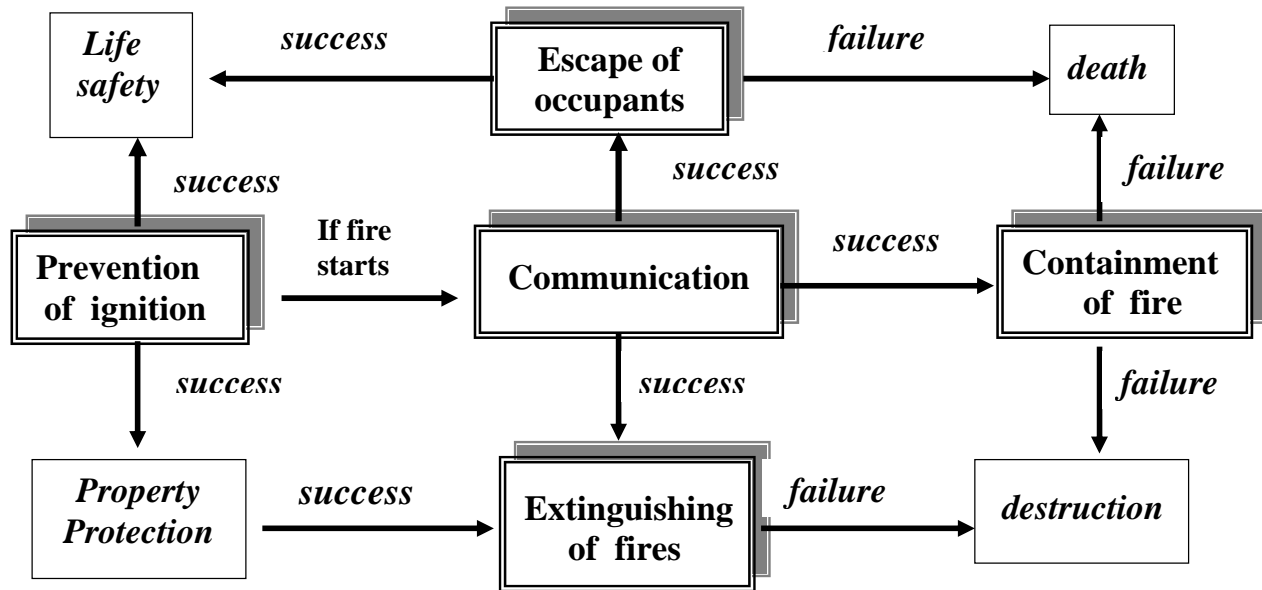


## *Fire Safety Procedures and Tactics*

Fire risks exist wherever combustibles and air exist together. When fires go out of control they cause great destruction and casualties. It is accepted that complete safety from fire is impossible but if fires are well controlled, the risks become minimum.

*The strategies for fire safety are 5 steps (as shown in the figure):*

1-prevention    2-Communication    3-Escape    4-Containment    5-Extinguishing



- 1) **Prevention** : (stop ignition to take place by using good conductors and insulation for electric connections or wiring and following safety and fire prevention codes).
- 2) **Communication** : (if ignition takes place and fire starts) by using fire detectors and Sounding alarms to ensure that occupants are informed and any active fire fighting systems are triggered. Fire alarms shall be distinguishable from all non-fire alarms. The most common alarm signals are electric bells and flash lights (in case of noisy areas). Direct telephone link to general fire station must be provided. Fire alarm system can be used to actuate other systems such as automatic-doors, motorised ventilation systems (dampers/controls) , powered smoke extraction systems and also fire extinguishing systems.
- 3) **Escape of occupants** : (shall be according to prearranged evacuation strategy). Time needed for evacuation shall be less than time for fire to spread. Evacuation time depends on type of building or occupancy and expected response of occupants. Signs and fire notices are important in giving good information to the occupants and fire service people. They should indicate all available escape routes. Refuge in a safe place inside the building may be an alternative if occupants will not be able to safely escape outside the building. Minimum numbers of exits and width of escape routes shall be proportional to the number of people to be evacuated.
- 4) **Containment** : To contain fire products (heat, flame & smoke) in fire area and to stop fire spread to adjoining properties. There are passive & active containment:

- a- Passive measures (called envelope protection): All fire zones must be defined and separated by fire barriers or fire resistant walls (as per NFPA 101). External walls and roofs shall protect surroundings from fire inside the building and to prevent ignition from external fire. Compartment walls and floors shall stop fire spreading.
- b- Active measures : using air pressurization, forced ventilation, automatic doors or dampers to resist the inflow of smoke to the areas to be protected. Sprinklers can also be used to cool the fire surroundings to reduce the risk of fire growing.

5) **Extinguishing:** In case of fire, and regardless of the containment effectiveness in limiting its spread, fire must be extinguished to limit the damage to property. Fire may be extinguished by many methods: (a) cooling the burning materials; (b) blanketing the fire with inert gas or foam to choke it for the lack of oxygen; (c) introducing materials that chemically inhibit combustion; and (d) covering the burning matter with a blanket or a layer of solid particles (powder) to prevent access of air. Fire extinguishers operate on one or a combination of these principles.

	Fires in solids	Electrical fires	Fires in liquids	Fires in gases
Water	Excellent	No	No	No
Foam	Good	No	Excellent	No
CO <sub>2</sub>	Poor	Good	Good	Good
Powder	Poor	Excellent	Excellent	Excellent
Halons	Poor	Excellent	Excellent	Excellent

Water is the most effective cooling agent in fire extinguishing. Wetting agent and foaming agents increase the effectiveness of water. Automatic water sprinkler systems are common in industrial plants and large buildings. CO<sub>2</sub> is safe and effective for confined fires on a floor or in a vessel but not effective in elevated locations or outdoors where the wind can blow the gas away. A dry powder, consisting principally of sodium bicarbonate, must have the correct particle size and contain materials that prevent it from caking. The powder generates CO<sub>2</sub> and cools the burning material and also provides a shielding to prevent access of air.

### **Automatic Alarm System**

It is a system that operates a warning device after the occurrence of abnormal or dangerous condition. Alarm systems are used to signal undesirable situations such as a fire, the presence of an intruder, existing of a runaway condition in a petroleum refinery, excessive process temperature or pressure, etc. Alarm systems are usually open-loop control systems. A basic alarm system contains two essential components: an alarm detector and an alarm indicator. Frequently, alarm systems are remote-control systems, that is the detector is located in one place remote from the indicator.