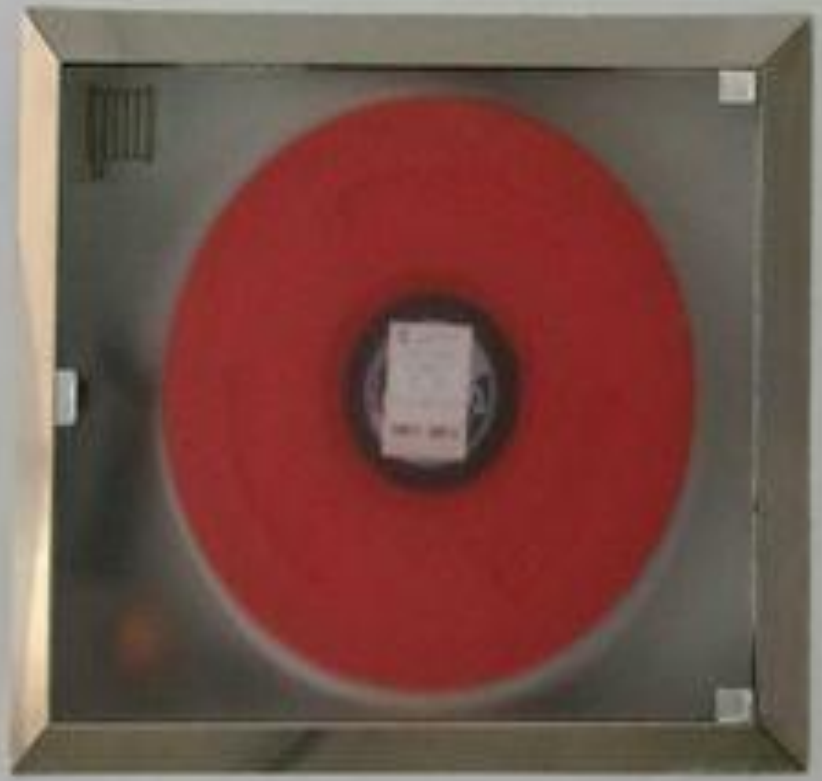
WORKPLACE FIRE SAFETY

Presentation by Norman Chavula – JCTR PDE Manager



Presentation Outline

1 – INTRODUCTION
2 – UNDERSTANDING FIRE
3 – FIRE PREVENTION
4 – FIRE FIGHTING EQUIPMENT AND TECHNIQUES
5 – EXTINGUISHING A FIRE
6 – FIRE DRILLS
7 – DISCUSSION/WAY FORWARD



What is a fire

In two minutes, discuss as a pair, how you would define a fire and write your definition of fire on a piece of paper, provided to you.

INTRODUCTION

Fire has always been an essential part of human's day to day living.

The Bible indicates that fire has been used by human beings starting from the first family to live on Earth.

1. **Genesis 4:3 – 4** talks about Cain and Abel making a burnt offering – this requires a fire.
2. **Genesis 8:20** talks about Noah building an altar and making a burnt offering – this requires a fire.
3. **Genesis 22:2** talks about Abraham going to mount Moriah to sacrifice Isaac as a burnt offering – this too requires a fire.
4. **Genesis 4:22** talks about a person named Tubal-Cain, who was a forger who made instruments of bronze and iron – this required high temperatures.
5. **Daniel Chapter 3** talks about Shadreck, Misheck and Abednego being thrown into the fiery furnace. Here we even see the king asking the workers at the furnace to increase the heat 7 times, indicating the knowledge of use and controlling fire.

Following the archaeological path, there is evidence on sites in Africa, Europe and Asia indicating that early humans had regular and controlled use of fire.

The discovery of charcoal, ash, burnt bones, and fire-affected tools at archaeological sites including Koobi Fora (Kenya), Wonderwerk Cave (South Africa), and Zhoukoudian (China) shows that early humans used fire in their dwellings and workplaces. These date back to the stone and iron age era.

As human societies developed, fire became a critical source of energy, supporting daily life, survival, and social development.

The use of fire was a major turning point because it allowed humans to:

1) **Cook food,** making it safer, taste better and easier to digest, and this made food to be more nutritious.
2) **Keep warm,** making it possible for humans to live in colder regions.
3) **Protect themselves from predators,** making it possible for humans to live near sources of water and food, even when these areas were infested with predators.
4) **Religious purposes**, in the past people used to burn offerings, but to date a number of churches have continued the practice of burning incise and lighting up of candles.

5) **Extend activity into the night**, since fire offered protection from predators and was a source of light.
6) **Strengthen social interaction**, as people often interacted around fires in the evenings, exchanging ideas, telling stories and passing knowledge across generations.
7) **Communication** - Fire and Smoke has been used to send messages across villages. Fires on high grounds like hills and mountains could be seen from far away (beyond where sound can reach) and therefore fires were used to alert communities of invasion, danger, or disaster (or even inviting them to social occasions)

8) **Preserve Food** – Elements of fire such as heat and smoke has been used to dry and preserve food, enhancing food security for societies. Food preservation enabled the transportation of food over long distances as well as extending the consumption of seasonal foods beyond their seasons.
9) **Make Tools and weapons** – The high temperatures realized from fire enabled people to smelt ores into metals and shaping them into weapons and tools, thereby enhancing their industrial activity and safety of the communities.

While fire has been essential for cooking, warmth, and energy, it also presents significant risks to human health, safety, the environment, and the economy.

Uncontrolled fire can cause serious injuries, loss of life, and can destroy homes, forests, crops, and infrastructure.

This makes it critical for people to understand how to manage and control fires, especially in homes and workplaces.

In fact, fire has a unique characteristic: When people want fire, they usually struggle to light it up, but when it starts accidentally or on its own (especially in wrong places) it does not take long to spread.


Fire can consume everything
including your job.

Understanding fire

For us to understand how we can control or fight a fire we need to know what a fire is.

UNDERSTANDING FIRE

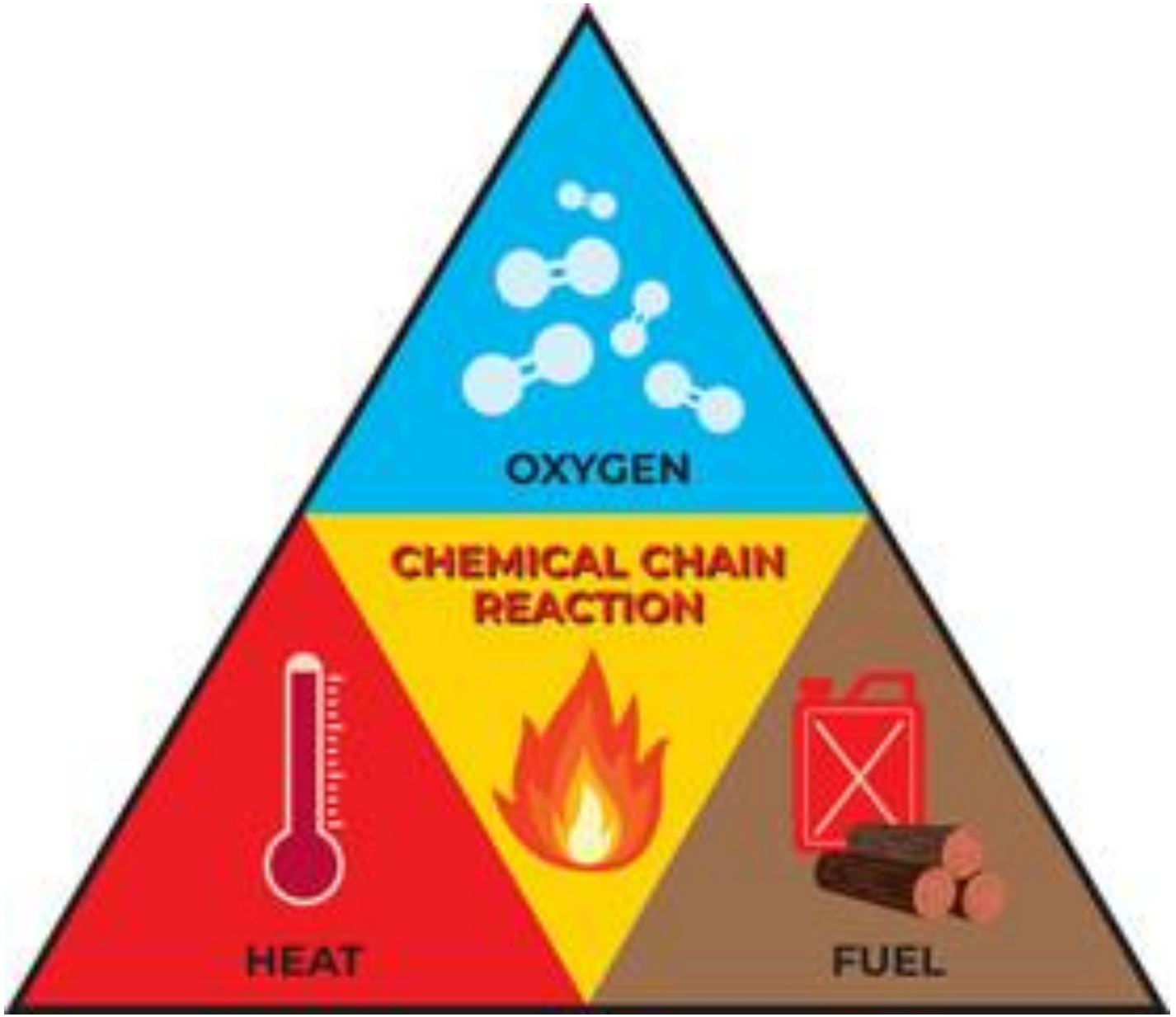
Mostly when people are asked to define a fire, they describe its appearance, its use or what it does. Rarely do they say what a fire really is.

In simple terms, a fire can be defined as:

“An ***IRREVERSIBLE*** chemical reaction, which occurs when a combustible substance (***Fuel***) reacts with ***Oxygen*** in the air in the presence of ***Heat*** (a process known as oxidation), to produce Heat, Light, Smoke (or fumes) and Residue (or Ash).

Being irreversible, a fire is a destructive process. Fire will only take place when Fuel, Oxygen and Heat are available. These three elements form what is called as the triangle of fire.

Triangle of Fire



FIRE: A Combustible Fuel + Oxygen + Heat →

OXIDATION

FUEL
(Combustible Substance)

HEAT

OXYGEN
(O_2 in Air)

IRREVERSIBLE

CHEMICAL REACTION

HEAT

LIGHT

SMOKE
(Smoke / Fumes)

ASH
(Residue / Ash)

Fuel

Fuel is the combustible material that provides the substance needed for a fire to start and keep burning. It is any material that can burn. (Flammable or Inflammable substances)

Fuels exist in all the phases of matter, i.e:

1. **Solid** – such as wood, dry leaves, paper, cloth, plastic and other organic materials including wax.
2. **Liquid** – such as petrol, diesel, oil, methylated spirit, organic solvents and many other petroleum-based liquids.
3. **Gas** – petroleum gases like LPG, methane, acetylene and vapours from volatile organic and petroleum substances.

Oxygen

Oxygen is the element in the air that reacts with fuel to produce fire.

Air contains about 21% oxygen, which is the gas that is needed to sustain burning

Heat

Heat is the energy required to ignite fuel and maintain combustion. Heat energy raises the temperature of the fuel to its ignition point (or flash point) to begin the combustion process. Sources of heat include:

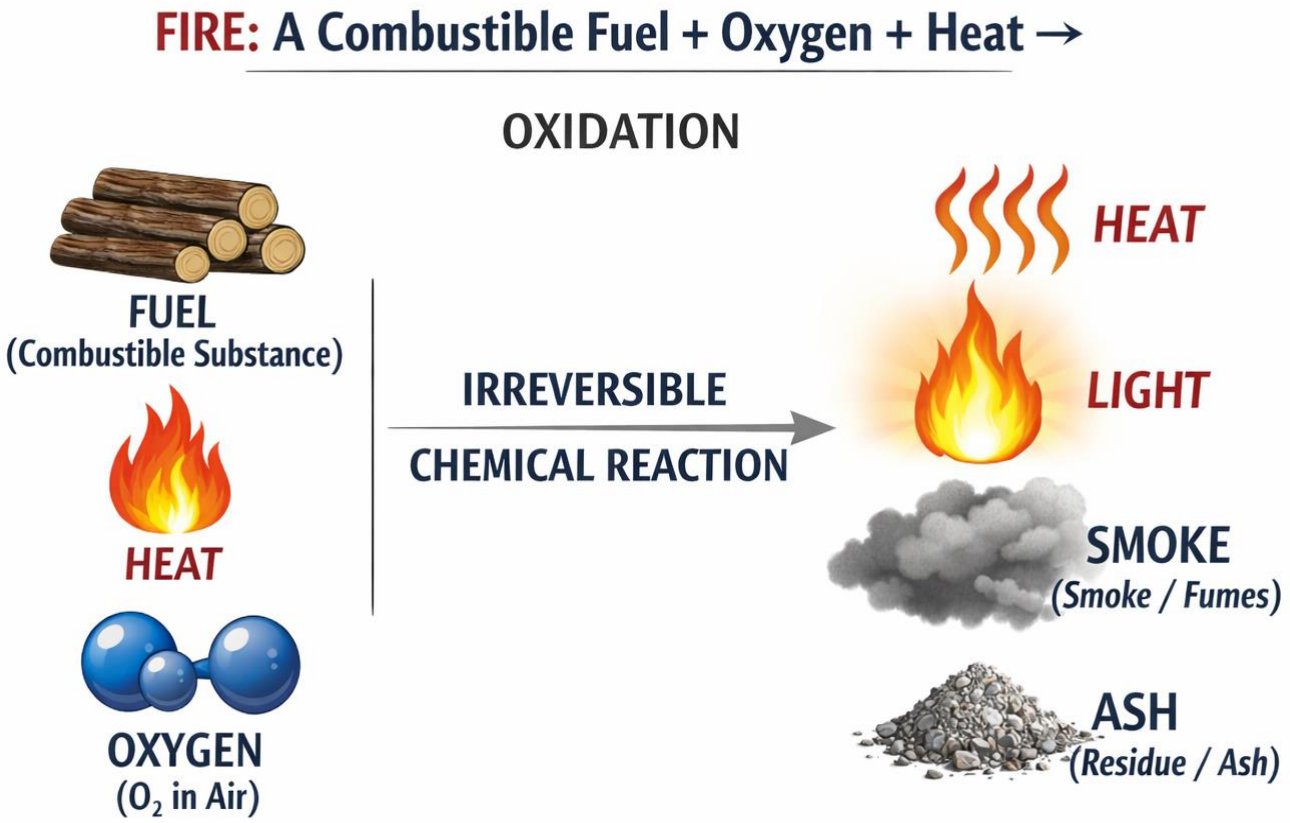
1) Open flames
2) Sparks
3) Electrical faults (Short Circuits)
4) Friction (especially with combustible elements)
5) Cigarette Butts (especially in waste bins)
6) Match Sticks and cigarette lights (especially with children)
7) Lightening
8) Hot surfaces
9) Flying embers from fires
10) In some cases, heat from the sun has caused fires.

Different fuels have different ignition point temperatures depending on the type and materials they are composed of.

Generally, gases and vapours can ignite at extremely low temperatures in relation to liquids and solids. Vapours can easily be ignited by sparks compared to liquids and solids (that is why it is not advisable to weld in the places where volatile organic liquids are stored).

Most liquids will ignite at higher temperatures than gases, while solids like wood require higher temperatures in comparison to liquids and gases to ignite. That is why we sometimes burn a liquid such as kerosine (paraffin) to burn charcoal or firewood.

In a fire, heat is both a prerequisite and a product and this property gives fire its progressive effect i.e. a fire starting small and growing as more heat is produced.



Light

Light is the energy in the visible part of the electromagnetic spectrum (between the violet and red range of the spectrum), which is produced in the oxidation process during a fire.

In a fire, light is manifested as the visible part of the fire which is also called a flame. The colour of the flame will vary between violet and red depending on the type of substance being burnt.

Smoke

Smoke is the visible mixture of tiny solid particles, liquid droplets, and gases produced when a material burns or undergoes thermal decomposition, especially during incomplete combustion.

Smoke contains soot (carbon particles), ash, water vapor, and gases including carbon monoxide (CO), carbon dioxide (CO_2), and other chemicals depending on the burning material.

Smoke usually forms when the fire does not have enough oxygen or heat to fully burn the fuel into clean products like CO_2 and water.

The color and density of smoke can indicate the type of material burning and the fire's condition (e.g., white smoke often means moisture, black smoke means incomplete combustion of hydrocarbons).

In a fire, smoke is dangerous because it contains harmful gases like carbon monoxide (CO), which can cause poisoning by reducing oxygen in the blood, and other irritants that damage the lungs.

Inhaling smoke reduces the amount of oxygen available to your body, leading to suffocation or unconsciousness. In fact, during fires, more people die of smoke inhalation than the heat from the fire itself – Most fire victims have burnt after they have already died of suffocation.

Ash or Residue

Ash is the powdery or granular residue left after the complete combustion of a material, consisting mostly of oxides and the non-combustible mineral components of the substance that has burned.

Ash forms when all combustible elements (like carbon and volatile compounds) have been burned away, leaving only their oxides and inorganic matter.

Ash can still pose hazards even after a fire is extinguished because it can retain heat for hours or even days, which may ignite nearby flammable materials and cause a secondary fire.

FIRE PREVENTION

Fire is a most common hazard in the homes and workplaces. The media often reports of people that have died in infernos in homes and workplaces. Preventing fire saves lives, property, investment and the environment.

Common causes of fire include electrical faults (overloaded circuits, short circuits and damaged wires). In the homes fires are usually caused by open flames (candles, stoves, fireplaces, kerosene lamps, etc.), keeping flammable materials like chemicals, cooking gas, paper, fabrics and wood near fires or sources of heat.

Fires have also been caused by human negligence (unattended to fires for cooking and lighting) as well as smoking and using matches indoors.

To prevent fires, it is essential to adopt proactive safety measures. These include:

Keeping all flammable items, such as paper, fabrics, cooking gas and chemicals, away from heat sources and open flames.

Ensuring that fires and cooking are not left unattended, as kitchen fires are among the most common household hazards.

Ensuring that electrical systems are regularly inspected for signs of wear, damage, or overloading and are only serviced by qualified electricians to reduce the risk of electrical fires.

Prohibition of smoking in offices, library and equipment rooms or have designated places for smoking if necessary.

Ensuring that equipment that use fuel and flammable gasses such as motor vehicles and gas stoves are regularly serviced and inspected for leakages.

Installing smoke detectors throughout your home or workplace and test them monthly to ensure they function properly.

Where chemicals are used, these should be stored in clearly labeled containers and kept in cool, well ventilated, secure locations away from heat and open flames.

Installing fire extinguishers that are easily accessible and ensuring that everyone knows how to operate them effectively in case of an emergency.

FIRE FIGHTING EQUIPMENT AND TECHNIQUES

When it comes to fire safety in the home or office space, having the right equipment on hand can make a huge difference in preventing a small flame from turning into a raging inferno.

Some of the common items to keep at home or in the office space for basic fire safety include fire extinguishers and other electronic equipment that can detect smoke. These provide early warning on the presence of a fire before it becomes too large to handle.

Fire extinguishers can be used to put out small fires before they become too big to handle and all members of staff must be trained on how to use fire extinguishers and other fire fighting equipment like fire hoses and fire blankets.

JCTR has some fire extinguishers placed in various locations within its premises. In addition, there are fire hoses installed within the premises.

Different types of fire extinguishers have been installed. These have different extinguishing agents in order to cater for the different classes of fire that that could occur in a home or workplace.

Fires are classified into many classes depending on what's burning, but the common ones are the five classes below:

Class A Fires: - Class A fires involve the burning of materials like wood, paper and textile materials. These can be extinguished using a water hose or a water fire extinguisher. Water extinguishers are generally colour coded **Red**.

Class B Fires: - Class B fires involve the burning of flammable liquids like oil and fuel. These can be extinguished by Dry Powder fire extinguisher. Dry Powder extinguishers are generally colour coded **Blue**. Foam fire extinguishers (Coded Cream) can also be used to extinguish class B fires. In some cases CO_2 extinguishers coded **Black** can be used.

Class C Fires: - Class C fires involve the burning of flammable gases, such as cooking gas (LPG). These can be extinguished using Dry Powder extinguisher colour coded **Blue**. If a fire is small CO_2 coded **black** can also be used.

Class D Fires: - Class D fires involve the burning of Electric circuits and equipment. These can be extinguished by Dry Powder fire extinguisher (**Blue**) and CO_2 extinguishers coded **Black**.

Class F Fires: - Class F fires involve the burning of Cooking oil or fats. These can be extinguished by Wet Chemical fire extinguisher (**Orange**). In some cases CO_2 extinguishers coded **Black** can be used. Water should not be used in fires involving oils because water will cause burning oil to splash or splatter and spread the fire (this can burn the fire fighter).

Symbols found on fire extinguishers & what they mean

	Water	Foam spray	ABC powder	Carbon dioxide	Wet chemical
Wood, paper & textiles	✓	✓	✓	✗	✓
Flammable liquids	✗	✓	✓	✓	✗
Flammable gases	✗	✗	✓	✗	✗
Electrical contact	✗	✗	✓	✓	✗
Cooking oils & fats	✗	✗	✗	✗	✓

Fire blankets: in a situation where a person's clothes catch fire it is not advisable to pour water on the person or to use any fire extinguisher. Instead, the person should be covered in a fire blanket (or made to roll on the ground). Fire blankets can be also be used to smother small fires. They are made of fire-resistant materials and can be easily stored in a kitchen drawer or cabinet. It's important to know how to use a fire blanket properly in case of an emergency.

Escape Routes or Fire Exits: In case of a fire, it's important to have a plan for getting people out of the building quickly for them to get to designated fire assembly points outside the building.

In this case fire exits or routes and fire assembly points must be provided and clearly marked.

Below is how a map of fire escape routes, with instructions and locations of fighting equipment could look like.

FIRE ESCAPE ROUTE

EXTINGUISHING A FIRE

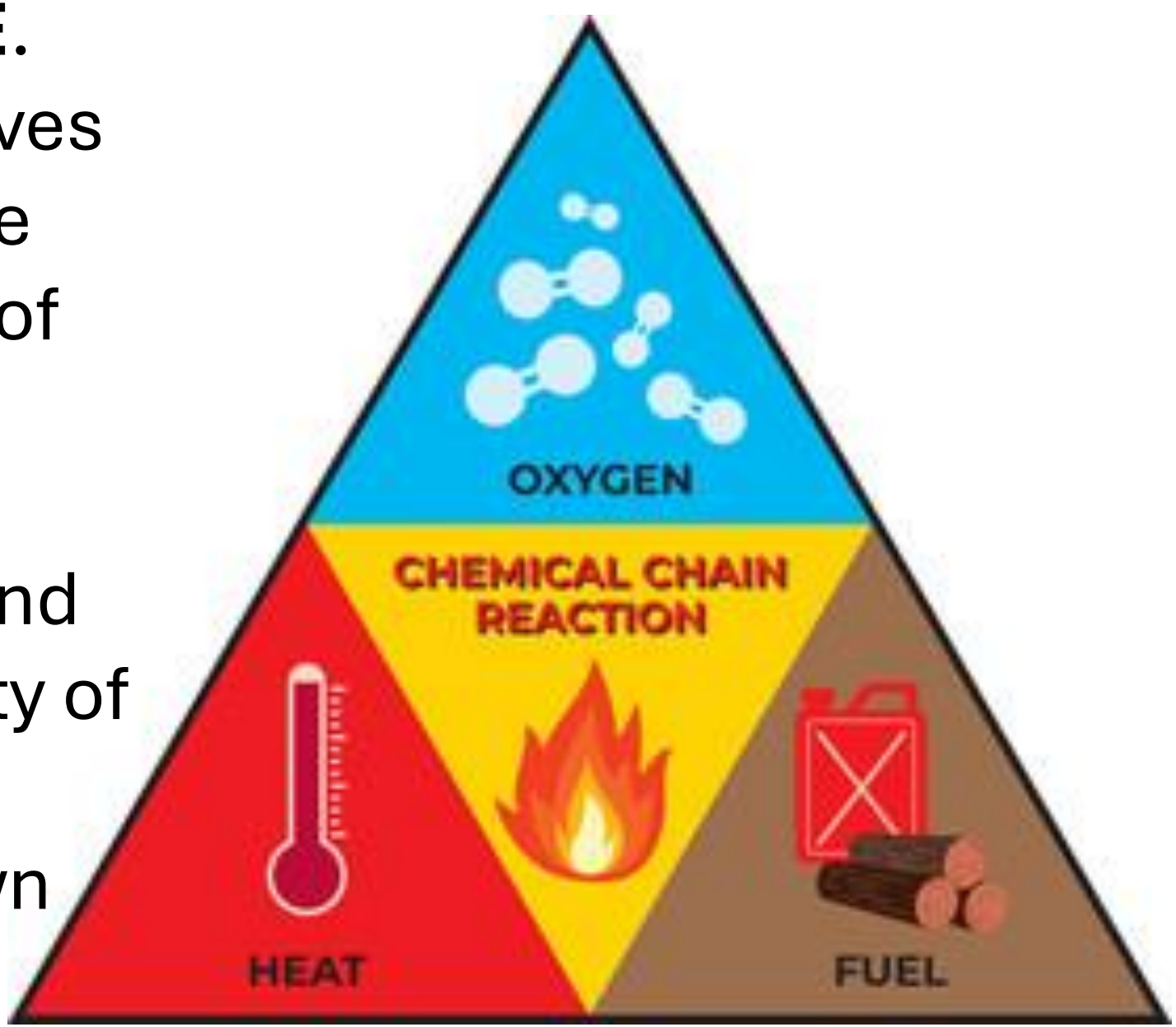
In case of a fire breaking out in a home or office, one must prioritize saving human life before saving any property. Therefore, the first step is to evacuate people from the building suspected to be on fire using the procedure in a fire drill.

Members of staff must be trained on how to safely evacuate from their offices during a fire to avoid unnecessary panic, which would result in injuries and people getting stuck at the exits. All staff must be shown their designated fire exits and fire assembly points.

Evacuating people quickly from the building will help in leaving enough time to extinguish the fire.

EXTINGUISHING A FIRE.

Extinguishing a fire involves removing any of the three elements in the triangle of fire. E.g. CO_2 and Dry Powder will displace O_2, Water will reduce heat and reduce the combustibility of most materials and Wet Chemical will break down oils and organic liquids.



If a fire begins from one room in a building, during evacuation, where possible, it is advisable to close windows and doors to the burning room. This will help in reducing the amount of air (oxygen) to the fire and subsequently help in slowing down the progression of the fire. Immediately call **999,** which is a general emergency line or **993** (Fire Brigade).

Once people have been evacuated from the burning building, staff members oriented in handling fire equipment can proceed with fighting the fire in line with the following steps:

1. Classify the fire by determining what is burning. This is an important step, which will help in choosing the type of fire extinguisher to use.

2. Choose the appropriate extinguisher and a safe position to fight the fire. The safest position to fight a fire is to stand between the fire and the exit way. Never put the fire between you and the exit.

Keep a safe distance from the fire.

A fire extinguisher is a first-response tool designed ***to put out small, manageable fires***.

Before attempting to use a fire extinguisher, ***always ensure the fire is not spreading rapidly*** and that you have a clear escape route behind you.

The correct method for using a fire extinguisher is a four-step process commonly known as **PASS** (**P**ull, **A**im, **S**queeze, **S**weep):

Step 1: Pull the safety pin at the top of the extinguisher. This breaks the seal and allows you to discharge the extinguisher.

Step 2: Aim the nozzle or hose at the base of the fire, not at the flames. Targeting the base removes the fuel source.

Step 3: Squeeze the handle slowly and evenly to release the extinguishing agent. Make sure you stand firm with one leg forward to absorb the backward push of the extinguisher.

Step 4: Sweep the nozzle from side to side at the base of the fire until it is fully extinguished.

Remember: PASS

P – Pull

Pull the pin.

A – Aim

Aim at the base of the fire.

S – Squeeze

Squeeze the handle.

S – Sweep

Sweep side to side.

Important Safety Tips:

1. Always keep a safe distance **(about 2–3 metres)** when starting. Test the extinguisher before you approach the fire.
2. **If the fire does not go out immediately or begins to spread, stop and evacuate.** You should also vacate when you are getting choked by smoke or when the heat starts becoming unbearable.
3. **Never turn your back on a fire**. Face the fire even as you are retreating from it. Watch the area where the fire has been extinguished in case it re-ignites.
4. **Use the correct extinguisher type** for the fire (e.g. electrical, flammable liquids, ordinary combustibles).

FIRE DRILLS

A fire drill is a planned and supervised exercise that trains staff or occupants of a building on how to respond safely and efficiently in the event of a real fire. Its main purpose is to ensure that everyone knows the evacuation routes, assembly points, and emergency procedures, thereby reducing panic, injuries, and loss of life during a real fire emergency.

A Fire Drill is conducted by following the steps outlined below:

1. Step One – is the planning process were Fire Marshals, evacuation routes, fire exits, and assembly points are identified and designated to appropriate offices.

Step Two – is conducting the fire drill by activating a fire alarm to simulate a real fire emergency.

Step three – is evacuation, where all the occupants are expected to stop work immediately and evacuate using designated exits. Where necessary fire marshals should guide people and assist those with disabilities.

Step four – is Assembly and Roll Call, were all the occupants are called out to confirm everyone is accounted for.

Step five – is Evaluation, where the drill is reviewed to identify delays, confusion, or unsafe behaviour.

Step Six - Corrective actions, where the measures to address the shortcomings are implemented.

Other Key Points in Firefighting and Fire Prevention

1. Ensure that all members of staff adhere to fire drills. A serious fire safety policy includes punitive measures for not responding to fire drills.
2. There is a need for regular inspection and maintenance of electrical systems and other equipment.
3. Ensure safe storage of flammable materials.
4. Ensure that a no-smoking policy in restricted areas is enforced at all times with punitive measures for non-adharance.
5. Ensure good housekeeping to avoid accumulation of combustible waste.

6. Ensure that escape routes are clear and unobstructed at all times.

7. It also a good practice to install appropriate fire extinguishers and ensure they are clearly labelled.

8. Staff members must be trained in the use of fire extinguishers (PASS method).

9. It is a good idea to install and maintain fire alarms, smoke detectors, and emergency lighting.

10. Ensure fire hydrants and hose reels are functional where applicable.

Fire drill must be conducted at least once or twice a year and new members of staff must be provided with fire safety training.

In conclusion it can be said that fire safety in an institution depends on prevention, preparedness, training, and regular drills.

A well-conducted fire drill ensures that occupants respond calmly and correctly, significantly reducing the risk of injury or loss of life during a real fire incident.

JCTR

Promoting Faith and Justice

THANK YOU

for your attention!

Discussion/Way Forward

1. In your groups analyse the JCTR fire fighting system using the following questions:
   a) Does JCTR has an efficient fire fighting system?
   b) What elements of the fire fighting system are missing?

2. What recommendations can you make to improve the system?