



# Ensuring Fire safety



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## Maharashtra: 10 newborn babies die in a hospital fire in Bhandara; CM Thackeray orders probe; Rs 5 lakh ex gratia for kin of dead

By Pratik Mukane / Updated: Jan 9, 2021, 10:19 IST

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### DELHI NEWS

#### Fire breaks out at Covid-19 designated hospital opposite IIT Delhi

The fire at the Covid-19 designated hospital which started at around 5:45 pm has been doused

Hindustan Times, New Delhi | By hindustantimes.com  
 UPDATED ON MAY 23, 2020 07:30 PM IST



Fire broke out at the Cygnus Orthocare Hospital in south Delhi.(HT)

Fire broke out at the Cygnus Orthocare Hospital opposite IIT campus on Saturday. At least eleven newborn babies were rushed

Close x



In a shocking and unfortunate incident, 10 newborn babies died after a major fire broke out at a hospital in Bhandara district of Maharashtra.

The incident took place at around 2 am on Saturday at the neonatal care unit of a district government hospital.

... babies lost their lives due to asphyxiation after the smoke filled the ward. The fire was quickly extinguished by the fire brigade.

## 11 killed in Mumbai hospital fire, CM Thackeray apologises, announces Rs 5 lakh relief | All that happened

Pankaj Upadhyay  
 Mumbai  
 March 26, 2021 UPDATED: March 26, 2021 18:26 IST

A major fire broke out at a mall in Mumbai that houses a Covid-19 hospital on the third floor. Eleven newborn babies have died in the fire that broke out late on Thursday night.



Delhi: A fire has broken out on first and second floor of All India Institute of Medical Sciences (AIIMS). Fire brigade present at the spot.

# Learning Objectives



Recognition of the fire hazards & risk in a Health care facility



Understand the fundamental aspects of fire safety



Understanding of potential fire hazards and control measures



Understand the overview of the fire protection system.



Be familiar with overall administration of Emergency Management

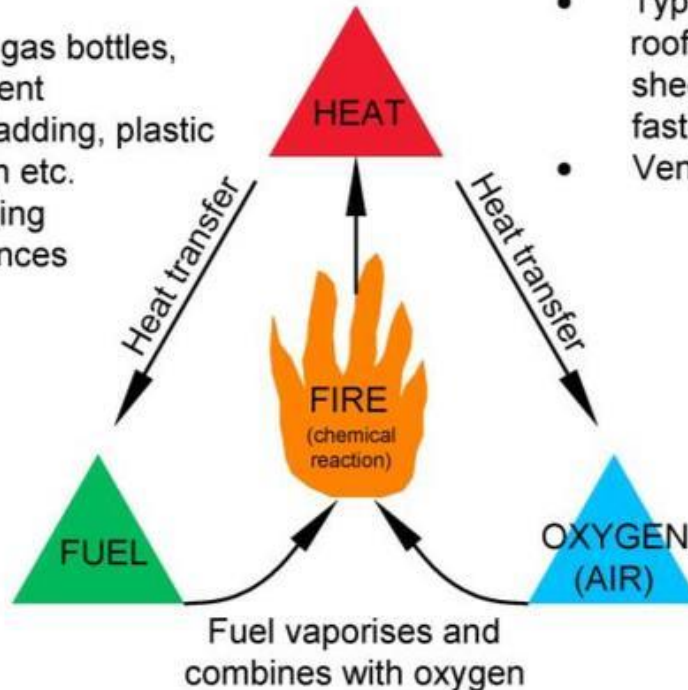
# Why Fire Management?

- To minimize deaths and losses.
- Minimum level of preparedness & planning can do it.
- Without identification of risk & vulnerability, only knowledge of hazards is of no use.
- Normal procedures are insufficient to handle grave situations

# Fire Triangle

## Fuel sources:

- Furniture
- Paraffin stoves, gas bottles, cooking equipment
- Timber walls, cladding, plastic layers, insulation etc.
- Clothing & bedding
- Electrical appliances
- etc.



## Influences on heat retained:

- Type and thickness of walls and roof construction. Thin steel sheets allow heat to radiate out faster than timber boards.
- Ventilation as below.

## Influences on ventilation:

- Number and position of doors & windows.
- Spaces between floors, walls and roof.
- Changes occur due to windows breaking, walls opening, people intervening, structure collapse etc.

# Fire safety

- Responsibility of the hospital to patient, to employees and to the community for fire safety, general safety and emergency programmes are shared by administration.
- Fire safety is an indispensable part of the general safety programmes.

# Causes of fire in Hospitals

Following are the most frequent causes of fire:

- Smoking/ Carelessness of contractors/ workers hospital staff/ visitors
- Defective electrical equipment & wiring
- Overcrowding of electrical equipment with use of extension plugs
- Medical gas and vacuum system/ Gas cylinder
- HVAC fire hazard
- Kitchen
- Laboratory
- Unknown causes



# Fire Protection Plan

Whenever there is a fire in the hospital efforts are made to extinguish it as early as possible. But sometimes it may occur in certain areas, such as patient care, where it may cause heavy loss of life. Hence fire safety has been divided into five steps:

- Prevention
- Detection and Containment
- Restricting Fire Spread
- Extinguishing the fire
- Evacuating the building

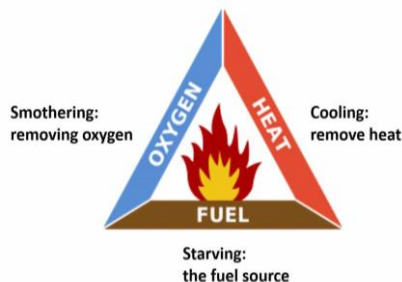


# ONCE A BURN PATIENT ALWAYS A PATIENT

95% of Burn injuries are preventable  
so,  
always stress on Prevention

# Fire Protection System & Equipment

## Basic Fire Fighting Principle



- Starvation - Removing or blanketing the fuel
- Smothering – Cutting off or diluting the oxygen supply
- Cooling – Removing heat from the fire



Alarm CO detector



Bell



CO detector



Manual call point



Smoke detector



Fire Alarm Siren



Loudspeaker



Fire extinguisher



Fire bucket



Beacon



Figure



Fire door



Smoke detector



Fire alarm control panel



High-resolution CO digital camera



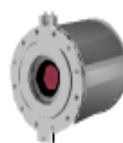
Infrared system for early fire detection



Infrared thermal imaging



Security camera



Thermographic process control system

# ACTIVE FIRE PROTECTION

- Active Fire Protection consists of the components of fire protection that require some kind of action to work.
- This action may be manual, like using a fire extinguisher, or automatic like the sprinkler system dousing flames.
- The action itself will help contain, suppress, or extinguish a fire that has already started.

# Smoke detector sprinkler system



The sprinklers detect the smoke and are first line of defense in extinguishing the fire. The fire doors marked to cordon off the fire are closed, smoke vents are opened and all escape routes are lit up.

# Manual And Automatic Fire Fighting System

## Fire Hydrants

- A fire hydrant system is a water supply with a sufficient pressure and flow delivered through pipes throughout a building.
- Strategically located network of valves for fire-fighting purposes.

## Maintenance schedule for Fire Pump

**Table 8.1 Summary of Fire Pump Inspection, Testing, and Maintenance**

Item	Frequency	Reference
<b>Inspection</b>		
Pump house, heating ventilating louvers	Weekly	8.2.2(1)
Fire pump system	Weekly	8.2.2(2)
<b>Test</b>		
Pump operation		
No-flow condition	Weekly	8.3.1
Flow condition	Annually	8.3.3.1
<b>Maintenance</b>		
Hydraulic	Annually	8.5
Mechanical transmission	Annually	8.5
Electrical system	Varies	8.5
Controller, various components	Varies	8.5
Motor	Annually	8.5
Diesel engine system, various components	Varies	8.5



# Structural Fire Prevention

The purpose of **structural fire protection** is to place such barriers in its path to:

- Limit the fire by creating fire compartments
- Keeps the intensity of the fire low by using suitable materials (Fire retardents) and at the same time preventing the accumulation of smoke.
- Ensuring the strength of structural components even in fire.
- Making the hospital a “No smoking zone”.
- Equipment are carefully selected and meticulously installed and maintained.
- The ceiling height of the hospital especially the newly constructed buildings is increased.

# PASSIVE FIRE PROTECTION

- It is set of components used to [compartmentalized a building](#) in order to keep a fire from spreading and require no action to work.
- Passive fire protection is usually structural and built into the building. By using [fire-resistant](#) walls and floors, PFP gives people time to escape from a building that has a fire.
- Other examples of PFP include dampers which prevent the spread of fire and smoke through a building's ductwork, and fire doors which compartmentalize fires.
- Fire-proofing successfully compartmentalizes fires and keeps damage to a minimum by eliminating possible fuel a fire could use to spread or ignite with in the first place.
- A small fire or a fire restricted to a small area gives you a greater chance of putting it out, avoiding costs, and avoiding injury.



# Passive Fire Protection system

## Building Compartmentation

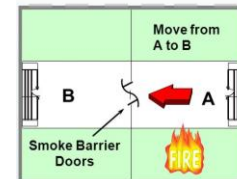
A hospital is divided into one or more fire compartments with the aim of limiting the maximum extension area of the fire within the building.

The following are the components of Fire compartmentation (with adequate fire ratings)

- Fire doors and fire windows
- Wall & Ceiling linings
- Sandwich panels
- Ducts and openings
- Due to compartmentation, a hospital will have a 'horizontal phased evacuation'
- This **allows patients to be moved only a short distance if necessary**, drastically reducing the dangers of being away from essential equipment, such as life support machines, during an emergency.



## Horizontal Evacuation



- Move persons beyond smoke barrier doors
- Rescuer returns to evacuate others

# Fire Detection & Containment

- Fire can breakout in a hospital despite preventive measures.
- The fire officer is informed immediately so that he can take adequate measures to contain spread and coordinate the activities of the fire fighters staff and trained safety committee personnel.
- The vigilance is maintained round the clock.

# Restricting Fire Spread

- Any occupants from the involved area are removed and the door is closed.
- Each floor is sub- divided into sections by a fire resistive partitions called as smoke barriers
- Each floor of all hospital buildings are properly equipped with fire extinguishers. Identified employees consisting of building safety officer, security staff and HCW (as many as possible) are trained in the use of these fire extinguishers.

## FIRE EXTINGUISHER SYMBOLS, CLASSIFICATIONS & AGENTS



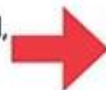
**CLASS A** fires involve common combustibles such as wood, paper, cloth, rubber, trash and plastics.



ABC Dry Chemical (Multipurpose)  
Halotron  
Water  
Foam



**CLASS B** fires involve flammable liquids, solvents, oil, gasoline, paints, lacquers and other oil-based products.



ABC Dry Chemical (Multipurpose)  
BC Dry Chemical (Regular)  
Purple K  
Carbon Dioxide  
Halotron  
Foam



**CLASS C** fires involve energized electrical equipment such as wiring, controls, motors, machinery or appliances.



ABC Dry Chemical (Multipurpose)  
BC Dry Chemical (Regular)  
Purple K  
Carbon Dioxide  
Halotron



**CLASS D** fires involve combustible metals such as magnesium, lithium and titanium.



Dry Powder



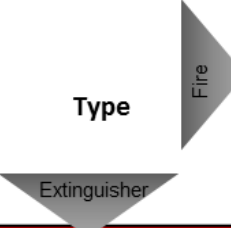
**CLASS K** fires involve combustible cooking media such as oils and grease commonly found in commercial kitchens.



Wet Chemical



# TYPES OF FIRE EXTINGUISHER

Type 	CLASS A	CLASS B	CLASS C	CLASS D	Electrical	CLASS F	Comments
	Combustible materials (e.g. paper & wood)	Flammable liquids (e.g. paint & petrol)	Flammable gases (e.g. butane and methane)	Flammable metals (e.g. lithium & potassium)	Electrical equipment (e.g. computers & generators)	Deep fat fryers (e.g. chip pans)	
Water	✓	✗	✗	✗	✗	✗	Do not use on liquid or electric fires
Foam	✓	✓	✗	✗	✗	✗	Not suited to domestic use
Dry Powder	✓	✓	✓	✓	✓	✗	Can be used safely up to 1000 volts
CO2	✗	✓	✗	✗	✓	✗	Safe on both high and low voltage
Wet Chemical	✓	✗	✗	✗	✗	✓	Use on extremely high temperatures



# Provision Of Escape Routes

- There is a long and tragic history of fires caused by problems with fire exits
- Hence proper exits, fire fighting equipment, and employee training to prevent fire deaths and injuries in the healthcare facility & workplace is important.

## Exit routes:

- A continuous and unobstructed path of exit travel from any point within a workplace to a place of safety (including refuge areas)
- Exit routes must be permanent
- An exit must be separated by fire resistant materials.



# Evacuation



- Hospital should have a defined evacuation plan.
- Proper illumination and signages are made for exit ways.
- Generators are available to operate emergency fire lifts and illumination.
- All fire exit stair ways are free between different buildings.
- Priority areas for evacuation are well defined and regular drill for evacuation is done

# Exit Requirements

- Ample space is available for escape of occupants in case of fire and all routes are planned in such a way that the occupants reach a place of safety in the shortest period of time.
- All exits lead to stairways which have access to street or outside of hospital building.
- These exits are so arranged that they may be reached without passing through another occupied unit.
- More than two exits are available for every floor either as a door leading to outside, stairways or ramps.
- All exits from hospital are not less than 150 cms in width to permit transportation of patient beds or mattresses. The minimum width of corridors is 240 cms.

# Exits

- Primary and secondary exits - These exits must be remote from each other and so arranged as to minimize any possibility that both may be blocked by any fire or other emergency condition.
- No emergency exits in restrooms
- Exit away from rooms with hazardous materials
- No emergency exits into narrow passages
- Exit signs indicating the nearest emergency exits
- No use of elevators to reach an emergency exit
- Designate an assembly point area

# Evacuation Exercise

- If the circumstances are such that there is no immediate danger to the life and safety of patients, staff and visitors, Safety Officer/ Ward Incharge/ Nurse is to give the order to relocate, or evacuate through Horizontal Evacuation.
- If Vertical Evacuation is necessary, the directive will state (Vertical Evacuation) then evacuate from (higher level to lower level) using the stairs and not the elevators.
- If a complete evacuation is necessary, Safety Officer or his designee will define the sequence of evacuation and when to begin the movement of patients to the External Assembly Point Area.
- Staff are to be prepared to evacuate the patients, according to the level of patients acuity.

# DRILLS AND EXERCISES

## Table Top

- Simulate Emergency Situation in an informal setting
- Shall be conducted after initial implementation of EPRP or when there is major revision

## Functional Drills

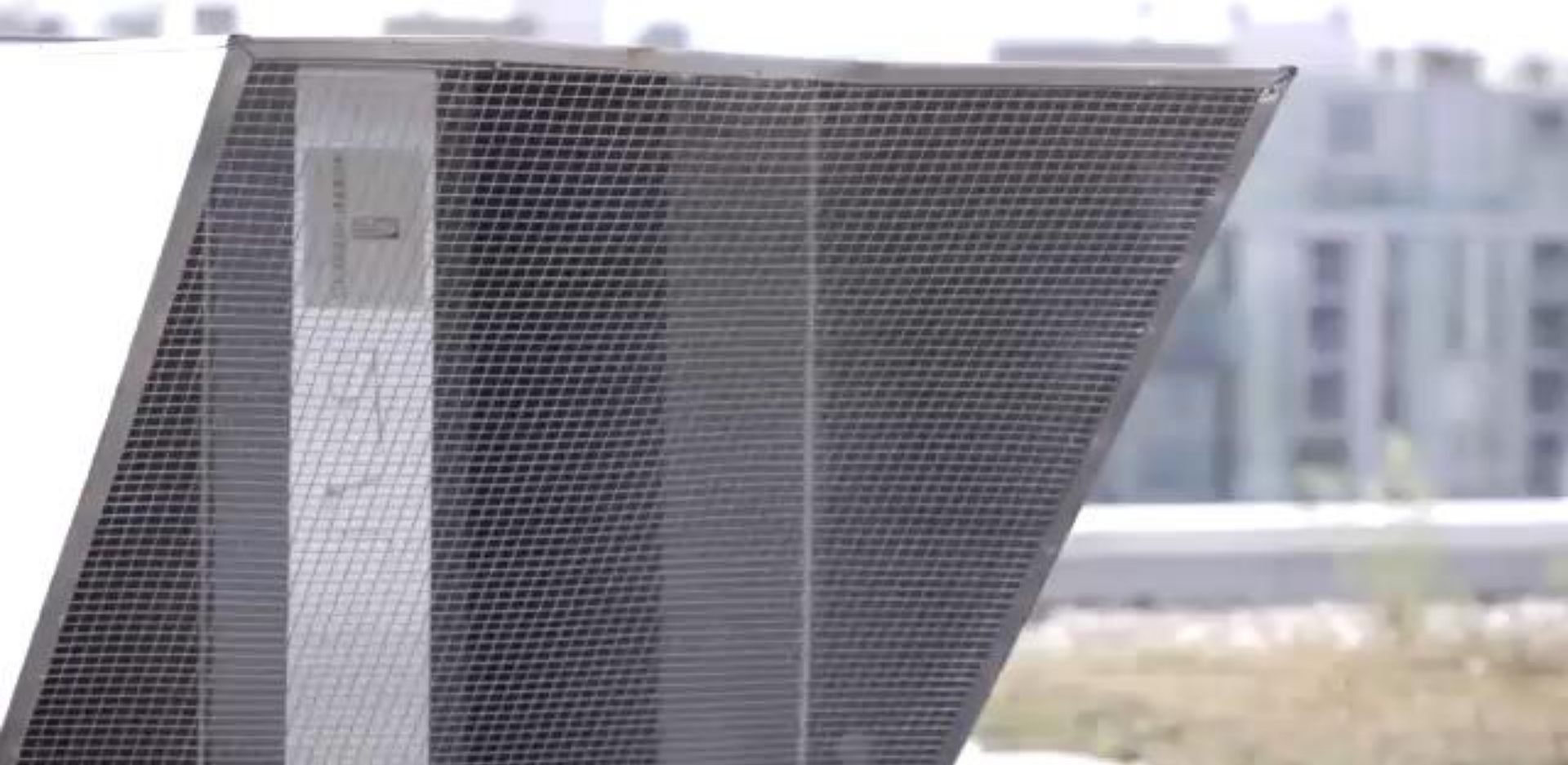
- Practical Exercises designed to test capability of personnel and adequacy of plan
- Shall be based on type of emergency scenarios
- Conduct drill for each scenario annually

## Follow-up Activity

- Review and document performance
- Modify to resolve deficiencies notes
- Performance results be recorded and train ERT, other employees
- Testing and maintenance mechanism for materials and firefighting equipment

# Smoke

- Smoke has been the biggest killer in the event of a Fire.
- Hence, we need to provide such effective arrangements, which will not allow the smoke from Fire to spread to un-effected areas of the Building.
- Things have to be planned in advance for each part of the Building as per risk etc.





## Case Study - Fire Incident at AMRI Hospital, Kolkata, India

- Date and Time: 09th December 2011; Around 03.30 am
- Location: Advanced Medicare and Research Institute, Dhakuria, Kolkata, India
- Reason for ignition of fire – Not identified.
- Origin of fire –Basement. Basement was stacked with high pile of combustibles, oxygen cylinders and LPG cylinders. Fire was originated in the basement and confined in the basement.
- Reason for casualties - [Suffocation](#)

## What went wrong?

### *Hardware*

- The fire alarm system found SWITCHED OFF to avoid false alarms.
- AC not integrated with Fire Alarm Panel. No fire/smoke dampers were found working in the fire situation. The sprinklers, the gas jets and other water releasing equipment were defunct.
- External glass Façade made of double glass panels were very difficult to break and the building had no operable windows to dissipate smoke.
- Emergency lighting too did not work / nor was adequately available resulting in total darkness inside the building hampering rescue /fire fighting
- The Fire Brigade vehicles could not reach closer to the building since the approach route blocked due to DG set and Gas Bank installation.

### *Systems and Procedures*

- Emergency preparedness plan not available and mock drills not conducted.

### *People*

- Staff not trained on Fire Fighting and was unaware of any emergency preparedness.
- Duty staff did not inform the incident to Fire Brigade for nearly one and half hours.



# Take home points

- Prevention is the best policy
- Know when to act
- Smoke is the main killer
- Utilize your resources judiciously
- Be prepared- Divide your roles
- Additional Resources: “Flash over” NIST (USA)

THANK YOU!