

भारतीय मानक
भवनों (सामान्य) की अग्नि सुरक्षा: निकासी की आवश्यकताएँ
और निजी जोखिम — रीति संहिता
(दूसरा पुनरीक्षण)

Indian Standard
FIRE SAFETY OF BUILDINGS (GENERAL): EXIT
REQUIREMENTS AND PERSONAL HAZARD —
CODE OF PRACTICE
(*Second Revision*)

ICS 13.220.01



© BIS 2013

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 2013

Price Group 8

MAX. RETAIL PRICE
₹370/- ALL TAXES

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Safety Sectional Committee had been approved by the Civil Engineering Division Council.

Indian Standards relating to fire safety of buildings have been formulated covering general principles and fire grading, details of construction, exposure hazard and exit requirements. This standard covering the last aspect was formulated in 1960 and revised in 1988. In the past years, useful data has been made available. The provision in this revision has, therefore, been made based on the data adopted by some developed countries. Requirements for stair case and horizontal exit have been modified. Additional precautions, exceptions and deviations in requirements for various occupancies incorporated. Fire protection provisions for cinema halls and metro stations included. Criteria for compartmentation is now given. Further the provisions have been aligned with SP 7 : 2005 'National Building Code of India 2005'.

The exit requirements and personal hazard dealt with in this standard is considered as at least of equal importance to all other aspects; in fact in most cases, it is paramount because of the density of population associated with particular occupancy; an example is that of a cinema or similar densely occupied building when constructed with a godown of similar occupancy.

Density of population varies from one building to another and also in the same building from time-to-time; one example is that of a large general or mixed bazar, emporium or stores where a great variety of goods are displayed for sale; and at certain periods may be offered at special attractive bargain prices, with the result that normal population will be rapidly exceeded, more so during peak shopping hours when an outbreak of fire would cause considerable confusion, possibly panic; therefore, the closet attention to design and maintenance of escape routes including any staircases, cannot be overemphasized. Likewise special consideration is essential to arrangement of display of any highly flammable articles or materials for sale in such risks because of the danger; normal escape routes being made unsafe or altogether useless.

It would be neither possible nor advisable to rely on electrical or mechanical devices, such as lifts for moving the population of various floors to a place of safety because of the probability of fire rendering these devices inoperative. Therefore, staircases with associated escape routes become all important and staircases considered in this Code are the means of communication in an up and down direction of a building and serve not only as escape routes for occupants but also afford a direct means of access to the source of fire by the fire fighting staff. In fact, staircase landings of buildings which present a serious hazard are required to have fire fighting equipment mounted thereon comprising hydrant stand, pipes and accessories.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FIRE SAFETY OF BUILDINGS (GENERAL): EXIT REQUIREMENTS AND PERSONAL HAZARD — CODE OF PRACTICE

(*Second Revision*)

1 SCOPE

This standard covers requirements regarding fire safety of buildings with respect to exit requirements and personal hazard.

2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions listed were valid. All standards are subject to revision and the parties to agreements based on this standard are encouraged to investigate the possibility of apply the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 1641 : 1988	Fire safety of building (general) : General principles of fire grading and classification — Code of practice
IS 1642 : 1989	Fire safety of buildings (general) : Details of construction — Code of practice
IS 1646 : 1997	Fire safety of buildings (general) : Electrical installations — Code of practice
3614 (Part 1) : 1966	Specification for fire check doors: Part 1 Plate, metal covered and rolling type
4786 : 1968	Specification for variable high pressure regulators for use with liquefied petroleum gases
4878 : 1986	Byelaws for construction of cinema buildings
4963 : 1987	Recommendations for buildings and facilities for the physically handicapped
5572 : 1994	Classification of hazardous areas (other than mines) having flammable gases and vapours for electrical installations
SP 7 : 2005	National Building Code of India 2005

3 EXIT REQUIREMENTS

3.1 Ample provision for escape of population of a building when on fire is vital and all routes should be constructed to ensure that the population reaches a place of safety in the shortest period of time without undue hindrance by smoke, fumes, debris and the like. Every exit, exit access or exit discharge shall be continuously maintained free of all obstructions or impediments to full use in the case of fire or other emergency.

Every building meant for human occupancy should be provided with exits sufficient to permit safe escape of occupants, in case of fire or other emergency.

3.2 Types of Exits

3.2.1 An exit may be a doorway, a corridor or passageway(s) to an internal staircase, or external staircase, or to a *verandah* or terrace(s) which have access to the street, or roof of a building, or a refuge area. An exit may also include a horizontal exit leading to an adjoining building at the same level.

3.2.2 Lifts and escalators should not be considered as exits.

3.3 General

3.3.1 In every building, exits should comply with the minimum requirements except those not accessible for general public use.

3.3.2 All exits should be free of obstructions.

3.3.3 No building should so altered as to reduce the number, width or protection of exits to less than that required.

3.3.4 Exits should be clearly visible and the routes to reach the exit should be clearly marked and sign posted to guide the population of the floor concerned. Signs shall be illuminated and wired to an independent electrical circuit on an alternative source of supply. The colour of the exit signs shall be green.

NOTE —This provision should not apply to A-2 and A-4 occupancies up to 15 m in height (*see* 3.7.3 and 3.7.5).

3.3.5 The floors of areas covered for the means of exit shall be illuminated to values not less than 1 ft candle (10 lux) at floor level. In auditoriums, theatres, concert halls and such other places of assembly, the illumination of floor exit/access may be reduced during period of performances to values not less than 1/5 ft candle (2 lux).

3.3.6 Fire check doors [see IS 3614 (Part 1)] should at appropriate places along the escape routes to prevent spread of fire and smoke and particularly at the entrance to lifts and stairs where a 'funnel or flue effect' may be created, including an upward spread of fire.

3.3.7 All exits should provide continuous means of access to the exterior of a building or to an exterior open space leading to a street.

3.3.8 Exits should be so arranged that they may be reached without passing through another occupied unit.

3.4 Occupant Load

For determining the exits requirement, the number of persons within any floor area or the occupant load should be based on the actual number of occupants, but in no case less than that specified in Table 1.

3.4.1 Mezzanine and Balcony

The occupant load of a mezzanine floor and balcony discharging to a floor below should be added to that floor occupancy and the capacity of the exits shall be designed for the local occupancy load thus established.

Table 1 Occupant Load
(Clause 3.4)

Sl No.	Group of Occupancy (see IS 1641)	Occupant Load, Floor Area in m ² /Person
(1)	(2)	(3)
i)	Residential (A)	12.5
ii)	Educational (B)	4
iii)	Institutional (C)	15 ¹⁾
iv)	Assembly (D)	
	a) with fixed or loose seats and dance floors	0.6 ¹⁾
	b) without seating facilities including dining rooms	1.5 ²⁾
v)	Mercantile (F)	
	a) street floor and sales basement	3
	b) upper sale floors	6
vi)	Business and Industrial (E and G)	10
vii)	Storage (H)	30
viii)	Hazardous (J)	10

¹⁾ Occupant load in dormitory portions of homes for the aged, orphanages, insane asylums etc, where sleeping accommodation is provided, should be calculated at not less than 7.5 m² gross floor area/person.

²⁾ The gross floor area should include, in addition to the main assembly room or space, any occupied connecting room or space in the same storey or in the storeys above or below where entrance in common to such rooms and spaces and they are available for use by the occupants of the assembly place. No deductions should be made in the gross area for corridors, closets or other subdivision; the area should include all space serving the particular assembly occupancy.

3.5 Capacity of Exits

3.5.1 The unit of exit width, used to measure the capacity of any exit, should be 50 cm. A clear width of 25 cm should be counted as an additional half unit. Clear widths less than 25 cm should not be counted for exit width.

3.5.2 Occupants per unit exit width should be in accordance with Table 2.

3.5.3 Horizontal Exit Allowance

When horizontal exit is provided in buildings of mercantile, storage, industrial, business and assembly occupancies, the capacity per storey per unit width of exit of stairways in Table 2 may be increased by 50 percent; and in buildings of institutional occupancy, it may be increased by 100 percent.

Table 2 Occupant per Unit Exit Width
(Clauses 3.5.2 and 3.5.3)

Sl No.	Group of Occupancy (see IS 1641)	Number of Occupants		
		Stairway	Ramps	Doors
(1)	(2)	(3)	(4)	(5)
i)	Residential (A)	25	50	75
ii)	Educational (B)	25	50	75
iii)	Institutional (C)	25	50	75
iv)	Assembly (D)	40	50	60
v)	Business (E)	50	60	75
vi)	Mercantile (F)	50	60	75
vii)	Industrial (G)	50	60	75
viii)	Storage (H)	50	60	75
ix)	Hazardous (J)	25	30	40

3.6 Arrangement of Exits

3.6.1 Exits should be so located that the travel distance on floor should not exceed the distance given in Table 3.

3.6.2 The dead end travel distance to an exit in a corridor should not exceed half the distance specified in Table 3 except in educational, assembly and institutional occupancies in which case it should not

Table 3 Travel Distance for Occupancy and Type of Construction
(Clauses 3.6.1 and 3.6.2)

Sl No.	Group of Occupancy (see IS 1641)	Maximum Travel Distance as per Construction (see IS 1642)	
		Types 1 & 2	Types 3 & 4
(1)	(2)	(3) m	(4) m
i)	Residential (A)	22.5	22.5
ii)	Educational (B)	22.5	22.5
iii)	Institutional (C)	22.5	22.5
iv)	Assembly (D)	30.0	30.0
v)	Business (E)	30.0	30.0
vi)	Mercantile (F)	30.0	30.0
vii)	Industrial (G)	45.0	30.0
viii)	Storage (H)	30.0	30.0
ix)	Hazardous (J)	22.5	22.5

exceed 6 m. The capacity of any open mezzanine or balcony shall be added to the capacity of the floor for the purpose of determining exit capacity.

3.6.3 Whenever more than one exit is required for any room, space or floor of a building, exits should be placed as remote from each other as possible and should be arranged to provide direct access in separate directions from any point in the area served.

3.7 Number of Exits

3.7.1 General Requirement

All buildings which are more than 15 m in height and all buildings used as educational (B), assembly (D), institutional (F), industrial (G), storage (H), and hazardous (J) occupancies and mixed occupancies with any of the aforesaid occupancies, having area more than 500 m² on each floor should have a minimum two staircases. They should be of enclosed type; at least one of them should be on external walls of buildings and should open directly to the exterior, interior open space or to an open place of safety. Further, the provision or otherwise of alternative staircase should be subject to the requirements of travel distance being complied with.

3.7.2 Rooming Houses of Residential Buildings (A-1)

Every sleeping room above the street floor should have access to two separate means of exit, at least one of which should consist of an enclosed interior stairway or an exterior stairway, or a fire escape or horizontal exit, all so arranged as to provide a safe path of travel to the outside of the building without traversing any corridor or space exposed to an unprotected vertical opening.

3.7.3 One or Two Family Private Dwellings or Residential Building (A-2)

3.7.3.1 For more than two rooms, every occupied room excluding areas used solely for storage, should have at least two means of exit, at least one of which should be a door or a stairway providing a means of unobstructed travel to the outside of the building or street or grade level and not more than one of which may be a window. No room or space should be occupied which is accessible only by a ladder, folding stairs or through a trap door.

3.7.3.2 All locking devices which would impede or prohibit exit, such as chain type bolts, limited opening sliding type locks and burglar locks which are not disengaged easily by quick releasing catches, should be prohibited. All closet door latches should be such that even children may open the doors from inside. All bathroom door locks or fasteners should be designed to permit the opening of the locked or closed door from

the outside in an emergency.

3.7.4 Dormitories (A-3)

All dormitories, except those mentioned in **3.7.6** should have exits so arranged that from any sleeping room or open dormitory sleeping area, there should be access to two separate and distinct exits in different directions with no common path of travel unless the room or space is subject to occupancy by not more than 10 persons and has a door opening directly to the outside of the building at street or grade level, or to an outside stairway in which case one means of exit may be accepted.

3.7.5 Apartment House (A-4)

3.7.5.1 Every individual living unit should comply with the requirements for occupancy sub-division A-2 in respect of exit (*see 3.7.3*).

3.7.5.2 Every living unit should have access to at least two separate exits which are remote from each other and are reached by travel in different directions except that a common path of travel may be permitted for the first 6 m (that is, a dead-end corridor up to 6 m long may be permitted) provided that single exit may be permitted under any of the conditions given in **3.7.5.3**.

3.7.5.3 Any building not more than two storeys in height with no basement, or in case there is a basement and with street floor level not more than 2.5 m above ground at any point next to the building, excluding driveways, not more than 10 percent of the perimeter should be subject to the condition that the access to the basement is only from the exterior of the building if the basement contains a heating plant, group storage, incinerator room or paint shop or other hazardous occupancy.

3.7.5.4 At least half of required exits should discharge direct to the outside of the buildings, any other exit should be the same as required for the hotels (*see 3.7.6*).

3.7.6 Hotels (A-5)

3.7.6.1 Not less than two exits, as remote from each other as practicable, should be accessible from every floor, including basements occupied for hotel purposes, except as a single exit as permitted in **3.7.6.2**. Exits and ways of access thereto should be so arranged that they are accessible in at least two different directions from every point in any open area, or from any room door.

3.7.6.2 Any room or section with an outside door at street or grade level may have such outside door as a single exit provided no part of the room or area is more than 15 m from the door measured along the natural path of travel.

3.7.6.3 Where stairways or other exits serve two or

more upper floors, the same stairway or other exit required to serve any one upper floor may also serve other upper floors except that no inside open stairway or ramp may serve as a required egress facility from more than one floor.

NOTE — Under this provision, if the second and third floors were each required to have three stairways, the second floor may use the stairways serving the third floor so that the total number of stairways required is three, and not six.

3.7.7 Basement Exits for Residential Buildings (A)

3.7.7.1 Basements occupied for hotel purposes should have exits arranged in accordance with 3.7.6.

3.7.7.2 Basement exits should be sufficient to provide for the capacity of the basement as determined in accordance with 3.3 and in no case should there be less than two independent basement exits.

3.7.7.3 Basements or sub-basements not open to the public and used only for heating equipment, storage and service operations (other than kitchens which are considered part of the hotel occupancy) should have exits appropriate to the actual occupancy, in accordance with applicable provisions or in case of mixed occupancy where there may be doubt as to which other section is applicable, such basements should have exits determined on the basis of lesser exit capacity.

3.7.8 Educational (B)

3.7.8.1 Buildings intended for educational occupancy shall not be used for any hazardous occupancy except incidental to educational buildings like laboratories etc.

3.7.8.2 At least two separate exits are available in every floor area. Exits should be as remote from each other as practicable and so arranged that there are no pockets or dead ends of appreciable size in which occupants may be trapped.

3.7.8.3 Every room with a capacity of over 45 persons in area should have at least two doorways as remote from each other as practicable. Such doorways should provide access to separate exits but may open upon a common corridor leading to separate exits in opposite directions.

3.7.8.4 Exterior doors should be operated by bars or some other panic hardware device except that doors leading from classroom directly to the outside may be equipped with the same type of lock as is used on classroom doors leading to corridor with no provision whatsoever for locking against egress from the classroom.

3.7.8.5 Additional precautions

- a) Storage of volatile flammable liquids shall be prohibited and the handling of such liquids shall be restricted to science laboratories only.

- b) Each building shall be provided with an approved outside gas shut-off valve **conspicuously marked**. The detailed requirements regarding safe use of gas shall be as specified in IS 4786.
- c) All exterior openings in a boiler room or rooms containing central heating equipment, if located below opening in another storey or if less than 3 m from other doors or windows of the same building, shall be protected by a fire door assembly. Such assemblies shall be fixed, automatic or self-closing. Provisions of residential buildings shall also apply to this group of occupancy.

3.7.8.6 Exception and deviation

- a) Gymnasiums, indoor stadiums and similar occupancies may have floors/ running tracks of wood, cinder, synthetic or unprotected steel or iron.
- b) In gymnasiums and in multi-purpose school rooms having an area not greater than 300 m², 25 mm nominal tight tongue-and-grooved or 20 mm plywood wall covering may be used in the inner side in lieu of fire-resistance plaster.
- c) A building, which will have only the first floor and is accessible to not more than 20 students at any time, may be used for school purposes with the following exceptions:
 - 1) Exterior walls or parts of walls which are less than 1 000 mm from adjacent property lines shall have no openings therein.
 - 2) Classrooms may have only one exit not less than 1 000 mm wide.

3.7.9 Institutional (C)

3.7.9.1 In buildings or sections occupied by bedridden patients where the floor area is over 280 m², facilities should be provided to move patients in hospital beds to the other side of a smoke barrier from any part of such building or section not directly served by approved horizontal exits or exits from the first floor (Floor 2) of a building to the outside.

3.7.9.2 Not less than two exits of one or more of the following types should be provided for every floor, including basement, of every building or section:

- a) Doors leading directly outside the building,
- b) Stairways,
- c) Ramps,
- d) Horizontal exits, and
- e) Fire tower.

3.7.9.3 All required exits which serve egress from hospital or infirmary sections should be not less than 2 m in clear width, including **patient bedroom doors**, to permit transport of patients on beds, litters or mattresses. The minimum widths of corridors serving patients bedrooms in building should be 240 cm. For detailed information on recommendations for buildings and facilities for the physically handicapped, reference may be made to IS 4963.

3.7.9.4 Revolving doors should not be counted as required exits and should not be installed, except in situations, such as revolving doors at a main entrance where they are not subject to emergency exit used by patients.

3.7.9.5 Elevators constitute a desirable supplementary facility but are not counted as required exits. Patient lifts shall also be provided with enough room for transporting a stretcher trolley.

3.7.9.6 Each storey in which 35 or more patients are housed should be divided into at least two compartments by smoke barriers and the Authority may require storeys housing a lesser number of patients to be divided into compartments when, in its judgment, such division is essential for the protection of the patients. Any area providing sleeping accommodation to the patients exceeding 500 m² (unsprinkled) or 750 m² (sprinkled) shall be divided into compartments by fire resisting walls.

3.7.9.7 Doors in smoke barriers should be so installed that these may normally be kept in open position but will close automatically or may be released manually to self-closing action. Corridor door openings in smoke barriers should not be less than 150 cm in width. Provision should also be made for double swing single/double leaf type door.

3.7.9.8 Exits and other features for penal and mental institutions, and custodial institutions should be the same as specified for hospitals, in so far as applicable. Reliable means should be provided to permit the prompt release of inmates from any locked section in case of fire or other emergency.

3.7.9.9 Wherever any inmates are confined in any locked rooms or spaces, adequate guards or other personnel should be continuously on duty or immediately available to provide for release of inmates or for such other action as may be indicated in case of fire or other emergency.

3.7.9.10 No building constructed in whole or in part of combustible materials should be used to combine inmates in cells or sleeping quarters unless automatic sprinkler protection is provided.

3.7.9.11 All buildings or sections of buildings penal

and mental institutions used for manufacturing, storage or office purposes should have exits in accordance with **the provisions of occupancies.**

3.7.9.12 *Additional precautions*

- a) No combustible material of any kind shall be stored or used in any building or section thereof used for institutional occupancy, except as necessary to normal occupancy and use of the building.
- b) Bare minimum quantities of flammable material such as chloroform, ethyl alcohol, spirit, etc shall be allowed to be stored and handled. The handling of such liquids shall not be permitted by un-authorized persons. Bulk storage of these items, will be governed by relevant rules and safe practices.

3.7.9.13 *Exception and deviation*

It is recognized that in institutions or part of buildings housing various types of psychiatric patients, or used as penal and mental 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.

3.7.10 *Assembly Building (D)*

3.7.10.1 Every place of assembly, every tier or balcony, and every individual room used as a place of assembly should have exits sufficient to provide for the total capacity thereof as determined in accordance with **3.7.7**. Door width for assembly buildings shall not be less than 2 000 mm.

3.7.10.2 Every place of assembly of sub-division D-1 should have at least four separate exits as remote from each other as practicable.

3.7.10.3 Every place of assembly of sub-division D-2 should have at least two separate exits remote from each other as practicable and if of capacity is over 600, at least three exits should be provided with each exit not less than of 2 000 mm widths.

3.7.10.4 Every place of assembly of sub-divisions D-3, D-4 and D-5 should have atleast two means of exit, consisting of separate exits or doors leading to corridor or other spaces giving access to two separate and independent exits in different directions, except that for places of assembly having a capacity of less than

100 persons, one 2 000 mm doorway may be permitted in rooms where no part of the room is more than 15 m from the doorway, measured along the line of travel, and the doorway leads directly outside the building at grade level or leads to a corridor or other space giving access to two separate and independent exits.

3.7.10.5 Clear aisles not less than 1.2 m in width should be formed at right angles to the line of seating in such number and manner that no seat should be more than seven seats away from an aisle. Rows of seats opening on to an aisle at one end only should have not more than seven seats. Under the conditions where all these aisles do not directly meet the exit doors, cross-aisles should be provided parallel to the line of seating so as to provide direct access to the exit, provided that not more than one cross-aisle for every 10 rows should be required. The width of cross-aisles should be a minimum of 1 m. Steps should not be placed in aisles to overcome differences in levels unless the gradient exceeds 1 in 10.

3.7.10.6 The fascia of boxes, balconies and galleries shall have substantial railings not less than 1 000 mm high above the floor. The railings at the end of aisles extending to the fascia shall be not less than 1 100 mm high for the width of the aisle or 1 200 mm high at the foot of steps.

3.7.10.7 Cross-aisles except where the backs of seats on the front of the aisle project 60 cm or more above the floor of the aisle, should be provided with railings not less than 90 cm high.

3.7.10.8 No turnstiles or other devices to exits which restrict the movement of persons should be installed in any place of assembly in such a manner as to interfere in any way with the required exit facilities.

3.7.10.9 In theatres and similar places of public assembly where persons are admitted to the building at a time when seats are not available for them and are allowed to wait in a lobby or similar space until seats are available, such use of lobby or similar space should not encroach upon the required clear width of exits.

Such waiting should be restricted to areas separated from the required exit ways by substantial permanent partitions or fixed rigid railing not less than 105 cm high. Exits should be provided for such waiting spaces on the basis of one person for each 0.3 m² of waiting space area. Such exits should be in addition to the exits specified for the main auditorium area and should conform in construction and arrangement to the general rules of exits given above.

3.7.10.10 No display or exhibit should be so installed or operated as to interfere in any way with access to any required exit, or with any required exit sign. All displays or exhibits of combustible material or

construction and all booths and temporary construction in connection with it should be so limited in combustibility or protected as to avoid any undue hazard of fire which might endanger occupants before they have opportunity to use the available exits.

3.7.10.11 No mirrors should be placed in or adjacent to any exit way in such a manner as to confuse the direction of the exit.

3.7.10.12 Places of assembly in buildings of other occupancy may use exits common to the place of assembly and other occupancy. Provided the assembly area and other occupancy are considered separately, each has exits sufficient to meet the requirements.

3.7.10.13 Exits should be sufficient for simultaneous occupancy of both the places of assembly and other parts of the building, unless the conditions are such that simultaneous occupancy will not occur.

3.7.10.14 For any place of assembly under sub-division D-1, at least half the required means of exits should lead directly outdoors or through exit ways completely separated from exits serving other parts of the building.

3.7.10.15 For detailed information regarding cinema buildings, reference may be made to the latest provisions of *Cinematography Act*. However, following guidelines may be adopted:

3.7.10.15.1 *Lighting*

No open flame lighting devices shall be used in any place of assembly, except in the following cases:

- a) Where necessary for ceremonial purposes, the enforcing Authority may permit open flame lighting under such restrictions as are necessary to avoid danger of ignition of combustible materials or injury to occupants.
- b) Candles may be used on restaurant tables if securely supported on non-combustible bases and so located as to avoid danger of ignition of combustible materials.
- c) Open flame devices may be used on stages where they are a necessary part of theatrical performance, provided adequate precautions, satisfactory to the Authority are taken to prevent ignition of combustible materials.

3.7.10.16 *Additional precautions*

The decorations of places of assembly shall be of non-flammable materials. Fabrics and papers used for such purpose shall be treated with an effective flame-retardant material. Stage settings made of combustible materials shall likewise be treated with fire retardant materials of Class 1 flame spread.

3.7.10.17 Seats in places of public assembly,

accommodating more than 300 persons, shall be securely fastened to the floor, except as permitted in next subclause. All seats in balconies and galleries shall be securely fastened to the floor, except that in nailed-in enclosures, boxes with level floors and having not more than 14 seats, the seats need not be fastened.

3.7.10.18 Chairs not secured to the floor may be permitted in restaurants, night clubs and other occupancies where the fastening of seats to the floor may not be practicable, provided that in the area used for seating, excluding dance floor, stage, etc, there shall be not more than one seat for each 1.4 m² of floor area and adequate aisles to reach exits shall be maintained at all times.

Rows of seats between aisles shall have not more than 14 seats.

Rows of seats opening on to an aisle at one end only shall have not more than 7 seats.

Seats without dividing arms shall have their capacity determined by allowing 450 mm per person.

The spacing of rows of seats from back to back shall be neither less than 850 mm nor less than 700 mm plus the sum of the thickness of the back and inclination of the back. There shall be a space of not less than 350 mm between the back of one seat and the front of the seat immediately behind it as measured between plumb lines.

3.7.10.19 Rooms containing high pressure boilers, refrigerating machinery other than domestic refrigerator type, large transformers or other service equipments subject to possible explosion shall not be located directly under or adjacent to the required exits. All such rooms shall be effectively cut off from other parts of the building and provided with adequate vents to the outer air.

3.7.10.20 All rooms or areas used for storage of any combustible materials or equipment, or for painting, refinishing, repair or similar purposes shall be effectively cut off from assembly areas or protected with a standard system of automatic sprinklers. They shall be located away from staircases.

3.7.10.21 Every stage equipped with fly galleries, grid irons and rigging for movable theatre type scenery, shall have a system of automatic sprinklers over and under such stage areas or spaces and auxiliary spaces, such as dressing rooms, store rooms and workshops, and the proscenium opening shall be provided with a fire-resisting curtain, capable of withstanding a lateral pressure of 4 kN/m² over the entire area. The curtain shall have an emergency closing device capable of causing the curtain to close without the use of power and when so closed, it shall be reasonably tight against

the passage of smoke.

3.7.10.22 The stage roof of every theatre using movable scenery or having a motion picture screen of highly combustible construction shall have a ventilator or ventilators in or above it, open able from the stage floor by hand and also opening by fusible links or some other approved automatic heat/smoke actuated device, to give a free opening equal to at least one-eighth the area of the floor of the stage.

3.7.10.23 The proscenium wall of every theatre using movable scenery of decorations shall have, exclusive of the proscenium opening, not more than two openings entering the stage, each not to exceed 2 m² and fitted with self-closing fire resistant doors.

3.7.10.24 Every place of assembly in which projection of motion pictures by light is made shall have the projection apparatus enclosed in a fire-resisting fixed booth in accordance with IS 4878, except that such booth shall not be required where no nitrocellulose motion picture film is used.

3.7.10.25 Automatic smoke vents actuated by smoke detectors shall be installed above the auditorium or theatres, including motion picture houses, with vent area equal to not less than 3/3 percent of the floor area of the auditorium, including the sum of the floor areas of all balconies, galleries, boxes and tiers. It may be desirable to provide a large number of small vents rather than a small number of large vents.

3.7.10.26 *Exception and deviation*

Where boilers or central heating plants using liquid or solid fuel are located at grade level, these shall be separated from the remainder of the building by a separating wall with openings protected as given under mixed occupancies and openings in separating walls and floors in the general requirements.

Gymnasiums, indoor stadiums and similar occupancies may have floors/running tracks of wood, cinder, synthetic or un-protected steel or iron.

The underside of continuous steel deck grand stands when erected outdoors need not be fire-protected when occupied for public toilets.

3.7.10.27 *Fire protection and fire fighting system for metro stations*

3.7.10.27.1 *Wet riser system*

Main and diesel fire pump of 1 800 LPM capacity to be provided to support 3 to 4 hydrants at a time. Jockey pump capacity shall be 180 LPM. Where it is possible to extend reliable DG supply to the fire pump room without routing through the station building, the provision of diesel pump can be dispensed with and

instead, two electric pumps may be provided out of which at least one should have DG backup. The jockey pump should also have DG back up.

3.7.10.27.2 Internal hydrant

The internal hydrant is proposed to be provided with 2 numbers RRL hose pipes of 38 mm diameter with 63 mm standard instantaneous coupling along with associated branch pipes and cabinet and a first aid hose reel of 25 mm diameter, length 45 m and fitted with 6.5 mm nozzle.

Two internal hydrants are proposed to be provided on each platform in such a way so that most of the platform is covered by hose. However, in case of necessity, the hose pipes from other hose cabinets can be utilized for extending the length of fire hose pipe for fire fighting, if need be. At the concourse level minimum two hydrants will be provided. In station where the concourse is split into two halves at least one hydrant is to be provided in each half of the concourse. Further, in case the area is more than 2 000 sq m, an additional first aid hose-reel point shall be provided for every additional 1 000 sq m.

In addition, hydrants shall be provided in commercial areas also. One hydrant shall be provided at entry of each station at ground floor for providing the coverage to the parking area.

3.7.10.27.3 Sprinklers

Sprinklers are required to be provided only in the commercial areas, if any, in the station. The commercial areas will be segregated from the station area through 2 h fire rated walls and doors. Additional sprinklers pumps are not required, as two pumps already provided for hydrant system will take care of the sprinkler flow requirements.

However, if such commercial areas in the premises of stations are in isolated building separate from the station building then the provision of sprinkler pump and water tank capacities shall be as per SP 7. The water storage and pumps may however be common.

3.7.10.27.4 Detectors

Detectors are required to be provided only in areas where there are false ceiling and false floor and areas of equipment rooms. Wherever there are false ceiling, the detectors should be provided both above and below false ceiling giving due consideration to depth of false ceiling/flooring. However, in concourse, the detectors below false ceiling may not be effective due to heights/cross ventilation and therefore may not be provided. In other areas, because of high heights and cross-ventilations, detectors will not be effective and hence therefore can be dispensed. A conventional detection system will suffice at a normal station.

3.7.10.27.5 Manual call box

Manual call box should be provided at a central place on each platform (near emergency plunger) and at least two on the concourse, on each sidewall. When the concourse in two halves there should be one manual call box on each side.

3.7.10.27.6 Manual panel gas flooding

Electric panels should have provision of manual gas flooding. Alternatively panels can be provided with linear heat sensing tubes with CO₂ cylinder. This required to be provided only in main power panels that is HT panel, main LT panel, main LT distribution board and Essential power panels and other such major panels.

3.7.10.27.7 External area of the station

A 'two way/four way' fire brigade inlet to be provided at ground level on each rising main for hydrants/sprinkles.

The 'Draw Off Connection' shall be provided on the underground tank for fire brigade.

3.7.10.27.8 Water tank capacity

Capacity of fire tanks at stations without any commercial development (Beverage stall/ATM/Florist/Book stalls up to total 250 m² excluded) shall be 50 000 litres.

However, at stations having commercial development, the fire tank capacity shall be 100 000 litres.

3.7.10.27.9 Portable fire extinguishers

The following portable extinguishers are recommended:

- a) Water CO₂ type 9 litres, and
- b) CO₂ fire extinguishers 4.5 kg.

3.7.11 Business (E)

3.7.11.1 In the case of mezzanines or balconies open to the floor below, or other unprotected vertical openings between floors, the population of the mezzanine or other subsidiary floor level should be added to that of the main floor for the purpose of determining the required exits, provided, however, that in no case should the total number of exits, units be less than that required if all the vertical openings were enclosed.

3.7.11.2 Not less than two exits should be provided for every floor, including basements occupied for office purposes or uses incidental thereto.

3.7.11.3 Additional requirements

The handling and use of gasoline, fuel oil and other

flammable liquids shall not be permitted, unless such use and handling complies with the appropriate regulations.

Every boiler room or room containing a central heating plant using solid or liquid fuel shall be separated from the rest of the building by a separating wall of 4 h rating. Every boiler room or room containing a central heating plant, which burns gas as a fuel shall be adequately separated from the rest of the building.

3.7.11.4 *Exception and deviation*

Basements used only for storage, heating, any other service equipment shall conform to exit requirements for Group H occupancies in all respects.

3.7.12 *Mercantile (F)*

3.7.12.1 In the case of mezzanines or balconies open to the floor below, or other unprotected vertical openings between floors, the population or area of the mezzanine or other subsidiary floor level should be added to that of the main floor for the purpose of determining the required exits, provided, however, that in no case should the total number of exits units be less than that required if all vertical openings were enclosed.

3.7.12.2 At least two separate exits should be accessible from every part of every floor, including basements; such exits should be as remote from each other as practicable and so arranged as to be reached by different paths of travel in different directions except that a common path of travel may be permitted for the first 15 m from any point.

3.7.12.3 *Additional precautions*

Requirements specified for Business buildings shall be applicable to all Group F occupancies also.

Hazardous areas of mercantile occupancies shall be segregated or protected suitably as per the requirements laid down in J (Hazardous Occupancy).

In self-service stores, no check-out stand or associated railings or barriers shall obstruct exits or required aisles or approaches thereto.

Open-air mercantile operations, such as open-air markets, gasoline filling stations, roadside stands for the sale of a farm produce and other outdoor mercantile operations shall be so arranged and conducted as to maintain free and unobstructed ways of travel at all times to permit prompt escape from any point of danger in case of fire or other emergency, but no dead-ends in which persons might be trapped due to display stands, adjoining buildings, fences, vehicles or other obstructions.

If mercantile operations are conducted in roofed-over areas, these shall be treated as mercantile buildings,

provided canopies over individual small stands to protect merchandise from the weather shall not be **constructed to constitute buildings for the purpose of the Code.**

NOTE — Classification of Low/Moderate/High hazard occupancies are given in IS 1641.

3.7.12.4 *Exception and deviation*

Any mercantile occupancy, where goods of a highly hazardous nature are pre-dominant, shall be considered under Group J occupancy for the purpose of the Code.

3.7.13 *Industrial (G)*

3.7.13.1 Not less than two exits should be provided for every floor or section, including basements used for industrial purposes or uses incidental thereto.

3.7.13.2 In buildings used for aircraft assembly or other occupancy requiring undivided floor areas so large that the distance from points within the area to the nearest outside walls where exit doors could be provided are in excess of 45 m, requirements for distance to exits may be satisfied by providing stairs leading to exit tunnels or to overhead passageways. In cases where such arrangements are not practicable, permit other exit arrangements for one storey buildings with distance in excess of the maximum distances specified in 3.6. If completely automatic sprinkler protection is provided and if the heights of ceiling curtain boards and roof ventilation are such as to minimize the possibility that employees will be overtaken by the spread of fire or smoke within 180 cm of the floor level before they have time to reach exits, provided, however, that in no case may the distance of travel to reach the nearest exit exceed 120 m where smoke venting is required as a condition for permitting distances of travel to exits in excess of the maximum otherwise allowed. The distance of travel to reach the nearest exit shall be 45 m for unsprinkled and 60 m for sprinkled.

3.7.13.3 Basements used only for storage, heating and other service equipment, and not subject to industrial occupancy should have exits in accordance with the requirements of Group H occupancies.

3.7.13.4 The following exceptions should apply to special purpose industrial occupancies:

- a) Exits need be provided only for the persons actually employed; spaces not subject to human occupancy because of the presence of machinery or equipment may be excluded from consideration.
- b) Where unprotected vertical openings are necessary to manufacturing operations, these may be permitted beyond the limits specified for industrial occupancy provided every floor level has direct access to one or more enclosed

stairways or other exits protected against obstruction by any fire in the open areas connected by the unprotected vertical openings or smoke therefrom.

3.7.13.5 The following exceptions should apply to high hazard industrial occupancies:

- a) Exits should be so located that it will not be necessary to travel more than 22.5 m from any point to reach the nearest exit.
- b) From every point in every floor area, there should at least be two exits accessible in different directions; where floor areas are divided into rooms, there should be at least two ways of escape from every room, however small, except toilet rooms, so located that the points of access thereto are out of or suitably shielded from areas of high hazard.
- c) In addition to types of exits for upper floors specified for Group G occupancies, slide escapes may be used as required exits for both new and existing buildings.

3.7.13.6 Additional precautions

In any room in which flammable substances are used or stored, no device generating a glow or flame capable of igniting flammable vapour shall be installed or used. Such a room shall be provided with a suitably designed exhaust ventilation system. To ensure safety from fire due to short circuit, faulty electrical connection or some similar cause, proper care shall be taken in designing electrical installations in such room (*see* IS 1646). All electrical fittings of class O rating shall be as per IS 5572.

The storage, use and handling of gasoline, fuel oil and other flammable liquids shall not be permitted in any Group G occupancy unless it complies with regulations pertaining to *Petroleum Act, 1934* and Rules thereunder.

Every boiler room or room below the first floor containing a heating plant shall be adequately separated by 4 h rating wall from the rest of the buildings.

For requirements regarding electrical generating and distribution stations, reference may be made to IS 1646.

Industrial buildings of low hazard are permitted only up to 18 m height.

The following exceptions shall apply to high hazard industrial occupancies:

All high hazards industrial occupancies shall have automatic sprinkler protection or such other protection as may be appropriate to the particular hazard, including explosion venting for any area subject to explosion hazard, designed to minimize danger to occupants in case of fire or other emergency before

they have time to utilize exits to escape.

Industrial buildings of moderate and high hazard are permitted only up to 15 m height.

For detailed information on fire safety of certain individual (specific) industrial occupancies reference may be made to relevant standards.

Fire protection considerations for venting industrial occupancies shall be as given in Annex D of SP 7.

3.7.14 Storage (H)

3.7.14.1 Every building or structure used for storage, and every section thereof considered separately, should have access to at least one exit so arranged and located as to provide a suitable means of escape for any person employed therein and in any room or space exceeding 1 400 m² gross area, or where more than 10 persons may be normally present, at least two separate means of exit shall be available, as remote from each other as practicable.

3.7.14.2 Every storage area should have access to at least one means of exit which can be readily opened. This should not be subject to locking so long as any persons are inside and should not depend on power operation.

3.7.14.3 The following special provisions should apply to parking garages of closed or open type, above or below ground but not to mechanical parking facilities where automobiles move into and out of storage mechanically which are not normally occupied by persons and thus require no exit facilities. Where repair operations are conducted, the exits should comply with the requirements of Group G occupancies in addition to compliance with the following:

- a) Where both parking and repair operations are conducted in the same building, the entire building should comply with the requirements for Group G occupancies unless the parking and repair sections are effectively separated by separation walls.
- b) Every floor of every closed parking garage should have access to at least two separate means of exit so arranged that from any point in the garage, the paths of travel to the two means of exit should be in different directions, except that a common path of travel may be permitted for the first 15 m from any point.
- c) On the street floor, at least two separate exit doors should be provided except that any opening for the passage of automobiles may serve as a means of exit provided no door or shutter is installed thereon. Street floor exits in closed garages should be so arranged that no point in the area is more than 30 m from

the nearest exit, or 45 m in the case of garages protected by automatic sprinklers, distance being measured along the natural path of travel.

- d) On floors above the street, at least two means of exit should be provided, one of which should be an enclosed stairway. The other means of egress may be a second exit of any of the types, or in a ramp type garage with open ramps not subject to closure, the ramp may serve as the second means of exit.
- e) Upper floor exits in closed garages should be so arranged that no point in the area should be more than 30 m from the nearest exit other than a ramp on the same floor level, or 45 m in the case of garages protected by automatic sprinklers.
- f) On floors below the street (either basement or outside underground garages), at least two exits should be provided, not counting any automobile ramps except that for garages extending only one floor level below the street, a ramp leading direct to the outside may constitute one required means of exit. In garages below street level, exits should be so arranged that no part of the area should be more than 30 m from the nearest stair exit.
- g) If any gasoline pumps are located within any closed parking garage, exits should be so located that travel away from the gasoline pump in any direction should lead to an exit, with no dead-end in which the occupants might be trapped by fire or explosion at any gasoline pump. Such exit should lead to the outside of the building on the same level, or downstairs; no upward travel should be permitted unless direct outside exits are available from the floor and any floor below (as in the case of a basement garage where the grade is one storey or more lower at the rear than at the street).

3.7.14.4 Exits from aircraft hangars (storage or servicing areas) should be provided at intervals of not more than 45 m on all exterior walls of aircrafts hangars. There should be a minimum of two exits serving each aircraft storage or servicing area. Horizontal exits through interior fire walls should be provided at intervals of not more than 30 m. 'Dwarf' or 'smash' doors in doors accommodating aircraft may be used to comply with these requirements. All doors designated as exits should be kept unlocked in the direction of exit travel while the area is occupied.

3.7.14.5 Exits from mezzanine floors in aircraft storage or servicing area should be so arranged that the

maximum travel to reach the nearest exit from any point on the mezzanine should not exceed 22.5 m. Such exits should lead directly to a properly enclosed stairwell discharging directly to the exterior or to a suitable cut-off area or to outside fire escape stairs.

3.7.14.6 The following provisions should apply to grain elevators:

- a) There should at least be one stair tower from basement to first floor and from first floor to top floor of the workhouse enclosed in a dust-tight non-combustible shaft;
- b) Non-combustible doors of self-closing type should be provided at each floor landing;
- c) An exterior fire escape of the stair or basket ladder type should be provided from the roof of the workhouse to the ground level or to the roof of an adjoining annex with access from all floors above the first; and
- d) An exterior fire escape of either the stair or basket ladder type should be provided from the roof of each storage annex to the ground level.

3.7.14.7 Every area used for storage of hazardous commodities should have an exit within 22.5 m of any point in the area where persons may be present or 30 m where automatic sprinkler protection is provided.

3.7.14.8 *Additional precautions*

In addition to the general requirements specified for type of construction and occupancy group and the exit requirements, the following requirements shall be complied with:

3.7.14.8.1 *Fire Detection/ Extinguishing System*

The requirements for group H occupancy, as specified in Table 23 and Annex C (for high rise building) of SP 7 shall apply.

NOTE — Automatic sprinklers are prohibited where water reactive materials are kept. Instead automatic fire alarm system coupled with suitable fire extinguishing systems shall be installed.

3.7.14.9 *Exceptions and deviations*

Every area used for the storage of hazardous commodities shall have an exit within 22.5 m of any point in the area where persons may be present or 35 m where automatic sprinkler protection is provided.

3.7.15 *Hazardous (J)*

Same as in **3.7.13.5**.

3.7.15.1 *Additional precautions*

In addition to the general requirements specified for type of construction and occupancy group and the exit

requirements, the following requirements shall be complied with:

Fire Detection/ Extinguishing System

The requirements for Group J occupancy, as specified in Table 23 and Annex C (for high rise building) of SP 7 shall apply.

NOTE — Hazardous buildings shall have vapour detectors/explosion suppression systems/automatic sprinklers, besides hydrant system, wet risers and automatic fire alarm system depending on the type of fire hazard involved.

Exit Facilities

General requirements and those specified for industrial buildings shall apply to Group J occupancies also.

3.7.15.2 The following requirements shall also apply to all Group J occupancies, as applicable:

- a) Each building where gas is employed for any purpose shall be provided with an approved outside gas shut-off valve conspicuously marked. The detailed requirements regarding safe use of gas shall be as specified in relevant standards.
- b) Each boiler room or room containing a heating plant shall be separated from the rest of the building by a separating wall.
- c) In any room in which volatile flammable substances are used or stored, no device generating a spark, or glow flame capable of igniting flammable vapour shall be installed or permitted unless it is enclosed in a flameproof enclosure.
- d) The use, handling, storage and sale of gasoline, fuel oil and other flammable liquids shall not be permitted in Group J occupancies unless such use, handling, storage and sale is in accordance with appropriate legislation in force.
- e) All openings in exterior walls except wall vents shall be protected by a fire stop assembly and they shall be fixed, automatic or self-closing. Wall vents having an area of not less than 100 cm² each shall be placed in the exterior walls near the floor line, not more than 1 800 mm apart horizontally. Each building shall be provided with a power driven fan exhaust system of ventilation which shall be arranged and operated so as to produce a complete change of air in each room every 3 min.
- f) Each machine in dry-cleaning establishments which uses flammable liquid shall have an adequate steam line or any other suitable extinguishing agent directly connected to it, so arranged as to have the agent automatically released to the inside of each machine should an explosion occur in the machine.

- g) Equipment or machinery which generates or emits combustible or explosive dust or fibres shall be provided with an adequate dust collecting and exhaust system.

3.8 Doorways

3.8.1 Every exit doorway should open into an enclosed stairway, or horizontal exit of a corridor, or passageway providing continuous and protected means of egress.

3.8.2 No exit doorway shall be less than 1 000 mm in width except assembly buildings where door width shall be not less than 2 000 mm. Doorways shall be not less than 2 000 mm in height.

Mirrors shall not be placed in exit ways or exit doors to avoid confusion regarding the direction of exit.

3.8.3 Exit doorways should open outwards, that is, away from the room but should not obstruct the travel along any exit. No door, when opened, should reduce the required width of stairway or landing to less than 90 cm; overhead or sliding door should not be installed.

NOTE — In the case of buildings where there is a central corridor, the doors of rooms should open inwards to permit smooth flow of traffic in the corridor.

3.8.4 Exit door should not open immediately upon a flight of stairs, a landing equal to at least the width of the door should be provided in the stairway at each doorway; the level of landing should be the same as that of the floor which it serves.

3.8.5 Exit doorways should be openable from the side which they serve without the use of a key.

3.8.6 Revolving Doors

3.8.6.1 Revolving doors should not be considered as required exits. Additional doors should be provided for exits from fire safety point of view. In mercantile buildings where there is possibility of congregation of a large number of people (more than 200), revolving doors should not be permitted.

3.8.6.2 Where the revolving door provided are completely made of toughened glass (plate glass), a red circle or emblem or logo at 1.5 m level above sill should be painted on the glass. The thickness of the toughened glass should not be not less than 12 mm.

3.9 Corridors and Passageways

3.9.1 Exit corridors and passageways should be of width not less than the aggregate required width of exit doorways leading from them in the direction of travel to the exterior. All means of exit including staircases lifts lobbies and corridors shall be adequately ventilated.

3.9.2 Where stairways discharge through corridors and

passageways, the height of corridors and passageways should be not less than 2.4 m.

3.10 Internal Staircases

3.10.1 Interior stairs should be constructed of non-combustible materials throughout.

3.10.2 Interior staircase should be constructed as a self-contained unit with an external wall constituting at least one of its sides and should be completely enclosed.

3.10.3 A staircase should not be arranged round a lift shaft unless the latter is totally enclosed by a material of fire-resistance rating as that for the type of construction itself.

3.10.4 Hollow combustible construction should not be permitted.

3.10.5 No gas piping or electrical panels shall be allowed in the stairway. Ducting in stairway may be permitted if it is of the fire resistance rating of the enclosure.

3.10.6 Notwithstanding the detailed provision for exits given above the following minimum width should be provided for staircases:

- a) Residential buildings (dwellings) — 1.0 m
NOTE — For row housing with 2 storeys, the width should be 0.75 m.
- b) Residential hotel buildings — 1.5 m
- c) Assembly buildings like auditorium, theatres and cinemas — 1.5 m
- d) Educational buildings:
 - 1) Up to 24 m in height — 1.5 m
 - 2) More than 24 m in height — 2.0 m
- e) Institutional buildings like hospitals:
 - 1) Up to 10 beds — 1.5 m
 - 2) More than 10 beds — 2.0 m
- f) All other buildings — 1.5 m

3.10.7 The minimum width of tread without nosing should be 25 cm for internal staircase of residential buildings. This should be 30 cm for hotels, assembly, educational, institutional, business and other buildings. The treads should be constructed and maintained in a manner to prevent slipping.

3.10.8 The maximum height of riser should be 19 cm for residential buildings and 15 cm for other buildings and the number should be limited to 15 per flight.

3.10.9 Hand rails should be provided at a minimum height of 100 cm and not exceeding 120 cm to be measured from the base of the middle of the treads to the top of the hand rails. Further, the gap between the two verticals should not exceed 30 cm. This gap should be reduced to 15 cm where children are likely to use the staircase. Balusters/railing shall be provided such

that the width of staircase does not reduce.

3.10.10 The design of staircase shall also take into account the following:

- a) The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2.2 m.
- b) For building 15 m in height or more, access to main staircase shall be through a fire/smoke check door of a minimum 2 h fire resistance rating. Fire resistance rating may be reduced to 1 h for residential buildings or half of the rating if sprinkled with open and control valve (except hotels and starred hotels).
- c) No living space, store or other fire risk shall open directly into the staircase or staircases.
- d) External exit door of staircase enclosure at ground level shall open directly to the open spaces or through a large lobby, if necessary.
- e) The main and external staircases shall be continuous from ground floor to the terrace level.
- f) No electrical shafts/AC ducts or gas pipes, etc, shall pass through or open in the staircases. Lifts shall not open in staircase.
- g) No combustible material shall be used for decoration/wall paneling in the staircase.
- h) Beams/Columns and other building features shall not reduce the head room/width of the staircase.
- j) The exit sign with arrow indicating the way to the escape route shall be provided at a 300 mm 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 flush with the wall and so designed that no mechanical damage shall occur to them due to moving of furniture or other heavy equipments. Further, all landings of floor shall have floor indicating boards prominently indicating the number of floor as per bye-laws.
The floor indication board shall be placed on the wall immediately facing the flight of stairs and nearest to the landing. It shall be of size not less than 0.5 m × 0.5 m.
- k) Individual floors shall be prominently indicated on the wall facing the staircases.
- m) In case of single staircase it shall terminate at the ground floor level and the access to the basement shall be by a separate staircase.

The second staircase may lead to basement levels provided the same is separate at ground level by

ventilated lobby with discharge points to two different ends through enclosures.

3.11 Fire Escapes or External Stairs

An external staircase is desirable to be provided for high rise buildings. External stairs, when provided shall always be kept in sound operable conditions.

3.11.1 Fire escapes should not be taken into account in calculating the evacuation time of a building.

3.11.2 All fire escapes should be directly connected to the ground.

3.11.3 Entrance to the fire escape should be separate and remote from the internal staircase.

3.11.4 Care should be taken to ensure that the wall opening or window opens on to or close to a fire escape.

3.11.5 The route to the fire escape should be free of obstructions at all times.

3.11.6 The fire escape should be constructed of non-combustible materials, and any doorway leading to the fire escape should have the required fire resistance.

3.11.7 No staircase, used as a fire escape, should be inclined at an angle greater than 45° to the horizontal.

3.11.8 External stairs shall have straight flight not less than 1 250 mm wide with 250 mm treads and risers not more than 190 mm. The number of risers shall be limited to 15 per flight.

3.11.9 Handrails shall be of a height not less than 1 000 mm and not extending 1 200 mm. There shall be provisions of balusters with maximum gap of 150 mm.

3.11.10 Spiral Fire Escape

The use of spiral staircase should be limited to low occupant load and to a building not exceeding 9 m in height unless they are connected to platforms, such as balconies and terraces to allow escapees to pause.

3.11.11 Spiral fire escape should be not less than 150 cm in diameter and should be designed to give adequate headroom. Unprotected steel frame staircase shall not be accepted as means of escape. However, steel staircase in an enclosed fire rated compartment of 2 h will be accepted as means of escape.

3.12 Roof Exit

In all buildings over three storeys in height where the slope of the roof is less than 20°, direct access to the roofs should be provided from the street by means of a stairway. Where roofs are used as roof gardens or for other habitable purposes, sufficient stairways should be extended to them to provide necessary exit facilities required for such occupancy.

NOTE — This does not apply to A-2 and A-4 occupancies up to 15 m height.

3.13 Horizontal Exits

3.13.1 The width of horizontal exit should be the same as for the exit doorways (*see 3.8*).

3.13.2 A horizontal exit shall be equipped with at least one fire/smoke door of minimum 1 h fire resistance, of self-closing type. Further, it is required to have direct connectivity to the fire escape staircase for evacuation.

3.13.3 Floor area on the opposite or refuge side of a horizontal exit should be sufficient to accommodate occupants of the floor areas served, allowing not less than 0.3 m²/person. For buildings more than 24 m in height, refuge area of 15 m² or an area equivalent to 0.3 m² per person to accommodate the occupants of two consecutive floors, whichever is higher, shall be provided as under:

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

- a) *For floors above 24 m and Up to 39 m* — One refuge area on the floor immediately above 24 m.
- b) *For floors above 39 m* — One refuge area on the floor immediately above 39 m and so on after every 15 m. Refuge area provided in excess of the requirements shall be counted towards FAR.

NOTE — Residential flats in multi-storied building with balcony, need not be provided with refuge area, however flats without balcony shall provide refuge area as given above.

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

3.13.5 Doors in horizontal exits should be openable at all times from both sides.

3.14 Fire Tower

Fire towers are the preferred type of escape route for storeyed buildings and their application should be considered as the safest route for escape. Their number, location and size should depend on the building concerned, and its associated escape routes.

3.14.1 In every mercantile, industrial, business, assembly buildings other than theatres, institutional and residential buildings, over 8 storeys or 24 m in height, at least one required means of egress should be a fire tower.

3.14.2 The enclosure of fire towers should be

constructed of walls with a 2 h fire-resistance rating without openings other than the exit doorways with platforms, landings and balconies having the same fire-resistance rating.

3.15 Ramps

3.15.1 Ramps should comply with all the applicable requirements for stairways regarding enclosure,

capacity and limiting dimensions except where specified for special uses and occupancies.

3.15.2 The slope of a ramp should not exceed 1 in 10. In certain cases, steeper slopes may be permitted but in no case greater than 1 in 8.

3.15.3 For all slopes exceeding 1 in 10 and wherever the use is such as to involve danger of slipping, the ramp should be surfaced with approved non-slipping material.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Fire Safety Sectional Committee, CED 36

<i>Organization</i>	<i>Representative(s)</i>
Delhi Fire Services, New Delhi	SHRI R. C. SHARMA (<i>Chairman</i>) SHRI A. K. SHARMA (<i>Alternate</i>)
Bhabha Atomic Research Centre, Mumbai	SHRI A. K. TANDLE
Builders Association of India, New Delhi	REPRESENTATIVE
Central Building Research Institute, Roorkee	DR M. P. SINGH DR SUVIR SINGH (<i>Alternate</i>)
Central Electricity Authority, New Delhi	SHRI C. S. KASANA SHRI P. C. KUREEL (<i>Alternate</i>)
Central Glass and Ceramic Research Institute, Kolkata	REPRESENTATIVE
Central Industrial Security Force, New Delhi	DEPUTY INSPECTOR GENERAL (FIRE) SHRI S. L. NAGARKAR (<i>Alternate</i>)
Central Public Works Department, New Delhi	SHRI SATYA PRAKASH BARNWAL SHRI ASHOK KUMAR GOEL (<i>Alternate</i>)
Centre for Fire & Explosive Environment Safety, New Delhi	DIRECTOR DR K. C. WADHWA (<i>Alternate</i>)
Chennai Petroleum Corporation Ltd, Chennai	SHRI J. P. K. HEPAT
Controllorate of Quality Assurance, Pune	LT-COL B. T. MANJUNATH SHRI M. B. PARADKAR (<i>Alternate</i>)
Council of Architecture, New Delhi	SHRI A. R. RAMANATHAN SHRI GIRISH MISHRA (<i>Alternate</i>)
Delhi Metro Rail Corporation Ltd, New Delhi	SHRIMATI TRIPTA KHURANA
Directorate General of Factory Advice Service & Labour Institute, Mumbai	SHRI A. K. GANGULY SHRI S. P. BANDOPADHYAYA (<i>Alternate</i>)
Electricity Consumer Grievances Redressal Forum, New Delhi	SHRI HEMANT KUMAR
Engineer-in-Chief's Branch, New Delhi	SHRI A. K. RAY SHRI S. K. GUPTA (<i>Alternate</i>)
Engineering Industrial Technical Section, Ministry of Industry, New Delhi	SHRI P. K. SUNKARIA SHRI K. C. MATHUR (<i>Alternate</i>)
Engineers India Limited, New Delhi	SHRI ARVIND KUMAR MS ALPANA SRIVASTAVA (<i>Alternate</i>)
GAIL, New Delhi	SHRI JAYANT CHAKRABORTY
Indian Oil Corporation Limited, Noida	SHRI T. K. KUMAR
Institution of Fire Engineers, New Delhi	PRESIDENT GENERAL SECRETARY (<i>Alternate</i>)
Lloyd Insulations (India) Limited, New Delhi	SHRI K. K. MITRA SHRI SANJEEV ANGRA (<i>Alternate</i>)
Ministry of Home Affairs, New Delhi	SHRI OM PRAKASH SHRI D. K. SHAMI (<i>Alternate</i>)
Mumbai Fire Brigade, Mumbai	CHIEF FIRE OFFICER DEPUTY CHIEF FIRE OFFICER (<i>Alternate</i>)
National Thermal Power Corporation Ltd, New Delhi	SHRI D. K. SURYANARAYAN
Oil Industry Safety Directorate, New Delhi	SHRI S. C. GUPTA SHRI B. R. GADEKAR (<i>Alternate</i>)
Reliance Refineries Limited, Jamnagar	SHRI VARADENDRA KOTI SHRI UMESH KHANDALKAR (<i>Alternate</i>)
Shriram Institute of Industrial Research, Delhi	REPRESENTATIVE
State Bank of India, Mumbai	SHRI J. S. GAHLAUT

<i>Organization</i>	<i>Representative(s)</i>
In personal capacity, P/4 Belgacuta, Kolkata	SHRI S. N. KUNDU
In personal capacity, K-33-A Green Park, New Delhi	SHRI S. K. DHERI
In personal capacity, C-127 Kendriya Vihar, Noida	SHRI H. S. KAPARWAN
In personal capacity, 305 SJR Verity, Amrita College Road, Kasavanahalli, Bangalore	SHRI T. R. A. KRISHNAN
BIS Directorate General	SHRI A. K. SAINI, Scientist 'F' & Head (Civil Engg) [Representing Director General (<i>Ex-officio</i>)]
<i>Member Secretary</i> SHRI S. CHATURVEDI Scientist 'E' (Civil Engg), BIS	

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc No.: CED 36 (7665).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002

Telephones : 2323 0131, 2323 3375, 2323 9402

Website: www.bis.org.in

Regional Offices:

Telephones

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

{ 2323 7617
2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi
KOLKATA 700054

{ 2337 8499, 2337 8561
2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 260 3843
260 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113

{ 2254 1216, 2254 1442
2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093

{ 2832 9295, 2832 7858
2832 7891, 2832 7892

Branches: AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.