HISTORY OF FIRE

• Through the centuries there has been such an intimate connection of fire with the cultural growth of humanity. Logically we assume there was once a time when man had no fire, but very early he must have become acquainted with fire derived from natural sources, and made use of it; for no remains of man's art show him without fire as his companion. Much later in the scheme of things he invented processes for making fire artificially.

• Worship or deification of fire is known from various religions. Fire has been an important part of human culture since the Lower Paleolithic, as when people could not curtail fire easily, they started to revere it.

• Fires -needed watching, not only to keep them from going out, but from spreading, or theft, so a fire-keeper was delegated to the work, thus starting a social organization.

• The early fires also formed a nucleus for human grouping, and became tribal or communal fires, from which the individual family fires derived.

• For as long as cities have existed, fires have been a problem. People have been concerned with an organized response to fire fighting.
GOALS OF A FIRE PREVENTION PROGRAM

• Life Safety
  The primary goal of fire safety efforts is to protect building occupants from injury and to prevent loss of life.

• Protection of Property
  The secondary goal of fire safety is to prevent property damage.

• Protection of Operations
  By preventing fires and limiting damage we can assure that work operations will continue.

STRATEGY OF FIRE PREVENTION

A fire must have three things to ignite and maintain combustion:
• Fuel
• Heat
• Oxygen

The basic strategy of fire prevention is to control or isolate sources of fuel and heat in order to prevent combustion. If all three are not present in sufficient quantities a fire will not ignite or a fire will not be able to sustain combustion.
FIRE SAFETY AND REGULATIONS

• The primary goal of fire safety efforts is to protect building occupants from injury and to prevent loss of life and prevent property damage. According to Indian law, minimal fire safety equipment is mandatory for any developed property.

• These laws are given by the National Building Code, which is a document containing standardized requirement for the design & construction of most types of building in the country.

• The National Building Code (NBC) is a national instrument that guides the regulations for construction activity. It contains all the important aspects relevant for safe and orderly building development.

• The building that does not satisfy building code or violation of National building code will lead to penalty, cancellation of sanction or demolition of the building.
FIRE SAFETY IN HYDERABAD :-

THE GOVERNMENT OF ANDHRA PRADESH, MUNICIPAL ADMINISTRATION AND URBAN DEVELOPMENT DEPARTMENT STATES IN THE HYDERABAD REVISED BUILDING RULES, 2006 I.E. G.O. 86 THAT ALL BUILDINGS SHALL BE PLANNED, DESIGNED AND CONSTRUCTED TO ENSURE FIRE SAFETY REQUIREMENTS ARE MET AND MAINTAINED AND SHALL COMPLY IN ACCORDANCE WITH THE FIRE PROTECTION REQUIREMENTS OF NATIONAL BUILDING CODE OF INDIA. THE BUILDING SCHEMES SHALL BE CLEARED BY DIRECTOR OF FIRE SERVICE FOR SPECIAL BUILDINGS ABOVE 15M IN HEIGHT AND ABOVE 500 SQ.M GROUND.
CLASSIFICATION OF BUILDINGS BASED ON OCCUPANCY:-

Residential Buildings - lodging or rooming houses, private dwellings, apartments, dormitories, hotels.

Educational Buildings - schools up to senior secondary level, all other schools, training institutes

Institutional Buildings - Hospitals and sanatoria, Custodial Institutions, Penal and Mental Institutions

Assembly Buildings - mixed occupancy such as shopping, theatre, auditoriums, restaurants.

Business Buildings – offices, banks, professional establishments, laboratories, libraries, test houses, computer institutions, telephone exchanges, broadcasting stations and TV Stations.
CLASSIFICATION OF BUILDINGS BASED ON OCCUPANCY:-

**Mercantile Buildings** - shops, stores, departments, markets, underground shopping centres, storage and service facilities.

**Industrial Buildings** – low hazard, moderate hazard, high hazard.

**Storage Buildings** - Storage of Goods, wares and merchandise.

**Hazardous Buildings** - Storage of Gases, Flammable Liquids, Liquefiable Gases, explosive materials, artificial flowers, synthetic leather, ammunition, explosives and fireworks.
CLASSIFICATION OF BUILDINGS BASED ON FIRE ZONES:-

Demarcations: - A city or area under the jurisdiction of the authority shall for the purpose of the Code, be demarcated into distinct zones, based on fire hazards inherent in the buildings and structures according to Occupancy that shall be called as “Fire Zones”.

**FIRE ZONES**

- **Fire Zone 1**: Residential, educational, institutional, assembly, small business and retail mercantile buildings.
- **Fire Zone 2**: Business and Industrial Buildings except High Hazard Industrial Buildings.
- **Fire Zone 3**: High Hazard Industrial Building, Storage Building and Buildings for Hazardous Use.

**Overlapping Fire Zones**: - When any building is situated in more than fire zone, it shall be deemed to be in the fire zone in which the major portion of the building or structure is situated.

When the building is so situated that it exceeds equally to more than one fire zone, it shall be deemed to be in the fire zone having more hazardous occupancy.
2.1 Automatic Fire Detection and Alarm System — Fire alarm system comprising components for automatically detecting a fire, initiating an alarm of fire and initiating other actions as appropriate.

NOTE — The system may also include manual fire alarm call points.

2.2 Automatic Sprinkler System — A system of water pipes fitted with sprinkler heads at suitable intervals and heights and designed to actuate automatically, control and extinguish a fire by the discharge of water.

2.3 Building — Any structure for whatsoever purpose and of whatsoever materials constructed and every part thereof whether used as human habitation or not and includes foundation, plinth, walls, floors, roofs, chimneys, plumbing and building services, fixed platforms, VERANDAH, balcony, cornice or projection, part of a building or anything affixed thereto or any wall enclosing or intended to enclose any land or space and signs and outdoor display structures. Tents, SHAMIANAHS, tarpaulin shelters, etc. erected for temporary and ceremonial occasions with the permission of the Authority shall not be considered as building.

2.4 Building, Height of — The vertical distance measured in the case of flat roofs, from the average level of the ground around and contiguous to the building or as decided by the Authority to the terrace of the last livable floor of the building adjacent to the external wall; and in the case of pitched roofs, up to the point where the external surface of the outer wall intersects the finished surface of the sloping roof; and in the case of gables facing the road, the mid-point between the eaves level and the ridge. Architectural features serving no other function except that of decoration, shall be excluded for the purpose of measuring heights.

2.5 Combustible Material — The material which either burns itself or adds heat to a fire, when tested for non-combustibility in accordance with accepted standard.

2.6 Covered Area — Ground area covered by the building immediately above the plinth level. The area covered by the following in the open spaces is excluded from covered area (see Table 19):

a) garden, rockery, well and well structures, plant nursery, waterpool, swimming pool (if uncovered), platform round a tree, tank, fountain, bench, CHABUTARA with open top and unenclosed on sides by walls and the like;

b) drainage culvert, conduit, catch-pit, gully pit, chamber, gutter and the like;

c) compound wall, gate, unstoreyed porch and portico, slide, swing, uncovered staircases, ramp areas covered by CHHAJJA and the like; and

d) watchman’s booth, pumphouse, garbage shaft, electric cabin or sub-stations, and such other utility structures meant for the services of the building under consideration.

NOTE — For the purpose of this Part, covered area equals the plot area minus the area due for open spaces in the plot.

2.7 Down-comer — An arrangement of fire fighting within the building by means of down-comer pipe connected to terrace tank through terrace pump, gate valve and non-return valve and having mains not less than 100 mm internal diameter with landing valves on each floor/landing. It is also fitted with inlet connections at ground level for charging with water by pumping from fire service appliances and air release valve at roof level to release trapped air inside.

2.8 Dry Riser — An arrangement of fire fighting within the building by means of vertical rising mains not less than 100 mm internal diameter with landing valves on each floor/landing which is normally dry but is capable of being charged with water usually by pumping from fire service appliances.
2.12 Fire Door — A fire-resistive door approved for openings in fire separation.

2.13 Fire Exit — A way out leading to an escape route having panic bar hardware provided on the door.

2.14 Fire Lift — The lift installed to enable fire services personnel to reach different floors with minimum delay, having such features as required in accordance with this Part.

2.15 Fire Load — Calorific energy of the whole contents contained in a space, including the facings of the walls, partitions, floors and ceilings.

2.16 Fire Load Density — Fire load divided by floor area.

2.17 Fire Resistance Rating — The time that a material or construction will withstand the standard fire exposure as determined by fire test done in accordance with the standard methods of fire tests of materials/structures.

2.18 Fire Resistance — Fire resistance is a property of an element of building construction and is the measure of its ability to satisfy for a stated period some or all of the following criteria:
   a) resistance to collapse,
   b) resistance to penetration of flame and hot gases, and
   c) resistance to temperature rise on the unexposed face up to a maximum of 180°C and/or average temperature of 150°C.

2.19 Fire Separation — The distance in metres measured from the external wall of the building concerned to the external wall of any other building on the site, or from other site, or from the opposite side of street or other public space for the purpose of preventing the spread of fire.

2.20 Fire Separating Wall — The wall provides complete separation of one building from another or part of a building from another or part of a building from another part of the same building to prevent any communication of fire or heat transmission to wall itself which may cause or assist in the combustion of materials on the side opposite to that portion which may be on fire.

2.21 Fire Stop — A fire resistant material, or construction, having a fire resistance rating of not less than the fire separating elements, installed in concealed spaces or between structural elements of a building to prevent the spread/propagation of fire and smoke through walls, ceilings and like as per the laid down criteria.

2.22 Fire Tower — An enclosed staircase which can only be approached from the various floors through landings or lobbies separated from both the floor areas and the staircase by fire-resisting doors, and open to the outer air.

2.23 Fire Resisting Wall — A fire resistance rated wall, having protected openings, which restricts the spread of fire and extends continuously from the foundation to at least 1 m above the roof.

2.24 Floor Area Ratio (FAR) — The quotient obtained by dividing the total covered area (plinth area) on all floors by the area of the plot:

\[
FAR = \frac{\text{Total covered area of all floors}}{\text{Plot area}}
\]

2.25 High Rise Building — For the purpose of this Part, all buildings 15 m or above in height shall be considered as high rise buildings.

2.26 Horizontal Exit — An arrangement which allows alternative egress from a floor area to another floor at or near the same level in an adjoining building or an adjoining part of the same building with adequate fire separation.
2.28 Occupancy or Use Group — The principal occupancy for which a building or a part of a building is used or intended to be used; for the purpose of classification of a building according to the occupancy, an occupancy shall be deemed to include subsidiary occupancies which are contingent upon it.

2.29 Plinth Area — The built-up covered area measured at the floor level of the basement or of any storey.

2.30 Pressurization — The establishment of a pressure difference across a barrier to protect a stairway, lobby, escape route or room of a building from smoke penetration.

2.31 Pressurization Level — The pressure difference between the pressurized space and the area served by the pressurized escape route, expressed in pascals (Pa).

2.32 Roof Exit — A means of escape on to the roof of a building, where the roof has access to it from the ground. The exit shall have adequate cut-off within the building from staircase below.

2.33 Site Plot — A parcel (piece) of land enclosed by definite boundaries.

2.34 Stack Pressure — Pressure difference caused by a temperature difference creating an air movement within a duct, chimney or enclosure.

2.35 Travel Distance — The distance to be travelled from any point in a building to a protected escape route, external escape route or final exit.

2.36 Ventilation — Supply of outside air into, or the removal of inside air from an enclosed space.

2.37 Venting Fire — The process of inducing heat and smoke to leave a building as quickly as possible by such paths that lateral spread of fire and heat is checked, fire fighting operations are facilitated and minimum fire damage is caused.

2.38 Volume to Plot Area Ratio (VPR) — The ratio of volume of building measured in cubic metres to the area of the plot measured in square metres and expressed in metres.

2.39 Wet Riser — An arrangement for fire fighting within the building by means of vertical rising mains not less than 100 mm nominal diameter with landing valves on each floor/landing for fire fighting purposes and permanently charged with water from a pressurized supply.
## Minimum Requirements for Fire Fighting Installations (NBC)

### Table 23 Minimum Requirements for Fire Fighting Installations

*(Clauses 4.18.2, 6.1.2, 6.2.3, 6.3.2, 6.4.3, 6.5.2, 6.5.2.1, 6.5.2.2, 6.5.2.3, 6.5.2.4, 6.5.2.5, 6.6.2, 6.7.2, 6.8.2 and 6.9.2)*

<table>
<thead>
<tr>
<th>SI No.</th>
<th>Type of Building Occupancy</th>
<th>Type of Installation</th>
<th>Water Supply (in l)</th>
<th>Pump Capacity (in l/min)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Fire Extinguisher</td>
<td>Hose Reel</td>
<td>Dry Riser</td>
<td>Wet Riser</td>
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<td>(1)</td>
<td>(2)</td>
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<tr>
<td>RESIDENTIAL BUILDINGS (A)</td>
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</tbody>
</table>

a) Lodging or Rooming Houses (A-1) *(see Note 1)*

1) Less than 15 m in height

   i) Up to 15 rooms: R NR NR NR NR R (see Note 2) NR NR NR NR 5000 (see Note 3) NR NR NR

   ii) More than 15 and up to 30 rooms: R R NR NR NR NR R (see Note 2) NR NR NR NR 5000 (5000) (see Note 4) NR 450 (450) (see Note 4)

   iii) More than 30 rooms: R R NR NR NR NR R (see Note 2) R (see Note 5) NR NR NR NR NR NR NR 10000 (5000) (see Note 4) NR 450 (450) (see Note 4)

b) One or two Family Private Dwellings *(A-2)*

   NR NR NR NR NR NR NR NR NR NR NR NR NR NR NR NR
### MINIMUM REQUIREMENTS FOR FIRE FIGHTING INSTALLATIONS (NBC):

#### Table 23 — Continued

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<th>(14)</th>
<th>(15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) 15 m and above but not exceeding 30 m</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>150 000</td>
<td>20 000</td>
<td>(see Note 20)</td>
<td>NR</td>
<td></td>
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<tr>
<td>3) Above 30 m in height</td>
<td>R</td>
<td>R</td>
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<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>200 000</td>
<td>20 000</td>
<td>(see Note 21)</td>
<td>NR</td>
<td></td>
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<tr>
<td>e) Hotels (A-6)</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>200 000</td>
<td>20 000</td>
<td>(see Note 22)</td>
<td>NR</td>
<td></td>
</tr>
</tbody>
</table>

#### EDUCATIONAL BUILDINGS (B) (see Note 12)

1) Less than 15 m in height
   i) Ground plus one storey
      | R | NR | NR | NR | NR | NR | R | NR | NR | NR | 5 000 | NR | 450 | (see Note 3) |
   ii) Ground plus two or more storeys
      | R | R | NR | NR | NR | NR | R | NR | NR | NR | 10 000 | 5 000 | NR | 450 | (450) | (see Note 4) |

2) 15 m and above but not exceeding 30 m in height
   | R | R | NR | NR | R | NR | R | NR | NR | NR | 25 000 | NR | 900 |

#### INSTITUTIONAL BUILDINGS (C) (see Note 12)

a) Hospitals, Sanatoria and Nursing Homes (C-1)
   1) Less than 15 m in height with plot area up to 1 000 m²
      i) Up to ground plus one storey, with no beds
         | R | R | NR | NR | NR | NR | R | NR | NR | NR | 2 500 | (2 500) | NR | NR |
      ii) Up to ground plus one storey with beds
         | R | R | NR | NR | R | NR | R | NR | NR | NR | 5 000 | (5 000) | NR | 450 | (450) | (see Note 4) |
      iii) Ground plus two or more storeys, with no beds
         | R | R | NR | NR | R | NR | R | NR | NR | NR | 5 000 | (5 000) | NR | 450 | (450) | (see Note 4) |
      iv) Ground plus two or more storeys, with beds
         | R | R | NR | R | NR | NR | R | R | R | R | 50 000 | 5 000 | (see Note 19) | NR |
### Minimum Requirements for Fire Fighting Installations (NBC):

**Table 23 — Continued**

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<th>(13)</th>
<th>(14)</th>
<th>(15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2)</td>
<td>Less than 15 m in height with plot area more than 1000 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>R</td>
<td>100 000</td>
<td>10 000</td>
<td>(see Note 19)</td>
</tr>
<tr>
<td>3)</td>
<td>15 m and above but not exceeding 24 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>R</td>
<td>100 000</td>
<td>20 000</td>
<td>(see Note 20)</td>
</tr>
<tr>
<td>4)</td>
<td>Above 24 m and not exceeding 30 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>R</td>
<td>150 000</td>
<td>20 000</td>
<td>(see Note 21)</td>
</tr>
<tr>
<td>b) Custodial (C-2), and Penal and Prisinal (C-3)</td>
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<tr>
<td>1) Less than 10 m in height</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>i) Up to 300 persons</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>NR</td>
<td>10 000</td>
<td>(5 000)</td>
<td>(see Note 4)</td>
<td>450 (900)</td>
</tr>
<tr>
<td>ii) More than 300 persons</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>NR</td>
<td>15 000</td>
<td>(5 000)</td>
<td>(see Note 4)</td>
<td>450 (900)</td>
</tr>
<tr>
<td>2)</td>
<td>10 m and above but not exceeding 15 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>R</td>
<td>50 000</td>
<td>5 000</td>
<td>(see Note 4)</td>
</tr>
<tr>
<td>3)</td>
<td>15 m and above but not exceeding 24 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>R</td>
<td>75 000</td>
<td>10 000</td>
<td>(see Note 20)</td>
</tr>
<tr>
<td>4)</td>
<td>24 m and above but not exceeding 30 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 2)</td>
<td>R</td>
<td>R</td>
<td>100 000</td>
<td>20 000</td>
<td>(see Note 21)</td>
</tr>
</tbody>
</table>

**Assembly Buildings (D) (see Note 12)**

| a) Buildings (D-1 to D-5) |
| 1) Less than 10 m in height |
| i) Up to 300 persons | R | R | NR | NR | R | NR | R | NR | 10 000 | (5 000) | (see Note 4) | 450 (450) | (see Note 4) |
MINIMUM REQUIREMENTS FOR FIRE FIGHTING INSTALLATIONS (NBC):

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(11)</th>
<th>(12)</th>
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<th>(14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ii) More than 300 persons</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>15 000</td>
<td>(5 000)</td>
<td>NR</td>
</tr>
<tr>
<td>2) Above 10 m but not exceeding 15 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
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<td>NR</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>50 000</td>
<td>(5 000)</td>
<td>5 000</td>
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<tr>
<td>3) Above 15 m but not exceeding 24 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>75 000</td>
<td>(5 000)</td>
<td>10 000</td>
<td>(see Note 4)</td>
</tr>
<tr>
<td>4) Above 24 m but not exceeding 30 m in height</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>100 000</td>
<td>20 000</td>
<td>(see Note 20)</td>
<td>(see Note 21)</td>
<td>NR</td>
</tr>
<tr>
<td>b) Multiplex D-6</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>200 000</td>
<td>20 000</td>
<td>(see Note 22)</td>
<td>NR</td>
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</tr>
<tr>
<td>c) D-7</td>
<td>For details see 6.4.8</td>
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<tr>
<td>BUSINESS BUILDINGS (E)</td>
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<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>10 000</td>
<td>(5 000)</td>
<td>(see Note 4)</td>
</tr>
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<td>2) Above 10 m but not exceeding 15 m in height</td>
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<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>R</td>
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<td>(see Note 20)</td>
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</tr>
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<td>3) Above 15 m and up to 24 m in height</td>
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<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>75 000</td>
<td>10 000</td>
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<td>4) Above 24 m and up to 30 m in height</td>
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<td>R</td>
<td>NR</td>
<td>R</td>
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<td>R</td>
<td>R</td>
<td>100 000</td>
<td>20 000</td>
<td>(see Note 21)</td>
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<tr>
<td>5) Above 30 m in height</td>
<td>R</td>
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<td>R</td>
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<td>R</td>
<td>R</td>
<td>R</td>
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<td>MERCANTILE BUILDINGS (F)</td>
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<td>a) F-1 &amp; F-2</td>
<td>For details see 12</td>
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<td>1) Less than 1.5 m in height</td>
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<tr>
<td>i) Ground plus one storey, with total covered area not exceeding 500 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
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MINIMUM REQUIREMENTS FOR FIRE FIGHTING INSTALLATIONS (NBC):

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<tr>
<td>ii)</td>
<td>Ground plus one storey and covered area exceeding 500 m²</td>
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<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R (see Note 2)</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>25 000</td>
<td>NR</td>
<td>900</td>
</tr>
<tr>
<td>iii)</td>
<td>More than ground plus one storey</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R (see Note 2)</td>
<td>R</td>
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<td>5 000 (5 000)</td>
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<td>2)</td>
<td>Above 15 m but not exceeding 24 m in height</td>
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<td>NR</td>
<td>R</td>
<td>NR</td>
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<td>10 000</td>
<td>(see Note 20)</td>
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<td>R</td>
<td>NR</td>
<td>R (see Note 10)</td>
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<td>R</td>
<td>150 000</td>
<td>10 000</td>
<td>(see Note 21)</td>
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<tr>
<td>b)</td>
<td>Underground shopping complex (F-3) (see Note 13)</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R (see Note 10)</td>
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<td>150 000</td>
<td>10 000</td>
<td>(see Note 21)</td>
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INDUSTRIAL BUILDINGS (G) (see Note 14)

a) Low Hazard (G-1) (see Note 15)

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<tbody>
<tr>
<td>i)</td>
<td>Built up area up to 100 m²</td>
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<td>NR</td>
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<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>5 000 (see Note 3)</td>
<td>NR</td>
</tr>
<tr>
<td>ii)</td>
<td>Built up area more than 100 m² and up to 500 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R (see Note 2)</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>5 000 (5 000)</td>
<td>NR</td>
<td>450</td>
</tr>
<tr>
<td>iii)</td>
<td>Built up area more than 500 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>100 000</td>
<td>10 000</td>
<td>(see Note 20)</td>
<td>450</td>
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b) Moderate Hazard (G-2) (see Note 14)

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<tbody>
<tr>
<td>i)</td>
<td>Built up area up to 100 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>10 000</td>
<td>NR</td>
<td>450</td>
</tr>
<tr>
<td>ii)</td>
<td>Built up area more than 100 m² and up to 500 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>10 000</td>
<td>NR</td>
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MINIMUM REQUIREMENTS FOR FIRE FIGHTING INSTALLATIONS (NBC):

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<tbody>
<tr>
<td>iii) Built up area more than 500 m² and up to 1000 m²</td>
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<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
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<td>R</td>
<td>75 000</td>
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<td>iv) Built up area more than 1000 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 7)</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>100 000</td>
<td>20 000</td>
<td>(see Note 20)</td>
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c) High Hazard (G-3) (see Note 16)

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<tbody>
<tr>
<td>i) Built up area up to 50 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>5 000</td>
<td>NR</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>ii) Built up area more than 50 m² and up to 150 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>5 000</td>
<td>NR</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>iii) Built up area more than 150 m² and up to 300 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>NR</td>
<td>R</td>
<td>25 000</td>
<td>10 000</td>
<td>(see Note 19)</td>
<td>450</td>
</tr>
<tr>
<td>iv) Built up area more than 300 m² and up to 500 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>50 000</td>
<td>20 000</td>
<td>(see Note 19)</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>v) Built up area more than 500 m²</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>(see Note 7)</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>100 000</td>
<td>20 000</td>
<td>(see Note 20)</td>
<td>900</td>
</tr>
</tbody>
</table>

STORAGE BUILDINGS (H) (see Note 17)

1) Below 15 m in height and covered area less than 250 m²
   | R   | R   | NR  | NR  | NR  | NR  | NR  | R   | NR  | NR  | 25 000 | 5 000 | (see Note 19) | 450 |

2) Below 15 m in height and covered area more than 250 m²
   i) Ground floor only | R   | R   | NR  | NR  | R   | R   | NR  | R   | 50 000 | 10 000 | (see Note 20) | 450 |
   ii) Ground plus one floor | R   | R   | NR  | NR  | R   | R   | NR  | R   | 75 000 | 10 000 | (see Note 20) | 450 |
MINIMUM REQUIREMENTS FOR FIRE FIGHTING INSTALLATIONS (NBC):

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<tr>
<td>iii) More than ground plus one floor</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>NR</td>
<td>R</td>
<td>100000</td>
<td>10000</td>
<td>(see Note 20)</td>
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</table>

HAZARDOUS BUILDINGS (J) (see Note 17)

1) Up to 15 m in height
   i) Single Storey Building
      | R   | R   | NR  | NR  | NR  | R   | R   | R   | R   | Minimum 4 h fire fighting requirements | NR   | (see Note 18) | NR   |
   ii) More than one floor building but not exceeding 15 m
      | R   | R   | NR  | R   | R   | R   | R   | R   | R   | Minimum 4 h fire fighting requirements | R    | 50000 | (see Note 18) | 900  |

R — Required
NR — Not Required
FIRE PROTECTION AND MEANS OF EXIT REQUIREMENTS (INCLUDING HIGH RISE BUILDINGS):-

1) General Exit Requirements :-
   • may be a doorway, corridor, passageway to an internal or external staircase or to a verandah or roof which have access to the street or to the roof of the building or a refuge area. May include horizontal exit leading to the adjoining building at same level.
   • Shall be continuously maintained free of all obstructions or impediments in case of use in an emergency and shall provide continuous means of egress to exterior.

2) Fire Access Stair Cases :-
   • Buildings having an area of more than 500 sq.m. per floor shall have a minimum of two staircases.

3) Doorways:-
   • Shall open into an enclosed stairways or a horizontal exit of a corridor providing protected means of egress.
   • Shall not be less than 1000mm in width, except in assembly buildings where it should not be less than 2000mm in width. Shall not be less than 2000mm in height.
FIRE PROTECTION AND MEANS OF EXIT REQUIREMENTS (INCLUDING HIGH RISE BUILDINGS):-

4) Corridors and Passageways:-
   • Width shall not be less than the width of the exit doorways leading out from them.
   • Height shall not be less than 2400mm.
   • Shall be adequately ventilated.

5) Internal Staircases:-
   • Shall be composed of non-combustible materials throughout.
   • External wall of building shall constitute one of its sides.
   • Shall not be arranged around a lift shaft.
   • Minimum flight width=1000mm, Maximum flight width=2000mm.
   • Minimum tread = 250mm, Maximum riser=190mm, Minimum Head Room=2200mm.
     (varying slightly based on classification of buildings).
6) External Staircases:

• An external staircase is desirable to be provided for high rise buildings.
• Shall be kept in sound operable condition.
• Shall be directly connected to the ground.
• Entrance shall be separate and remote from the internal staircase.
• No wall opening or window opens on to or close to the external stairs.
• Route to the external stairs shall be free of obstruction at all times.
• Shall be constructed of non-combustible materials and any doorway leading to it shall have the required fire resistance.
• Shall have straight flight not less than 1250mm wide with 250mm treads and risers not more than 190mm. The number of risers shall be restricted to 15 per flight.
• Handrails shall be of a height not less than 1000mm and not exceeding 1200mm. Provision of balusters with maximum gap of 150mm.
• The use of spiral staircase shall not be less than 1500mm in diameter and shall be designed to give adequate headroom.

• Unprotected steel frame will not be accepted as a means of escape. However steel staircase in an enclosed fire rated compartment of 2h will be accepted as a means of escape.

7) Horizontal Exits:-

• The width of horizontal exit shall be same as that for the exit doorways.

• A horizontal exit shall be equipped with at least one fire / smoke door of minimum 1h fire resistance, of self closing type.

• Where there is a difference in level between connected areas for horizontal exits, ramps not more than 1 in 10 slope shall be provided, steps shall not be used.

• Doors in horizontal exits shall be operable at all times from both sides.
FIRE PROTECTION AND MEANS OF EXIT REQUIREMENTS (INCLUDING HIGH RISE BUILDINGS):-

8) Refuge Areas: -
• Shall be provided on the periphery of the floor or preferably on a cantilever projection and open to air at least on one side protected with suitable railing.

• For floors above 24 m and up to 39m- one refuge area on the floor immediately above 24m.

• For floors above 39m – one refuge area on the floor immediately above 39 m and so on after every 15m.

• Residential flats in multi storied buildings with balcony need not be provided with refuge area, flats without balcony shall provide refuge area.

9) Fire Towers: -
• Preferred and safest type of escape route for storied buildings.

• In high rise buildings with over 8 storeys or 24m in height, at least one required means of egress shall preferably be a fire tower.

• Shall be constructed of walls with a 2h fire resistance without openings other than the exit doorway.
The attack on the World Trade Center created a catastrophic collapse of both towers. This tragedy will be reviewed and evaluated for a long time to come, to prevent another disaster of this kind, governments all over the world recommend some standard safety procedures to be followed in emergency situations.

A fire in a high-rise building usually can be confined to the area where it starts. However, smoke and heat can travel throughout the building, especially upward.

High-rise buildings are constructed to be fireproof. Most of what is inside the buildings, though, including furniture, furnishings and belongings, can burn and produce a tremendous amount of heat and smoke.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

CONSTRUCTION:-

• All materials of construction in load bearing elements, stairways and corridors and facades shall be non-combustible.

• The interior finishes should not have a flame spreadability rating exceeding Class 1.

• The internal walls or staircase shall be of brick or RCC with minimum of 2H fire rating.

• The staircase shall be well ventilated.

• The roof of the shaft shall be one meter above the surrounding roof with fire resistance rating of 2h.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

LIFT:-

• Walls of lift enclosure shall have fire rating of 2h with vent at the top of lift shaft.

• Landing doors in lift enclosures shall have a fire resistance of not less than 1h.

• The number of lifts in a row shall not exceed 4.

• Lift car door shall have a fire resistance rating of half an hour.

• Collapsible gates for lifts shall not be permitted.

• Lifts shall not normally communicate with the basement.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

FIRE LIFT:-

• One fire lift per 1200 square meters of floor area for exclusive use of firemen in an emergency.

• The lift shall have a floor area of not less than 1.4 square meter. (8 persons lift)

• The electric supply shall be on a separate service from electric supply mains.

• Lift should be provided with a ceiling hatch.

• The word FIRE LIFT shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor level.

• The speed of fire lift shall be such that it can reach the top floor from the ground floor within one minute.
BASEMENT:-

Each basement shall be separately ventilated.
Staircase of basement shall be enclosed type.

SERVICE DUCTS / SHAFTS:-

Service Ducts should be enclosed by walls of 2h and doors of 1h fire rating.

A vent opening at the top of the service shaft shall be provided.

PROVISION OF FIRST AID FIRE FIGHTING APPLIANCES

The first aid fire fighting equipment shall be provided on all floors including basements, lift rooms, etc. in accordance with good practice in consultation with the authority.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

ELECTRICAL SERVICES:-

Electric Distribution Cables / Wiring shall be laid in a separate duct.

Water mains, telephone lines, intercom lines, gas pipes and any other service pipes shall not be laid in the same duct as the electrical cables.

Fire fighting pumps, lifts, staircases and corridor lighting and blowers for pressurizing system shall be laid in separate conduit pipes.

GAS SUPPLY :-

Gas pipes, if present, should be laid in a separate shaft exclusively for this purpose, on external walls away from the staircases.

STAND BY ELECTRIC GENERATOR :-

A stand by electric generator shall be installed to supply power to staircase and corridor lighting circuits, fire lifts, stand by fire pumps, and all other fire fighting systems in case of failure of normal electric supply.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

FIRE ALARM SYSTEM

Two Types: - Manually Operated Electric Fire Alarm System (MOEFA) or Automatic Fire Alarm System (above 30m height).

LIGHTNING PROTECTION OF BUILDINGS

FIRE CONTROL ROOM

To be placed at the entrance floor of the building with communication systems to all floors and facilities for receiving the message from different floors.

FIRE OFFICER

A qualified Fire Officer with experience of not less than 3 years shall be appointed who will be available on the premises in hotels, business and mercantile buildings with height more than 30m.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

HOUSEKEEPING

To eliminate fire hazards, good housekeeping, both inside and outside the building, shall be strictly maintained by the occupants and / or the owner of the building.

HOUSEKEEPING STRATEGIES

• Good housekeeping habits are an important part of a safe place.

• To reduce amounts of flammable and combustible materials.

• To reduce ignition hazards.

• To ensure safe emergency evacuation of occupants.

• To allow for quick emergency response.
FIRE PROTECTION REQUIREMENTS FOR HIGH RISE BUILDINGS – 15M in Height or Above

COMPARTMENTATION

The building shall be suitably compartmentalized so that the fire / smoke remain confined to the area where fire incident has occurred and does not spread to the remaining part of the building.

HELIPAD

For high rise buildings above 60m in height, provision for helipad should be made.

MATERIALS FOR INTERIOR DECORATION / FURNISHING

The use of materials which are combustible in nature and may spread toxic fume/ gases should not be used for interior decoration / furnishing, etc.

EMERGENCY AND ESCAPE LIGHTING

Shall be powered from a source independent of that supplying the normal lighting and shall be provided to be put on within 1s of the failure of the normal lighting supply.
GUIDELINES FOR FIRE DRILL AND EVACUATION PROCEDURES FOR HIGH RISE BUILDINGS

• In case of fire in a high rise building, for the safe evacuation of its occupants the following guidelines have to be followed:-

• ALARMS :- Any person discovering fire, heat or smoke shall immediately report such condition to the fire brigade.

• FIRE DRILLS :- Fire Drills shall be conducted in accordance with the Fire Safety Plan at least once every three months for existing buildings during the first 2 years, thereafter fire drills shall be conducted at least once every six months. All occupants of the building shall participate in the fire drill. A written record of such drills has to be maintained and available for inspection.

• SIGNS AND PLANS :-

- Signs at Lift Landings :- A Sign reading “IN CASE OF FIRE USE STAIRS UNLESS INSTRUCTED OTHERWISE” shall be posted on every floor at or near the lift landing.

Lettering shall be properly spaced, should be clearly legible, with 12.5mm block letters in red with a white background, sign size should be at least 250mm x 300mm.
GUIDELINES FOR FIRE DRILL AND EVACUATION PROCEDURES FOR HIGH RISE BUILDINGS

• SIGNS AND PLANS :-
- Floor Numbering Signs:- A sign shall be posted and maintained within each stair enclosure on every floor, indicating the number of the floor.

- Stair and Elevator Identification Signs:- Each stairway and each elevator shall be identified by an alphabetical order.

• FIRE SAFETY PLAN :-

- The Fire Safety Plan shall be distributed to all the tenants and workers of the building after it has been approved by the Fire Authority.

• FIRE COMMAND STATION :-
- Shall be established in the lobby of the building on the entrance floor, adequately illuminated, and furnished with copies of the floor plans and the fire safety plans of the building.

• COMMUNICATIONS AND FIRE ALARM :-

- A means of communication and fire alarm for use during fire emergencies shall be provided and maintained by the owner or person in charge of the building.
GUIDELINES FOR FIRE DRILL AND EVACUATION PROCEDURES FOR HIGH RISE BUILDINGS

• FIRE SAFETY PLAN:-

Purpose:- To establish a method of systematic, safe and orderly evacuation of an area or a building by its occupants in case of fire or any other emergency, in the least possible time to a safe area by the nearest safe means of egress; also the use of available fire appliances.

Objective:- To provide proper education for all its occupants, to ensure prompt reporting of fire, the response of fire alarms as designated and the immediate initiation of fire safety procedures to safeguard life and contain fire until the arrival of the fire brigade.

- Should include names and contact numbers of the nearest fire station, the fire safety director, deputy fire safety director, fire wards, building evacuation supervisor, etc.
FIRE SAFETY INSTALLATIONS IN BUILDINGS

• Fire Safety is an important issue for all of us. Most people will never face a major fire but fire is an unpredictable catastrophe which can occur any time.

• The primary goal of fire safety efforts is to protect building occupants from injury and to prevent loss of life and prevent property damage.

• According to Indian law, minimal fire safety equipment is mandatory for any developed property.

• Fire Safety arrangements have become the basic necessity for MNC (Multi National Companies), Offices, Schools, High Rise Buildings, Societies, Homes/Houses, Multi Storey Buildings/Houses, Shopping Complex.

• Fire Safety device or Fire Detector Units come in a variety of models depending on the facility to be protected.

• As per the Fire Services Rules and National Building Code of India, the installation of the minimum fire safety equipment is mandatory in Schools, High Rise Buildings and Shopping Complex.
• Carbon Monoxide Detector, Smoke Alarms, Fire Extinguishers, Escape Ladders, Fire sprinkler systems, Fire doors & frames, Water storage etc are some of important Fire Safety equipments.

• Installation of fire safety device is offered as a part of project by builders or developers. According to National Building Code, at least one stair case shall be provided as a fire staircase as defined in the National Building Code. The performance of a fire protection system depends not only on the quality of the product, but in the quality of its maintenance program.
FIRE SAFETY INSTALLATIONS IN BUILDINGS

Smoke alarm sounds and occupants are alerted

Escaping
First person out

Exiting the home

Last person out

As time elapses, smoke increases and flames develop

Fire growth is fast and may not be survivable

FIRE
FIRE PROTECTION SPRINKLER SYSTEM

1) Automatic Sprinkler System

2) Stand Pipe Systems

3) Fire Extinguishers and Cabinets

4) Special Fire Protection Systems
   - Carbon Dioxide System
   - Dry Chemical System
   - Halon System
   - Foam Extinguishing System
   - Grease Exhaust Hood Fire Protection System
Fire safety objectives

Prevent fire ignition

Manage fire impact

Manage fire

Control combustion

Suppress fire

Control fire by construction

Manage exposed