

(These conditions are indicative and not exclusive all relevant provisions related to fire and life safety of NBC 2016 are mandatory and shall be complied before applying for NOC and CC)

Group C, Sub Division C2 Custodial and institutions and C3 Penal and mental institutions, NBC 2016

Details of Fire prevention, Fire fighting & Evacuation measures to be furnished for issuing of NOC & CC etc., for the construction of High Rise Hospital Buildings (Group C) Sub Division C1 Hospital Buildings, NBC 2016			
Part-A: General Building requirements.			
Sl. no.	Details	:	General Requirements
1.	<i>Address of the Premises.</i>	:	
2.	<i>Number of Buildings.</i>	:	
3.	<i>Number of floors.</i>	:	Ex: Basements, Ground floor and upper floors
4.	<p><i>Type of Occupancy</i></p> <p><i>Part 4, Fire and Life Safety of Part-IV of NBC of 2016 clause 2.46</i></p> <p><i>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.</i></p> <p><i>Part 4, Fire and Life Safety of Part-IV of NBC of 2016 clause 3.1.2 classification of Business buildings.</i></p> <p><i>3.1.2 Group C Institutional Buildings</i></p> <p><i>These shall include any building or part thereof which is used for purposes, such as medical or other</i></p>	:	Plz Specify

	<p><i>treatment or care of persons suffering from physical or mental illness, disease or infirmity; care of infants, convalescents or aged persons and for penal or correctional detention in which the liberty of the inmates is restricted. Institutional buildings ordinarily provide sleeping accommodation for the occupants.</i></p> <p><i>Buildings and structures under Group C shall be further sub divided as follows:</i></p> <p>Sub-division C-2 Custodial Institutions: <i>These shall include any building or group of buildings under single management, which is used for the custody & care of persons, such as children, convalescents and the aged who are incapable of self-preservation, for example, homes of the aged and infirm, convalescent homes & orphanages.</i></p> <p>Sub-division C-3 Penal & Mental Institutions: <i>These shall include any building or group of buildings under single management, which is used for housing persons under restraint, or who are detained for penal or corrective purposes, in which the liberty of the inmates is restricted, for example, jails, prisons, mental hospital, mental sanatoria & reformatories.</i></p>		
5.	Floor wise details of the occupancy :-		
	<i>Basement</i>	:	Parking & services. (details to be provided)
	<i>Ground floor</i>	:	Details of occupancy. (details to be provided)
	<i>Upper floors</i>	:	Details of occupancy. (details to be provided)
	<i>Terrace floors</i>	:	Over head tanks, lift Machine room. (details to be provide)
6.	Height of the building.	:	In Mtrs.

	<p>As per Part 3 Development Control Rules and General Building Requirements clause 2.10 of NBC 2016</p> <p>Building, Height of – 2.10 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 last liveable floor of the building adjacent to the external walls; 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.</p>		
7.	<p>Site Area.</p> <p>As per Part 3 Development Control Rules and General Building Requirements clause 2.75 of NBC</p> <p>Site (Plot) — A parcel (piece) of land enclosed by definite boundaries.</p>	:	In Sq.Mtrs.
8.	<p>Built up area of each floor. (Block wise)</p>	:	In Sq.Mtrs.
9.	<p>Total Built-up area.</p>	:	In Sq.Mtrs.
10.	<p>Surrounding Properties.</p>		
	<p>Front (North)</p>		
	<p>Rear (South)</p>		
	<p>Side (East)</p>		
	<p>Side (West)</p>		

B. Structural details indicating the fire prevention, fire fighting and evacuation measures to be indicated in the drawings

Sl.	Details	:	General Requirements
1.	<p><i>Width of the road to which the building abuts and whether it is hard surfaced to carry the weight of 45000 kgs.</i></p> <p><i>As per Part 3 Development Control Rules and General Building Requirements clause 2.83 of NBC 2016</i></p> <p><i>Street : Any means of access, namely, highway, street, lane, pathway, alley, stairway, passageway, carriageway, footway, square, place or bridge, whether a thoroughfare or not, over which the public have a right of passage or access or have passed and had access uninterruptedly for a specified period, whether existing or proposed in any scheme, and includes all bunds, channels, ditches, storm-water drains, culverts, footpaths, sidewalks, traffic islands, roadside trees and hedges, retaining walls, fences, barriers and railings within the street lines.</i></p>	:	<p>Name of the Road _____</p> <p>Width of the Road _____ mtrs</p> <p>Type of Road _____ (Asphalted or Kaccha road)</p> <p>Is road a Dead end _____</p>
2.	<p><i>Number of entrances and width of each entrance to the premises & height clearance over the entrance.</i></p> <p><i>As per Part 3 Development Control Rules and General Building Requirements clause 4.6 (d) of NBC 2016</i></p> <p><i>1) The main entrance to the plot shall be of adequate width to allow easy access to the fire engine and in no case shall it measure less than 6 m.</i></p>	:	<p>Main entrance width _____ mtrs</p> <p>Is Entrance gate provisioned _____</p> <p>Is any Parabola planned _____</p>

<p>2) <i>The entrance gate shall fold back against the compound wall of the premises, thus leaving the exterior access way within the plot free for movement of fire tender.</i></p> <p>3) <i>If the main entrance at the boundary wall is built over, the minimum clearance shall be 4.5 m.</i></p> <p>As per Part 3 Development Control Rules and General Building Requirements clause 4.6 of NBC 2016</p> <p>a) <i>The width of the main street on which the building abuts shall not be less than 12 m and one end of this street shall join another street not less than 12 m in width.</i></p> <p>b) <i>The road shall not terminate in a dead end; except in the case of residential building, up to a height of 30 m.</i></p>	
<p>3. Width of open space (Setbacks)</p> <p>As per Part 3 Development Control Rules and General Building Requirements of NBC 2016</p> <p>Clause 2.57 Open Space: — <i>An area, forming an integral part of the plot, left open to the sky. NOTE — The open space shall be the minimum distance measured between the front, rear and side of the building and the respective plot boundaries.</i></p> <p>2.58 Open Space, Front — <i>An open space across the front of a plot between the building line and front boundary of the plot.</i></p> <p>2.59 Open Space, Rear — <i>An open space across the rear of a plot between the rear of the building and the rear boundary of the plot.</i></p> <p>2.60 Open Space, Side — <i>An open</i></p>	<p>Height of the building _____ mtrs</p> <p>Setback space left _____ mtrs</p> <p>Driveway space left _____ mtrs.</p> <p>a. 6.00 mtrs. upto 30.0 m height</p> <p>b. 8.00 mtrs. above 30.0 m height.</p> <p>Note: Any specific claims on relaxation of setback to be notified with necessary supporting documents.</p>

space across the side of the plot between the side of the building and the side boundary of the plot.

As per Part 3 Development Control Rules and General Building Requirements clause of NBC 2016 Table 4 Side and Rear Open spaces to be left around the Building (Clause 8.2.3.1)

Sl No.	Height of the Building	Side and rear open spaces to be left around the building
1.	10	3
2.	15	5
3.	18	6
4.	21	7
5.	24	8
6.	27	9
7.	30	10

NOTES:

1 For buildings above 24 m in height, there shall be a minimum front open space of 6 m.

2. Where rooms do not derive light and ventilation from the exterior open space, the width of such exterior open space as given in col 3 may be reduced by 1 m subject to a minimum of 3 m and a maximum of 8 m. No further projections shall be permitted.

3. If the length or depth of the building exceeds 40 m, add to col (3) ten percent of length or depth of building minus 4.0 m subject to maximum requirement of 20 m.

As per Part 3 Development Control Rules and General Building Requirements clause of NBC 2016

Clause 4.6 (C):

	<p>1) <i>The approach to the building and open spaces on all its sides shall be not less than 6 m in width, and a turning radius of minimum 9 m shall be provided for fire tender movement of fire tenders weighing up to 45 t.</i></p> <p>2) <i>The same shall be hard surface capable of taking the mass of fire tender, weighing up to 45 t minimum. For heavier fire tenders, the minimum width, turning radius and the hard surface capable of taking the fire tender loads shall be as per the requirement laid down by the Fire Department. The layout for the open space for fire tender movement shall be done in consultation with the Chief Fire Officer of the city, which shall be kept free of obstructions and shall be motorable. The compulsory open spaces around the building shall not be used for parking.</i></p> <p>3) <i>If the main entrance at the boundary wall is built over, the minimum clearance shall be 4.5 m.</i></p>		
4.	<p><i>Width of means of access</i> <i>As per Part 3 Development Control Rules and General Building Requirements of NBC 2016</i> <i>Clause 4.3.1 Width of Means of Access</i> <i>For all assembly buildings like, theatres, cinema houses assembly halls, stadia; educational buildings; markets, hospitals; industrial buildings and other buildings which attract large crowd, the means of access shall not be less than the following:</i></p>	:	<p>Street/ Road width _____ mtrs Please mention if applicable.</p>

<i>Sl no.</i>	<i>Width of means of access</i>	<i>Length of means of access</i>
(1)	(2)	(3)
i.	12.0	200
ii.	15.0	400
iii.	18.00	600
iv.	24.00	Above 600

Further, in no case shall the means of access be lesser in width than the internal access ways in layouts and subdivision.

5.	<p>Arrangement for parking the cars and ramps.</p> <p><i>As per Part 3 Development Control Rules and General Building Requirements of NBC 2016</i></p> <p><i>Clause 2.63: Parking Space — An area enclosed or unenclosed, covered or open, sufficient in size to park vehicles, together with a drive-way connecting the parking space with a street or alley and permitting ingress and egress of the vehicles.</i></p> <p>Note: As per Clause 3.10) of ZR 2007 of BDA</p> <p>Ramps</p> <p>i. <i>Provision for ramp shall have a minimum width of 3.5 m and a slope of not less than 1 in 12 or 1 in 10 and 1 in 8 in special cases. The ramp and the driveway in the basement shall be provided after leaving a clear gap of minimum 2.0 m from the common property line/ set back line. The slope of the ramp shall commence from 1.5 m of the edge of property line.</i></p>	:	<p>No. of car parkings _____</p> <p>No. of ramps _____</p> <p>Width of Ramp _____ mtr</p> <p>Type of Ramp; Single or double (one way/ two way) _____</p> <p>Location of Ramp</p> <p>Gradation</p>
6.	<p>Staircases.</p> <p><i>As per NBC 2016, Part 4, Fire and</i></p>	:	<p>No. of staircases Blocks / Wing wise _____</p>

<p>Life Safety clause 4.4.2.4.3 Staircases, <i>As mentioned in Part 4, Fire and Life Safety clause 1.2 All buildings, shall have a minimum of two staircases. The provisions of this Part are applicable to,</i></p> <p><i>a) all high rise buildings; where any of these buildings have floor area more than 500 m² on any one or more floors;</i></p> <p><i>6) Buildings with two basements or more, or with one basement of area more than 500 m² unless otherwise mentioned specifically in the provisions.</i></p> <p><i>The minimum width of tread without nosing shall be 250 mm for staircase of Business buildings. The treads shall be constructed and maintained in a manner to prevent slipping. The maximum height of riser shall be 150 mm. The number of risers shall be limited to 12 per flight. The staircases may be internal staircases or external staircases.</i></p> <p>4.4.2.4.3.2 Internal staircases <i>The internal staircases may be constructed with an external wall, or otherwise, and shall comply with the following:</i></p> <p><i>a) Internal stairs shall be constructed of non-combustible materials throughout, and shall have fire resistant rating of minimum 120 min.</i></p> <p><i>b) A staircase shall not be arranged round a lift shaft.</i></p> <p><i>c) Exits shall not be used as a portion of a supply, return or exhaust air system serving adjoining areas. Any opening(s) shall not be permitted in walls or in doors, separating exits from adjoining areas.</i></p>	<p>Floor area _____ sqmt</p> <p>Area of Basement _____ sqmt</p> <p>No. of Basement _____</p> <p>Thread width _____ mm</p> <p>No. of Risers _____ nos</p> <p>Fire Rating _____ min</p> <p>Stairs around Lift : <u>YES/NO</u></p> <p>Stairs are clear from any other service routings : <u>YES/NO</u></p> <p>No other services is taken inside the stairs : <u>YES/NO</u></p> <p>Staircase width : _____ mtrs</p> <p>Staircase head room: _____ mtrs</p> <p>Fire door rating : _____ min</p>
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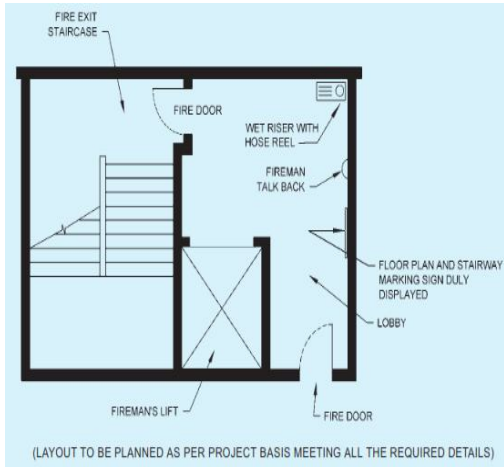
<p>d) No flue chimney, electromechanical equipment, air conditioning units, gas piping or electrical panels shall be allowed in the stairway.</p> <p>e) Notwithstanding the detailed provision for exits in accordance with 4.2 and 4.3, the following minimum width shall be provided for staircases for respective occupancies:</p> <p>1) Institutional : 2.00 m.</p> <p>f) A handrail shall be provided on one side of the staircase of width less than 1 500 mm, and on both sides of the staircase of width 1 500mm and more. The projection of handrail(s) in the staircase width shall not be more than 115 mm.</p> <p>h) The design of staircase shall also take into account the following:</p> <p>1) The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2.2 m</p> <p>2) Access to exit staircase shall be through a fire door of a minimum 120 min fire resistance rating.</p> <p>3) No living space, store or other fire risk shall open directly into staircases.</p> <p>4) The exit (including staircases) shall be continuous from refuge floors or terrace level, as applicable, to the level of exit discharge.</p> <p>5) No electrical shafts/air conditioning ducts or gas pipes, etc, shall pass through or open in the staircases.</p> <p>6) Lifts shall not open in staircase.</p> <p>7) No combustible material shall be used for decoration/wall panelling in the staircase.</p> <p>8) Beams/columns and other building features shall not reduce the head room/ width of the staircase.</p> <p>9) The floor indication board,</p>	<p>Fire Signage board : <u>YES/NO</u></p> <p>Staircase terminated at Ground level: <u>YES/NO</u></p>
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<p><i>indicating the location/designated number of staircase, respective floor number and direction to exit discharge shall be placed inside the staircase, on the wall nearest to the fire door. It shall be of size not less than 300 mm × 200 mm (see Fig. 9).</i></p> <p><i>10) Individual floors shall be prominently indicated on the wall outside the staircase and facing it.</i></p> <p><i>11) All staircases shall terminate at the level of exit discharge. The access to the basement shall be by a separate staircase.</i></p> <p><i>12) Scissors type staircases shall not be treated as part of exit.</i></p>	
<p>7. EXTERNAL STAIRCASE 4.4.2.4.3.4 External staircases <i>The external staircases are the staircases provided on the external wall / facade, and shall comply with the following:</i></p> <p><i>a) External stairs shall always be kept in sound and usable condition.</i></p> <p><i>b) All external stairs shall be directly connected to the ground.</i></p> <p><i>c) Entrance to the external stairs shall be separate and remote from the internal staircase.</i></p> <p><i>d) Where an external staircase is provided, it shall be ensured that the use of it at the time of fire is not prejudiced by smoke and flame from openings (for example, windows, doors) in the external face of the building. Care shall be taken to ensure that no external wall or window opening opens on to or close to an external stair. If such openings exists within 3 m from an external staircase, they shall be protected with fire rated doors/window assemblies with rating of at least 60 min.</i></p>	<p>Type of External staircase:</p> <p>Location of External stairs:</p> <p>YES/ NO</p> <p>Fire rating of door _____ min</p> <p>Width of stairs: _____ mtrs</p> <p>Section & Elevation of stairs: _____</p>

<p>e) The external stairs shall be constructed of non-combustible materials, and any doorway leading to it shall have minimum 120 min fire resistance.</p> <p>f) No external staircase shall be inclined at an angle greater than 45° from the horizontal.</p> <p>g) External stairs shall have straight flight not less than 1 500 mm wide. h) Handrails, to be provided on both sides, shall be of a height not less than 1 000 mm and not exceeding 1 200 mm. There shall be provisions of balusters with maximum gap of 150 mm.</p>		
Staircase Size:		
<p>a. Width of the staircases. As per Clause 4.4.2.4.3.2 of Part 4 Fire and Life Safety of NBC 2016 The following minimum width shall be provided for: 1) Institutional : 2.00 m</p>	:	
<p>b. Width of treads As per clause 4.4.2.4.3.1 of Part 4 Fire and Life Safety of NBC 2016: The minimum width of tread without nosing shall be 300 mm for staircase of Institutional buildings.</p>	:	
<p>c. Height of riser. As per clause 4.4.2.4.3.1 of Part 4 Fire and Life Safety of NBC 2016 : The maximum height of riser shall be 150 mm for staircase of Institutional buildings.</p>	:	
<p>d. Number of risers in a flight As per clause 4.4.2.4.3.1 of Part 4 Fire and Life Safety of NBC 2016: The number of risers shall be limited to 12 per flight.</p>	:	

	<p>e. Height of hand rails <i>As per clause 4.4.2.4.3.2 (f) of Part 4 Fire and Life Safety of NBC 2016: Handrails shall be provided at a height of 1 000 mm to be measured from the base of the middle of the treads to the top of the handrails. Balusters/railing shall be provided such that the width of staircase does not reduce.</i></p>	:	
	<p>f. Head room clearance <i>As per Part 3 Development Control Rules and General Building Requirements clause 2.70 of NBC 2016</i> <i>As per clause 4.4.2.4.3.2 (h) (1) of Part 4 Fire and Life Safety of NBC 2016:</i> <i>The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2.2 m.</i></p>		
8.	<p>Fire Tower <i>As per Part-4, NBC 2016, 2.24 Firefighting Shaft (Fire Tower) -An enclosed shaft having protected area of 120 min fire resistance rating comprising protected lobby, staircase and fireman's lift, connected directly to exit discharge or through exit passageway with 120 min fire resistant wall at the level of exit discharge to exit discharge. These shall also serve the purpose of exit requirement/ strategy for the occupants. The respective floors shall be approachable from fire-fighting shaft enabling the fire fighters to access the floor and also enabling the fire fighters to assist in evacuation through fireman's lift. The firefighting shaft shall be equipped with 120 min fire doors. The firefighting shaft shall be equipped with firemen talk back,</i></p>		

wet riser and landing valve in its lobby, to fight fire by fire fighters (see Fig. 2 for a typical fire fighting shaft).



9. **Travel Distance:** — The distance to be travelled from any point in a building to a protected exit or external escape route or final exit measured along the line of travel.

Table 5 Travel Distance (Based on Occupancy and Construction Type) (Clauses 4.4.2.1 and 4.4.2.2) of Part 4 of NBC 2016.

Sl No	Occupancy Group	Maximum Travel distance	
		Type 1 & 2	Type 3 and 4
i.	Institutional	30.00	22.50

Notes:

- For fully sprinklered building, the travel distance may be increased by 50 percent of the values specified.
- Ramp shall not be counted as an exit in case of basement below the first basement in car parking.

10. **Number of lifts and capacity.**
Lift: An appliance designed to

No. Of Lifts	
Description	
Capacity	

transport persons or materials between two or more levels in a vertical or substantially vertical direction by means of a guided car or a platform. The word elevator is also synonymously used for lift.

As per clause 4.15.1 of Part-4 Fire and Life Safety of NBC-2005

Where applicable, fire lifts shall be provided with a minimum capacity for 8 passengers and fully automated with emergency switch on ground level. In general, buildings 15 m in height or above shall be provided with fire lifts.

Fire Lifts — *Following details shall apply for a fire lift:*

1) To enable fire services personnel to reach the upper floors with the minimum delay, one fire lift per 1 200 m² of floor area shall be provided and shall be available for the exclusive use of the firemen in an emergency.

2) The lift shall have a floor area of not less than 1.4 m². It shall have loading capacity of not less than 545 kg (8 persons lift) with automatic closing doors of minimum 0.8 m width.

3) The electric supply shall be on a separate service from electric supply mains in a building and the cables run in a route safe from fire, that is, within the lift shaft. Lights and fans in the elevators having wooden panelling or sheet steel construction shall be operated on 24 V supply.

4) Fire fighting lift should be provided with a ceiling hatch for use in case of emergency, so that when the car gets stuck up, it shall be easily openable.

5) In case of failure of normal electric supply, it shall automatically

trip over to alternate supply. Alternatively, the lift shall be so wired that in case of power failure, it comes down at the ground level and comes to stand-still with door open.

6) The operation of a fire lift is by a simple toggle or two-button switch situated in a glass-fronted box adjacent to the lift at the entrance level. When the switch is on, landing call-points will become inoperative and the lift will be on car control only or on a priority control device. When the switch is off, the lift will return to normal working. This lift can be used by the occupants in normal times.

7) The words 'Fire Lift' shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor level.

8) The speed of the fire lift shall be such that it can reach the top floor from ground level within 1 min.

Specification of lifts:

C-1.5 Lifts

General requirements of lifts shall be as follows:

a) Walls of lift enclosures shall have a fire rating of 2 h; lifts shafts shall have a vent at the top of area not less than 0.2 m².

b) Lift motor room shall be located preferably on top of the shaft and separated from the shaft by the floor of the room.

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

d) The number of lifts in one row for a lift bank shall not exceed 4 and the total number of lifts in the bank (of two rows) shall not exceed 8. A wall of 2 h fire rating shall separate

<p><i>individual shafts in a bank.</i></p> <p><i>e) Lift car door shall have a fire resistance rating of half an hour.</i></p> <p><i>f) Collapsible gates shall not be permitted for lifts and shall have solid doors with fire resistance of at least 1 h.</i></p> <p><i>g) If the lift shaft and lobby is in the core of the building, a positive pressure between 25 and 30 Pa shall be maintained in the lobby and a positive pressure of 50 Pa shall be maintained in the lift shaft. The mechanism for pressurization shall act automatically with the fire alarm; it shall be possible to operate this mechanically also.</i></p> <p><i>h) Exit from the lift lobby, if located in the core of the building, shall be through a self closing smoke stop door of half an hour fire resistance.</i></p> <p><i>j) Lifts shall not normally communicate with the basement; if, however, lifts are in communication, the lift lobby of the basements shall be pressurized as in (g), with self-closing door as in (h).</i></p> <p><i>k) Grounding switch(es), at ground floor level, shall be provided on all the lifts to enable the fire service to ground the lifts.</i></p> <p><i>m) Telephone or other communication facilities shall be provided in lift cars for building of 30 m in height and above. Communication system for lifts shall be connected to fire control room for the building.</i></p> <p><i>n) Suitable arrangements such as providing slope in the floor of lift lobby, shall be made to prevent water used during fire fighting, etc, at any landing from entering the lift shafts.</i></p> <p><i>p) A sign shall be posted and maintained on every floor at or near</i></p>	
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	<p><i>the lift indicating that in case of fire, occupants shall use the stairs unless instructed otherwise. The sign shall also contain a plan for each floor showing the locations of the stairways.</i></p> <p><i>Alternate source of power supply shall be provided for all the lifts through a manually operated changeover switch.</i></p>		
11.	<p>Structural material</p> <p><i>RCC materials and brick walls of not less than two hours fire resistance should be used for the construction of structures. Only fire resistant materials or materials treated with fire retardant chemicals, should be used for interior decoration work. While attending the interior decoration the fixed fire fighting systems like sprinklers / risers etc., should not be covered or shifted from their original location.</i></p>	:	
12.	<p>Basements:-</p> <p>12.9.3. The basement shall have the following requirements:</p> <p>a) Every basement shall be in every part at least 2.4 m in height from the floor to the underside of the roof slab or ceiling;</p> <p>b) Adequate ventilation shall be provided for the basement. The ventilation requirements shall be the same as required by the particular occupancy according to byelaws. Any deficiency may be met by providing adequate mechanical ventilation in the form of blowers, exhaust fans, air conditioning systems, etc;</p> <p>c) The height of the ceiling of any basement shall be minimum 0.9 m and the maximum, 1.2 m above the average surrounding ground level. However, in case of parking, mercantile or business occupancy at</p>		

<p>ground floor, minimum height of the ceiling of the basement may be 0.3 m above the average surroundings ground level subject to mechanical ventilation being provided (see Fig. 11);</p> <p>d) Adequate arrangements shall be made such that surface drainage does not enter the basement;</p> <p>e) The walls and floors of the basement shall be watertight and be so designed that the effects of the surrounding soil and moisture, if any, are taken into account in design and adequate damp proofing treatment is given;</p> <p>f) The access to the basement shall be separate room the main and alternative staircase providing access and exit from higher floors.</p> <p>Where the staircase is continuous in the case of buildings served by more than one staircase, the same shall be of enclosed type serving as a fire separation from the basement floor and higher floors. Open ramps shall be permitted if they are constructed within the building line subject to the provision of (d);</p> <p>g) Access to basements through ramps shall be permitted subject to provision of (d). The requirements for the ramps shall be in accordance with 4.6.1.3 [see also Fig. 8 (b)];</p> <p>h) For all public buildings and uses including group housing, having basement going up to more than one level, access to all levels shall also be provided through lift. The exit requirements in basements shall comply with the provisions of Part 4 .Fire and Life Safety. of the Code.</p> <p>Pressurization of staircases & lift lobbies may be recommended as per requirement mentioned in Table-6.</p>	
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13.	<p><i>Smoke control of exits</i></p> <p><i>NBC 2016, Part 4, Fire and Life Safety Clause 4.4.2.5 Smoke control of exits a)</i> <i>In building design, compartmentation plays a vital part in limiting the spread of fire and smoke. The design should ensure avoidance of spread of smoke to adjacent spaces through the various leakage openings in the compartment enclosure, such as cracks, openings around pipes ducts, airflow grills and doors. In the absence of proper sealing of all these openings, smoke and toxic gases will obstruct the free movement of occupants of the building through the exits. Pressurization of staircases is of great importance for the exclusion of smoke and toxic gases from the protected exit.</i></p> <p><i>b) Pressurization is a method adopted for protecting the exits from ingress of smoke, especially in high-rise buildings. In pressurization, air is injected into the staircases, lobbies, etc, as applicable, to raise their pressure slightly above the pressure in adjacent parts of the building. As a result, ingress of smoke or toxic gases into the exits will be prevented. The pressurization of staircases and lift lobbies shall be adopted as given in Table 6. The pressure difference for staircases shall be 50 Pa. Pressure differences for lobbies (or corridors) shall be between 25 Pa and 30 Pa. Further, the pressure differential for enclosed staircase adjacent to such lobby (or corridors) shall be 50 Pa. For enclosed staircases adjacent to non-pressurized lobby (or corridors), the pressure differential shall be 50 Pa.</i></p>	
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<p><i>c) Equipment and ductwork for staircase pressurization shall be in accordance with one of the following:</i></p> <ol style="list-style-type: none"> <i>1) Directly connected to the stairway by ductwork enclosed in non-combustible construction.</i> <i>2) If ducts used to pressurize the system are passed through shafts and grills are provided at each level, it shall be ensured that hot gases and smoke from the building cannot ingress into the staircases under any circumstances.</i> <p><i>d) The normal air conditioning system and the pressurization system shall be designed and interfaced to meet the requirements of emergency services. When the emergency pressurization is brought into action, the following changes in the normal air conditioning system shall be effected:</i></p> <ol style="list-style-type: none"> <i>1) Any re-circulation of air shall be stopped and all exhaust air vented to atmosphere.</i> <i>2) Any air supply to the spaces/areas other than exits shall be stopped.</i> <i>3) The exhaust system may be continued provided,</i> <ol style="list-style-type: none"> <i>i) the positions of the extraction grills permit a general air flow away from the means of egress;</i> <i>ii) the construction of the ductwork and fans is such that, it will not be rendered inoperable by hot gases and smoke; and</i> <i>iii) there is no danger of spread of smoke to other floors by the path of the extraction system which can be ensured by keeping the extraction fans running.</i> <i>e) For pressurized stair enclosure systems, the activation of the systems</i> 	
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shall be initiated by signalling from fire alarm panel.

f) Pressurization system shall be integrated and supervised with the automatic/manual fire alarm system for actuation.

g) Wherever pressurized staircase is to be connected to unpressurized area, the two areas shall be segregated by 120 min fire resistant wall.

h) Fresh air intake for pressurization shall be away (at least 4 m) from any of the exhaust outlets/grille.

As per clause 2.49 of Part 4 Fire and Life Safety of NBC 2016:

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.

Smoke exhaust and Pressurization of areas above ground as per clause 4.6.1 of Part 4 Fire and Life Safety of NBC 2016

Corridors in exit access (exit access corridor) are created for meeting the requirement of use, privacy and layout in various occupancies. These are most often noted in hospitality, health care occupancies and sleeping accommodations.

Smoke exhaust system having make-up air and exhaust air system or alternatively pressurization system with supply air system for these exit access corridors shall be required.

Smoke exhaust system having make-up air and exhaust air system shall also be required for theatres/auditoria. Such smoke exhaust system shall also be required for large lobbies and which have exit through staircase leading to exit discharge. This would

enable eased exit of people through smoke controlled area to exit discharge.

All exit passageway (from exit to exit discharge) shall be pressurized or naturally ventilated. The mechanical pressurization system shall be automatic in action with manual controls in addition. All such exit passageway shall be maintained with integrity for safe means of egress and evacuation. Doors provided in such exit passageway shall be fire rated doors of 120 min rating.

Smoke exhaust system where provided, for above areas and occupancies shall have a minimum of 12 air changes per hour smoke exhaust mechanism. Pressurization system where provided shall have a minimum pressure differential of 25-30 Pa in relationship to other areas.

The smoke exhaust fans in the mechanical ventilation system shall be fire rated, that is, 250°C for 120 min. For naturally cross-ventilated corridors or corridors with operable windows, such smoke exhaust system or pressurization system will not be required.

Smoke Exhaust and Pressurization of areas below Ground.

As per clause 4.6.2 of Part 4 Fire and Life Safety of NBC 2016:

Each basement shall be separately ventilated. Vents with cross-sectional area (aggregate) not less than 2.5 percent of the floor area spread evenly round the perimeter of the basement shall be provided in the form of grills, or breakable stall board lights or pavement lights or by way of shafts.

Alternatively, a system of mechanical ventilation system may be provided

<p><i>with following requirements:</i></p> <p><i>a) Mechanical ventilation system shall be designed to permit 12 air changes per hour in case of fire or distress call. However, for normal operation, air changes schedule shall be as given in Part 8 'Building Services, Section 3 Air conditioning, Heating and Mechanical Ventilation' of the Code.</i></p> <p><i>b) In multi-level basements, independent air intake and smoke exhaust shafts (masonry or reinforced concrete) for respective basement levels and compartments therein shall be planned with its make-up air and exhaust air fans located on the respective level and in the respective compartment. Alternatively, in multi-level basements, common intake masonry (or reinforced cement concrete) shaft may serve respective compartments aligned at all basement levels. Similarly, common smoke exhaust/outlet masonry (or reinforced cement concrete) shafts may also be planned to serve such compartments at all basement levels. All supply air and exhaust air fans on respective levels shall be installed in fire resisting room of 120 min. Exhaust fans at the respective levels shall be provided with back draft damper connection to the common smoke exhaust shaft ensuring complete isolation and compartmentation of floor isolation to eliminate spread of fire and smoke to the other compartments/floors.</i></p> <p><i>c) Due consideration shall be taken for ensuring proper drainage of such shafts to avoid insanitation condition. Inlets and extracts may be terminated at ground level with stall board or</i></p>	
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pavement lights as before. Stall board and pavement lights should be in positions easily accessible to the fire brigade and clearly marked 'AIR INLET' or 'SMOKE OUTLET' with an indication of area served at or near the opening.

d) Smoke from any fire in the basement shall not obstruct any exit serving the ground and upper floors of the building.

e) The smoke exhaust fans in the mechanical ventilation system shall be fire rated, that is, 250°C for 120 min.

f) The smoke ventilation of the basement car parking areas shall be through provision of supply and exhaust air ducts duly installed with its supports and connected to supply air and exhaust fans. Alternatively, a system of impulse fans (jet fans) may be used for meeting the requirement of smoke ventilation complying with the following:

1) Structural aspects of beams and other down stands/services shall be taken care of in the planning and provision of the jet fans.

2) Fans shall be fire rated, that is, 250°C for 120 min.

3) Fans shall be adequately supported to enable operations for the duration as above.

4) Power supply panels for the fans shall be located in fire safe zone to ensure continuity of power supply.

5) Power supply cabling shall meet circuit integrity requirement in accordance with accepted standard [4(13)].

The smoke extraction system shall operate on actuation of flow switch actuation of sprinkler system. In

	<p><i>addition, a local and/or remote 'manual start-stop control/switch' shall be provided for operations by the fire fighters. Visual indication of the operation status of the fans shall also be provided with the remote control. No system relating to smoke ventilation shall be allowed to interface or cross the transformer area, electrical switchboard, electrical rooms or exits. Smoke exhaust system having make-up air and exhaust air system for areas other than car parking shall be required for common areas and exit access corridor in basements/ underground structures and shall be completely separate and independent of car parking areas and other mechanical areas. Supply air shall not be less than 5 m from any exhaust discharge openings.</i></p>	
14.	<p>Compartmentation</p> <p><i>As per clause 4.5 of Part 4 Fire and Life Safety of NBC 2016:</i></p> <p>4.5.1 General</p> <p><i>a) It is important to limit the spread of a fire in any building. The usual method is to use fire barriers. In some instances these barriers need to be penetrated for ductwork, plumbing and electrical systems, and in such cases, use of passive fire protection measures shall be done so that the integrity of these barriers is not compromised.</i></p> <p><i>b) Floor(s) shall be compartmented with area as given below.</i></p> <p>4.5.2 <i>All floors shall be compartmented / zoned with area of each compartment being not more than 750 m². The maximum size of the compartment shall be as follows, in</i></p>	

	<p><i>case of sprinklered Basement / Building:</i></p> <table border="1" data-bbox="220 320 692 757"> <thead> <tr> <th><i>Sl No</i></th> <th><i>Use</i></th> <th><i>Compartmentation Area m²</i></th> </tr> </thead> <tbody> <tr> <td><i>1.</i></td> <td><i>Basement car parking</i></td> <td><i>3000</i></td> </tr> <tr> <td><i>2.</i></td> <td><i>Basements (other than car parking)</i></td> <td><i>2000</i></td> </tr> <tr> <td><i>3.</i></td> <td><i>Institutional buildings: Sub division C-2 and C3</i></td> <td><i>1125</i></td> </tr> </tbody> </table> <p><i>In addition, there shall be requirement of a minimum of two compartments if the floor plate size is equal or less than the areas mentioned above. However, such requirement of minimum two compartments shall not be required, if the floor plate is less than 750 m². Compartmentation shall be achieved by means of fire barrier having fire resistance rating of 120 min.</i></p>	<i>Sl No</i>	<i>Use</i>	<i>Compartmentation Area m²</i>	<i>1.</i>	<i>Basement car parking</i>	<i>3000</i>	<i>2.</i>	<i>Basements (other than car parking)</i>	<i>2000</i>	<i>3.</i>	<i>Institutional buildings: Sub division C-2 and C3</i>	<i>1125</i>	
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15.	<p>Gas Supply</p> <p><i>As per clause 4.7.1 of Part 4 Fire and Life Safety of NBC 2016:</i> Town Gas/ LPG supply pipes <i>Where gas pipes are run in buildings, the same shall be run in separate shafts exclusively for this purpose and these shall be on external walls, away from the staircases. Gas distribution pipes shall always be below the false ceiling. The length of these pipes shall be as short as possible. In the case of kitchen cooking range area, hood should have grease filters using metallic grill to trap oil vapours escaping into the fume hood.</i> <i>NOTE — For detailed information on gas pipe installations, reference may</i></p>													

be made to Part 9 'Plumbing Services, Section 4 Gas Supply' of the Code.

4.7.2 Thermal detectors These shall be installed into fume hoods of large kitchens for hotels, hospitals, and similar areas located in high rise buildings. Arrangements shall be made for automatic tripping of the exhaust fan in case of fire. If gas is used, the same shall be shut off. The voltage shall be 24 V or 100 V d.c. operated with external rectifier. The valve shall be of the hand re-set type and shall be located in an area segregated from cooking ranges. Valves shall be easily accessible. The hood shall have manual facility for steam or suitable hood extinguishing gas released depending on duty condition.

4.7.3 Gas cylinders and manifold shall need to be housed in a detached location with no other occupancy within distances prescribed in good practice [4(14)] thereof. There shall be an enclosure suitably ventilated. It is desirable to provide medium velocity spray nozzles which can be operated by quick opening valve situated away from the enclosure.

4.7.4 In the case of gas cylinders, if manifold has to be installed on podium/close to podium, the same shall be away from any air intakes/smoke exhaust openings/ any windows.

4.7.6 Gas meters shall be housed in a suitably constructed metal cupboard located in a well-ventilated space, keeping in view the fact that LPG is heavier than air and town gas is lighter than air.

	<p><i>4.7.7 Wherever LPG reticulation/cylinders are used in buildings above 100 m, gas leak detectors shall be provided at the usage points and monitored from fire command centre. The cables used for signalling shall be circuit integrity cables. 4.7.8 The gas lines shall not be installed through any electrical shafts, escape routes, refuge areas / refuge floors. 4.7.9 Kitchens working on LPG fuel shall not be permitted in basements.</i></p>		
16.	<p>3.4.5.4 Service ducts and shafts <i>Openings in walls or floors which are necessary to be provided to allow passages of all building services like cables, electrical wirings, telephone cables, plumbing pipes, etc, shall be protected by enclosure in the form of ducts/shafts having a fire resistance not less than 120 min. The inspection door for electrical shafts/ducts low voltage wiring running in shafts/ducts, shall either be armoured type or run through metal conduits. The space between the electrical cables/conduits and the walls/slabs shall be filled in by a fire stop material having fire resistance rating of not less than 120 min. This shall exclude requirement of fire stop sealing for low voltage services shaft.</i> <i>For plumbing shafts in the core of the building, with shaft door opening inside the building, the shafts shall have inspection doors having fire resistance rating not less than 30 min. For plumbing shafts doors which open in wet areas or in naturally ventilated areas or on external wall of the building, the shafts may not require doors having any specified fire rating.</i></p> <p>3.4.6 Electrical Installation</p>	:	

	<p><i>3.4.6.1 The electric distribution cables/wiring shall be laid in a separate shaft. The shaft shall be sealed at every floor with fire stop materials having the same fire resistance as that of the floor. High, medium and low voltage wiring running in shaft and in false ceiling shall run in separate shaft/conduits. Water mains, gas pipes, telephone lines, intercom lines or any other service line shall not be laid in the duct for electrical cables; use of bus ducts/solid rising mains instead of cables is preferred.</i></p>	
17.	<p>Escape Lighting and Exit Signage's. :</p> <p>3.4.7 Escape Lighting and Exit Signage Exit access, exits and exit discharge shall be properly identified, with adequate lighting maintained in the elements of the egress systems so that all occupants shall be able to leave the facility safely.</p> <p>3.4.7.1 Lighting</p> <p>a) The exit, exit access and exit discharge systems shall be illuminated continuously. The floors of the means of egress shall be illuminated at all points, including angles and intersections, in corridors and passageways, stairwells, landings of stairwells and exit.</p> <p>b) Emergency lighting shall be powered from a source independent of that supplying the normal lighting.</p> <p>c) Escape lighting shall be capable of,</p> <ol style="list-style-type: none"> 1) indicating clearly and unambiguously the escape routes; 2) providing adequate illumination along such routes to allow safe movement of persons towards and through the exits; and 	

<p>3) Ensuring that fire alarm call points and Fire fighting equipment provided along the escape routes can be readily located.</p> <p>d) The horizontal luminance at floor level on the centreline of an escape route shall not be less than 10 lumen / m². In addition, for escape routes up to 2 m wide, 50 percent of the route width shall be lit to a minimum of 5 lumen / m².</p> <p>e) Required illumination shall be arranged such that the failure of any single lighting unit, such as the burning out of one luminaire, will not leave any area in darkness and does not impede the functioning of the system further.</p> <p>f) The emergency lighting shall be provided to be put on within 5 s of the failure of the normal lighting supply. Also, emergency lighting shall be able to maintain the required illumination level for a period of not less than 90 min in the event of failure of the normal lighting even for smaller premises.</p> <p>g) Battery pack emergency lighting, because of its limited duration and reliability, shall not be allowed to be used in lieu of a diesel engine driven emergency power supply.</p> <p>h) Escape lighting luminaries should be sited to cover the following locations:</p> <ol style="list-style-type: none"> 1) Near each intersection of corridors, 2) At exits and at each exit door, 3) Near each change of direction in the escape route, 4) Near each staircase so that each flight of stairs receives direct light, 5) Near any other change of floor level, 	
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6) Outside each final exit and close to it,

7) Near each fire alarm call point,

8) Near fire fighting equipment, and

9) To illuminate exit and safety signs as required by the enforcing authority.

NOTE. For the purpose of this clause 'near' is normally considered to be within 2 m measured horizontally.

j) The luminaries shall be mounted as low as Possible, but at least 2 m above the floor level.

k) Signs are required at all exits, emergency exits and escape routes, which should comply with the graphic requirements of the relevant Indian Standards.

3.4.7.2 Exit passageway (at ground) and staircase lighting shall also be connected to alternative supply. The alternative source of supply may be provided by battery continuously trickle charged from the electric mains.

3.4.7.3 Suitable arrangements shall be made by installing double throw switches to ensure that the lighting installed in the staircase and the corridor does not get connected to two sources of supply simultaneously. Double throw switch shall be installed in the service room for terminating the stand-by supply.

The emergency lighting system shall be well maintained by periodical inspections and tests so as to ensure their perfect serviceability at all times.

3.4.7.4 Exit signage Where exit access is provided through corridors / paths, the occupants shall be able to easily identify the way to exits. Exit signs shall be provided such that no point in an exit access is more than 30 m from

<p><i>a visible exit directional sign. An exit sign indicating the direction to an exit shall be provided at all changes in direction.</i></p> <p><i>Exits shall be clearly visible and the route to reach the exits shall be clearly marked and signs posted to guide the occupants of the floor concerned. Signs shall be illuminated and wired to an independent electrical circuit on an alternative source of supply. The sizes and colours of the exit signs shall be in accordance with good practice [4(7)]. The colour of the exit signs shall be green.</i></p> <p>NOTE. <i>This provision shall not apply to A-2 and A-4 occupancies less than 15 m in height. The exit sign with arrow indicating the way to the escape route shall be provided at a suitable height from the floor level on the wall and shall be illuminated by electric light connected to corridor circuits. All exit way marking signs should be so installed that no mechanical damage shall occur to them due to moving of furniture or other heavy equipment. Further, all landings of floor shall have floor indicating boards prominently indicating the number of the floor. Photo luminescent markings shall be pasted at internal hydrant boxes.</i></p>	
<p>18. <i>Additional fire prevention requirements for Institutional Buildings C to be referred & followed as per Clause: 6.3 of NBC 2016, Part 4 of Fire & Life Safety.</i></p> <p><i>6.3 Institutional Buildings (Group C)</i></p> <p><i>6.3.1 Fire Prevention</i></p> <p><i>No combustible material of any kind shall be stored or used in any building or section thereof used for institutional occupancy, except as</i></p>	

necessary to normal occupancy and use of the building.

6.3.2 Life Safety

a) The common path of travel shall be 30 m. The maximum dead end of corridor distance shall not exceed 6 m.

b) Principle of progressive horizontal evacuation is of paramount consideration for hospital patients particularly those lacking self-preservation. This calls for moving occupants from a fire affected area to an adjoining area at the same level through a fire resistant wall, to protect them from the immediate dangers of fire and smoke (see Fig. 14).

c) Progressive horizontal evacuation operates on the basis of evacuation from compartment to compartment and on use of adjacent compartments as temporary means of refuge. All compartments shall be divided with self-closing (door closers) fire doors with electromagnetic hold open. A coordinator shall be provided to sequence the closing of double leaf in case of emergency.

d) Doors in fire resistant walls shall be so installed that these may normally be kept in open position, but will close automatically. Corridor door openings shall be not less than 2.0 m in width of double swing double leaf type door. A coordinator shall be provided as above, for closing of double leaf in case of emergency.

e) Exits and other features for penal and mental institutions, and custodial institutions shall be the same as specified for hospitals [see 6.3.2 (g)], in so far as applicable. Reliable means shall be provided to permit the prompt release of inmates from any locked section in case of fire or other emergency.

f) All buildings or sections of buildings in penal and mental institution used for manufacturing, storage or office

<p><i>purposes shall have exits in accordance with the provisions of the Code for those occupancies.</i></p> <p><i>g) For hospitals (Subdivision C-1), the following shall also be complied with:</i></p> <ol style="list-style-type: none"> <i>1) Compartmentation shall meet the requirement as per 4.5.2.</i> <i>2) Each compartment (see 4.5.2) shall be able to accommodate, in addition to its own, the patients from adjoining compartment also considering 3.5 m² per person. If patients are not bed-ridden, a factor of 0.6 m² per person is recommended.</i> <i>3) All critical patients and those incapable of self-preservation and having physical impairment shall be housed within 30 m height.</i> <i>4) Other types of patients and occupancies incidental to the hospitals such as consultation rooms, nurses. stations, medical shops, canteens, etc may be housed at heights beyond 30 m but not more than 45 m.</i> <i>5) Basement shall not be used to store flammables or for pathological or other laboratories particularly those involving usage of chemicals.</i> <i>6) Operation theatres, delivery rooms, Intensive care units, recovery rooms, etc, that containing patients lacking self-preservation in case of emergencies shall be fire/smoke separated (120 min minimum rating) from all the adjoining areas.</i> <i>7) Aisles, corridors, ramps, etc, through which patients are moved, shall have a minimum width of 2.4 m throughout. Aisles, corridors, and ramps in other areas not intended for the housing, treatment, or use of inpatients shall be not less than 1.5 m in width.</i> <i>8) All exits from hospital or infirmary sections shall be not less than 2.0 m in width.</i> <i>9) Minimum width of door of single or double occupancy patient room shall be 1.25 m while for the wards for 3 to</i> 	
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<p><i>5 patient beds shall be 1.50 m, to permit movement of patients. The minimum width of door for wards for more than 5 patient beds and for areas necessarily requiring patient evacuation on bed (such as ICU, recovery units, delivery rooms, etc), shall have door width of 2.0 m. The width of 2.0 m may be reduced to minimum of 1.5 m where two such doors are provided in such areas.</i></p> <p><i>10) Any sleeping accommodation or suite exceeding 100 m² in area shall have at least two doorways leading to the exit access corridors.</i></p> <p><i>11) Floor surface of corridors shall not be inclined at a gradient steeper than 1 in 12 to the horizontal.</i></p> <p><i>12) Exit access corridors from a compartment to another compartment shall be divided at the compartment intersection by a fire door of 120 min fire rating in the fire compartment wall.</i></p> <p><i>13) Rooms designated for laboratory and the like shall not exceed 100 m² in area and if additional space is required, fire separation of 120 min shall be provided.</i></p> <p><i>14) Storage of flammable liquids in laboratories or in any other area shall be not more than 3 litre for every 10 m² area.</i></p> <p><i>15) Disposal of any equipment and other (particularly hazardous) materials shall be accomplished in the premises by a disposal specialist or at a safe location away from the health care facility by competent personnel using procedures established in concurrence with the safe practices.</i></p> <p><i>16) A stretcher lift in a lift bank shall also act as fireman.s lift meeting the requirements of Part 8 .Building Services, Section 5</i></p> <p><i>Installation of Lifts, Escalators and Moving Walks, Subsection 5A Lifts. of the Code.</i></p> <p><i>h) Progressive evacuation strategy .</i></p>	
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<p><i>See Fig. 15, in which, as an example, the exit calculations at two locations shall be based on requirements of total occupancy for area (A, B and C) divided by 2 considering progressive evacuation strategy.</i></p> <p><i>6.3.3 Exception and Deviation It is recognized that in institutions or part of buildings housing various types of psychiatric patients, or used as mental institutions and penal institutions, it is necessary to maintain locked doors and barred windows; and to such extent the necessary provision in other sections of the code requiring the keeping of exits unlocked may be waived. It is also recognized that certain type of psychiatric patients are not capable of seeking safety without adequate guidance. In buildings where this situation prevails, reliable means for the rapid release of occupants shall be provided, such as remote control of locks, or by keying all locks to keys commonly used by attendants.</i></p>		
<p>D. The builder should arrange for the following fire fighting and evacuation measures:-</p>		
<p>1. <i>Electric Power Supply.</i></p> <p><i>NBC 2016, Part-4 Fire and Life Safety, 3.4.6.2 Emergency power for fire and life safety systems Emergency power supplying distribution system for critical requirement for functioning of fire and life safety system and equipment shall be planned for efficient and reliable power and control supply to the following systems and equipment where provided:</i></p> <p><i>a) Fire pumps.</i></p> <p><i>b) Pressurization and smoke venting; including its ancillary systems such as dampers and actuators.</i></p>	:	

c) Fireman's lifts (including all lifts).
 d) Exit signage lighting.
 e) Emergency lighting.
 f) Fire alarm system.
 g) Public address (PA) system (relating to Emergency voice evacuation and annunciation).
 h) Magnetic door hold open devices.
 j) Lighting in fire command centre and security room. Power supply to these systems and equipment shall be from normal and emergency (standby generator) power sources with changeover facility. If power supply, is from HV source and HV generation, the transformer should be planned in standby capacity to ensure continuity of power to such systems. Wherever and backup DG sets are of higher voltage rating, then dual redundant cables shall be taken to all transformers. The generator shall be capable of taking starting current of all the fire and life safety systems and equipment as above. Where parallel HV/LV supply from a separate substation fed from different grid is provided with appropriate transformer for emergency, the provision of generator may be waived in consultation with the Authority.

3.4.6.4 Standby supply

Diesel generator set(s) shall not be installed at any floor other than ground/first basement. If the same are installed indoors, proper ventilation and exhaust shall be planned. The DG set room shall be separated by 120 min fire resistance rated walls and doors. The oil tank for the DG sets (if not in the base of the DG) shall be provided with a dyked enclosure

	<p>having a volumetric capacity of at least 10 percent more than the volume of the oil tank. The enclosure shall be filled with sand for a height of 300 mm. For detailed information regarding fire safety requirements for hazardous petroleum products, reference may be made to The Petroleum Act, 1934 and the Rules framed there under.</p>		
2.	<p>Down comer system. NBC-2016, Part-4, Fire & Life Safety, 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.</p> <p>NBC 2016, Part-4, Fire & Life Safety Table 7 (6) down comer shall be provided for every 1000 sq.mtrs. built up area, Institutional buildings (Sub division C-2 & C-3)</p> <ol style="list-style-type: none"> 1. Less than 10 m in height. <ol style="list-style-type: none"> i. More than 300 persons. Size of mains shall be 100 mm with single outlet landing valves upto 30 m height. 	:	
3.	<p>Wet riser system. NBC 2016 Part-4, Fire & Life Safety, Clause 2.65 Wet Riser — An arrangement for fire fighting within the building by means of vertical rising mains not less than 100 mm</p>	:	

	<p>nominal diameter with landing valves on each floor/landing for fire fighting purposes and permanently charged with water from a pressurized supply.</p> <p>NBC -2016, Part-4 Fire & Life Safety, Table 7 (5) wet riser shall be provided for every 1000 sq.mtrs. built up area,</p> <p>Institutional buildings (Sub division C-2 & C-3)</p> <p>1. 10 m and above but not exceeding 30.00 m in height. Size of mains shall be 100 mm with single outlet landing valves – upto 30 m height.</p>		
4.	<p>First aid hose reel hose system.</p> <p>NBC-2016, Part-4, Fire and Life Safety, Table 7 (4) First Aid Hose reel shall be provided for,</p> <p>Institutional buildings (Sub division C-2 & C-3)</p> <p>1. Should be provided in all the buildings irrespective of height and irrespective of occupancy. Rubber lined Hose reel hose of size minimum 19 mm of 40 mtr length as per IS 884, with Gate valve (upstream) and shut off nozzle of 5 mm size. The hose reel hose should be connected at each landing by means of an adaptor. Adequate BIS marked re-in forced rubber lined delivery hoses of 63 mm size to reach the farthest point of the floor / setbacks from the system should be provided with a branch pipe near each hydrant outlet in a proper box to protect it from withering.</p>	:	
5.	<p>NBC-2016, Part-4, Clause 2.64.1 :</p> <p>Hydrant system – A distribution system having a network of piping installed underground / above ground</p>	:	

	<p><i>around and / or through inside of a building with internal and / or external hydrants fitted with landing walls at regular interval according to the occupancy. The distribution system is connected to water supply system from fire fighting.</i></p> <p>NBC-2016, Part-4, Table 7 (7)Yard hydrant shall be provided for,</p> <p><i>Institutional buildings (Sub division C-2 & C-3)</i></p> <p><i>1. 10 m and above but not exceeding 30 m in height.</i></p> <p><i>At least two fire service inlets to boost the water in the riser directly from the mobile pump should also be provided. These inlets should be located at an easily accessible position, preferable near the entry point to the premises.</i></p>	
6.	<p>NBC-2016, Part-4, Table 7 (11) Underground Static Water Storage Tank Combined Capacity for Wet Riser, Yard hydrant and Sprinklers per set of Pumps shall be provided for,</p> <p><i>Institutional buildings (Sub division C-1)</i></p> <p><i>1. 10 m and above but not exceeding 15 m in height – 1,00,000 Ltrs.</i></p> <p><i>2. 15 m and above not exceeding 24 m in height – 1,50,000 Ltrs.</i></p> <p><i>3. 24 m and above not exceeding 30 m in height – 2,00,000 Ltrs.</i></p> <p><i>Note: Fire tank to be always filled with water. Over flow of fire tank to be taken to domestic tank. Arrangement should be such that any incoming water should first fill-up fire tank, then overflow to other utilizations.</i></p> <p>H-4 ENCLOSED PARKING STRUCTURES</p>	

	<p>c) For basement car parking, compartmentation can be achieved, with fire barrier or with water curtain nozzle (K-23) or with combination there of. Automatic deluge system comprising deluge valve, piping, nozzles, etc shall be used to zone the compartment in case of water curtain system. In case of water curtain, existing water storage shall be supplemented by water demand for water curtain nozzles for 60 min considering the largest compartment. perimeter out of all compartments of car parking in any of the basements.</p> <p>d) The water supply for the water curtain nozzles shall be through independent electric pump of adequate capacity (flow and head) with piping/riser for the water supply to the nozzles.</p> <p>e) The water curtain shall be operated by the actuation of flow switch actuating sprinkler system.</p>		
7.	<p>NBC-2016, Part-4 Table 7(12) Terrace Tank Over Respective Tower Terrace shall be provided for Institutional buildings (Sub division C-2 and C-3)</p> <p>1. Less than 10 m in height.</p> <p>i. Upto 300 persons – 10,000 lts. (5,000 lts.) (Note:6 Additional value given in parenthesis shall be added if basement area exceeds 200 m²)</p> <p>ii. More than 300 persons – 15,000 lts. (5,000 lts.) (Note:6 Additional value given in parenthesis shall be added if basement area exceeds 200 m²)</p> <p>2. 10 m and above but not exceeding 15 m in height – 5,000 lts. (5000 lts) (Note:6 Additional value given in parenthesis shall be added if basement area exceeds 200 m²)</p>	:	

	<p>3. 15 m and above but not exceeding 24 m in height – 10,000 lts.</p> <p>4. 24 m and above but not exceeding 30 m in height.</p> <p><i>Note: Over head tank to overflow to domestic tank. Arrangement should be such that any incoming water should first fill-up fire tank, then overflow to other utilizations.</i></p>		
8.	<p>NBC-2016, Part-4, Table 7 (13) Pump near underground static water storage tank (Fire pump) with minimum pressure of 3.5 kg/cm² at remotest location.</p> <p>Institutional buildings (Sub division C-2 & C-3)</p> <ol style="list-style-type: none"> 1. 10 m and above but not exceeding 15 m in height (Note 10) 2. 15 m and above but not exceeding 24 m in height (See note 11) 3. 24 m and above but not exceeding 30 m in height (see note 11) <p><i>(Note 10: Provide required number of sets of pumps each consisting of one electric and one diesel pump (stand by) of capacity 2 280 litre/min and one electric pump of capacity 180 litre/min)</i></p> <p><i>(Note 11: Provide required number of sets of pumps each consisting of two electric and one diesel pump (stand by) of capacity 2 280 litre/min and two electric pump of capacity 180 litre/min (see also Notes 22 and 23).</i></p> <p><i>(Note 22: One set of pumps shall be provided for each 100 hydrants or part thereof, with a maximum of two sets. In case of more than one pump</i></p>	:	

	<p>set installation, both pump sets shall be interconnected at their delivery headers. Note 23: Alternative to provisions of additional set of pumps, the objective can be met by providing additional diesel pump of the same capacity and doubling the water tank capacity as required for one set of pumps.)</p> <p>If Basement is compartmented using water curtains additional pump as per clause H-4 d) The water supply for the water curtain nozzles shall be through independent electric pump of adequate capacity (flow and head) with piping/riser for the water supply to the nozzles to be provided.</p>		
9.	<p>NBC-2016, Part-4, Table 7 (14) pumps at the Terrace tank level with Minimum Pressure of 3.5 kg/cm² shall be provided for, Institutional buildings (Sub division C-2 & C-3)</p> <p>1. Less than 10 m in height.</p> <p>i. Upto 300 persons – 450 lpm (450 lpm) (Note:6 Additional value given in parenthesis shall be added if basement area exceeds 200 m²).</p> <p>ii. More than 300 persons – 900 lpm (450 lpm) (Note:6 Additional value given in parenthesis shall be added if basement area exceeds 200 m²)</p>	:	
10.	<p>Manually operated fire alarm system.</p> <p>NBC-2016, Part-4, Clause 2.1 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</p>	:	

	<p><i>manual fire alarm call points.</i></p> <p><i>NBC-2016, Part-4, Table 7 (9) Manually operated Electric Fire alarm system is required</i></p> <p><i>Institutional buildings (Sub division C-2 & C-3)</i></p> <p><i>1. Should be provided in all the buildings irrespective of height and irrespective of occupancy.</i></p> <p><i>Manually operated electrical fire alarm system should be installed with call boxes located near each staircase landing of each building. The call boxes should be of 'break glass' type, where the call is transmitted automatically to the control room when the glass of the system is broken. This system should also be connected to an alternative source of power supply (diesel generator).</i></p> <p><i>The call boxes should be so installed that their location can be easily noticed from either direction and should be at a height of one meter from the floor level.</i></p>		
11.	<p><i>NBC -2016, Part-4, Clause 2.1 as per Table 7(10) Automatic Fire Detection and alarm systems required (see Note 2: automatic detection and alarm system is not required to be provided in car parking area. Such detection system shall however be required in other areas of car parking such as electrical rooms, cabins and other areas) – Fire alarm system comprising components for automatically detecting a fire, initiating an alarm of fire and initiating other actions as appropriate.</i></p> <p><i>Institutional buildings (Sub division</i></p>	:	

	<p>C-2 & C-3) 1. 10 m and above but not exceeding 30 m in height.</p>		
12.	<p>Public Address System: A system of two way talk back speaker with push to talk speakers to be provided at every staircase or firemen telephone to be provided at every staircase. Necessary console & amplifier with micro phone to be provided at ground floor in fire command centre.</p>		
13.	<p>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.</p> <p>NBC-2016, Part-4, Table 7 (8) Automatic Sprinkler system. Institutional buildings (Sub division C-2 & C-3) 1. Upto 15 m in height irrespective of occupancy (See note 4 : required to be installed in basement if basement area exceeds 200 m²) 2. 15 m and above but not exceeding 30 m in height.</p>	:	
14.	<p>HORIZONTAL EXITS/REFUGE AREA NBC-2016, Part-4, Annex-E-4 a) A horizontal exit shall be through a fire door of 120 min rating in a fire resistant wall. Horizontal exit require separation with the refuge area or adjoining compartment through 120 min fire barrier. The adjoining compartment of the horizontal exit should allow unlocked and ease of egress and exits for the occupants using defend in place strategy. Requirements of horizontal exits are</p>	:	

as under: a) Width of horizontal exit doorway shall be suitable to meet the occupant load factor for egress.

b) Doors in horizontal exits shall be openable at all times from both sides.

c) All doors shall swing in the direction of exit travel. For horizontal exits, if a double leaf door is used, the right hand door leaf shall swing in the direction of exit travel.

d) Refuge area shall be provided in buildings of height more than 24 m. Refuge area provided shall be planned to accommodate the occupants of two consecutive floors (this shall consider occupants of the floor where refuge is provided and occupants of floor above) by considering area of 0.3 m² per person for the calculated number of occupants and shall include additionally to accommodate one wheel chair space of an area of 0.9 m² for every 200 occupants, portion thereof, based on the occupant load served by the area of refuge or a minimum of 15 m², whichever is higher, shall be provided as under;

1. The refuge area shall be provided on the periphery of the floor and open to air at least on one side protected with suitable railings.

2. Refuge area (s) shall be provided at / or immediately above 24 m and thereafter at every 15 m or so.

e) A prominent sign bearing the words 'REFUGE AREA' shall be installed at the entry of the refuge area, having height of letters of minimum 75 mm and also containing information about the location of refuge areas on the floors above and below this floor. The same signage shall also be conspicuously located within the

	<p>refuge area.</p> <p>f) Each refuge area shall be ventilated and provided with first aid box, fire extinguishers, public address speaker, fire man talk back, and adequate emergency lighting as well as drinking water facility.</p> <p>g) Refuge areas shall be approachable from the space they serve by an accessible means of egress.</p> <p>h) Refuge areas shall connect to fire fighting shaft (comprising fireman's lift, lobby and staircase) without having the occupants requiring to return to the building spaces through which travel to the area of refuge occurred.</p> <p>j) The refuge area shall always be kept clear.</p> <p>No storage of combustible products and materials, electrical and mechanical equipment, etc shall be allowed in such areas.</p> <p>k) Refuge area shall be provided with adequate drainage facility to maintain efficient storm water disposal.</p> <p>m) Entire refuge area shall be provided with sprinklers.</p> <p>n) Where there is a difference in level between connected areas for horizontal exits, ramps of slope not steeper than 1 in 12 shall be provided (and steps should be avoided).</p> <p>NOTE – Refuge area provided in excess of the requirements shall be counted towards FAR.</p>		
15.	<p>Fire Command Centre.</p> <p>NBC-2016, Part-4 Clause 3.4.12 Fire Command Centre (FCC)</p> <p>a) Fire command centre shall be on the entrance floor of the building having direct access. The control</p>	:	

	<p>room shall have the main fire alarm panel with communication system (suitable public address system) to aid floors and facilities for receiving the message from different floors.</p> <p>b) Fire command centre shall be constructed with 120 min rating walls with a fire door and shall be provided with emergency lighting. Interior finishes shall not use any flammable materials. All controls and monitoring of fire alarm systems, pressurization systems, smoke management systems shall happen from this room. Monitoring of integrated building management systems, CCTVs or any other critical parameters in building may also be from the same room.</p> <p>c) Details of all floor plans along with the details of fire fighting equipment and installations (2 sets laminated and bound) shall be maintained in fire command centre.</p> <p>d) The fire staff in charge of the fire command centre shall be responsible for the maintenance of the various services and fire fighting equipment and installations in coordination with security, electrical and civil staff of the building.</p>		
16.	<p>NBC-2016, Part-4, Annex-D, Clause 4.11 D-5 FIRE SAFETY PLAN</p> <p>D-5.1 A format for the Fire Safety Plan shall be as given in D-9.10.</p> <p>D-5.2 The applicable parts of the approved Fire Safety Plan shall be distributed to all tenants of the building by the building management when the Fire Safety Plan has been</p>	:	

<p><i>approved by the Fire Authority.</i></p> <p><i>D-5.3 The applicable parts of the approved Fire Safety Plan shall then be distributed by the tenants to all their employees and by the building management to all their building employees.</i></p> <p><i>D-5.4 In the event there are changes from conditions existing at the time the Fire Safety Plan for the building was approved, and the changes are such so as to require amending the Fire Safety Plan, within 30 days after such changes, an amended Fire Safety Plan shall be submitted to the fire brigade for approval.</i></p>		
<p>17. <i>As per clause 4.10 of Part 4 Fire and Life Safety of NBC 2016:</i></p> <p><i>4.10 Fire Officer</i></p> <p><i>4.10.1 A qualified Fire Officer with experience of not less than 3 years shall be appointed who will be available on the premises, for Institutional buildings of 15 m and above.</i></p> <p><i>4.10.2 The Fire Officer shall,</i></p> <p><i>a) maintain the fire fighting equipment in good working condition at all times.</i></p> <p><i>b) prepare fire orders and fire operational plans and get them promulgated.</i></p> <p><i>c) impart regular training to the occupants of the buildings in the use of fire fighting equipment provided on the premises and keep them informed about the fire emergency evacuation plan.</i></p> <p><i>d) keep proper liaison with the city fire brigade.</i></p> <p><i>e) ensure that all fire precautionary measures are observed at the times.</i></p> <p><i>NOTE - Competent authority having jurisdiction may insist on compliance of the above rules in case of buildings having very large areas even if the height is less than 30 m.</i></p>	:	

18.	<p>Fire extinguishers.</p> <p><i>NBC-2016, Part-4, Table 7 (3) Fire extinguishers shall be provided for, Business Building (E)</i></p> <ol style="list-style-type: none"> 1. <i>One ABC powder extinguishers of 6 kgs. Capacity for every 8 cars at parking areas should be provided.</i> 2. <i>One CO₂ extinguishers of 4.5 kgs. Capacity should be provided near the entrance to the electrical room.</i> 3. <i>One Mechanical Foam extinguishers of 9 litres capacity & one ABC powder extinguishers of 6 kgs. Capacity should be provided near the transformer.</i> 4. <i>One Mechanical foam extinguishers of 9 litres capacity and one ABC powder extinguishers of 6 kgs. Capacity should be provided near the diesel generator.</i> 5. <i>One CO₂ extinguishers of 2 kgs. Capacity should be provided inside each lift machine room.</i> 6. <i>One Water Mist type extinguishers of 4 litres & 9 litres capacity should be kept near each staircase landing at each floor.</i> <p><i>All the extinguishers suggested above should be with B.I.S. markings and should be located at an easily accessible position without obstructing the normal passage and maintained periodically.</i></p>	:	
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NOTE :

1. *The above mentioned requirements are indicative and not exhaustive. All other requirements of National Building Code not specifically mentioned above shall also be complied with mandatorily.*
2. *The additional requirements for irrespective occupancy buildings as enumerated in NBC 2016 shall be incorporated in order to comply with this NOC.*

