IS : 1643 - 1988
(Reaffirmed 2002)

Indian Standard

CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): EXPOSURE HAZARD

(First Revision)

First Reprit OCTOBER 1998

UDC 699·81 : 72·011·2

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September 1988

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0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 2 May 1988, after the draft finalized by the Fire Safety Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A series of Indian Standards covering the fire safety of buildings in general, principles of fire grading, details of construction, exit requirements and exposure hazard, have been formulated. This Indian Standard, covering the last aspect, was first formulated in 1960. In the past 25 years, useful data has become available based on studies conducted in countries such as USA, UK and Canada. This revision includes the values in respect of floor area ratio, and open space according to norms adopted by these countries.

0.3 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers requirements regarding spacing of buildings to provide adequate safety against exposure hazard.

2. GENERAL

2.1 The construction and spacing of buildings with due regard to their classification (*see* IS : 1641-1988*) are the major factors to be considered which otherwise may lead to a serious conflagration intensely built-up areas. Thus exposure hazard expressed the danger or risk of spread of fire through the open air in a building on fire to another building situated in the vicinity.

2.2 The precautions taken by keeping proper spacing of the building prevent spread of fire by direct contact of flames and hot gases emitted from the burning building or by radiated heat and flying brands.

2.3 The factors like type of construction (*see* IS : 1642-1988†) based on occupancy distance between the buildings and size of the buildings influence the severity of exposure hazard.

3. MAXIMUM HEIGHT

3.1 Every building should be restricted in its height above the ground level and the number of storeys, depending upon its occupancy and the type of construction. The maximum permissible height for any combination of occupancy and types of construction should necessarily be related to the width of street fronting the building or floor area ratio (*see* **4**).

4. FLOOR AREA RATIO

4.1 The comparative floor area ratios for different occupancies and types of construction are given in Table 1.

4.2 Each portion of a building, which is separated by one or more continuous fire resisting walls, having a fire resistance of not less than 4 h, extending from the foundation to 1 m above the roof at all points, may be considered to be a separate building for the calculation of maximum permissible height and floor area, provided openings, if any, in the separating wall, are also protected by fire assemblies of 4 h.

*Code of practice for fire safety of buildings (general): General principles of fire grading and classification (*first revision*).

†Code of practice for fire safety of buildings (general): Details of construction (*first revision*).

TABLE 1 COMPARATIVE FLOOR AREA RATIOS FOR OCCUPANCIES FACING ONE PUBLIC STREET OF AT LEAST 9 m WIDTH

(*Clause* 4.1)

Occupancy Classification	Floor Area Ratio's Type of Construction			
	Type 1	Type 2	Type 3	Type 4
Residential	UL	2·0	1·4	1·0
Educational	UL	2·0	1·4	1·0
Institutional	UL	1·5	1·0	0·8
Assembly	UL	1·0	0·7	0·5
Business	UL	2·9	2·3	1·6
Mercantile	8·0	1·8	1·4	1·0
Industrial	7·5	1·9	1·6	1·3
Storage (*see* Note 4)	6·0	1·5	1·3	1·0
Hazardous (*see* Note 4)	2·8	1·1	0·9	NP

UL — Unlimited,

NP — Not permitted.

Note 1 — The FAR/values given in this table are subject to overall restrictions on the heights of buildings in the case of educational, institutional, assembly, storage and hazardous occupancies is specified in col 3 of Table 2.

Note 2 — This table has been prepared, taking into account the combustible content in the different occupancies as well as the fire resistance offered by the type of construction.

Note 3 — This table should be modified by the authority, taking into account the other aspects as given below:

a) Density in terms of dwelling units per hectare;
b) Traffic considerations;
c) Parking spaces;
d) Local fire fighting facilities; and
e) Water supply, drainage and sanitation requirements.

Note 4 — The FAR values specified in this table may be increased 20 percent for the following services:

a) A basement or cellar; space under a building constructed on stilts and used as a parking space and air-conditioning plant room used as accessory to the principal use;
b) Watchman's booth, pumphouse, garbage shaft, electric cabin or substation and other utility structures meant for the services of the building under consideration;
c) Projections and accessory buildings as specifically exempted under the code; and
d) Staircase room and lift rooms above the topmost storey; architectural features; and chimneys and elevated tanks of dimensions as permissible under the code; the area of the lift shaft shall be taken only on one floor.

Note 5 — In so far as single storey storage and hazardous occupancies are concerned, they would be further governed by volume to plot area ratio (VPR) to be decided by the authority.

5. OPEN SPACES

5.1 General — Every room intended for human habitation should have an interior or exterior open space or an open verandah open to such interior or exterior open space.

5.1.1 The open space inside and around a building have essentially to cater for the lighting and ventilation requirements of the rooms abutting such open spaces, and in the case of buildings abutting on streets in the front, rear or sides, the open spaces provided should be sufficient for the future widening of such streets.

5.2 Open Spaces Separate for Each Building of Wing — The open spaces should be separate or distinct for each building and where a building has two or more wings, each wing should have separate or distinct open spaces for the purposes of lighting and ventilation of the wings.

However, separation between accessory and main buildings more than 7 m in height should not be less than 1·5 m ; for buildings up to 7 m in height, no such separation shall be required.

5.3 Residential Buildings

5.3.1 *Exterior Open Space*

5.3.1.1 *Front open spaces*

a) Every building fronting a street should have a front space, forming an integral part of the site as below:

Sl. No.	*Front Open Space Min*	*Width of Street Fronting the Plot*
	m	m
i)	1·5*	Up to 7·5*
ii)	3·0	7·5 to 18
iii)	4·5	18 to 30
iv)	6·0	Above 30

Note — In case a building abuts two or more streets the value of open spaces is to be based on the average width of streets, of 1·8 m for cases (ii), (iii) and (iv).

b) For streets less than 7·5 m in width, the distance of the building (building line) should be at least 5 m from the centre line of the street (*see* **4.3.5**).

Note — This limiting distance has to be determined by the authority for individual road/street widths taking into account the traffic flow.

5.3.1.2 *Rear open space*

a) Every residential building should have a rear open space, forming an integral part of the site, of an average width of 3 m and at no place measuring less than 1·8 m, except that in the case of a back-to-back-site, the width of the rear open space should be 3 m throughout. Subject to the condition of free ventilation,

*For buildings up to a maximum height of 7 m.

the open space left up to half the width of the plot should also be taken into account for calculating the average width of the rear open space. For plots of depth less than 9 m, for buildings up to 7 m in height, the rear open space may be reduced to 1·5 m.

b) *Rear open space to extend throughout the rear wall* — The rear open space should be co-extensive with the entire face of the rear wall. If a building abuts on two or more streets, such rear open space should be provided throughout the face of the rear wall. Such rear wall should be the wall on the opposite side of the face of the building abutting on the wider street, unless the authority directs otherwise.

5.3.1.3 *Side open space*

a) Every semi-detached and detached building should have a permanently open air space, forming an integral part of the site as below:

1) For detached buildings, there should be a minimum side open space of 3 m on both the sides.

NOTE — For detached residential buildings up to 7 m in height on plots with a frontage less than 12 m, one of the side open spaces may be reduced to 1·5 m.

2) For semi-detached buildings, there should be a minimum side open space of 3 m on one side.

NOTE — For semi-detached buildings up to 7 m in height on plots with a frontage less than 9 m, the side open space may be reduced to 1·5 m.

3) For row-type buildings, no side open is required.

b) In the case of semi-detached buildings, the open spaces provided on one side should be as in (a) and all habitable rooms should abut either on this side open space or front and rear open spaces or an interior open space.

5.3.2 The provisions of **5.3.1.2** and **5.3.1.3** are not applicable to parking lock-up garages up to 3 m in height located at a distance of 7·5 m in any street line or front boundary of the plot.

5.3.3 The open spaces mentioned in **5.3.1.1** to **5.3.1.3** should be for residential buildings up to a height of 10 m.

5.3.3.1 For buildings of height above 10 m, the open spaces (side and rear) should be as given in Table 2.

TABLE 2 SIDE AND REAR OPEN SPACES FOR DIFFERENT HEIGHTS OF BUILDINGS

(*Clause* 5.3.3.1)

Sl No.	Height of Buildings	Side and Rear Open Spaces to be Left Around Building
(1)	(2)	(3)
	m	m
i)	10	3
ii)	15	5
iii)	18	6
iv)	21	7
v)	24	8
vi)	27	9
vii)	30	10
viii)	35	11
ix)	40	12
x)	45	13
xi)	50	14
xii)	53 and above	16

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

NOTE 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.

NOTE 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.

5.3.3.2 For tower-like structures, as an alternative to **5.3.3.1**, open spaces should be as below:

a) Up to a height of 24 m, with one set-back, the open spaces at the ground level, should be not less than 6 m;

b) For heights between 24 and 37·5 m with one set-back, the open spaces at the ground level should not be less than 9 m;

c) For heights above 37·5 m with two set-backs, the open spaces at the ground level should not be less than 12 m; and

d) The deficiency in the open spaces should be made good to satisfy **5.3.3.1** through the set-backs at the upper levels ; these set-backs should not be accessible from individual rooms/flats at these levels.

5.3.4 The front open space would govern the height of the building.

5.3.5 *Interior Open Spaces*

a) *Inner courtyard* — In case the whole of one side of every room excepting bath, WC and store room is not abutting on either the front, rear or side(s) open spaces it should abut on an inner courtyard where minimum width should be 3 m.

Further, the inner courtyard should have an area, throughout its height of not less than the square of one-fifth the height of the highest wall abutting the courtyard. Provided that when any room (excluding staircase bay, bathroom and water-closet) is dependent for its light and ventilation on an inner courtyard, the dimension should be such as is required for each wing of the building.

Where only water-closet and bathroom are abutting on the interior courtyard the size of the interior courtyard should be in line with the provision for ventilation shaft as given in **5.3.5** (b).

b) *Ventilation shaft* — For ventilating spaces for water-closets and bathrooms, if not opening on to front, side, rear and interior open spaces, these should open on to the ventilation shaft, the size of which should not be less than the values given below:

Height of Building	*Size of Ventilation Shaft*	*Minimum Size of Shaft*
m	m^2	m
Up to 10	1·2	0·9
12	2·8	1·2
18	4·0	1·5
24	5·4	1·8
30	8·0	2·4
Above 30	9·0	3·0

NOTE 1 — For buildings of height above 30 m, a mechanical ventilation system should be installed besides the provision of minimum ventilation shaft.

NOTE 2 — For fully air-conditioned residential buildings for lodging purposes, the ventilation shaft need not be insisted upon, provided the air-conditioning system works in an uninterrupted manner, also, provided there is an alternative sources of power supply.

c) *Outer courtyard* — The minimum width of the outer courtyard (as distinguished from its depth) should be not less than 2·4 m. If the width of the outer courtyard is less than 2·4 m, it should be treated as a notch and the provisions of outer courtyard should not apply. However, if the depth of the outer courtyard is more than the width, the provisions of **5.1.2** should apply for the open spaces to be left between the wings.

5.3.6 *Joint Open Air Space* — Every such interior or exterior open air space, unless the latter is a street, should be maintained for the benefit of such building exclusively and should be entirely within the owner's own premises.

5.3.6.1 If such interior or exterior open air space is intended to be used for the benefit of more than one building belonging to the same owner, the width of such open air space should be the one specified for the tallest building as specified in **5.3.3** abutting on such open air space.

5.3.6.2 If such interior or exterior open air space is jointly owned by more than one person, its width should also be as specified in **5.3**, provided every such person agrees to allow his portion of such joint open air space to be used for the benefit of every building abutting on such joint open air space and provided he sends such written consent to the authority for record. Such common open air space should thenceforth be treated as a permanently open air space required for the purposes of the Code. No boundary wall between such joint open air space should be erected or raised to a height of more than 2·0 m.

5.4 Other Occupancies

5.4.1 Open spaces for other occupancies should be as below:

a) *Educational buildings* — Except for nursery schools, the open spaces around the building should be not less than 6 m;

b) *Institutional buildings* — The open space at front should not be less than 12 m and the other open spaces around the building should be not less than 6 m;

c) *Assembly building* — The open space at front should be not less than 12 m and other spaces not less than 6 m;

NOTE — However, if assembly buildings are permitted in purely residential zones, the open spaces around the building should be not less than 12 m.

d) *Business, mercantile and storage buildings* — The open spaces around the building should be not less than 4·5 m. Where these occur in purely residential zone or in a residential with shops line zone the open spaces may be relaxed;

e) *Industrial buildings* — The open spaces around the building should be not less than 4·5 m for heights up to 16 m, with an increase in the open spaces of 0·25 m for every increase of 1 m or fraction thereof in height above 16 m; and

NOTE — Special rules for narrow industrial plots in the city, namely, plots less than 15 m in width, and with appropriate set-backs from certain streets and highways, should be applicable.

f) *Hazardous occupancies* — The open spaces around the building should be as specified for industrial buildings [*see* **5.4.1** (e)].

5.5 Exemption to Open Spaces

5.5.1 *Projections into Open Spaces* — Every open space provided either interior or exterior should be kept free from any erection thereon and should be open to the sky, except as below:

a) Cornice, roof or weather shade not more than 0·75 m wide;

b) Sunshades over windows/ventilators or other openings not more than 0·75 m wide;

c) Canopy at first level, but not to be used as sitout with clearance of 1·5 m between the plot boundary and the canopy;

d) Projected balcony at higher floors of width not more than 0·9 m; and

e) Projecting rooms/balconies [*see* **5.5.1** (d)] at alternate floors such that rooms of the lower two floors get light and air and the projection being not more than the height of the storey immediately below.

However, these projections into open spaces should not reduce the minimum required open spaces.

5.5.1.1 *Accessory building* — The following accessory buildings may be permitted in the open spaces:

a) In an existing building, sanitary block of 2·4 m in height subject to a maximum of 4 m in the rear open space at a distance of 1·5 m from the rear boundary may be permitted, where facilities are not adequate;

b) Parking lock-up garages not exceeding 2·4 m in height should be permitted in the side or rear open spaces at a distance of 7·5 m from any road line or the front boundary of the plot; and

c) Suction tank and pump room each up to 2·5 m in area.

5.5.2 *Projection into Street*

5.5.2.1 In existing built-up or congested areas, no projection of any sort whatsoever, except sunshades (*see* **5.5.2.3**) extending more than 23 cm below a height of 4·3 m, should project over the road or over any drain or over any portion outside the boundaries of the site, provided the projection arising out of the vertical part of the rain-water spouts projection at the road level or the water pipe may be permitted in accordance with the drainage plan.

5.5.2.2 *Porticos in existing developed area* — Porticos in bazar areas of existing developed areas may be permitted to project on road and subject to the following limitations:

a) Porticos may be allowed on such roads leaving a minimum clear space of 18 m between kerbs;

b) The porticos should not be less than 3 m wide;

c) Nothing should be allowed to be constructed on the portico which should be used as open terrace;

d) Nothing should be allowed to project beyond the line of arcades; and

e) The space under the portico should be paved and channelled as required.

5.5.2.3 *Sunshades over windows and ventilators* — Projections of sunshades over windows or ventilators in existing built-up or congested areas, when permitted by the authority should fulfil the following conditions:

a) No sunshade should be permitted over the road or over any drain or over any portion outside the boundaries of the site below a height of 2·8 m from the road level;

b) Sunshades provided above a height of 2·8 m from the ground level should be permitted to project up to a maximum width of 60 cm, if the road over which they project exceeds 9 m in width; and

c) No sunshade should be permitted on roads less than 9 m in width or on roads having no footpaths.

5.6 Limitations to Open Space

5.6.1 *Safeguard Against Reduction of Open Space* — No construction work on a building, should be allowed if such work operates to reduce an open air space of any other adjoining building, belonging to the same owner to an extent less than what is prescribed at the time of the proposed work or to reduce further such open space, if it is already less than that prescribed.

5.6.2 *Additions or extensions to a Building* — Additions or extensions to a building should be allowed, provided the open spaces for the additions/extensions satisfy **5.3** after such additions/extensions are made.

6. HIGH RISE BUILDINGS

6.1 For high rise buildings, the following additional provisions of means of access to the building should be ensured:

a) The width of the main street on which the building abuts should not be less than 12 m and one end of this street should join another street not less than 12 m in width;

b) The road should not end in a dead end;

c) The compulsory open spaces around the building should not be used for parking; and

d) Adequate passageway and clearances required for fire fighting vehicles to enter the premises should be provided at the main entrance; the width of such entrance should be not less than 4·5 m. If an arch or covered gate is constructed, it should have a clear head-room of not less than 5 m.

6.2 Mixed Occupancy — When any building is used for more than one type of occupancy, it should conform to the requirements for the most hazardous the occupancies. If mixed occupancies are separated by a separating wall of 4 h fire rating, the occupancies should be treated individually.

Bureau of Indian Standards

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Review of Indian Standards

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Kay Kay Printers, Delhi