



Institute for *Plasma Research*  
*Welcomes you all on*

# *FIRE SAFETY TRAINING PROGRAM*



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Compiled by: **SAFETY COMMITTEE, IPR**

# WHAT IS FIRE?

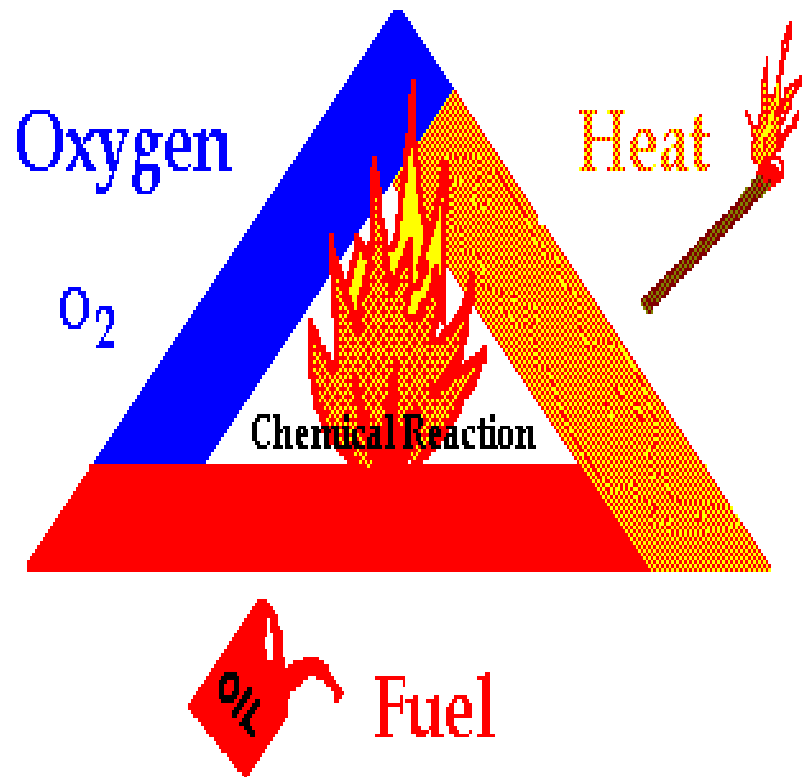
The self-sustaining process of rapid oxidation of a fuel, which produces heat & light.

Its a rapid chain reaction.



# HOW DOES FIRE START?

## Fire Triangle



# HOW DOES FIRE START?

## 1. Oxygen:

Oxygen is always available in air.

## 2. Heat / Source of Ignition:

Open flame, Spark, Temperature, static elect.

## 3. Fuel

Combustible material, Flammable Chemicals/Gas

**Individual component is not capable to cause fire. Three components together only can cause fire.**

# HOW TO PREVENT OR EXTINGUISH THE FIRE?

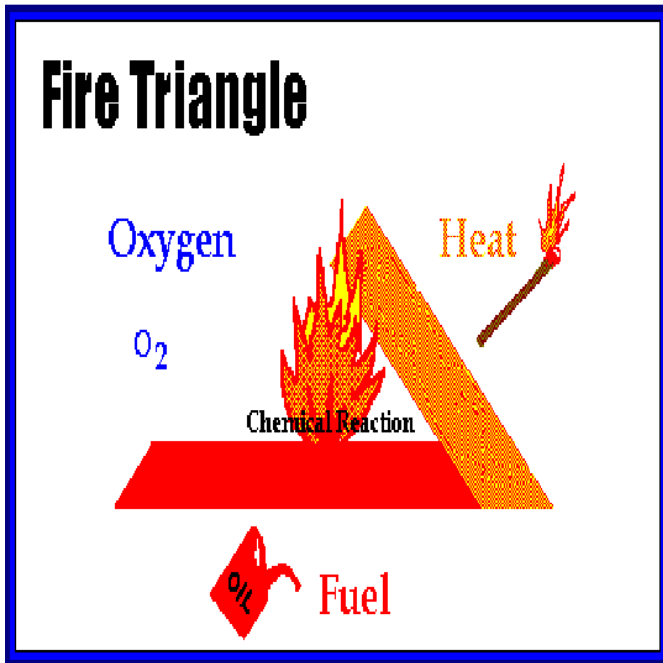
Prevention of fire means **absence** of any one of the three components,

and

Extinguishing means **removing** any one of the three components

# HOW TO PREVENT OR EXTINGUISH THE FIRE?

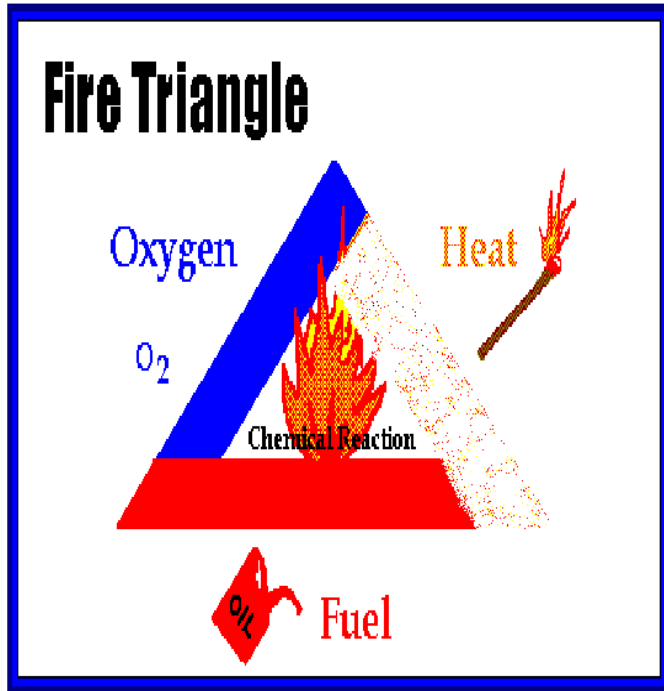
## 1. Removing Oxygen: (Smothering Technique)



Cut off air supply to fire by providing blanketing either by sand, DCP,  $CO_2$ , CA or other inert media,

Most widely accepted fire prevention technique in petroleum storage

# HOW TO PREVENT OR EXTINGUISH THE FIRE?



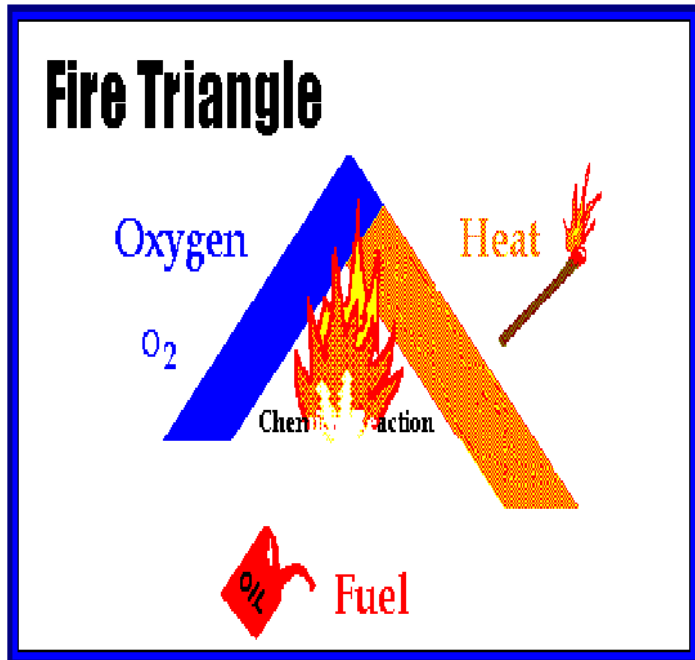
## 2. Removing Heat or Source of ignition: (Cooling Technique)

To prevent fire, eliminate all sources of ignition / spark etc.

To extinguish a fire cool down flame by water,

# HOW TO PREVENT OR EXTINGUISH THE FIRE?

## 3. Removing Fuel: (Starvation Technique)



Remove or eliminate all Combustible material, Flammable Chemicals or Gas from the source of ignition.

Cut off gas supply for gas fire.



# MAJOR CAUSES OF FIRE

- Carelessness with handling of ignition sources (smoking, matches, welding, gas cutting, open flame, etc) : **20%**
- Improper use of electricity (overloading a circuit or overuse of extension cords, improper maintenance): **15%**
- Improper rubbish disposal (Improper housekeeping)
- Improper storage of flammables (Chemicals, Solvents, Oil, etc.)



**40 %**

# HOW CAN WE PREVENT THE FIRE?

## PREVENTION IS ALWAYS BETTER THAN CURE

- Ensure that Offices and Labs are free of excess combustible material like papers, cartons, Oil, etc.
- Ensure lowest possible inventory of flammable chemicals & Gas Cylinders inside the Labs. Store incompatible chemicals separately.
- Avoid spark-producing jobs like welding, gas cutting, grinding, etc. near the flammable materials.

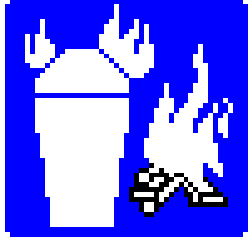
# HOW CAN WE PREVENT THE FIRE?

## PREVENTION IS ALWAYS BETTER THAN CURE

- Avoid joints in cables and loose connections.
- Avoid temporary connections. Prevent overloading of electrical circuits and ensure grounding.
- Turn off electrical appliances while leaving the Office.

# CLASSES OF FIRE

## Class A



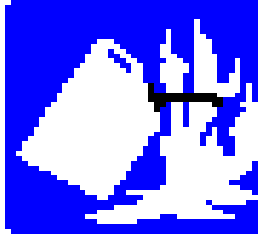
## Ordinary Combustibles



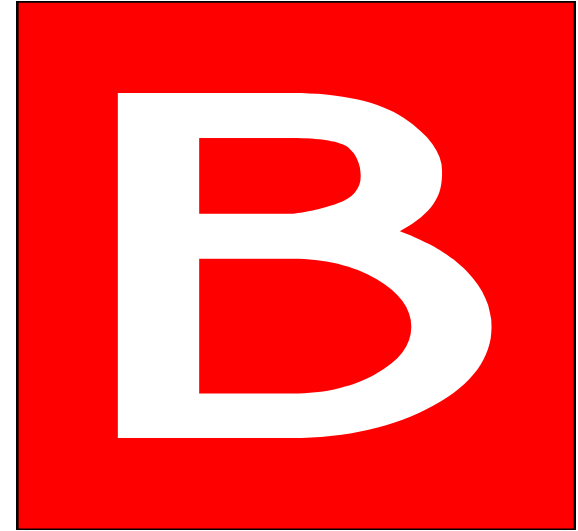
This includes fuels such as wood, paper, rubber, cloth etc.

# CLASSES OF FIRE

Class B



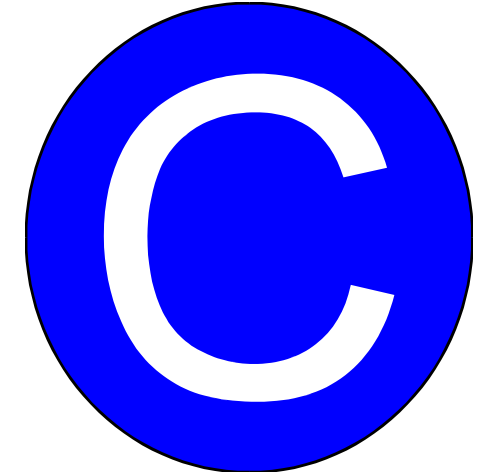
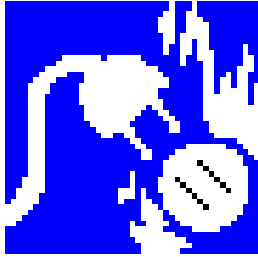
**Flammable Liquids**



**This includes all hydrocarbon and alcohol based liquids**

# CLASSES OF FIRE

## Class C



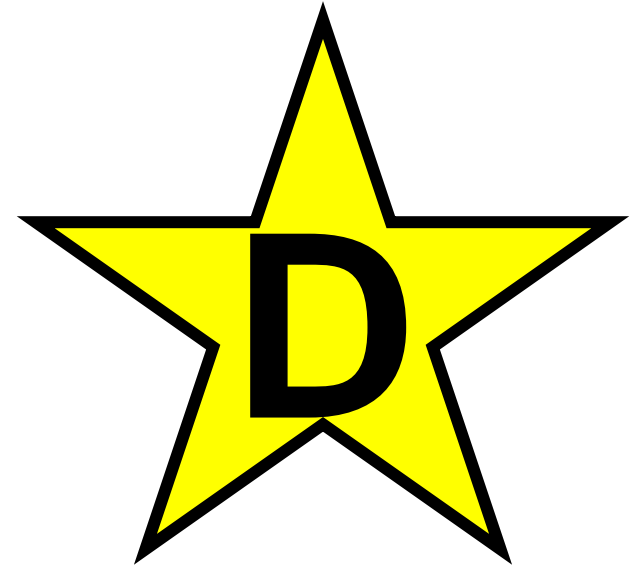
**Flammable Gases &  
Energized Electrical Equipment**

**This includes LPG, Acetylene gas fire.**

# CLASSES OF FIRE

## Class D

**Combustible Metals**



**Examples of these type of metals are Sodium, Lithium, Magnesium etc.**

# TYPES OF FIRE EXTINGUISHERS

**The importance of portable  
Fire Extinguishers?**

**Your first line of defence!**



# TYPES OF FIRE EXTINGUISHERS

**Based on filling material, fire extinguishers are classified in various categories mainly,**

- 1. Dry Chemical Powder (DCP) Type FE,**
- 2. ABC Type FE,**
- 3. Carbon Dioxide Type FE,**
- 4. Clean Agent FE**

# TYPES OF FIRE EXTINGUISHERS

## 1. Dry Chemical Powder (DCP) Type FE:



Sodium bicarbonate powder filled in the cylinder. It has inert gas cartridge.

To operate the FE, push the valve knob down which in turns puncture the gas cartridge. Pressure gas expel powder in form of jet.

Widely used for Class B & C fires.

# TYPES OF FIRE EXTINGUISHERS

## 1. Dry Chemical Powder (DCP) Type FE:



**2 kg. DCP F.E.**



**5 kg. DCP F.E.**

**Discharge Range  
6 ft. to 12 ft.**

**Discharge Time  
8 sec. To 20 sec.**

# TYPES OF FIRE EXTINGUISHERS

## 2. ABC Type Fire Extinguisher:



Mono-Ammonium Phosphate powder is filled in the cylinder. Powder is under stored pressure of Nitrogen instead of gas cartridge.

To operate the FE, squeeze the valve grips.

# TYPES OF FIRE EXTINGUISHERS

## 2. ABC Type Fire Extinguisher:



It has Pressure Gauge on the valve, which indicates readiness of FE. Pointer in green zone (Vertical) indicates OK condition. Widely used for all Class of fires.

The most effective extinguishing media. It can also be used on electric fire due to its non-conductive characteristic.

# TYPES OF FIRE EXTINGUISHERS

## 2. ABC Type FE:



**2 kg. ABC F.E.**



**5 kg. ABC F.E.**

**Discharge Range  
6 ft. to 12 ft.**

**Discharge Time  
8 sec. To 20 sec.**

# TYPES OF FIRE EXTINGUISHERS

## 3. Carbon Dioxide Type FE:



- Liquefied Carbon Dioxide ( $\text{CO}_2$ ) filled at pressure @ 60 Kg/cm<sup>2</sup> in the cylinder.
- It has horn on discharge nozzle and does not have Pressure Gauge.
- It has valve with wheel. To open, rotate the wheel anti-clockwise.

# TYPES OF FIRE EXTINGUISHERS

## 3. Carbon Dioxide Type FE:

Widely used for Class B & C fires.

No residue.

May not be effective for Class A fire because it may not be able to displace enough O<sub>2</sub> to put the fire out. Class A material may also re-ignite in open area, where air movement is high.





# TYPES OF FIRE EXTINGUISHERS

## 3. Carbon Dioxide Type FE:



**2 kg. CO2 F.E.**



**4.5 kg. CO2 F.E.**



**6.5 kg. CO2 F.E.**

**Discharge Range  
3 ft. to 8 ft.**

**Discharge Time  
8 sec. To 30 sec.**

# TYPES OF FIRE EXTINGUISHERS

## 4. Clean Agent Type FE:

Clean gas agent which leaves no residue, hence no collateral damage to the equipments,

Environmental friendly,

Clean Agent is a proprietary blend of HCFC-123 and inert material,

Widely used for all classes of fire,



# TYPES OF FIRE EXTINGUISHERS

## 4. Clean Agent Type FE:

It has Pressure Gauge on the valve, which indicates readiness of FE. Pointer in green zone (Vertical) indicates OK condition.

It can also be used on electric fire due to its non-conductive characteristic.

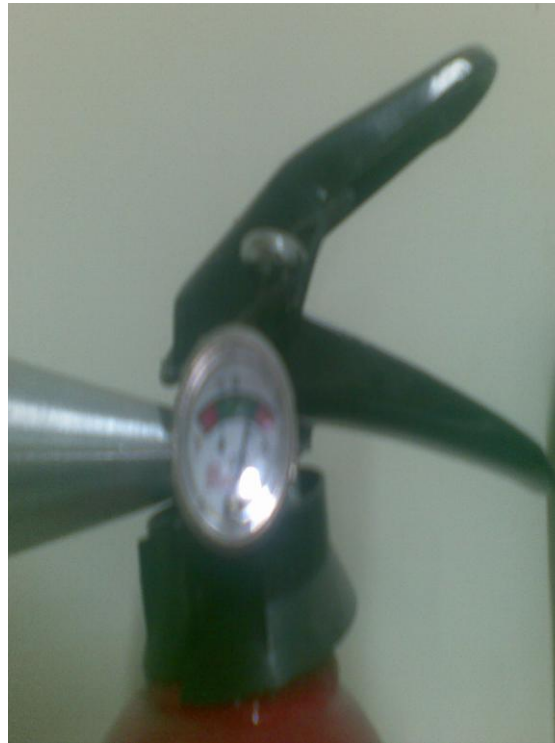


# TYPES OF FIRE EXTINGUISHERS

## 4. Clean Agent Type FE:



**2 kg. Clean agent F.E.**



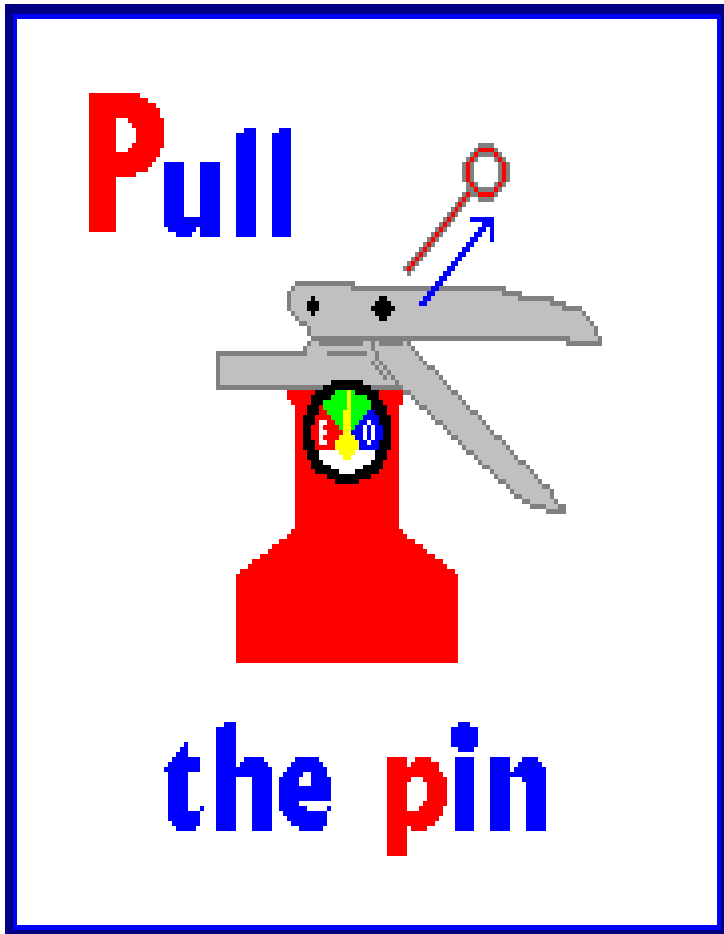
**Pressure gauge  
with nozzle.**

**Discharge Range  
6 ft. to 15 ft.**

**Discharge Time  
16 sec.**

# HOW TO OPERATE FIRE EXTINGUISHERS?

## **REMEMBER: P A S S METHOD**



### **P**ull the pin:

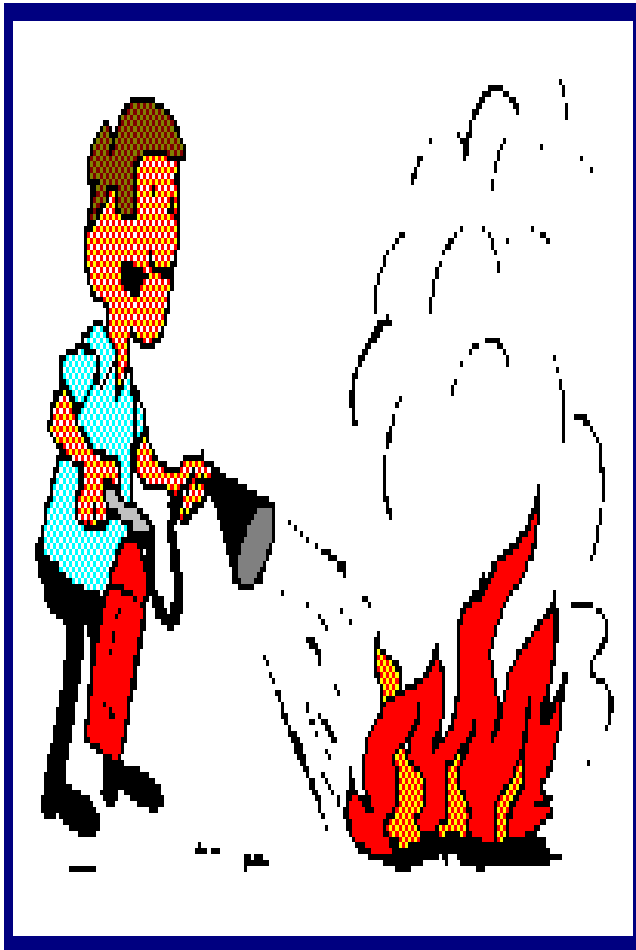
This will allow you

- to squeeze the handle for ABC / Clean agent FE
- to rotate the wheel for CO<sub>2</sub> FE &
- to push the knob for DCP FE

in order to discharge the content from FE

# HOW TO OPERATE FIRE EXTINGUISHERS?

## ***REMEMBER: P A S S METHOD***



**Aim at the base of the fire:**

Aiming at the middle will not be effective. The agent will pass through the flames.

Aim the discharge jet on the base of the fire.

# HOW TO OPERATE FIRE EXTINGUISHERS?

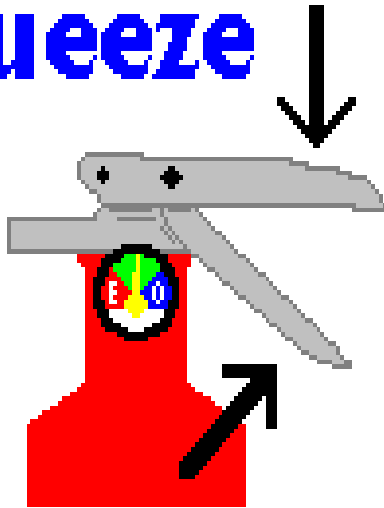
## **REMEMBER: P A S S METHOD**

### **S**queeze the handle:

Squeeze the handle (ABC/Clean agent FE) or rotate valve wheel anti-clockwise (CO<sub>2</sub> FE) or push the knob (DCP FE).

This will release the pressurized extinguishing agent.

**S**queeze



**the handle**

# HOW TO OPERATE FIRE EXTINGUISHERS?

## ***REMEMBER: P A S S METHOD***



### **Sweep side to side:**

Cover the entire area that is on fire. Continue until fire is extinguished.

Keep an eye on the affected area for re-lighting.



# FIRE EMERGENCY PROCEDURE

- Once fire starts it spreads very fast. It is very easy to fight fire in its incipient stage. So attack immediately on small fires without any delay.

## While fighting a fire ...

- Inform other people working in the affected area.
- Turn Off electrical equipment, if it is safe to do so.
- Keep an exit to your back for easy escape.
- Don't make affected area crowded. Assemble at safe location.
- Call outside fire services for major fire and guide them by right information & help them. Inform Lab In-charge, Safety & Administration / Security.

# FIRE EMERGENCY PROCEDURE

- If your **clothes catch fire**, do NOT run. This could make the fire spread more quickly. Instead, **stop, drop, and roll!** In other words, stop, drop to the ground, cover your face with your hands, and roll back and forth until the fire is put out.
- If there is smoke in the area, cover your nose and mouth with a small cloth and **stay low** to the ground as you're leaving. Smoke is very dangerous to breathe and difficult to see through. Since smoke naturally rises, **you should crawl on your hands and knees to exit the building.**



You are not expected  
to be **firefighters!**  
Do not take unnecessary risks!

**Let's try to prevent fire**

**If at all fire starts...**

**... Be ready to fight the fire  
with full confidence**

*THANK YOU FOR  
Your valuable time*

