
PART IV
Chapter 3
Means of Egress

3.1 scope

The provisions of this Section shall control the design, construction and arrangement of building components to provide a reasonably safe means of egress. Any repair or alteration works within a building shall be prohibited unless the existing means of egress and fire protection system are continuously maintained or a continuous alternative exits and protection measures are taken to provide an equivalent degree of safety for the occupant and the workers for the total duration of such project.

3.2 Components of Means of Egress

3.2.1 A means of egress is an evacuation system with the provisions of reentry for rescuers and fire fighters where a continuous and unobstructed way of exit travel shall be provided from any point within a building to a designated area of refuge for allowable delayed evacuation and ended up with the exit termination by reaching a street abutting building or plot or an safe area which is open to air and designated assemblies for evacuees.

The way of exit travel within a building form any point thereof along a means of egress shall consist of three parts: (1) the exit access, (2) the exit, and (3) the exit discharge

- (a) A way or path of evacuation from any point of an area affected due to fire incident leads to a protected entry to another separated area of a building shall be termed as exit access. Straight line distance between the remotest point of an area of incident and the entrance point of a separated area shall be measured and termed as a travel distance.
- (b) The exit is a component or a group of components start with a protected opening to evacuate an area of fire incidence and provides a safe entry to a separated area which is component of means of egress and subsequently leads to the exit discharge.
- (c) The outer edges or peripheral points of a building from where occupants shall evacuate the building envelope termed as Exit discharges which shall lead evacuees to the terminal points at a safe distance from thereof.

An area or any plot abutting street which is open to air and designated for systematic assemblies of evacuees to complete the process of egress system shall be termed as exit termination.

3.2.2 The parts of the means of egress consist of any of the following exit components:

- (a) A doorway, separated or refuge area like smoke and fire proof enclosure, compartment, corridor, passage, ramp, balcony, an exterior or open or interior fire stair, or any combination of these, leads orderly to the exit discharge which offer safety from fire or smoke from the area of incidence.
- (b) Horizontal exit shall provide a delayed egress by relocating the occupants from their initial location due to a fire incident to a separated area at same level of a same building or at the same level of adjoining or detached buildings connected through a fire door or a vestibule or a passage or corridors for relocation of evacuees. Receiving areas are capable to accommodate expected evacuees for certain time period, free from heat, smoke and aggressive fire, from the area of incidence and shall lead to exit discharges without returning the evacuees to their initial locations.

3.2.3 Generally lifts, escalators and moving walks shall not be regarded as components of means of egress. When they are designed and installed for safe operation during fire shall be included as components of means of egress.

3.2.4 Means of Escape: A way out of a building or structure that does not conform to the formation of means of egress but does provide a safe way out.

3.3 General Requirements

3.3.1 Design considerations or assumptions:

- (a) Fire initiated from only one source in single space shall aggravate within a building or adjacent structures over a time period.
- (b) More than one space or source of fire at the same time shall not be considered.
- (c) All Construction Materials by qualities and quantities including surface finish, utilities, fabrications of movables and immovable, stored materials shall be approved types as per provisions of this Code.
- (d) Stability of structural elements or building itself shall be as per provisions of this Code.
- (e) Occupants, Rescuers and fire fighters life safety shall be the prime consideration thus egress system including relocation and fight in place or evacuation and reentry provisions shall be as per provisions of this Code.

- (f) Fire suppression and extinguishment arrangement for life safety and minimize property damages shall be performance based as per provisions of this Code.
- (g) Provisions of this Part shall be the minimum standard, in excess of these provisions shall not be prevented to design a egress system or to install advance and higher standard of detection and extinguishment equipment or both which shall be approved by the authorities having jurisdiction.

3.3.2 All buildings constructed for human occupancy or control areas or storages shall be provided with adequate exit facilities to permit safe and quick unaided egress of the occupants in the event of fire or other emergency.

3.3.3 Exits shall not be used for any other purpose at any time that would obstruct the intended use of those components during emergency.

3.3.4 Where corridors or passages are components of exits shall not be designed or used as components to supply or return air.

3.3.5 Preferences of levels of walking surfaces in the means of egress shall be more than 1 in 20. Ramps or stairway shall be used in case of changes in elevations of walking surfaces.

- (a) Abrupt changes not exceeding 130 mm but exceeding 60 mm shall be beveled 1 in 2.
- (b) Changes in elevation exceeding 130 mm shall be considered as a change in level.
- (c) A stairway in walking surface of the means of egress shall consist of minimum two steps and all of them shall be identical and shall have tread depth not less than 330 mm and height of risers shall not be exceeded more than 230 mm but shall comply tread and riser combination as per provision of this Code.
- (d) Changes in levels 530 mm or more in walking surfaces of the means of egress shall be achieved either by a ramp or by a stairway.
- (e) Presence and location of such steps or ramps in the walkways shall be readily apparent.
- (f) Other than ramp, a slope of walking surfaces along the direction of travel shall not be steeper than 1 in 20 and slope perpendicular to the travel direction shall not be exceeded 1 in 48.
- (g) Slope of ramps shall be complied with the accessibility where required as per provisions of this Code.

3.3.6 From the exit access all exits shall be clearly visible. Corridors and passages leading to the exit discharge shall be marked and signposted to guide the evacuees as per provisions of this Code. A space used in darkness having more than one exits shall be illuminated exits sign as per provision of this Code.

3.3.7 The owner or lessee of all new and existing buildings shall be responsible to provide the safety provisions for all occupants and rescuers and firefighters. If in any existing building, the exit facilities are deemed inadequate in view of the requirements of this Code, the authority having jurisdiction may order to comply with the provisions of this Code.

3.4 General Provisions of Exits

3.4.1 All exits shall be easily discernible and accessible from the areas served by them.

3.4.2 Exit from any room or space shall not open into an adjoining or intervening room or area except where such adjoining room or area is an accessory to the area served, is not a hazardous occupancy. If hazardous or a control area, provide a direct exit to the outside of a building envelope or directly connect with the components of egress system.

3.4.3 No portion of Exits shall pass through a room that may be subject to lock with detachable key or be intervened by a door that may have detachable key operated lock and the door is locked when the building is occupied.

3.4.4 All entry points to the assembly occupancy shall serve as Exits and shall have the total capacity for at least one-half of the total occupant load. Provisions of exits other than entries shall have capacity to evacuate at least two-thirds of occupant from each level of assembly occupancy.

3.4.5 All exits shall be so located and arranged that they shall provide continuous and unobstructed means of egress up to the exit discharge.

3.5 Occupant Load

Total occupant load means summation of all occupants of only one level at the pick hour occupancy where maximum occupants are present.

Occupant load shall be considered as per provisions of this Code to design each and every component of means of egress system shall be termed as design occupant load.

3.5.1 Design Occupant Load

The design occupant load for which the component of means of egress is to be provided shall be the highest number computed as per the provisions of (a), (b) and (c) as stated below:

- (a) The actual number of occupants for whom the area served by the exits is designed;
- (b) Number of occupants shall be computed as prescribed in Table 4.3.1.
- (c) The number of occupants in any area shall be computed as per provisions of (a) or (b) as stated above and in all cases the higher value shall govern the design.
- (d) The computation of design occupant load shall be the summation of occupants of a space and the evacuees of other spaces whose are using the said space as for waiting or passing through in case of emergency to gain an access to a component of means of egress.

Table 4.3.1: Occupant Load Factor

Occupancy		Unit of Floor Area in m ² per Occupant*
A	Residential	18 gross
B	Educational:	
	Class room	2 net
	Preschool	3.5 net
C	Institutional	12 gross
D	Health Care:	
	In patient areas	15 gross
	Out-patient areas	10 gross
I	Assembly:	
	with fixed seats	Number of seats designed.
	with movable seats	0.93 net
	standing space only	0.37 net
	with table and chairs	1.5 net
	Passengers that can be unloaded simultaneously to a terminal or a platform	0.15 net
E	Business: Office Space	3 gross

Occupancy		Unit of Floor Area in m ² per Occupant*
F	Mercantile:	
	Retail sales Area, Ground floor	2.3 net
	or Basement	4.6 net
	All other floor	
G	Industrial	10 gross
H	Storage	20 net
K	Garages and open parking structures	23 net
L	Utility	Actual occupant load
M	Miscellaneous Building	Actual occupant load

* As per Sec 3.5.1(b) of this Chapter, design occupant load shall be calculated and any fraction shall be rounded to next higher integer value. Width of all components of egress system shall satisfy requirements of specified in the Table 4.3.2

3.5.2 Fixed Seats

The occupant load for an assembly or educational area having fixed seats shall be determined by the seating capacity of the area. For fixed seats without dividing arms, the capacity shall be taken as one person for every 500 mm of seat.

3.5.3 Maximum Occupant Load

The design occupant load, need not to be calculated more than one person per 0.3 m² of usable floor space.

3.5.4 Mezzanine Floors

The occupants of a mezzanine floor evacuating through other floors the occupant load shall be added to the receiving floors.

3.5.5 Roofs

A Roof, an open air space used as assembly or refuge area, educational or other types of human occupancy shall be provided with exit facilities as per provisions of this Code.

3.6 Capacity of Exit Components

3.6.1 The capacity of egress components shall be complied with the occupant load of the area served. The required width of each component shall be computed on the basis of the allotted width per occupant prescribed in Table 4.3.2, subject to the minimum widths

of such components specified in Sections 3.7 to 3.12 and the travel distances of such components as per provision of this Code.

Table 4.3.2: Required Width per Occupant

Occupancy		Buildings without Sprinkler System (mm per person)			Buildings thoroughly Sprinkled (mm per person)		
		Stairways	Ramps & Corridors	Doors	Stairways	Ramps & Corridors	Doors
A	Residential						
B	Educational						
E	Business						
F1, F2	Mercantile	8	5	4	5	4	4
G	Industrial						
H	Storage						
C1, C2	Institutional	8	5	4	5	5	4
C3, C4, C5	Institutional	10	5	4	8	5	4
D	Health Care	25	18	10	15	12	10
I	Assembly						
F3	Mercantile	10	7	5	7	5	5
J	Hazardous	8	5	4	8	5	4
K, L, M		8	5	4	5	4	4

Note: width of the components of egress shall be divided by value specified in this table to determine the maximum allowable occupant load served by them.

3.7 Corridors and Passageways

3.7.1 Occupants commencing exit travel along a corridor or a passageway shall be lead to an exit discharge. Length of dead end corridors and passageways and branches thereof shall not be exceeded as per Sec 3.15.4 of this Chapter.

3.7.2 The required width of corridors and passageways shall be calculated on the basis of the occupant load in accordance with the provisions of this Code and shall not be less than as per Sec 3.15.4 of this Chapter.

3.7.3 The minimum ceiling height of the corridors and passageways used as a means of egress shall not be less than 2.4 m.

3.7.4 All exit corridors or passages shall have a fire resistance rating of 1 hour or more as per provisions of this Code.

3.7.5 Protective opening leads to an exit shall be fire doors or fire windows or a fire assembly having a fire resistance rating of at least 20 minutes or more as per provisions of this Code.

- (a) Certified Fire resistance rating of Doors shall be in accordance with ASTM E152 without the hose stream test.
- (b) Fire resistance rating of the fire door assembly has to perform as required 20, 30, 60, 90, 180 minutes or more shall be leveled A, B, C, D, E and F respectively.
- (c) Fire door assembly of any approved materials shall qualify through ASTM E152 without the hose stream test.

3.8 Assembly Seating and Waiting

- (a) Assembly buildings primarily meant for theatrical, operatic performances or cinematic projection shall have the seats securely fastened to the floor with exceptions as permitted in this Code. All seats in balconies and galleries shall be securely fastened to the floor except boxes with level floor and less than 14 seats.
- (b) Seats not fixed to the floor shall be permitted in restaurants and such other places provided that 1.25 m² of floor space is allotted for every seat excluding dancing floor and stage. Adequate aisles shall be maintained at all times to reach exits without obstruction when such occupancies are in use.

3.8.1 Assembly buildings which contain seats, tables, equipment or exhibitions or displays shall be provided with aisles, free of obstructions, leading to the exit.

3.8.2 Minimum clear widths of steeped aisles and other means of egress serving assembly seating shall be calculated on the basis of number of seats and in accordance with Table 4.3.3. Interpolation shall be permitted between the specific values shown thereof. The minimum clear width of steeped aisles as found by above calculation shall be modified in accordance with the conditions stated below:

- (i) If risers exceed 178 mm in height for steeped aisles the width of the steeped aisles as shown in the table shall be multiplied by factor a ,

$$\text{Where, } a = 1 + \frac{\text{Riser Height} - 178}{125} \quad (4.3.1)$$

- (ii) In the Table 4.3.3 values of steeped aisles not having a handrail within a 760 mm horizontal distance shall be 25 percent wider.

- (iii) In Table 4.3.3 values of width of ramps used for ascending and steeper than 1 in 10 slope shall be increased by 10 percent.

Table 4.3.3: Capacity Factors for Assembly Seating

Number of seats within a single assembly space.	Clear Width per Seat Served	
	Steeped aisles (mm)	Passageways, Ramps and Doorways(mm)
≤ 2,000	7.6 <i>a</i>	5.6
5,000	5.1 <i>a</i>	3.8
10,000	3.3 <i>a</i>	2.5
15,000	2.4 <i>a</i>	1.8
20,000	1.9 <i>a</i>	1.4
≥25,000	1.5 <i>a</i>	1.1

3.8.3 The minimum width of level or ramped aisles shall be as specified below:

Seats on both sides of the aisle 1.0 m

Seats on one side of the aisle 0.9 m

3.8.4 The minimum width of stepped aisles shall be as specified below:

Seats on both sides of the aisle 1.2 m

Seats on one side of the aisle 1.0 m

3.8.5 The minimum clear gap between rows, measured as the clear horizontal distance between the back of the row ahead and the nearest projection of the row behind shall be 300 mm. For chairs having automatic or self-rising seats, the measurement shall be made with the seats in the raised position, for non-automatic seats the measurement shall be taken with the seats in the down position.

3.8.6 For rows of seating served by an aisle or doorway at only one end of the row, the path of travel shall not exceed 10 m from any seat to the aisle or doorway. The minimum clear gap between rows shall be increased beyond 300 mm specified in Sec 3.8.6 by 15 mm for each seat in excess of 7, but the clear gap need not exceed 550 mm.

3.8.7 In any assembly occupancy spectators are allowed to wait in the lobby or similar space within the building until seats are available. Exits shall be provided for the waiting spaces on the basis of 0.28 m² areas per person waiting space and one wheel chair space

for every 100 occupant. Such waiting occupant load shall be added with main assembly load for calculating exit size for the assembly as per provisions of this Code.

3.9 Doorways

One surface of a door leaf which is exposed to a fire incident is the terminal point of exit access and other surface of that said door which is unexposed to that fire incident is the starting point of an exit. A door or an opening protective assembly is an obstruction for occupants to pass through from exit accesses to exits until and unless it is installed as per provisions of this Code.

3.9.1 Each occupant of a room or space shall have access to at least one exit door or exit access assembly. The occupant load per exit door and the travel distance up to that door shall not exceed the values specified in Table 4.3.4.

3.9.2 Where either the occupant load or the travel distance exceeds the values specified in Table 4.3.4 shall have multiple exit doors to comply the both.

3.9.3 The width of a door shall not be less than 1 m and the height shall be not less than 2 m. Exit doors shall be side swing or pivoted of side hinge type.

3.9.4 No sliding or hanging door shall be used as a means of exit. In pressurized areas and when occupant load is less than 10, restriction of Sec 3.9.3 may be exempted.

3.9.5 All exit access doors shall be of a side-swinging type. When the occupant load exceeds 50 or in a hazardous occupancy, the doors shall swing outward from the room or towards the direction of travel. Swinging of the door shall not constrict the width of the corridor narrower than 0.9 m measured at the most critical position.

3.9.6 Exit doorways shall not open directly on a flight of stairway. A clear area which more than the width of the door leaf as specified in the above Sec 3.9.5 shall be maintained immediately outside the doorway. The floor levels shall be same in the direction of travel as per provisions of this Code.

Table 4.3.4: Maximum Occupant Load and Travel Distance for Spaces with One Exit Door

Occupancy		Maximum Design Occupant Load	Maximum Travel Distance (m)
A	Residential	12	23
C	Institutional		
D	Health Care		
B	Educational	50	23
I	Assembly		
E	Business		
F	Mercantile		
G	Industrial		

H	Storage	30	30
J	Hazardous	5	8

3.9.7 Revolving doors shall not be used as a means of exit in assembly, educational or institutional buildings or in spaces with an occupant load of 200 or more. In all other cases revolving doors shall not constitute more than half of the total required exit door width and each revolving door with least diameter of 2.7 m shall be credited not more than 50 persons. Exit doors shall be installed in the same wall within proximity of 3m of Revolving doors and shall comply with the following:

3.9.7.1 Revolving doors shall be positioned with a dispersal area at a distance of 3m or more from the foot or top of stairway or escalators or moving walks or lift lobbies.

3.9.7.2 Revolving doors shall stop rotating and stand still in a book-fold position at a force not more than 800 N or when a force is applied not more than 578 N to a wing within 760 mm of outer edge or due to sudden power failure catch automatically released and ready to manual revaluation and that provide a path which shall have aggregate width minimum 910 mm.

3.9.7.3 A manual control switch shall be installed in an approved location.

3.9.7.4 Speed of revolving door shall not exceed the revolution per minute shown below:

Speed of Revolving Door		
Inside Diameter (m)	Manual-mode Speed limit (rpm)	Power-mode Speed limit (rpm)
2	12	11
2.1	11	10
2.3	11	9
2.4	10	9
2.6	9	8
2.7	9	8
2.9	8	7
3	8	7

3.9.7.5 All exit doors shall be operable without the using a detachable key from the side they serve to evacuate.

3.10 Stairways

Change in level in elevations achieved by steps combination of identical risers and treads as per provisions of this Code shall be termed as Stairway irrespective of their locations. Stairways within an envelope shall be termed as Staircase. Exception: stepped aisles with in an assembly.

Width of Stairways shall be a length perpendicular to the direction of travel, a clear distance measured between inner edges of handrails or a clear distance between inner edges of a handrail of exposed side to its opposite and parallel surface measured at a height of inner edge of cross section of that handrail. In case of variation in width measurement the smallest value shall represent the width of a stairway. Required combination of dimensions for risers and treads given in Table 4.3.5.

Required guards and handrails shall continue for the full length of each flight of stairways. Inner turns of handrail of flights shall be at the landings and grasp ability of handrails shall be smooth and continuous, Handrail Brackets or balusters attached to the bottom surface of handrail shall not be considered to be obstructions to grasp ability. Gap between any surface and handrail shall be not less than 63.5 mm.

Stairways serving more than three storey building having capacity more than 10 occupants shall have visual enclosures to avoid any impediments to stair use by persons having fear of height, any arrangement intended to meet this requirement shall be at least 1070 mm in height.

3.10.1 The required width of exit stairways shall be computed in accordance with the provisions of Sec 3.6, but it shall not be less than the minimum widths specified in Tables 4.3.6 and 4.3.7

3.10.2 The least dimension of landings or platforms in exit stairways shall not be less than the required width of stairway and shall be leveled, except that the landing between two stair flights in a straight run shall not be required to be wider than 1.2 m in the direction of travel.

When two stair flights are not straight or nonparallel to each other, a turning in the path of travel direction occurred which is other than U turn. Landing width shall be the

required width of stairway and length of the common landing between such flights shall be one tread depth more lengthen when measured from both edges of stairway from both the flights.

Table 4.3.5: Combination of Risers and Treads

Gradients			Step Dimensions		Available Headroom Clearance of Flight	Handrail or Guard Height	Maximum Number of Flights
Grade	Angle of Flight		Tread Depths	Risers			
(%)	Deg	(mins)	(mm)	(mm)	(mm)	(mm)	
31.25	17	21	406	127	2159	851	6
33.87	18	43	394	133	2184		
37.28	20	27	375	140			
41.07	22	20	356	146			
44.44	23	58	343	152	2210	838	Unlimited
48.07	25	40	330	159			
53.06	27	57	311	165	2235		
57.44	29	52	324	171			
63.63	32	28	279	178			
69.04	34	37	267	184	2286		
75	36	52	254	190	2311		
81.57	39	12	241	197	2362	851	
88.88	41	38	229	203	2388		
97.05	44	9	216	210	2438		
103.02	45	51	210	216	2464		
107.07	46	57	206	222	2489	864	10
112.5	48	22	203	229	2515		

Note: Allowable length of nosing at the outer edge of tread shall not be included in the tread depth measurement. The maximum rise of a single flight between landings shall not be exceeded 3658 mm and in case of large assembly maximum rise of a single flight between landings shall not be exceeded 2438 mm.

Table 4.3.6: Minimum Width of Stairways in Egress System

Occupancy		Minimum Width of Each Stairway (mm)
A	Residential: A1, A2 A3, A4, A5	As per Table 4.3.6 1120
B	Educational Occupant load up to 130 Occupant load more than 130 but not more 250	1120 2235
D	Hospital Patient area Staff area	2235 1120
I	Assembly: I1, I2, I3, I4, I5	As per provisions of this Code.
All others		As per provisions of this Code.

Note: The required number of stairways shall be determined by dividing the calculated total widths of stairways as per sections 3.5, 3.6 and Table 4.3.2 of this Chapter by applicable minimum stair width as specified in this table and any fractions thereof shall be rounded up with the next higher integer. Unit width of stair and multiple even numbers shall be maintained as per provisions this Code.

Table 4.3.7: Fire Escape Stairs

Element	Serving More than 10 Occupants	Serving 10 or Fewer Occupants
Clear widths	560 mm between handrails	
Minimum horizontal dimension of any landing or platform	560 mm	
Maximum riser height	230 mm	

Element	Serving More than 10 Occupants	Serving 10 or Fewer Occupants
Minimum tread, exclusive of nosing	250 mm	
Tread construction	Solid, 13 mm diameter perforation permitted	
Winders	Not permitted	permitted subject to Sec 3.10.7
Spiral	Not permitted	permitted subject to Sec 3.10.7
Maximum height between landings	3.70 m	
Headroom, minimum	2.00 m	
Access to protected openings	Door or casement windows, 600 mm x 2000 mm or double-hung windows 70 mm x 900 mm clear opening	Window providing a clear opening of at least 500 mm in width, 600 mm in height, and 0.53 m ² in area
Level of access openings	Not over 300 mm above floor; steps if higher	
Discharge to ground	Swinging stair section permitted if approved by authority having jurisdiction	
Capacity, number of person	13 mm per person if access by door; 25 mm per person if access by climbing over window sill	10

Note: The maximum design occupant load for a Fire escape stair shall not be exceeded 50 occupants from any floor level.

3.10.3 The rise and tread dimensions in a stairway shall be identical and the headroom requirements shall conform to the provisions of this Code.

3.10.4 Handrails height on stair shall be not less than 860 mm and not more than 960 mm above the surface of the tread, measured vertically from the top of the rail to the outer edge of the tread. Peripheral diameter of circular cross section of a handrail shall not be less than 32 mm and not more than 50 mm. Any other shape with perimeter dimension of not less than 100 mm, but not more than 160 mm and with the largest cross-sectional dimension not more than 55 mm shall be permitted provided that all edges are rounded to provide a radius of not less than 3 mm. Handrails shall be graspable along their entire length. Additional handrails that are lower or higher than main shall be permitted.

3.10.5 The height of guards shall not be less than 105 mm measured vertically from the top of the guards from the surface of adjacent area to be served by them. When balusters are used in the guards rail shall be used to create a pattern as such size that a sphere 100 mm in diameter shall not pass through any opening up to a height of 860 mm. Riser, tread and the bottom rail of guards formed a triangular opening shall not be of such size that a sphere 150 mm in diameter shall not pass through.

3.10.6 There shall be no variation in excess of 5 mm in depth of adjacent treads or in the height of adjacent risers, and the tolerance between the largest and smallest tread or between the largest and smallest riser is 10 mm in any flight.

3.10.7 Monumental stairs, Circular stairs, Curved stairs, Spirals and winders, stepped and rung ladders, alternate tread devices shall be permitted as per provisions of this Code.

3.10.7.1 When the width of stairways exceeded 4475 mm termed as Monumental or Grand Stairway shall be permitted as per provisions of this Code.

3.10.7.2 Curved stairs or circular stairs shall be permitted as a component of means of egress as per provisions of this Code provided that the depth of tread is not less than 280 mm at a point 300 mm from the narrower end of the tread and the smallest radius is not less than twice of stair widths and shall comply with the provisions of this Code.

3.10.7.3 Spiral stairways shall be permitted where occupant load shall not more than five. For spiral stairways the following conditions shall be applicable:

- (a) The clear width of the stairs shall not be less than 660 mm.
- (b) The height of risers shall not exceed 240 mm.
- (c) Headroom shall be not less than 1980 mm.
- (d) Treads shall have a depth not less than 190 mm at a point 300 mm from the narrower edge.
- (e) All treads shall be identical.

3.10.7.4 Winders shall be permitted in stairs where occupant load shall not be more than three.

- (a) Winders shall have a tread depth not less than 150 mm and a tread depth not less than 280 mm at a point 300 mm from the narrowest edge.
- (b) The clear width of the stairs shall not be less than 660 mm.

3.10.7.5 Stepped ladders and Rung ladders shall be installed with pitch that exceeds 75 degrees as per standards of ANSI A14.3. The lowest rung of any ladder shall not be more than 300 mm above the level of the surface beneath it.

- (a) From towers and elevated platforms around machinery or similar spaces subject to occupancy load not to exceed three persons.
- (b) Open structure, observation towers or railroad signals that are designed for occupancy not more than three persons.

3.10.7.6 Alternate tread device

The occupant load shall not exceed three and shall comply with the followings:

- (a) Handrail shall be provided on both sides of alternate tread device having clear width not less than 430 mm and not more than 610 mm
- (c) Headroom shall not less than 2000 mm and angle of the device shall be between 50 degrees and 68 degrees to horizontal.
- (c) The initial tread of the device shall begin at the same elevation as the platform, landing, or floor surfaces and the alternating treads shall not be laterally separated by a distance more than 50 mm.
- (d) Treads shall have projected depth not less than 150 mm and each tread providing 240 mm of depth, including overlapping of treads.
- (e) The height of the risers shall not exceed 240 mm.

3.10.8 Stairways shall have continuous guards on both side along the direction of travel and a continuous handrail shall be provided with inner edge guard. A stair of width more than 1120 mm but not more than 2235 mm shall have guards and handrails on both of the edges. Inner edge handrails shall be continuous and outer edge handrails shall be along the flights extended up to one tread depth on both the landings. A stair the width exceeds 2235 mm; intermediate handrails shall be installed with similar length of outer edge handrail. Single traffic lane shall be calculated 560 mm in the stairway and two traffic lanes shall be 1120 mm. Widths of stairs shall be multiple of two traffic lane other than width specified in the Table 4.3.6.

3.10.9 All exit stairways shall be constructed by materials that conform to the fire resistance requirements of the type of construction of the building, except that solid wooden handrails shall be permitted for all types of construction.

3.10.10 An exit stairway shall not be built around a lift shaft unless both of them are located in a smoke proof enclosure and made of a material with fire resistance rating required for the type of construction of smoke proof enclosure.

3.10.11 Exterior stairways used as fire stair shall not be considered as a component of means of egress, unless they lead directly to the ground or a refuge area, are separated from the building interior by fire resistive assemblies or walls and are constructed by noncombustible materials and free from smoke accumulation.

3.11 Ramps

3.11.1 Ramp is a sloping surface steeper than 1 in 20 but not steeper than 1 in 8 used by walkers only. Slope of ramps to comply with accessibility requirement shall not be steeper than 1 in 12.

3.11.2 The minimum width of exit ramps shall not be less than that width required for corridors or passages.

3.11.3 The slope of an exit ramp shall not exceed 1 in 8, but for slopes steeper than 1 in 10 the ramp shall be surfaced with approved non-slip material or finished such as to effectively prevent slipping.

3.11.4 Guards and handrails shall be provided on both sides of ramps having slope steeper than 1 in 15.

3.11.5 Ramps shall be straight, in case of changes in the travel direction that shall be made at the level platforms or at the landings except that ramps having a slope steeper than 1 in 12 may be curved at any place.

3.11.6 Length of the sloping portion of ramps shall be at least 915 mm but not more than 9150 mm long between level platforms or landings.

3.11.7 Level platforms or landings shall be at least as wide as the ramps and shall be placed at the bottom, at intermediate levels where required, and at the top of all ramps. Level platform shall be provided on each side of openings into or from ramps having minimum length of 915 mm in the direction of travel and when a door swings on the minimum length of platform or landing shall be 1525 mm.

3.11.8 Doors on ramps shall not be opened on sloping surface shall be complied with the requirements of 3.9 of this Chapter.

3.11.9 Sloping or ramp driveway approaching basements or any parking structures shall not be credited as an exit ramp when slope is steeper than 1 in 8 and not complied

with Sec 3.11 of this Chapter. Exits requirement of such basements shall be achieved by stairways or fire lifts within smoke proof enclosure approached by a two doors smoke lock vestibule.

3.12 Horizontal Exits

3.12.1 The connection between two separated areas of a building or connection between buildings at same level which the horizontal exit serves shall be provided with at least 2 hour fire resistance rated walls, or by an open air balcony or a bridge having protected openings.

3.12.2 The horizontal exits shall be protected from the area of incidence by self-closing fire door.

3.12.3 The width of a horizontal exit access door shall not be less than 1 m.

3.12.4 Changes in level in the elevation along the direction of the horizontal exit shall not be achieved by single step but by ramps which is not steeper than 1 in 12.

3.12.5 Where the horizontal exit serves for only one side, fire door shall swing in along the direction of travel. When horizontal exit serves both the side of separated area, the doors shall have two leaves and each leave dedicated to satisfy direction of travel from assigned area, or there shall be two independent doors assigned for two areas each of them serves only one area. When the building is occupied the doors installed in horizontal exit shall be operable at all times without the use of a detachable key.

3.12.6 Horizontal exit relocates occupants to an area which is either a public space or a space used by other occupants and shall be termed as a refuge area. The capacity of the refuge area shall be computed on the basis of net floor area excluding stairways, shafts and spaces allotted to occupants of the receiving end. The required capacity of a refuge area shall be 0.28 m² per healthy occupant and 0.3 m² per wheelchair or 2.8 m² per patients retained in bed for delayed egress or an area equivalent to a passage or a corridor having width to comply the capacity of evacuees and connected with the components of exits up to exit discharge.

3.13 Smoke Proof Enclosure

Any compartment or a room or a control area surrounded by barrier walls within a building structure shall be protected from smoke penetration during a fire incident occurred elsewhere in the building shall be termed as smoke proof enclosure.

A stairway with in an envelope shall be termed as Interior stairway or staircase. Any exterior side having opening of 50 percent or more in such a way that there shall be no smoke accumulation shall be termed as open stair.

3.13.1 An interior stairway conforming to Sec 3.10 and having entry from an exterior balcony or through a ventilated vestibule conform a smoke proof enclosure provided no direct opening or any aperture allowed on the walls of the stair from the building side.

3.13.2 All exit stairways mentioned above shall be protected by a smoke proof enclosure when serving occupants are located in a high rise building.

3.13.3 There shall be provision to access enclosed stairways through vestibule or an open balcony. The minimum width of a vestibule shall be equal to width of connected passages or corridors specified in section 3.7 in this Chapter and the minimum length of a vestibule in the direction of travel shall be 1.8 m.

3.13.4 The minimum fire resistance rating of the walls forming a smoke proof enclosure around stairway including the vestibule thereof shall be 4 hours and separated from the area of incidence having no openings other than a fire door for the entry to the vestibule. For fire rating of the door see Chapter 1 Part 3.

3.13.5 All doors in smoke proof enclosure and the vestibule shall be self-closing type or they shall be fitted with automatic closing devices actuated by the fire detection system.

3.13.6 The vestibule shall have adequate natural ventilation. Each vestibule shall have a minimum area of openings of 2 m² divided into two in an exterior wall facing a courtyard, street or public way wider than 6 m. The location of one opening measuring 1.5 m² shall be as high as possible and another shall be 0.5 m² as low as possible.

3.13.7 If the enclosed staircase is windowless, mechanical ventilation shall be installed. If the vestibule is windowless, mechanical ventilation shall also be installed. In addition to ventilation a positive pressure of 50 Pa shall be maintained in the vestibule. This positive pressure must be developed within 30 seconds of the incident of fire. When the staircase and the vestibule are windowless emergency illumination shall be provided.

3.14 Number of Exits

3.14.1 The number of exits shall be determined as per provisions of Sec 3.6, Tables 4.3.1, 4.3.2 and 4.3.8 of this Chapter and complying with maximum dead end passage or corridors and maximum travel distance.

3.14.2 Total required widths of exits shall be calculated as per provisions of the Tables 4.3.2 and 4.3.8 shall be divided and distributed at a distance not less than one-third of diagonal distance of space and the travel distance and the width of each exit shall comply with the provisions of this Code. The required number of exits in a space as specified below:

Occupant load less than 50	Minimum 1 exit
Occupant load 50 to 500	Minimum 2 exits
Occupant load 501 to 1000	Minimum 3 exits
Occupant load more than 1000	Minimum 4 exits

3.14.3 High rise buildings having a floor area larger than 500 m² on each floor used as educational, institutional, assembly, industrial, storage or a mixed occupancy involving any of these or hazardous occupancy, shall have a minimum of two staircases. These staircases shall comply with the requirements as specified in Sec 3.13 of this Chapter.

3.14.4 Where two accessible means of egress are required, the exits serving such means of egress shall be located at a distance from one another not less than one-half the length of the maximum overall diagonal dimension of the building or area to be served.

3.15 Travel Path

3.15.1 Travel path shall be measured along the center line of a natural and unobstructed path up to center of an exit access door opening. In case of a stairway exist in the travel path shall be measured along an inclined straight line through the center of outer edge of each tread of a stairway.

3.15.2 Occupant load and components of exits shall be arranged in such a manner that the travel path from any point in the area served shall not be exceeded as listed in the Table 4.3.8.

3.15.3 Unit width shall be 560 mm and fraction of unit width less than 280 mm shall not be credited. Where calculation of total required width give fractional result, next larger integral number of exit units or integral number plus one-half shall be used. Where changes in elevation exist, one-half or less unit of width shall not be permitted.

3.15.4 Capacity of exits shall be measured in unit of width of 560 mm and the number of occupants per unit width shall be determined by the occupancy group and type of exits as listed in Table 4.3.8.

3.15.5 Wherever more than one exit required in a room or in any floor they shall be placed as remote as possible from each other. As far as practicable, exits shall be arranged in such a manner to provide a refuge area or an exit discharge to the occupants irrespective of the direction of travel from any point in an area served.

3.16 Means of Exit Signs and Illumination

3.16.1 All required means of exit or exit access in buildings or areas requiring more than one exit shall be signposted. The signs shall be clearly visible at all times, where necessary supplemented by directional signs. All exit doors shall be clearly marked for easy identification.

Exceptions: Building Occupancy type A.

3.16.1.1 Location: Exit signs shall be installed at stair enclosure doors, horizontal exits and other required exits from the storey. When two or more exits are required from a room or area, exit signs shall be installed to clearly indicate the direction of egress.

Exceptions:

- (i) Main exterior exit doors which obviously and clearly are identifiable as exits need not be signed when approved by the Building Official.
- (ii) Exit signs are not required for buildings of occupancies A1, A2 and individual units of A3.
- (iii) No sign is needed for exits from rooms or areas with an occupant load of less than 50 for Occupancy type C.

Table 4.3.8: Determination of Exit and Access Requirements.

Occupancy Group/ Classification		Maximum Travel Path (meter)		Capacity Number of Occupancy per unit width of the component				Ramp, Passage , Corridors	
		Unsprinklered	Full fire resistive or sprinklered	Door openings		Stairs, Escalators	Ramp, Corridors, Exit passageways, Horizontal exit	Minimum width (mm)	Maximum Dead End (mm)
				To outdoors at Grade	All other Exit and corridor doors				
A1, A2	Residential	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
A3,		45	60	50	40	30	50	36	12190
A4,A5		45	60	50	40	30	50	36	12190
B	Educational	45	60	100	80	60	100	915	12190

C1, C2	Institutional	38	53	50	40	30	50	915	12190
C3, C4, C5		38	53	30	30	15	30	2440	9150
D	Health	38	53	30	30	15	30	2440	9150
E	Business	60	90	100	80	60	100	1120	15240
F	Mercantile	45	60	100	80	60	100	915	15240
G1	Industrial	60	120	100	80	60	100	1120	15240
G2		60	120	100	80	60	100	1120	15240
H1	Storage	30	53	75	60	45	75	915	15240
H2		38	45	75	60	45	75	915	15240
I	Assembly	45	60	100	80	60	100	1675	9150
J	High Hazard	15	45	50	40	30	50	915	N.P.

Notes:

1. In Hazardous occupancy (occupancy J) Travel Path should be performance based but shall not exceed 15240 mm.
2. N.P. = Not permitted
3. N.R. = No requirement, (except as provided in Table 4.3.5b)
4. Capacity of ramp shall be reduced by twenty five percent when slope is steeper than 1 in 10.
5. Corridors serving classroom area of an educational building. Other corridors shall have a minimum width of 1120 mm.
6. Applies to corridors to patient area. Staff corridors shall have a minimum width of 1120 mm.

3.16.1.2 Graphics: The color and design of lettering, arrows and other symbols on exit signs shall be in high contrast with their background as per NFPA 170. Words on the signs shall be at least 150 mm high with a stroke of not less than 20 mm. For vernacular alphabet and numeric height shall be at least 150 mm with stroke not less than 20 mm.

3.16.1.3 Illumination: Signs shall be internally or externally illuminated by two electric lamps or shall be of self-luminous type. When the luminance on the face of an exit sign is from an external source, it shall have an intensity of not less than 53.8 lux from either lamp. Internally illuminated signs shall provide equivalent luminance.

3.16.1.4 Source of Power: Supply of power to one of the lamps for exit signs shall be provided by the premises wiring system. Power to the other lamp shall be from an on-site generator set which shall be installed in accordance with the provisions of this Code.

3.16.1.5 Floor-level Exit Signs: For floor-level exit signs additional approved low-level exit signs which are externally or internally illuminated, or self-luminous, shall be provided in all interior exit corridors serving guest rooms of hotels in Occupancy A5. The bottom of the sign shall be 150 mm to 200 mm above the floor level. For exit doors, the

sign shall be on the door or adjacent to the door with the closest edge of the sign within 100 mm of the door frame.

3.16.2 Amusement Building Exit Marking: Approved exit direction marking and exit signs shall be provided. Approved low-level exit signs and directional marking shall be located not more than 200 mm above parallel the walking surface and at the exit path.

3.16.3 All exit signs shall be illuminated while in use at night, or during dark periods within the area served, in accordance with the provisions of this Code.

3.16.4 The means of exit and exit access in buildings requiring more than one exit shall be equipped with artificial lighting. The lighting facilities shall satisfy the provisions of this Code.

PART IV

Chapter 4

Equipment and In-Built Facilities Standards

4.1 Scope

The provisions of this chapter shall control standards of the design, installation and maintenance of equipment and in-built fixed, localized, portable facilities required for firefighting within a building and its premises. The regulations of this chapter shall be applicable for all buildings and the provisions stated herein shall not cover the firefighting requirements outside the building premises.

4.1.1 Extinguishing agents can be water, dry sand, ash, inert gas, dry chemical, and wet chemicals or mixed in nature of approved type. Agents will be selected as per the area have to extinguished.

4.1.2 The gaseous system shall be only used where water or foam cannot be used for fire extinguishing because of the special nature of the contents within the building or areas to be protected.

4.1.3 Fixed type fire protection system means there shall be a pipe circuit to cover full or part of a building and extinguishing agents supplied from a point. Localized fixed system means the system will cover a confined space with a self-extinguishing device fitted with a container ready to discharge automaticity. Portable type means the extinguishers can be hand carried in the site of incidents.

4.1.4 Fire Classification