RANGE

By the end of this unit, you will be able to understand:

- CLASSIFICATION OF FIRES
- FIRE ALARMS & SMOKE DETECTORS
- TYPES OF EXTINGUISHERS
- MEANS OF EGRESS
- ELEVATOR & KITCHEN EQUIPMENTS
FIRE

Three main factors required to start a fire:
1. FUEL
2. AIR (OXYGEN)
3. HEAT (GAS, ELECTRICITY etc.)

Factors required to extinguish a fire:
1. STARVING (Cut off or remove the fuel)
2. SMOTHERING (Cut off oxygen supply)
3. COOLING (Remove the heat)

Fuel is a thing which burns; Heat is that which sets the fuel alight; Oxygen is needed for burning.
TYPES OF FIRE

- **CLASS - A FIRE**: Fire caused due to ordinary combustibles like wood, textiles, paper, rubbish etc.

- **CLASS-B FIRE**: This includes fire caused by highly inflammable liquids.

- **CLASS-C FIRE**: This includes fire caused due to inflammable gases.

- **CLASS- D FIRE**: Fire caused due to combustible materials like zinc, aluminium, sodium, potassium.

- **CLASS-E FIRE**: Fire caused due to energized electric equipment or short circuit.
TYPES OF FIRES

- A TRASH
- C C

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FIRE DETECTORS & ALARMS

- Fire detectors are of following types:
  1. IONIZATION DETECTORS
  2. OPTICAL SMOKE DETECTORS
  3. RADIATION DETECTORS.

- RADIATION DETECTORS are of following types:
  A. INFRA RED
  B. ULTRA VIOLET
  C. FLAME FLICKER TYPE
  D. HEAT DETECTORS.
IONIZATION SMOKE DETECTORS

- There are two electrodes, one is positive & other is negative.
- Ions move from one electrode to other. When smoke particles come in contact with the ions the current flow is reduced.
- Alarm is initiated.
PHOTO BEAM DETECTOR is being used.

It has two disadvantages:
1. It is a big detector & requires a lot of smoke.
2. It is not very sensitive

The smoke has to be sufficiently thick enough to completely block out the light.

Inside the smoke detector there is a light & a sensor but they are positioned at 90° angle to each other.
OPTICAL SMOKE DETECTORS

A - LIGHT SOURCE
B - PHOTO SENSOR
C - SMOKE

IN THE NORMAL CASE, THE LIGHT FROM THE SOURCE ON THE LEFT SHOOTS ACROSS & MISSES THE SENSOR.

WHEN SMOKE ENTERS THE CHAMBER, HOWEVER THE PARTICLES SCATTER THE LIGHT & SOME AMOUNT OF LIGHT HITS THE SENSOR. THE SENSOR THEN SETS OFF THE HORN IN THE SMOKE DETECTOR.

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INFRA RED VISION

- **INFRA RED DETECTORS**: Infra red is generally used in the night vision equipment when there is insufficient visible light to see.
- Infra red creates images based on differences in surface temperature by detecting infra red radiation (heat) that emanates from objects.
- This is called as thermography & in case of very hot objects it is called as pyrometry.
- The main components include PE cells, lenses & amplifier. The lenses & amplifier allow only infra red rays to fall on PE cells. On detecting the radiations, the cell activates the alarm.
FLAME FLICKER TYPE

SOURCE

DETECTOR
FLAME FLICKER TYPE

- The PE cell is struck by deflected infra red radiation & the amplifier present identifies the characteristic flame flicker.
- If the infra red source is present for 10 – 15 seconds, the alarm goes.

ULTRA VIOLET RADIATIONS:
1) The PE cell has a gas filled tube similar to UV radiation.
2) When the tube is exposed to the UV radiation, a small current is generated making the tube a conductor of electricity.
3) When the flow of current becomes greater than the preset value, the alarm goes.
HEAT DETECTORS

These detectors detect fire in a more advanced stage when temperature starts rising. These detectors work on the following principles:
A) Melting or fusion in metals/plastics.
B) Expansion in solids/liquids/gases.
C) Electrical effect.
FIRE ALARMS

- Fire alarm system should consist of:
- Alarm related devices.
- Fire alarm systems should comply with the requirements laid down in NFPA 72.
- Registered fire protection engineer or a technician should be certified by NICET LEVEL III.

A DIGITAL ALARM COMMUNICATOR (DACT) must be connected to a pair of phone lines.
FIRE EXTINGUISHERS

- WATER TYPE FIRE EXTINGUISHER: It is of following types:

- WATER SODA ACID: This is basically meant for class-A fires.

- WATER (GAS CARTRIDGE): This may be 6 litres to 9 litres of water content. CO2 gas is filled in a cartridge inside the body of the fire extinguisher.

- WATER (STORED PRESSURE): Function is same as previous except that the whole container is pressurized or nitrogen is pumped in until the pressure reaches specified limit.
WATER TYPE FIRE EXTINGUISHERS

1. Handle Pressed
   - The release valve admits the gas to the space above the water.

2. Valve Opens
   - The pressure pushes down on the water, which is driven up the siphon tube to a hose connected to the nozzle.

3. Gas Escapes
   - A cartridge containing carbon dioxide gas at high pressure provides the pressure needed to work the extinguisher.

SULPHURIC ACID

BICARBONATE OF SODA AND WATER

INVERT TO USE
FOAM FIRE EXTINGUISHERS

- **CHEMICAL FOAM**: Chemical reaction in the cylinder produces foam containing CO2 bubbles.

- **SELF ASPIRING FOAM**: The cylinder is filled with a foam solution & discharged by a gas cartridge of CO2 or compressed air or nitrogen. Both can be accompanied by a freezing depressant.
FIRE EXTINGUISHER(CONTD)

➢ CARBON DIOXIDE FIRE EXTINGUISHER: This type of fire extinguisher is generally installed in kitchen, large restaurants because CO2 does not contaminate the oil when discharged onto it.

➢ DRY CHEMICAL POWDER FIRE EXTINGUISHER: Mainly for class A,B,C type of fires. The most common extinguishing agents are sodium bicarbonate or baking soda. It also has a small cartridge of CO2.
HALON FIRE EXTINGUISHER

- Available in the range of 0.7 to 7 kg. & are of stored pressured type.
- Once used, they have to be recharged by manufacturers.
- Halon is any of several compounds consisting of one or two carbon atoms combined with bromine & one or more halogens.
- They are ineffective on fuels containing their own oxidising agent or highly reactive metals such as sodium or potassium.
- HALON 1301 (BROMOTRIFLUOROMETHANE) is especially favoured for extinguishing fires involving electronic equipment.
DRY CHEMICAL POWDER, HALON FIRE EXTINGUISHER

Powder extinguisher (gas-cartridge type)

Operating lever
Carrying handle
Co2 Gas cartridge piercer
Gas inlet tube
Co2 Gas cartridge
Powder
Discharge tube
Nozzle

Stored Pressure

Halon 1211

Manufactured and Tested to ANSI/UL Standards:
Rugged: Clean: Safe: Efficient
UL Listed & USCG Approved

User Friendly

* Maximum Visibility During Discharge
* No Electrical Conductivity Back to the Operator
* No Thermal or Static Shock
* Bar Coded & Bilingual Labels

(Temperature Range: 40°F to 130°F)

* All extinguishers USCG approved except model B305

Specifications:

Halon 1211

| Models | A336T | C352TS | C354TSS | B305
|--------|-------|--------|---------|------
| Stored Pressure | 36 | 36 | 36 | 36
| Operating Pressure | 152.4 | 152.4 | 152.4 | 152.4
| Discharge Time | 30 sec | 30 sec | 30 sec | 30 sec
| Weight | 10 lb | 10 lb | 10 lb | 10 lb
| Dimensions | 14" x 12" | 14" x 12" | 14" x 12" | 14" x 12"

Halon 1211 is a liquidified gas, pressurized with nitrogen, which discharges as a vapor causing no cold or static shock and no impairment of the operator’s vision. This “CLEAN” agent quickly penetrates difficult to see and hard to reach areas and leaves no residue. It is recommended for protection of delicate, sensitive and expensive computer, electrical equipment, tapes and film, automobile and aircraft engines, laboratory chemicals and equipment.

Quality, industrial grade hardwares, “CLEAR” agent, light weight, good discharge range and excellent fire extinguishing ability.

1 YEAR WARRANTY

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STATIONARY EQUIPMENT

STATIONARY EQUIPMENTS are of the following types:
1. AUTOMATIC SPRINKLERS
2. FIRE HOSE SYSTEM & PERMANENTLY CONNECTED FOAM
3. CO2 DRY CHEMICAL POWDER.
STATIONARY EQUIPMENTS

AUTOMATIC SPRINKLERS:

- They are fixed below the ceiling light with a temperature detector used with each sprinkler.
- Each sprinkler head has heat sensitive seals.
- When the temperature rises, the detector is activated which in turn opens the water valve.
- With the increase in the volume of fire, more sprinklers get opened up.
- Sprinklers open up individually & independently when a predetermined temperature is reached.
- This is done to provide maximum water supply in the area where fire originates.
TYPES OF AUTOMATIC SPRINKLERS

- **WET SYSTEMS**: In these systems, pressurized water in the pipes which are held back by the sprinkler’s head.

- **DRY SYSTEMS**: These systems have a low maintenance air pressure in pipes.

- **DELUGE SYSTEMS**: These systems have open sprinklers which means that the fusible link is removed.

- **PRE-ACTION VALVES**: Similar to deluge system i.e. the sprinklers are closed & the entire system is filled with compressed air known as MAINTENANCE AIR.
STATIONARY EQUIPMENT

- **FOAM & GAS SYSTEMS**: Some places have foam instead of water suppression agents due to the presence of flammable liquids e.g. airport hangers.

- **HOSE REELS**: They have permanently fixed hose box. The hose box has a flexible hose pipe which can be moved throughout the building.
FIRE FIGHTING EQUIPMENT RECOMMENDED FOR HOTELS

- KITCHEN – Use heat detectors & foam type fire extinguisher is used.
- PUBLIC AREAS: Smoke cum heat detector is used. Fire extinguisher used is soda acid type & dry chemical powder types.
- STAIRCASE: Smoke cum heat detector is used & soda acid, DCP type fire extinguisher is used.
FIRE FIGHTING EQUIPMENT RECOMMENDED FOR HOTELS

- LAUNDRIES: Smoke cum heat detector/DCP or soda acid fire extinguisher is used.
- SUBSTATIONS: Smoke cum heat detectors/DCP & CO2 type fire extinguisher is used.
- OFFICES: Smoke cum heat detectors, soda acid type
EXITING

Every building consists of three components:
1) Way of exit access
2) The exit
3) Way of exit discharge

Means of egress is a continuous path of travel provided for the escape of persons from any point in a building or contained space.
It becomes the moral responsibility of the management to ensure that essential building systems are designed & maintained for fire safety. Main systems are:
1) ELEVATORS
2) KITCHEN EXHAUST SYSTEM.
ELEVATORS

- In case of fire breakout, elevators can be deadly for guests traveling in them.
- This is because the elevator shafts may act as chimneys for toxic gases & smoke.
- Capture mechanism is activated by fire detection systems which returns the elevator car to a safe area & becomes inoperable.
KITCHEN EXHAUST SYSTEM

Points to take care are:
A) The exhaust system should be made of proper construction materials.
B) The duct system should be properly installed.
C) The air movement in the duct should be proper.
D) It should have a proper fire suppression system.
E) The system should receive proper maintenances. A check can be made.
EMPLOYEE TRAINING

- FIRE PROBLEM AREAS
- FIRE TRAINING
- FIRE RESPONSE TEAM IN HOTELS
GUEST SAFETY

- Information of fire code & directions to guests.
- Explanation to be given to guest
- Safety precautions
FIRE HAZARDS

➢ It is a situation wherein there is a greater than normal risk of harm caused by fire.

➢ It may be the reasons from where the fire starts such as Blocked A/C vent, overload electrical system etc.

➢ Fire safety deals with safety measures to prevent fires which may be a set of norms such as:

➢ 1. Norms as per local building code when permit for construction of building was taken.

FIRE CODE OR FIRE SAFETY CODE

- It consists of rules & regulations laid down by municipal departments to prevent fires & explosion hazards due to storage & handling of dangerous materials.
- It also includes the building code.
NORMS LAID DOWN BY NFPA 13, NFPA 96

- Occupancy in a building should not exceed maximum occupancy.
- Provisions of fire exits, signages for exits etc.
- Provisions for fire extinguishers, fire alarms at appropriate places to easy access.
- Proper storage or banning of flammable materials.
- Regular inspection of building & prosecution incase there is a violation in norms.
- Installation of fire alarm control panels to detect fire quickly.

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NORMS LAID DOWN BY NFPA 13, NFPA 96

- Keep a record of the inventory of fire stops.
- Spray fire proofing should not be damaged.
- The occupants in the building need to be properly trained for fire prevention & safety.
- Conduct regular fire drills throughout the year.
REVIEW

- Class of fire
- Types of smoke detectors
- Types of fire extinguishers
- Stationary equipments
- Fire fighting equipment recommended for hotels
- Egress & means of egress
- Employee training & guest safety
- Fire hazards & norms laid down by NFPA.
ASSIGNMENT

- What are the factors required for a fire to take place? Classify fire giving examples.
- What are the different types of smoke detectors?
- Explain different types of fire extinguishers used in hotels.
- What is EGRESS? Explain means of egress in case of a breakout of fire.
- What is FIRE HAZARD? Explain fire safety norms laid down by NFPA 13, 96.

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REFERENCES

- TYPES OF FIRE EXTINGUISHERS: [http://www.mfs-fire-extinguishers.co.uk/types.htm](http://www.mfs-fire-extinguishers.co.uk/types.htm)
THANK YOU