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शैक्षिक संस्थानों में अग्नि शमन के लिए रीति संहिता

*Indian Standard*

**FIRE SAFETY IN EDUCATIONAL  
INSTITUTIONS — CODE OF PRACTICE**

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

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## FOREWORD

This Indian Standard has been 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.

Functional need of educational building is different from other buildings. It therefore requires specific fire safety measures suited to such type of building. The Fire Safety Sectional Committee therefore decided to formulate a separate standard on fire safety requirements of school buildings.

The hazards of fire in educational buildings can be considerably lowered by adoption of certain pre-determined fire safety measures with regard to proper planning of buildings, choice of proper materials and components, electrical equipments and making suitable provisions for fire detection and suppression system.

The composition of the technical committee responsible for the formulation of this standard is given at Annex A.

## *Indian Standard*

# FIRE SAFETY IN EDUCATIONAL INSTITUTIONS — CODE OF PRACTICE

### 1 SCOPE

This code covers the fire safety requirements in educational institutions.

### 2 NORMATIVE REFERENCES

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

### 3 CLASSIFICATION

3.1 For the purpose of the standard, the classification of educational buildings should be as given in 3.1.1.

3.1.1 All buildings shall be classified according to the use or the character of occupancy and shall be in accordance with IS 1641.

Buildings and structures under Group B shall be further subdivided as follows:

- a) *Subdivision B-1 schools up to higher secondary level*

This subdivision shall include any building or a group of buildings under single management which is used for students not less than 20 in number.

- b) *Subdivision B-2 all others/training institutions*

This subdivision shall include any building or a group of buildings under single management which is used for students not less than 100 in number.

NOTE — If residential accommodation is provided in the schools/institutions, it should be classified as building in subdivision A-3.

### 4 TYPES OF CONSTRUCTION

4.1 All educational buildings of permanent nature shall be of Type I construction having external shell and load bearing elements of 4 h fire resistance rating, while internal/non load bearing walls shall have 2 h fire resistance rating. Floors shall have same fire resistance as that of external shells, and false ceiling, if any shall have rating as laid down in

IS 1642. Basements, if constructed should not be used for classrooms or laboratories/libraries and assembly halls.

4.2 All educational buildings not of permanent nature, may have constructions conforming to Type II or Type III construction as per IS 1642. All such buildings shall be restricted to ground and one upper floor only and the floor area not exceeding to 1 000 m<sup>2</sup> on each floor.

NOTE — Temporary structures such as tents or with thatched construction should not be allowed for housing educational institutions.

### 5 OCCUPANT LOAD

5.1 Occupant load shall be in accordance with IS 1644.

### 6 ARRANGEMENT OF EXIT

6.1 Exits from the upper floor should be so located that no point in the floor is more than 22.5 m from the nearest exit, for the Type I, Type II and Type III construction.

NOTE — Type IV construction is not allowed for construction of educational buildings.

6.2 Exits should be so arranged that at least two separate exits are available in every floor area. Exits shall 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.

6.3 Every room with a capacity of 45 persons in area shall have at least two doorways.

6.4 Elevators, lifts and escalators shall not be counted as exits.

6.5 Fire escapes constitute only means of the required exit and should not be taken into account in calculating the evacuation time of the building. Fire escapes shall always be kept in sound operating conditions.

### 7 CORRIDOR AND PASSAGE WAYS

7.1 Exit corridors and passage ways shall be of width not less than the aggregate required width of exit doorways leading from them in the direction of travel to the exterior.

7.2 Where stairways discharge through corridors and passageways, the height of corridors and passageways shall be not less than 2.4 m.

7.3 All internal staircase, lift, lobbies and corridors should be adequately ventilated and illuminated.

## 8 DOORWAYS

8.1 No exit doorway shall be less than 1 m in width except assembly halls where door width should not be less than 2 m.

8.2 The height of door shall not be less than 2 m.

8.3 These shall be opening outwardly.

8.4 Overhead or sliding door shall not be installed.

NOTE — In case of buildings where there is Central Corridor the door shall open inwards to allow smooth flow of traffic in the corridor.

8.5 These shall be openable from inside and shall not be opening immediately on flight.

## 9 STAIRCASE

9.1 Any building having area more than 500 m<sup>2</sup> on each floor and 15 m or more in height shall have minimum two staircases of enclosed type; at least one of these shall be on external wall and shall directly open to exterior, interior open space or to an open place of safety. Further the provision or otherwise of alternative staircase shall be subject to the requirements of travel distance being complied with.

### 9.2 Internal Staircases

9.2.1 Internal stairs shall be constructed of non-combustible materials throughout. Hollow combustible construction shall not be permitted.

9.2.2 Internal staircases shall be constructed as a self-contained unit with an external wall constituting at least one of its sides and shall be completely enclosed.

9.2.3 Staircase shall not be arranged round a lift shaft.

9.2.4 No gas piping shall be laid in the stairway.

9.2.5 Notwithstanding, the detailed provision for exits in the educational buildings, the width of staircase shall not be less than 1.5 m up to a height of 30 m.

NOTE — Buildings above 30 m height are not permitted.

9.2.6 Minimum width of treads shall not be less than 300 mm. The treads should be constructed and maintained in a manner to prevent slipping.

9.2.7 Maximum height of riser shall not be more than 150 mm and number shall be limited to 15 per flight.

9.2.8 Height of railing shall be more than 1 m. Gap between verticles should not exceed 200 mm. The gap should be reduced to 150 mm where small children are likely to use the staircase.

9.2.9 The number of people in between floor landings in staircase shall not be less than the population on each floor for the purpose of design of staircase.

The other main parameters for the design of staircase are as given below:

- a) The minimum head room 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 or 1 h fire resistance rating. Fire resistance rating may be reduced to half an hour for residential buildings.
- 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 draught lobby, if necessary.
- e) The main staircase and external staircase shall be continuous from ground floor to the terrace level.
- f) No electrical shafts/AC ducts or gas pipe, etc, shall pass through the staircases. Lift shall not open in staircase.
- g) No combustible material shall be used for decoration/ wall panelling in the staircase.
- h) Beams/columns and other building feature 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 suitable height from the floor level on the wall and shall be illuminated by electric light connected to corridor circuits. All exit way marking signs shall 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 × 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. However, the second staircase may lead to basement levels provided the same is separated at ground level by ventilated lobby with discharge points to two different ends through enclosures.

### 9.3 External Stairs

9.3.1 All external stairs shall be directly connected to the ground.

9.3.2 Entrance to the external staircases shall be separate and remote from the internal staircase.

9.3.3 Care shall be taken to ensure that no wall opening or window opens on to or close to a external staircase.

9.3.4 The route to the external stairs shall be free from obstructions at all times.

9.3.5 The external staircase shall be constructed of non-combustible materials, preferably of masonry and any doorway leading to it should have the required fire resistance.

9.3.6 No external staircase, used as a fire escape, should be inclined at an angle greater than  $45^{\circ}$  to the horizontal.

9.3.7 External stairs shall have straight flight not less than 1 m wide with 200 mm treads and risers not more than 190 mm. The number of risers shall be limited to 15 per flight.

9.3.8 Hand rails shall be of a height not less than 1 m and not exceeding 1.2 m.

9.4 In case the educational building has got a mixed occupancy such as auditorium, etc, necessary recommendations for exits as per the requirements as given in SP 7 : 1983 shall be followed.

### 10 AIR CONDITIONING

10.1 In some educational institutions, a part of it may be having air conditioning arrangement. In case of room air conditioning, no extra precautions than laid down are required. In cases, like auditorium and laboratories having central air conditioning system, the measures as laid down in IS 1642 should apply.

### 11 CHIMNEYS

11.1 Where chimneys are used, the requirements shall be as laid down in IS 1642 and IS 1649.

### 12 RESTRICTION OF SPREAD OF FIRE AND SMOKE

12.1 The vertical shafts/ducts meant for electrical wiring, drainage pipes, etc, shall be effectively

sealed at all floor levels and shall be enclosed by 2 h fire resistance enclosures. Wherever inspection doors are required, these shall be of not less than 1 h fire resistance.

12.2 The material chosen for other use shall be as far as non-combustible and the wood/other material shall be treated with fire retardant composition if its use is unavoidable.

12.3 The laboratories which are likely to have highly flammable material/chemicals, etc, should be located in separate block and adequate precautions shall be taken to have separate stores for keeping hazardous chemicals.

12.4 The adequate care shall be taken while using any gas for burners, etc, in laboratory/kitchens and necessary precaution shall be taken for storage of gas in form of bullet, tanks, battery or cylinders, etc, as per rules.

### 13 ELECTRICAL EQUIPMENT AND SAFETY RULES

13.1 Transformer building/HT and LT control panels having aggregate oil capacity greater than 2 000 litres shall be housed in separate rooms/enclosures 6 m away, properly fenced.

13.2 Staircases and corridors lighting shall have separate circuits.

13.3 Miniature Circuit Breakers/Earth Leakage Circuit Breakers shall be provided in the circuits.

13.4 Earth connection shall be provided in building which are 15 m or more in height.

13.5 The lighting protection system for the buildings shall generally conform to IS 2309.

### 14 FIRE SAFETY MEASURES

14.1 The requirements of wet riser, down comer installations and capacity of water storage tanks and fire pumps should be as given below:

- a) For buildings less than 15 m in height:

<i>Installations</i>	<i>Minimum Requirements</i>
Hose reel	To be provided (For more than 2 storeyed buildings and covered area exceeding 1 000 m <sup>2</sup> )
Wet riser	—
Down comer	To be provided
Yard hydrant	—
Automatic sprinkler system	To be provided (In case of the buildings having basement area 200 m <sup>2</sup> and more)
Manually operated electric fire alarm system	—

<i>Installations</i>	<i>Minimum Requirements</i>	
Automatic detection and alarm system	—	<b>14.2 Fire Detection and Alarm System</b>
Underground static water storage tank	50 000 l (If total covered area exceeds 1 500 m <sup>2</sup> )	If automatic fire detection and alarm system is employed, the installation shall conform to IS 2189. The detectors, if provided, shall conform to IS 2175 and IS 11360.
Terrace tank	10 000 l (In case of hose reel and 20 000 l in case the buildings having basement area 200 m <sup>2</sup> and more)	<b>14.3</b> First aid fire fighting appliances shall be provided and installed and maintained in accordance with IS 2190.
Near underground static tank, (fire pump with) minimum pressure of 0.3 N/mm <sup>2</sup> at terrace level	One electric pump and one diesel pump of capacity 1 620 l/min and one electric pump of capacity 180 l/min	<b>15 EMERGENCY AND ESCAPE LIGHTING</b>
Pump at terrace level with minimum pressure of 0.3 N/mm <sup>2</sup>	450 l/min, in case of hose reel (900 l/min in case of hose reel and in case the buildings having basement area 200 m <sup>2</sup> and more)	<b>15.1</b> Emergency lighting shall be powered from a source independent of that supplying normal lighting.
		<b>15.2</b> The emergency lighting shall be provided to be put on within 5 second (preferably within 1 second) of the failure of the normal lighting supply.
		<b>15.3</b> Emergency lighting luminaries and their fittings shall be non-flammable.
		<b>15.4</b> It is essential that the wiring and installations of the emergency lighting systems are of high quality so as to ensure their perfect serviceability at all times.
		<b>15.5</b> The emergency lighting system shall be capable of continuous operation for a minimum duration of 1 h 30 min even for smallest premises.
		<b>15.6</b> It shall be ensured that the emergency lighting system is well maintained by periodical inspections and tests so as to ensure their perfect serviceability at all times.
		<b>15.7</b> Escape lighting shall be capable of:
		a) Indicating clearly and unambiguously the escape routes,
		b) Providing adequate illumination along such routes to allow safe movement of persons towards and through exit, and
		c) Ensuring that fire alarm call point and fire-fighting equipments provided along the escape routes can be readily located.
		<b>15.8</b> Escape lighting luminaries shall be sited to cover the following locations:
		a) Near each intersection of corridors,
		b) At each exit door,
		c) Near each change of direction in the escape route,
		d) Near each staircases so that each flight of stair receives direct light,
		e) Near any other change of floor level,
		f) Outside each final exit and close to it,
		g) Near each fire alarm call point,
		h) Near fire-fighting equipment, and
		j) To illuminate exit and safety signs as required by the enforcing authority.
		<b>NOTE</b> — For the purpose of this clause 'near' is normally considered to be within 2 m measured horizontally.
b) 15 m and above but not exceeding 30 m in height		
<i>Installation</i>	<i>Minimum Requirements</i>	
Hose reel	To be provided	
Wet riser	To be provided	
Down comer	To be provided	
Yard hydrant	To be provided	
Automatic sprinkler system	To be provided (In case the building is having a basement area 200 m <sup>2</sup> and more)	
Manually operated electric fire alarm system	To be provided	
Automatic detection and alarm system	Not to be provided	
Under ground static water storage tank	10 000 l for every 100 m <sup>2</sup> with a minimum of 5 000 l up to maximum of 1 00 000 l	
Terrace tank	20 000 l (30 000 l in case of the buildings having basement area 200 m <sup>2</sup> and more)	
Near underground static tank, fire pump with minimum pressure of 0.3 N/mm <sup>2</sup> at terrace level	One electric and one diesel pump of capacity 2 850 l/min and one electrical pump of capacity 180 l/min	
Pump at terrace level with minimum pressure of 0.3 N/mm <sup>2</sup>	900 l/min (1 620 l/min in case the buildings having basement area 200 m <sup>2</sup> and more)	

## ANNEX A

(Clause 2)

## LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
1641 : 1988	Code of practice for fire safety of buildings (general): General principles of fire grading and classification ( <i>first revision</i> )	2189 : 1988	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system ( <i>second revision</i> )
1642 : 1989	Code of practice for fire safety of buildings (general): Details of construction ( <i>first revision</i> )	2190 : 1992	Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers ( <i>third revision</i> )
1644 : 1988	Code of practice for fire safety of buildings (general): Exit requirements and personal hazard ( <i>first revision</i> )	2309 : 1989	Code of practice for the protection of buildings and allied structures against lighting ( <i>second revision</i> )
1649 : 1962	Code of practice for design and construction of flues chimneys for domestic heating appliances ( <i>first revision</i> )	11360 : 1985	Specification for smoke detectors for use in automatic electrical fire alarm system
2175 : 1988	Specification for heat sensitive fire detectors for use in automatic fire alarm system ( <i>second revision</i> )	SP 7 : 1983	National building code of India: Part IV Fire protection

## ANNEX B

### (Foreword)

#### FIRE SAFETY SECTIONAL COMMITTEE, CED 36

<i>Chairman</i>	<i>Representing</i>
SHRI J. N. VAKIL	Tariff Advisory Committee, Mumbai
<i>Members</i>	
SHRI K. RAVI ( <i>Alternate to</i> Shri J. N. Vakil)	Ministry of Defence (CEESO), New Delhi
DR A. K. BHALLA	Tariff Advisory Committee, Chennai, Calcutta
DR K. S. UPPAL ( <i>Alternate</i> )	Municipal Corporation of Mumbai (Mumbai Fire Brigade), Mumbai
SHRI S. N. CHAKRABORTY	Metallurgical and Engineering Consultants (India) Ltd, Ranchi
SHRI P. K. MAJUMDAR ( <i>Alternate</i> )	In personal capacity (B-4/5 A.G. Khan Road, Municipal Officers Society, Worli, Mumbai)
CHIEF FIRE OFFICER ( <i>Alternate</i> )	Bhabha Atomic Research Centre, Mumbai
SHRI R. N. CHACHRA	Delhi Fire Service, Government of Delhi, New Delhi
SHRI S. M. DESAI	Ministry of Home Affairs, New Delhi
SHRI RAMESH DHOBLEY	State Bank of India, Mumbai
SHRI S. K. DHERI	In personal capacity (J-1916, Chittaranjan Park, New Delhi 110019)
SHRI R. C. SHARMA ( <i>Alternate</i> )	Central Public Works Department, New Delhi
FIRE ADVISORY	Lloyd Insulations (India) Pvt Ltd, New Delhi
DY FIRE ADVISOR ( <i>Alternate</i> )	Engineers India Ltd, New Delhi
SHRI J. S. GAHLAUT	Bharat Heavy Electricals Ltd, Bhopal
SHRI P. N. GHOSH	In personal capacity (A-5, Puzhakkara Padam, Vennala, Cochin)
SHRI C. P. GOSAIN	Central Electricity Authority, New Delhi
SHRI S. C. GUPTA	Loss Prevention Association of India Ltd, Mumbai
SHRI SANJEEV ANGRA ( <i>Alternate</i> )	In personal capacity (4/34, Haji Ali Municipal Officers Cooperative Housing Society, Mumbai)
SHRI M. M. KAPOOR	Tata Consulting Engineers, Mumbai
SHRI RANA PRATAP ( <i>Alternate</i> )	In personal capacity (46, Block E-1, Pocket-II, Sector 15, Rohini, Delhi)
SHRI A. R. KHAN	Institution of Fire Engineers (India), New Delhi
SHRI NATARAJAN ( <i>Alternate</i> )	Ministry of Petroleum and Natural Gas
SHRI G. B. MENON	Ministry of Railways, New Delhi
MEMBER (HYDRO-CONSTRUCTION MONITORING)	Engineer-in-Chief's Branch, New Delhi
CHIEF ENGINEER (HTD-II) ( <i>Alternate</i> )	Central Building Research Institute, Roorkee
MANAGING DIRECTOR	National Thermal Power Corporation Ltd, New Delhi
SHRI T. V. MADHUMANI ( <i>Alternate</i> )	Ministry of Labour (Regional Labour Institute, Kanpur), New Delhi
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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 Handbook' and 'Standards Monthly Additions'.

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### Amendments Issued Since Publication

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