



Fire Safety In High Rise Building



CLASSIFICATION OF BUILDINGS AS PER NATIONAL BUILDING CODE

1. GROUPING.

- | | | |
|-----------|-----------------|---|
| Group 'A' | - Residential | : Lodgings, Dwellings, Dormitories, Flats, Hotels. |
| Group 'B' | - Educational | : School, Colleges, Recreations. |
| Group 'C' | - Institutional | : Hospitals, Homes for aged, Orphanages, Jails, Mental Hospital, reformatories. |
| Group 'D' | - Assembly | : Theatres, Drama Hall, Assembly Halls, Auditorium, Exhibition, Restaurants, Place of workship, Terminal etc. |

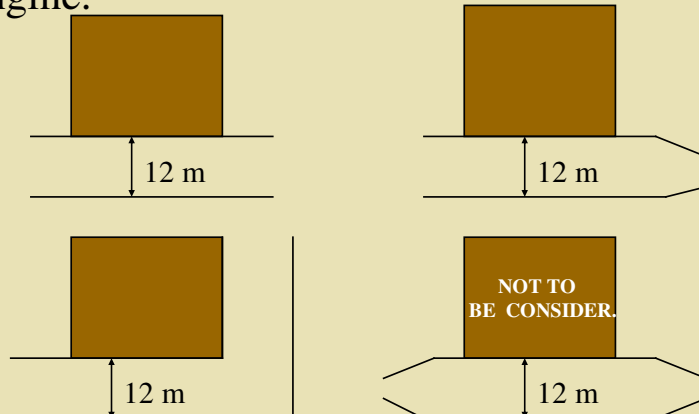


- Group 'E' - Business : Office, Labs, Computer Installations
- Group 'F' - Mercantile : Shops, Stores, Market.
- Group 'G' - Industrial : Assembly Plants, Labs, Pumping stations, Refineries, Saw mills.
- Group 'H' - Storage : All types of storages, Sheds, trucks & marine terminals, Garages, Hangars, Stables.
- Group 'J' - Hazardous : Used to store highly combustible or explosive materials which may produce poisonous fumes or explosions or toxic etc.

WIDTH OF ROAD

Sections:- As per section 4.6 (a) of part 3 & 7.4.1 (a) of part IV of N.B.C.

The road which abuts a High rise building to be constructed shall be more then **12 meter** width. The road should be hard surfaced to carry a minimum weight of 18,000 Kgs, the maximum weight of a Fire Engine.

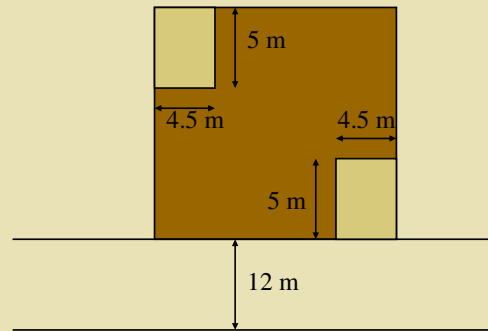




ENTRANCE WIDTH & HEIGHT CLEARANCE

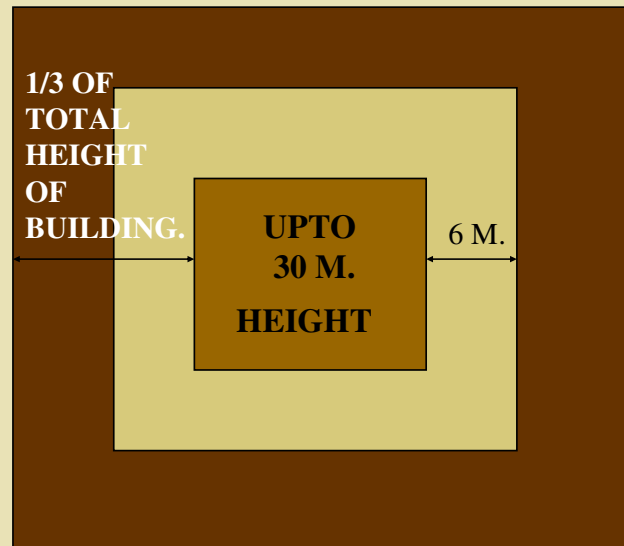
Section:- As per section 4.6 (c) of part C & 7.4.1(d) of part IV of N.B.C.

Every High rise building should have at least 2 means of access, one remote to the other, of minimum width 4.5m. with height clearance of 5m. This minimum width is essential to facilitate free movement of fire units.



SETBACK OR OPEN SPACES

Section : As per table 2 of section 8.2.3.1 of part III of N.B.C.





Sufficient open space (setbacks) around residential buildings, as indicated in the next slide, is essential to facilitate free movement and operation of Fire Service vehicles.



Sr.No	Height of building in Meters	Exterior open spaces/setbacks to be left on <i>all</i> sides. Minimum in meters
1.	Above 9.5 up to 12	4.5
2.	Above 12 up to 15	5.0
3.	Above 15 up to 18	6.0
4.	Above 18 up to 21	7.0
5.	Above 21 up to 24	8.0
6.	Above 24 up to 27	9.0
7.	Above 27 up to 30	10.0
8.	Above 30 up to 35	11.0
9.	Above 35 up to 40	12.0
10.	Above 40 up to 45	13.0
11.	Above 45 up to 50	14.0
12.	Above 50	16.0



For other Occupancies the setbacks shall have to be allowed as follows:

- a. **Educational buildings** - Except for nursery schools, the open space shall not be less than 6 meters.
- b. **Institutional buildings** - open space shall not be less than 6 meters.
- c. **Assembly building** - Except in front, open space shall not be less than 6 meter and front open space shall not be less than 12 meters.



- d. **Business/Mercantile & storage building** – Open space around the building shall not be less than 4.5meters. It can be relaxed in certain circumstances.
- e. **Industrial/Hazardous building** – Minimum 4.5 meters open space shall be kept around the building for the height up to16 meters. Open space shall be increased by 0.25meters for next each 1 meter height of the building.



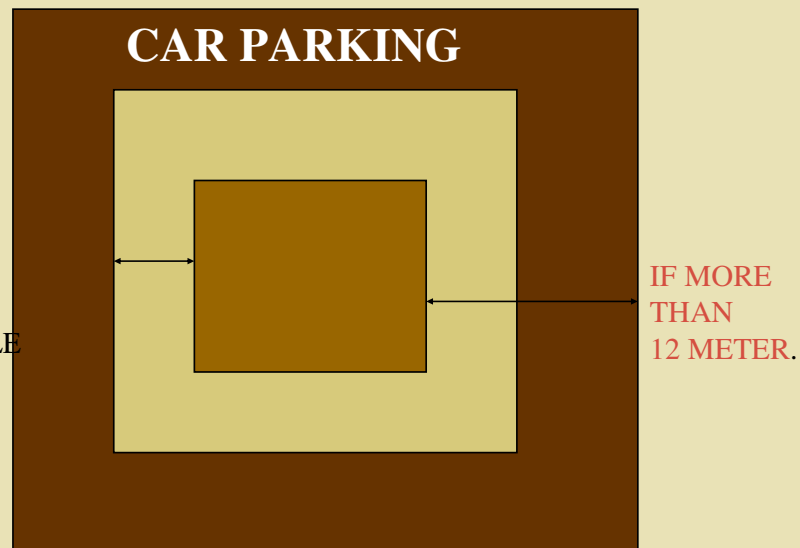
Car Parking in Setback / Open Spaces.

If the setback area / open spaces is more than 12 meter, the provision for car parking Can be done in the setback or open spaces at the periphery of the courtyard leaving the 6 meter motorable road.



Section: As per section 4.6 (b) of appendix B of part III of N.B.C.

6 M.
MOTARABLE
ROAD.

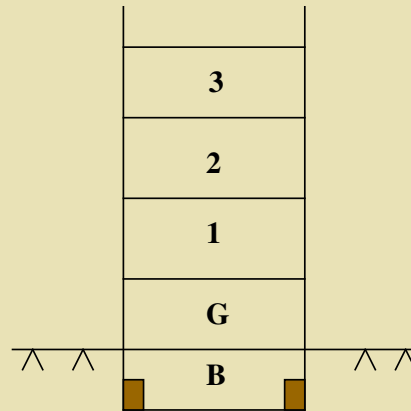




CAR PARKING

Section – As per section B/8 of appendix ‘B’ of part III of N.B.C

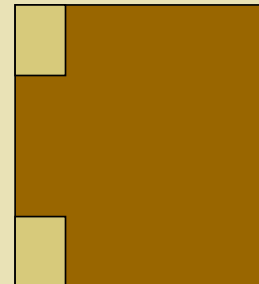
Car Parking shall have to be done at the basement with provision for minimum 2 ramps one remote to other.



STAIRCASES

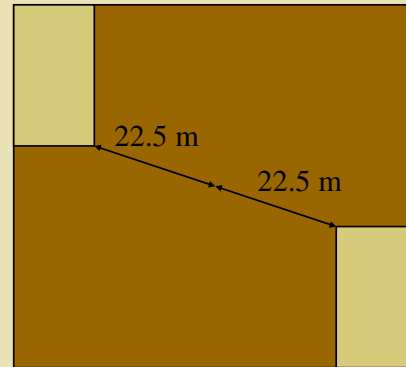
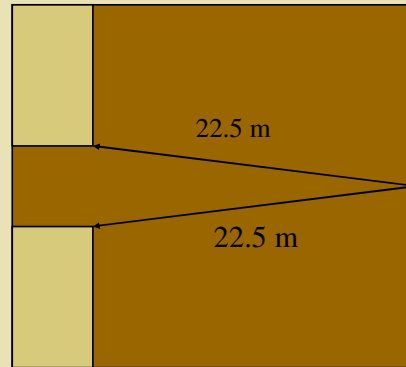
Section :- As per section 12.18 of part III, 8.5.1 (Table 24), 8.6.2,8.9,8.10,8.13, 9.3.5(a),10.4.1,11.3.2 of part IV & appendix D1.3,D1.4 of part of NBC.

- a) Every high rise building Have minimum 2 number of Staircases.
- b) Width of staircases varies from 1 m. to 2 m.
- c) For residential building width of staircases should be 1 mtr.





- d) Out of 2 staircases, 1 can be used as a fire escape staircase.
- e) Width of fire escape should be minimum 0.75 meter.
- f) Number of staircases shall be given as per the travel distances.



- g) Staircase shall not be extended to basement to prevent smoke, heat & gases. From the basement smoke, heat & gases can be travel to upper floors.
- h) Access to the basement from the ground should be through a separate staircase, which is not connected to main staircase (i.e. It should be remote to each other.)
- i) Staircase shall be of enclosed type to prevent entry of smoke & fire to the staircase & vice versa.
- j) Spiral staircase shall be provided up to 9 mtr. Height.
- k) External staircase normally shall not be allowed.



LIFTS

Section:- as per section 18 of part III & 6.18 & appendix A.15 of part IV of NBC.

- a) Minimum 1 lift capable of carrying minimum 8 persons weighing 545 kgs. Shall be provided for every high rise building.
- b) Landing doors of lifts shall open to ventilated lobby & shall have a fire resistance of 1 hour.
- c) 1 lift shall be designed as a **“Fire Lift”**
- d) **“Fireman Switch”** shall be provided for each lift.



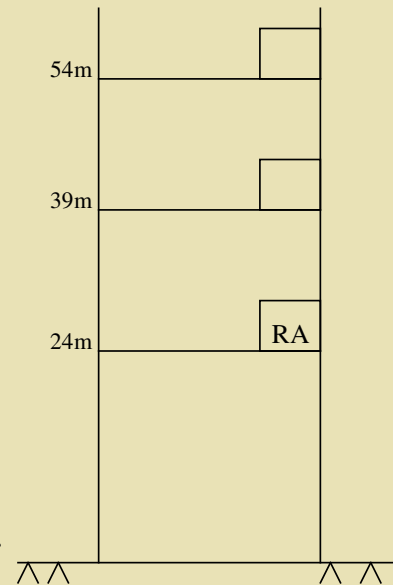
- e) Lifts shall not be used as means of evacuation.
- f) Collapsible gates shall not be provided for the lift.
- g) If more than 1 lifts are installed the partition wall should be of minimum 2 hours fire resistance.



THE REFUGE AREA

Section: As per section 8.12.3 on part IV of NBC, the refuge area shall be provided on the periphery of the floor & open to air atleast on one side protected with suitable railing.

- a) For floors above 24m & up to 39m one refuge area on the floor immediately above 24m.
- b) For floors above 39m one refuge area on the floor immediately above 39m & so on after 15m refuge area shall be provided.



Service Ducts

As per appendix D 1.9 part IV of N.B.C. all the services ducts, if provided, should have to be enclosed by walls of at least 2 hour fire resistance & should have to be sealed at every alternate floor with non-combustible materials having at least 2 hour fire resistance. The sealing at floor level is to prevent travel of smoke & fire to the upper floors through the ducts.



BUILT IN FIRE FIGHTING SYSTEM



WET RISER CUM DOWN COMMER SYSTEM

Wet riser : It is a vertical pipeline (dia. depends on the floor area of the building) connected to a bottom tank(underground water tank).

Down Commer : It is a vertical pipeline (dia. depends on the floor area of the building) connected to a overhead tank.



WET RISER CUM DOWN COMMER SYSTEM

- Dry riser** : It is a vertical pipe which is always kept dry to avoid the freezing of water.
- Hydrant** : It is a horizontal pipe line with outlet of 63 mm. dia. connected to underground water tank.



WET RISER

- ◆ Wet riser cum down commer or only down commer system shall be provided for residential building.
- ◆ For commercial building only only wet-riser system shall be provided.
- ◆ For hotels wet-riser cum down commer both the systems shall be provided.
- ◆ Diameter of riser will be 150mm for all the buildings.
- ◆ For each 1000m² floor area or it's part one riser shall be provided.
- ◆ At every landing twin outlet each of 63mm dia. shall be provided (one should be connected to hose reel & another should be to hose & branch).



- ◆ Length of hose should be such that it should reach at the last point of floor area.
- ◆ Minimum two courtyard hydrants shall be provided (courtyard hydrant will be an extension to riser).
- ◆ Hose reel hose of 12mm dia. shall be provided from landing valve to wet-riser at each floor.
- ◆ A separate fire service inlet shall be provided at the ground floor.
- ◆ Location of wet-riser shall be preferable as near to staircase.

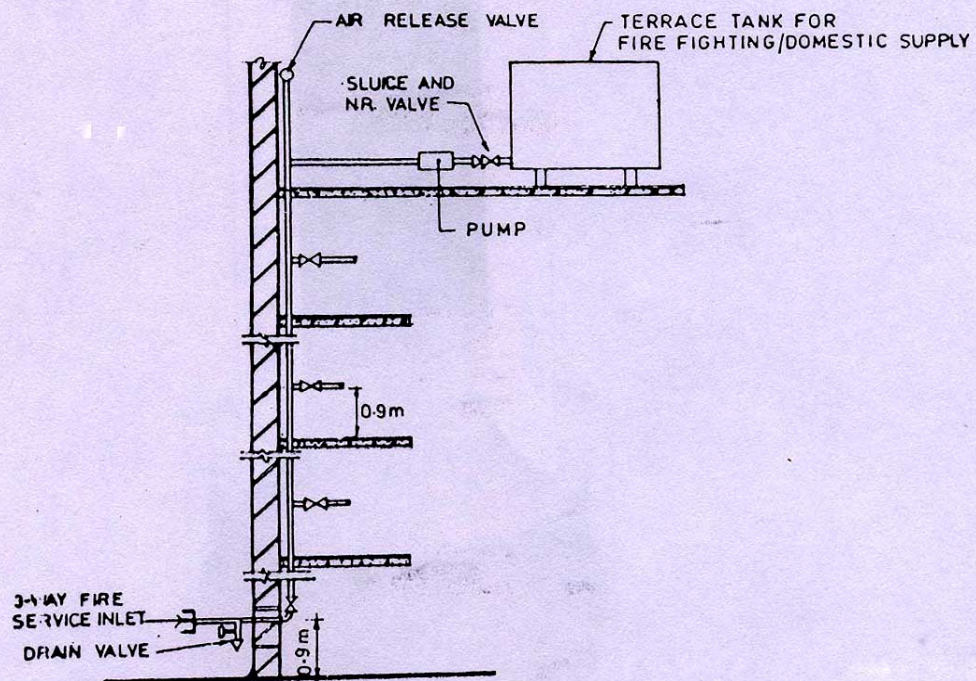


Fig. 1 Typical Arrangement of Down-comer for Building above 15 m but not Exceeding 30 m in Height




WATER TANK

Under Ground
Water Storage tank

Terrace
Level Tank

The Capacity of

- ◆ Underground water storage tank varies from 50,000 ltrs. to 250,000 ltrs. Depending on the type & occupancy of the buildings.
- ◆ The capacity of terrace level water storage tank varies from 10,000 ltrs. to 20,000 ltrs. Depending on the type & occupancy of the building.



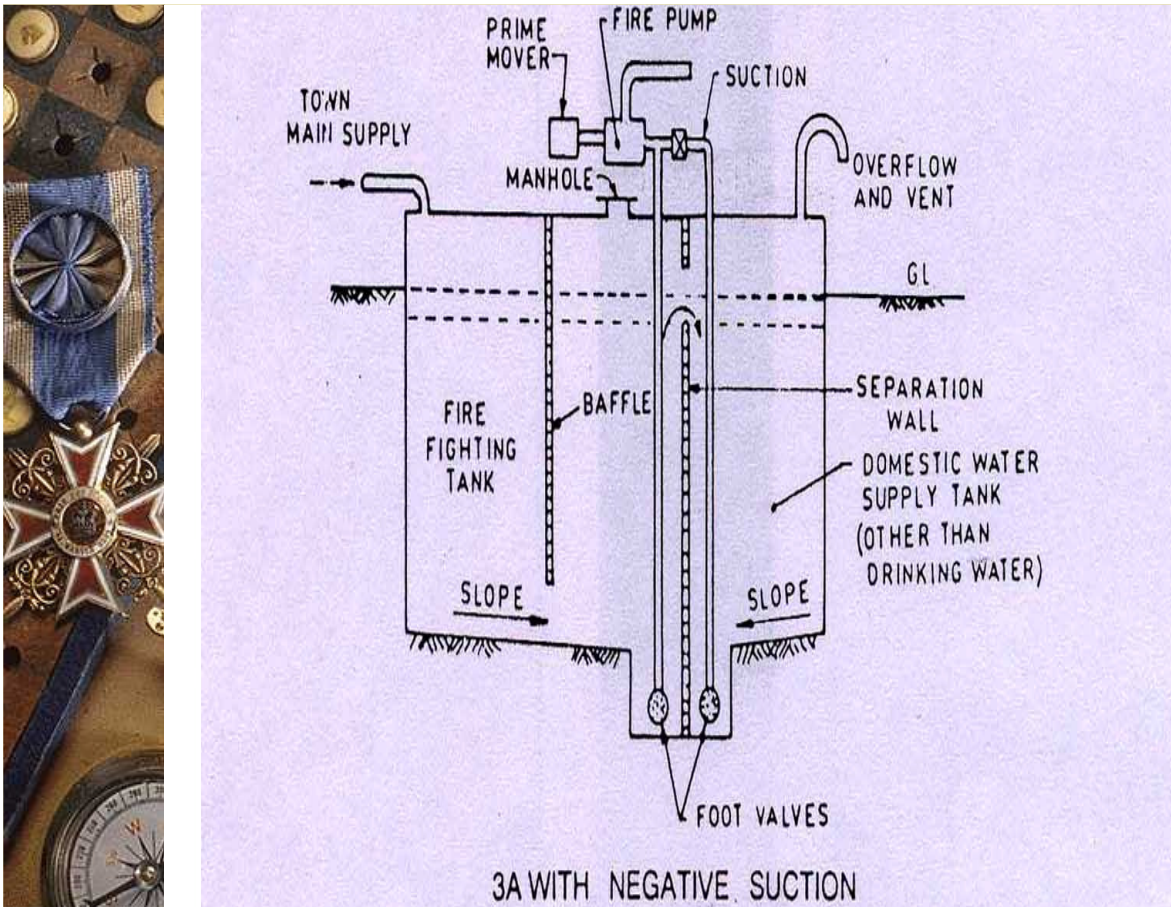
Above mentioned water tank capacity is for 1 riser. If the number of risers will be more than 1, than quantity of water shall be increased in that proportionate.

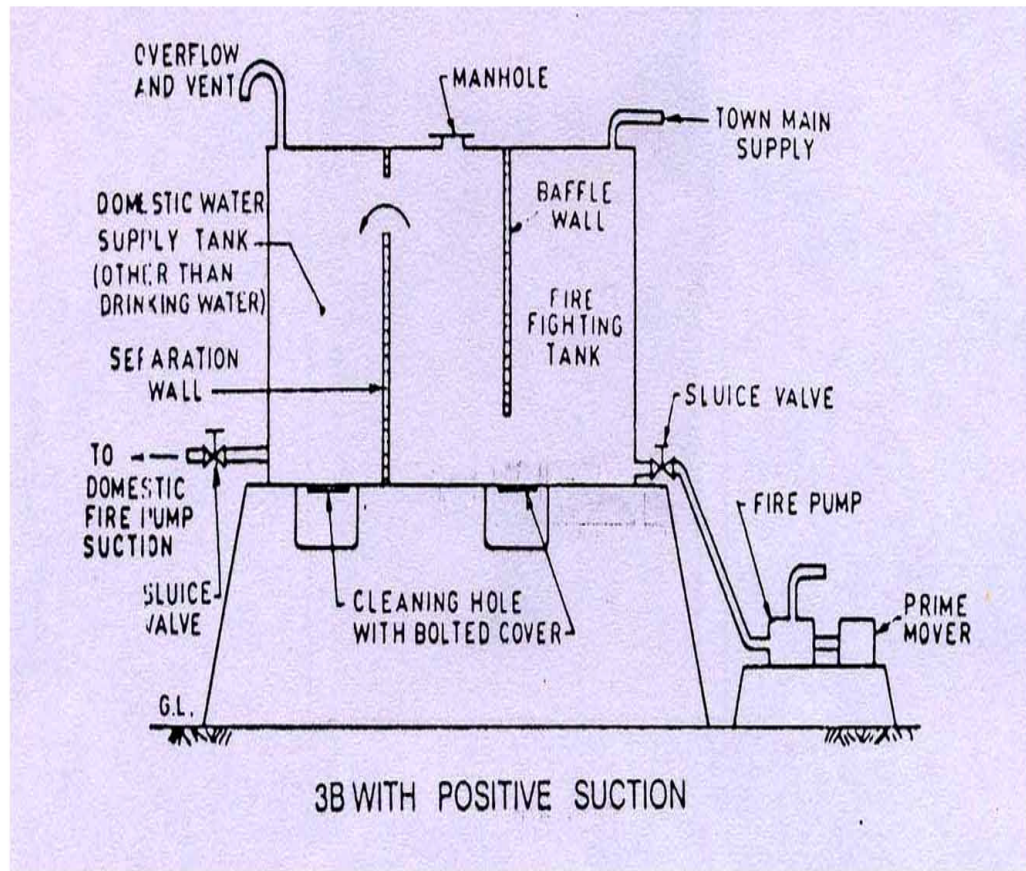
In addition to this if automatic sprinkler, drenchers are provided for special risk then this will be additional quantity of water.

PUMP CAPACITY

For underground water storage tank, pump shall be installed of a capacity either 1800 L.P.M. or 2400 L.P.M. depending on the type and occupancy of the building along with jockey pump.

- ◆ At topmost hydrant we should get a pressure of not less than 3.5 bar.
- ◆ For terrace level water storage tank, pump shall be installed of a capacity either 450 L.P.M. occupancy of the building.
- ◆ Alternative source of supply for the pump shall be provided.





FIRE ALARM SYSTEM

**Manually operated
Electrical fire alarm
system**

**Automatic Fire Alarm
System**

- ◆ Depending on the occupancy, M.O.E.F.A. system or automatic operated system shall be provided in the building.
- ◆ Every building more than 15m in height shall provide both i.e. M.O.E.F.A & A.F.A.



- ◆ Residential & office buildings between 15m & 24m in height may be exempted from installation of automatic fire alarm system if local fire brigade is well equipped to face the emergency up to 24m.
- ◆ One has to manually operate the glass in M.O.E.F.A.S.
- ◆ M.O.E.F.A.S. requires a special person or separate person to operate.

Fire Alarm System





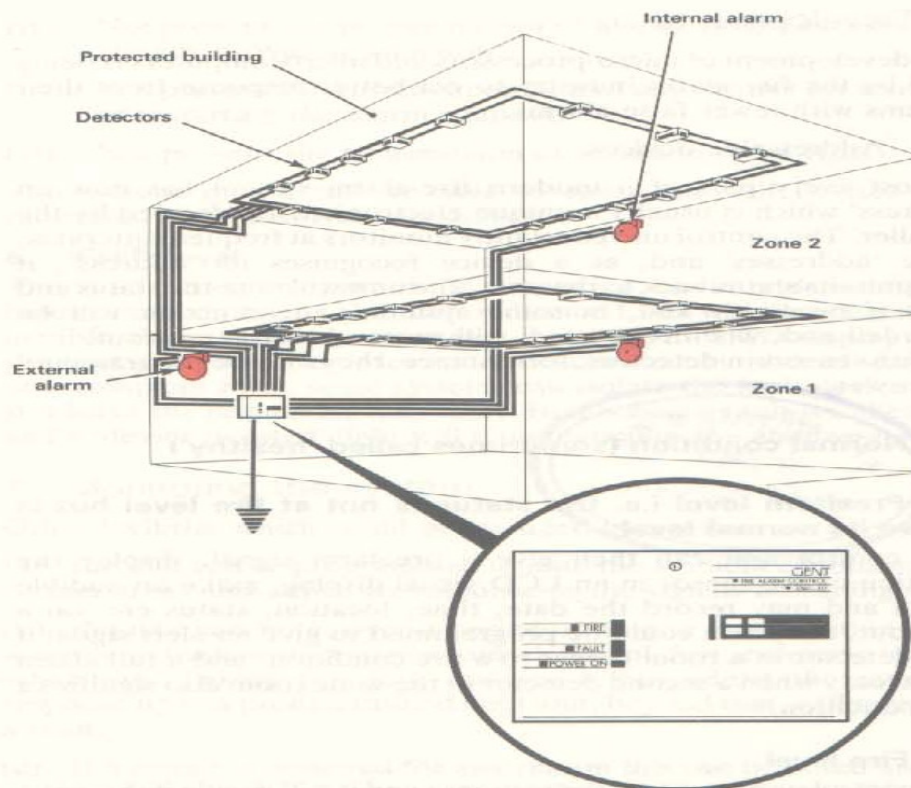
FIRE DETECTION SYSTEM

Section: As per section 7.9 of part IV of NBC.
(8 of Appendix A)

- ◆ Different types of detectors are provided as per the risk involved in the area.
- ◆ Zones are made as per the risk or as per the floor.
- ◆ 2way communication system to be provided which will help to contact from ground floor to specific floor or vice-versa.
- ◆ Mike on every floor has to be provided.
- ◆ On mike instructions can be given as per situation.
- ◆ Manual call points, automatic detector & public address system shall be interlinked.
- ◆ Detectors shall be installed as per IS 2189/ 1988.



Fire Detection System





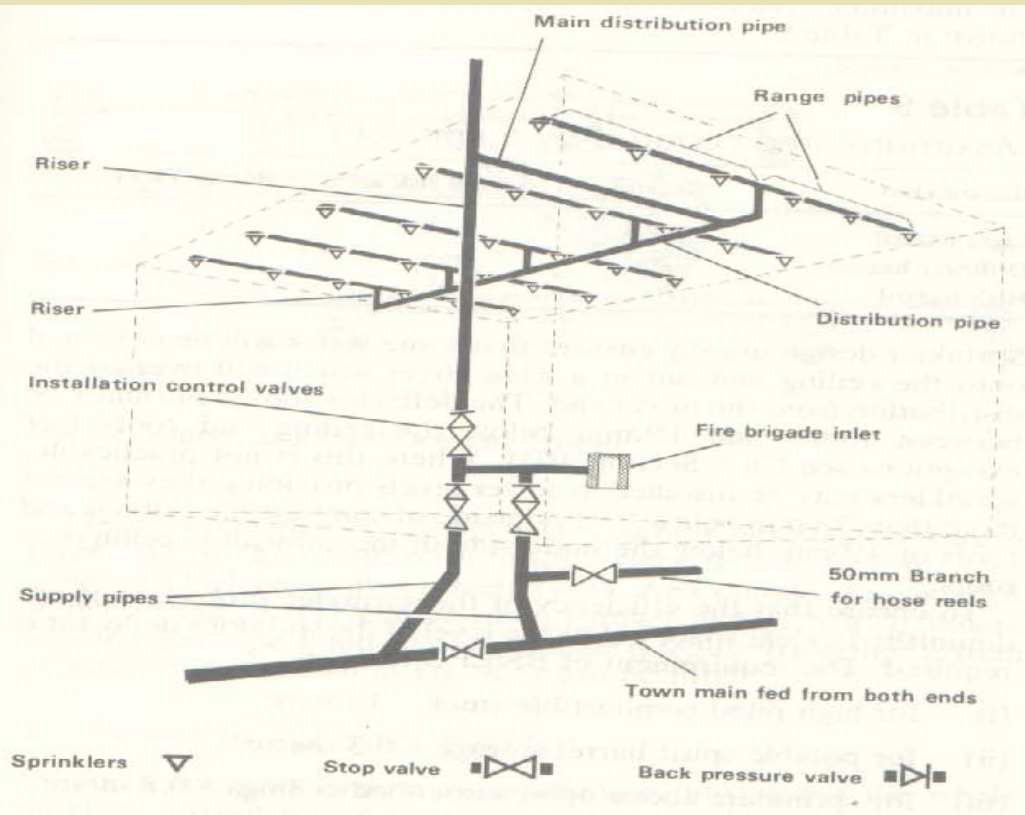
SPRINKLER SYSTEM

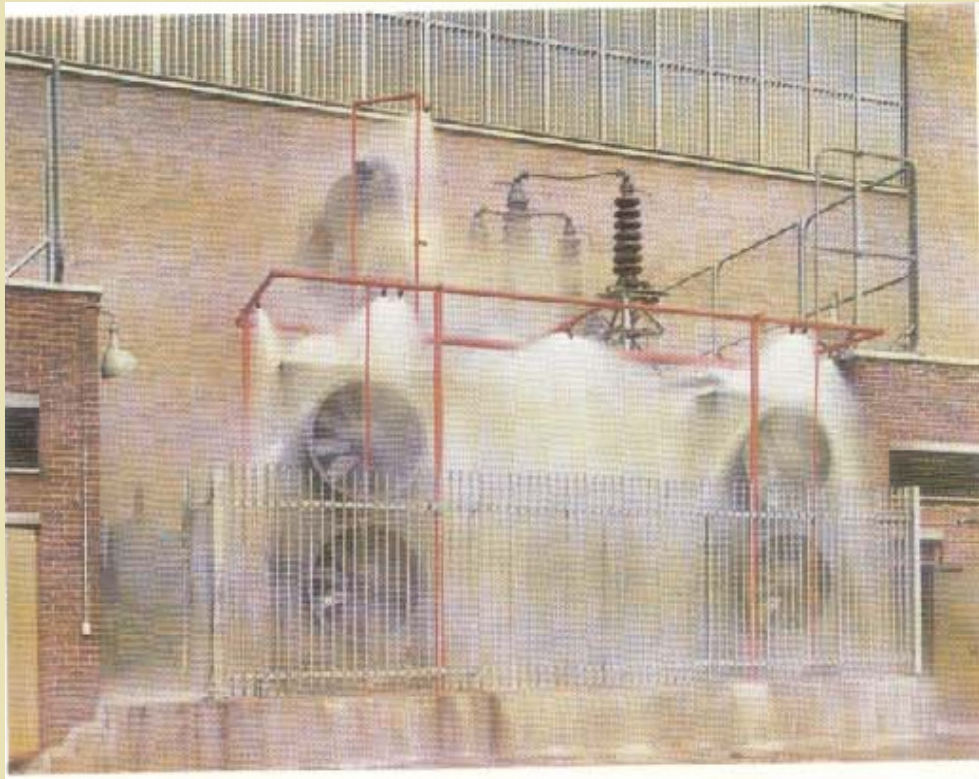
Section: As per section 7.10.7 of part IV of NCB.

- ◆ Sprinkler system is a must for basement parking & other risk areas where large quantities of combustible materials are stored.
- ◆ Each sprinkler should cover 6.96m² area.
- ◆ Normally a separate sprinkler should be provided for a separate car.
- ◆ Sprinklers may connect to main water tank & pump, but capacity of the tank & pump shall be increased in that proportionate.
- ◆ The capacity of water tank shall be calculated on the basis of sprinklers.



SPRINKLER SYSTEM





Alternate Power Supply

As per appendix D-1.5 of part IV of N.B.C. a stand by generator should be installed to supply power for staircase lighting, corridor lighting, fire pump, pressurization fan & blowers, in the event of disconnection of failure of main supply.



PORTABLE FIRE EXTINGUISHERS.

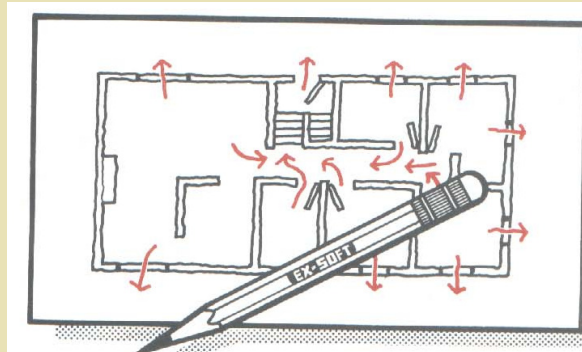
Section: As per section 7.10.4 part IV of N.B.C.

- First Aid Fire fighting appliances shall be provided & installed in accordance with **LATEST IS 2190.**



Escape Route

As per section 8.2.5 of part IV of NBC, the escape route should be marked with a sign board on the corridor & passage to guide evacuation. Normally, the escape route sign board must be written in luminous paint for easy identification. This is to guide every occupant of the building who is bound to panic in the event of accident.





Public Address System

As per appendix D.5 of part IV of NBC, every high rise building should have a public address system with 2 way communication to conduct evacuation in a systematic manner & to communicate any messages to occupants on every floor from the control room.



FIRE OFFICER

Section: As per section D6 (Appendix D) of part IV of N.B.C.

Fire Officer / Supervisor for Hotels, Business & Mercantile Buildings with Height more than 30 m.



PROVISION OF HELIPAD

Section: As per D 10(Appendix D) of part IV of N.B.C.

For High rise buildings above 60 m in height provision for Helipad should be made.



Fire Drills & Fire Orders

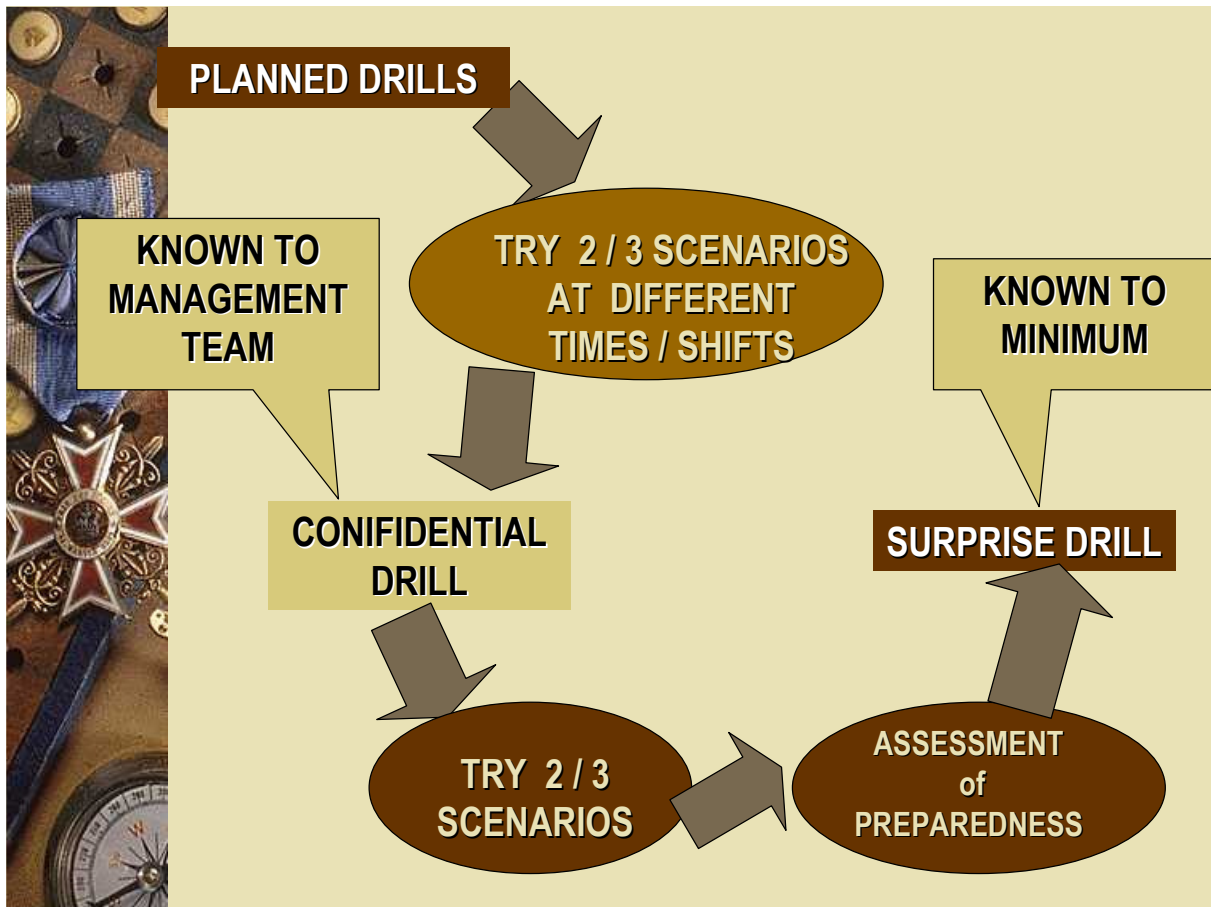
Section: As per section D 8 (Appendix D) of part IV of N.B.C.

Fire Safety Plan: It's very important to have a fire safety plan to prevent & extinguish any fire in the building with details action to be taken by each occupant. Telephone nos. of all emergence services much be indicated in the plan.

Why DRILLS?

“Drills provide virtually the only means, short of an actual incident, of measuring the state of readiness and of testing the effectiveness of an emergency response plan”

Robert B. Kelly





TRAINING



Nothing would be done at all, if a man waited till he could do it so well, that no one could find fault with it.

-Cardinal Newman