

PART IV**Chapter 5****Requirements For Fire Detection and Extinguishing System****5.1 Scope**

Installation of fire detection and firefighting equipment fixed centrally or localized or portable and their arrangement in the buildings shall be performance based. Construction type and occupancy classification of Buildings shall be as per provisions of this Code. Part 3 of this Code shall be determinant of construction type and the A-Z list for occupancy classification. Installation of fire detection and firefighting equipment shall comply with the Chapter 4 of Part 4 of this Code.

Intent of this Chapter is to reduce the probability of fire incident by confinement, extinguishment to reduce probability of injury or death from fire, structural failure due to fire and safety of building use.

Provisions of this Chapter shall be considered as minimum requirement and shall not be intended to prevent additional installation of higher standard of equipment.

5.1.1 Performance based fire protection system which includes “Passive” that is arrangement of building components and “Active” means detection, alarm, extinguishment devices and equipment which shall be incorporated in all buildings unless otherwise specified in this Code. Performance based design considerations shall be as follows:

- (a) The starting of a fire incident shall be a single source to evaluate the fire protection system.
- (b) The prime objective of a fire protection system to safe life and minimization of property damage shall be achieved by using required design scenarios and the performance criteria to be fulfilled. Each design scenario shall be challenging as realistic and the probability of occurrence is present in the building shall be reduced and protected.
- (c) Design scenario shall include but not limited to those specified in Sections 5.1.2 to 5.1.4 and shall be documented and demonstrated to the satisfaction of the authorities having jurisdiction.
- (d) Each design scenario used in the performance-based design shall be translated into input data specification as appropriate for calculation method or model.

- (e) Input data of any design scenario did not analyzed and explicitly addressed or incorporated shall be omitted from input data specifications, shall be identified by a sensitivity analysis of the consequences of the modification for such omissions shall be performed.

5.1.2 Design Scenario I

Fire Class and Fire resistance rating shall be determined as per provision of this Code for the followings:

- (a) All surface finish materials.
- (b) Structural Members.
- (c) Joints of Structural Members.
- (d) All slabs.
- (e) Roof Slab.
- (f) Joints between Slabs.
- (g) All Exterior Walls.
- (h) All Interior Walls.
- (i) Partitions.
- (j) Suspended Ceiling.

Construction classification and the structural stability shall be concluded and documented.

5.1.3 Design Scenario II

Occupancy specific design scenario representative of a typical fire shall explicitly specify the following:

- (a) Occupant activities.
- (b) Number and location of occupants.
- (c) Room size.
- (d) Number of Control Area.
- (e) Furnishings and contents.
- (f) Fuel Properties represented by Fire Class and ignition sources.
- (g) Ventilation conditions.
- (h) First item ignited and its location.

5.1.4 Design Scenario III

- (a) The largest possible fuel load characteristic of the normal operation of the building shall be considered regarding a rapid developing fire in presence of occupants.
- (b) A slow-developing fire shielded from protection in the close proximity to a high occupancy area shall be considered a concern regarding a relatively small ignition source causing a significant fire.
- (c) A concealed space or suspended ceiling space adjacent to a large occupied room shall be considered a concern regarding a fire originating in a concealed space that does not have either detection system or suppression system and then spreading into the room within holding the greatest number of occupants.
- (d) An Ultrafast developing fire in the main exit access portion in a condition when interior doors are open but reduction in number of available means of egress shall be considered.
- (e) A room normally unoccupied from where a fire starts that can potentially endanger a large number of occupants in a room or other area shall be considered.
- (f) The concern regarding exposure of fire outside of an area of incident started at a remote location either spreading from the area or bypassing barriers spread into another area and developed untenable condition thereof.
- (g) The reliability and the design performance shall be considered for fire detection and protection system in such a way that a fire originating in ordinary combustibles in a room with each passive or active fire protection system or fire protection feature independently rendered ineffective shall be considered individually being unreliable or becoming unavailable. This scenario shall not be considered for a room or a space or a building where fire detection and protection systems or any independent features are absent.

5.1.5 Fire class shall be determined for all movables in each room and all control areas in the building.

5.1.6 Fire Protection Plan

A building or part thereof must have a fire protection plan for the following cases.

- (a) High rise building or building sections 33 m and above in heights.
- (b) Building or building sections classified in the occupancy groups G, H, J, K and M which are two or more storey in height with over 1858 m² per gross floor area or are two or more in height with total area exceeding 4717 m² gross floor area.
- (c) Building classified as A3 containing 30 or more dwelling units; A4 and A5 having gross floor area of the building more than 1200 m².
- (d) Part of a building used as mercantile, assembly, institutional or health care having gross floor area of the building over 930 m².
- (e) Alteration to a building or a portion thereof listed in Sections 5.1.6(a) to 5.1.6(d) above, if cost of alteration equivalent to one third cost of new construction of the same or more or involves changes in occupancy classification.
- (f) The plan shall include information where applicable building address, height in meter, occupancy classification, detail occupant load.
- (g) Key Plan shows all floors, exits, corridors, partitions serving as fire separations or compartments, locations and ratings of required enclosures, windowless stair with pressurization, exit discharge, locations of frontage space including street width of abutting plot.
- (h) Descriptions in narrative forms of safety systems and features where applicable, including:
 - Communications systems
 - Alarm system
 - Detection systems
 - Location of fire command station
 - Elevator recall
 - Emergency lighting and power
 - Extinguishing equipment
 - Compartmentation
 - Horizontal exits
 - Mechanical ventilation and air conditioning

- Smoke control systems and equipment
 - Furnishing type and materials
 - Places of assembly
 - Fire department access
 - Other system, required or voluntary to be installed
- (i) A fire protection plan shall be signed by the same architect who is signing on the proposed drawings for building approval and any person responsible for the Fire protection design.

5.2 Specific Recommendations

Specific recommendations applicable for buildings complied with the followings:

5.2.1 All building constructed monolithically as per provisions of this Code as an inherent full fire resistive construction type shall be termed as Type I-A.

5.2.2 All surface finishes shall be Class-I within the range of zero to twenty five flame spread index.

5.2.3 Any offsite construction, pre-stressed, pre-fabricated or steel structure encased with fire resistive assembly shall be termed as Modified Type I-A.

5.2.4 The following recommendations for fire protection system specified in Sections 5.3 to 5.14 are made based on construction type and surface finishes specified in Sections 5.2.1 and 5.2.2 respectively.

5.2.5 All buildings of any occupancy type and construction type as per provisions of this Code other than Sec 5.2.1 with all surface finish as per Sec 5.2.2 shall provide a performance based fire protection.

5.3 Occupancy A: Residential

The residential buildings complied with Sections 5.2.1 and 5.2.2 shall provide the following active fire protection:

5.3.1 Occupancy A1 and A2: Single Family Dwelling and Two Families Dwelling

- (a) For buildings having total floor area less than 500 m², fire detection and fixed firefighting arrangements is not required.
- (b) Buildings exceeding total floor area 500 m² shall have manual alarm system and portable extinguishers provided in the escape stairs route or in lift lobby and as per provision of this Code.

5.3.2 Occupancy A3: Flats and Apartments

- (a) Up to 33 m height fire detection and fixed firefighting arrangement shall not be required.
- (b) No protection is required within the dwelling units of high rise flats and apartments; manual alarm system and fixed hydrant system shall be provided in the landings of fire stairs or in the lift lobby as per the provisions of this Code.

5.3.3 Occupancy A4: Mess, Boarding House and Hostels

- (a) For buildings up to 2 storey height, fire detection, fire alarm and fixed firefighting arrangements shall not be required.
- (b) Buildings having 3 stories and having floor area less than 300 m² shall not require fire detection and fixed firefighting arrangements.
- (c) The floor area of 3 stories building having more than 300 m² per floor and less than 33 m height having central corridor with rooms on both sides, manual fire alarm system shall be provided along with portable fire extinguishers. Instead of double loaded corridor a single loaded corridor having 3 m width shall not require any detection and fixed firefighting arrangements.
- (d) High rise boarding house, mess and hostels manually operated electric fire alarm system shall be provided along with hydrant system.

5.3.4 Occupancy A5: Hotels and Lodging Houses

- (a) For buildings up to 2 storey height, fire detection, fire alarm and fixed firefighting arrangements is not required.
- (b) Buildings having 3 floors or above and having floor area less than 300 m² shall not require fire detection and fixed firefighting arrangements.
- (c) The floor area of such building is more than 300 m² per floor and low rise building having central corridor with rooms on both sides, manually operated fire alarm system shall be provided along with portable fire extinguishers. For low rise buildings with other configurations performance based firefighting system shall be required as per the provisions of this Code.
- (d) High rise hotels and lodging houses manually operated electric fire alarm system shall be provided along with hydrant system.

5.4 Occupancy B: Educational

The educational buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.4.1 Low rise buildings with open corridor of 3m width fire detection and fixed firefighting arrangements shall not be required.

5.4.2 High rise building or building having central corridor with classrooms on both sides, manual fire alarm and hydrant systems shall be required as per provisions of this Code. Single loaded open corridor having width of 3 m or more shall have detection and manual alarm systems.

5.4.3 Where hydrants cannot be used to extinguish fire in those areas appropriate portable firefighting appliances shall be installed as per standard.

5.5 Occupancy C: Institution For Care

The Institution for care buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.5.1 Occupancy C1: Institution for Care of Children:

Fire detection and fixed firefighting arrangements shall not be required. Portable firefighting appliances shall be installed as per the provisions of this Code.

5.5.2 Occupancy C2: Custodial Institution for the Physically Capable adults:

Fire detection and fixed firefighting arrangements shall not be required. Portable firefighting appliances shall be installed as per the provisions of this Code.

5.5.3 Occupancy C3, C4, C5: Custodial Institution for the Physically Incapable, Penal and mental institutions for children and Penal and mental institutions for adults:

Manually operated electric fire alarm system shall be installed. Portable firefighting appliances shall be installed as per the provisions of this Code.

5.6 Occupancy D: Health Care Facilities

The Health care facilities buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.6.1 Occupancy D1: Normal and Emergency Medical Facilities:

- (a) Manually operated electric fire alarm system or automatic fire alarm system shall be installed in the duty room, so that the duty personnel receive the fire warning well in advance. Portable fire fighting appliances shall be installed as per the provisions of this Code.

- (b) For low rise health care facility buildings with more the 300 m² per floor, performance based fire fighting system shall be required as per the provisions of this Code.
- (c) For high rise health care facility buildings, manually operated electric fire alarm system shall be provided along with hydrant system.

5.7 Occupancy E: Business

The Business buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

Buildings	Active Fire Protection
(i) Office buildings up to 2 storey high and 500 m ² single effective undivided space in a floor.	Portable fire extinguishers or hydrants.
(ii) Office buildings more than 2 storey high or more than 500 m ² single effective undivided space in a floor.	Manually operated electric fire alarm system shall be provided along with portable fire extinguishers or hydrants.
(iii) Laboratories with precession instruments.	Automatic fire alarm system and performance based extinguishing system.
(iv) Control areas of office buildings dealing with flammable liquids.	Automatic foam or gaseous or dry chemical fire extinguishing system required along with portable fire extinguishers.
(v) Solvent storage in a control area of an office	Automatic fire alarm system and performance based foam or gaseous or dry chemical fire extinguishers or portable fire extinguishers.
(vii) Telecommunication, Internet gateway equipment or computer installation in an unattended server room.	Automatic fire alarm system and performance based fixed gaseous or fixed vaporizing liquid extinguishers or portable fire extinguishers.
(viii) Electrical low tension distribution panel room in a sub-station.	Automatic fire alarm system and performance based localized fixed gaseous or vaporizing liquid extinguisher or portable fire extinguishers.
(ix) Space under one false ceiling more than 500 m ²	Automatic fire alarm system shall be installed for above and under the false ceiling.

Buildings	Active Fire Protection
(x) Essential Services (Occupancy E3)	Due to importance of services and the functionality of the building of this occupancy classification during any national or local emergency situation thus the fire protection system design shall be performance based (Sec 5.1.1).
(xi) High rise office buildings	Manually operated electric fire alarm system shall be provided along with hydrant system.

5.8 Occupancy F: Mercantile

The Mercantile buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protections:

5.8.1 Occupancy F1: Small Shops and Markets

Mercantile	Active Fire Protection
(i) Whole sale establishments, transport booking establishments.	Manual fire alarm system shall be provided along with portable fire extinguishers or hydrant.
(ii) Other premises (other than shops, stores, markets etc.)	Manual fire alarm system shall be provided along with portable fire extinguishers or hydrant.

5.8.2 Occupancy F2: Large Shops and Markets

Mercantile	Active Fire Protection
(i) Shopping arcade with central corridors open to sky	Manual fire alarm system and portable fire extinguishers shall be provided or hydrant.
(ii) Mercantile building under covered roof with single effective undivided space more than 500 m ² on each floor	Manual fire alarm system and hydrant system with performance based portable fire extinguisher shall be installed.
(iii) Underground mercantile structure	Automatic fire alarm system, sprinklers and standpipe with performance based portable fire extinguisher shall be installed.

5.8.3 Occupancy F3: Petrol and CNG Stations

Mercantile	Active Fire Protection
(i) Petrol pump and CNG station, automobile garages	Fixed automatic foam or gaseous or dry chemical fire extinguishing system shall be provided along with portable extinguisher.
(ii) Aircraft hangars	Automatic foam or gaseous or dry chemical fire extinguishing system shall be provided along with portable extinguisher.

5.9 Occupancy G: Industrial

The Industrial buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following active fire protection:

5.9.1 Occupancy G1: Low Hazard Industries

Manually operated electric fire alarm system shall be installed with portable fire extinguishers or hydrants when occupant loads are not more than 150.

Where occupant loads are more than 150 active fire protections shall be performance based.

5.9.2 Occupancy G2: Moderate Hazard Industries

Among the moderate hazard industries where large number of occupants are densely populated in a building, the active fire protections shall be performance based. Fire safety requirement for such type industry is elaborated as follows:

- Where occupancy load is more than 150 per production area shall have minimum 9.5 m³ air volume per occupant.
- There shall have direct exits from the ground floor. This exit doors shall be used by only the occupant of the ground floor.
- Buildings less than 33 m in height shall have open stair and the interior stairs shall be protected by fire rated enclosures. Occupants located 33 m or above, all stair shall have smoke proof enclosures constructed as per provision of the Code.
- All windows or openings on exterior walls passable by occupant located above 3 m in height shall be protected by grills and all these grills shall be designed as such that a part or a portion having minimum 0.6 m height and minimum 0.75 m width framed and the grill within the frame shall be side hinged or pivoted so that it can swing. This swing type operable portion must be always locked and in case of emergency the firefighters can open by breaking the lock for rescue operation.

- (e) The floor shall be constructed such that the travel path of the occupant shall not be exceeded as per Table 4.3.7 of this Code.
- (f) As per general requirements, all exit access doors shall be of a side-swinging type. Fulfilling the conditions laid down by NFPA 101, edition 2015, article 7.2.1.4 horizontal sliding or vertical-rolling security grills or door assemblies that are part of the required means of egress shall be permitted.
- (g) All raw materials, finished good and accessories shall be stored in control areas as per provision of part 3.
- (h) Density of storage materials per control area shall not be exceeded the provision of this Code.
- (i) During production that is feeding, checking for quality control rejects, waiting area for finishing, packing, cartooning etc. in every case dedicated area shall be defined as on process storages. The total volume of materials on process shall be such that in every four hour the material shall be used up and the finished goods shall be transferred to controlled area as finished goods store.
- (j) From each end every work station shall be connected with a passage. The width of the passage shall comply with the provision of this Code Chapter 3 Part 4.
- (k) Cargo lift and passenger lift shall have smoke proof lift lobby.
- (l) Occupant load in a single effective undivided space shall not exceed 600. In case of existing building if the occupant load of a single effective undivided space exceeds 600, the space shall be compartmented complying with the horizontal exit provision of the Code.
- (m) Where control areas and in process stores having materials may cause a fire classified as fire class A shall have hydrant system as per provision of this Code. In the utility occupancy areas fire extinguishing system shall be installed as per provision as specified for utilities of this Code.
- (n) If there any change of fire classification due to the working condition or raw materials than appropriate extinguishing system shall be installed as per provision of this Code.
- (o) Up to 750 m² single effective undivided space in a floor shall be installed with manual fire alarm system with portable fire extinguishers or as an alternate hydrants system shall be installed as per provisions of this Code.
- (p) Above 750 m² single effective undivided space in a floor shall be fitted with manual fire alarms system with hydrants shall be installed.

5.10 Occupancy H: Storage

The Storage buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following Active fire protection:

5.10.1 Occupancy H1: Low Fire Risk Storage

Manually operated electric fire alarm system shall be installed. Depending on the type of materials to be stored, performance based fire protection shall be installed as per provision of this Code.

5.10.2 Occupancy H2: Moderate Fire Risk Storage

Performance based fire protection system shall be installed as per provision of this Code.

5.11 Occupancy I: Assembly

The Assembly buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following Active fire protection:

5.11.1 Occupancy I1: Large Assembly with Fixed Seats

All auditorium, corridor, green rooms and canteen attached to assembly buildings shall be fitted with manual fire alarm system and the performing stage should preferably be covered by an automatic sprinkler system. Portable firefighting appliances shall be installed as per specification of the manufacturer and provision of this Code.

5.11.2 Occupancy I2: Small Assembly with Fixed Seats

Requirements specified in Sec 5.6.1 shall be complied.

5.11.3 Occupancy I3: Large Assembly without Fixed Seats

Automatic fire alarm system shall be provided. Portable firefighting appliances shall be installed as per specification of the manufacturer and provision of this Code.

5.11.4 Occupancy I4: Small Assembly without Fixed Seats

Requirements specified in Sec 5.6.3 shall be complied.

5.11.5 Occupancy I5: Sports Facilities

Manually operated electric fire alarm system shall be provided. Portable firefighting appliances shall be installed as per specification of the manufacturer and provision of this Code.

5.12 Occupancy J: Hazardous

The Hazardous buildings complied with Sections 5.2.1 and 5.2.2 shall be provided with the following Active fire protection:

All hazardous occupancies shall be installed with automatic fire alarm and automatic fixed firefighting gaseous or foam or dry chemical extinguishing system as compatible with class of fire shall be installed as per provision of this Code.

5.13 Occupancy K: Garages

The parking buildings (garages) complied with Sections 5.2.1 and 5.2.2 shall provide the following fire protections:

- (a) Where both parking and repair operations are conducted in the same building, the entire building shall comply with the requirement stated in this Code for Occupancy G1.
- (b) Where the parking and repair sections are separated by not less than 1-hour fire-rated construction, the parking and repair sections shall be permitted to be treated separately.
- (c) In areas where repair operations are conducted, the requirement of Occupancy G1 shall be fulfilled.
- (d) The area used only for parking shall fulfill the requirement as laid down in chapter 42 of NFPA 101 edition 2015.

5.14 Occupancy L: Utilities

Fire protection system shall be as stated in Sec 2.12 of this Code.

5.15 Occupancy M: Miscellaneous

Performance based fire protection system shall be installed.

PART IV
Appendix A
Guidelines For Fire Drill and Evacuation Procedure

A.1 Introduction

The following provisions shall be applicable for emergency reporting, fire safety and evacuation plan of the occupants of different occupancies.

A.2 Fire Reporting

Any occupant within the occupancy discovering a fire or smoke shall immediately report the incident to the fire brigade directly or through the ground command station, if there is any. Reporting of this situation shall not be delayed by any person by way of making, issuing, posting or maintaining any regulation or order written or verbal to that effect.

A.3 Supervision of Fire Safety and Emergency Action and Plans

The owner shall designate competent persons to act as fire safety and evacuation plan staff, train the staff and conduct fire drill. Such persons shall possess such qualifications and/or hold such certificate of fitness as are required by the provisions of this Chapter. The owner shall ensure that adequate fire safety and evacuation plan staff is present on the premises during regular business hours and other time when the building is occupied, to perform the duties and responsibilities set forth in the fire safety and evacuation plan.

A.4 Fire Safety Staff

A.4.1 The fire safety and evacuation plan shall designate a fire safety director, a number of deputy fire safety directors and fire safety brigade members having following duties, authority and qualifications.

A.4.2 Fire Safety Director

- (a) The fire safety plan shall contain the name of fire safety director, whether employed by a fire security firm or directly employed by the management.
- (b) Depending on the size and complexity of the building, the Fire Safety director shall be a person of proven capability, having good training and schooling with adequate experience in dealing with fire.