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RECOMMENDATIONS FOR BASIC REQUIREMENTS OF SCHOOL BUILDINGS

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RECOMMENDATIONS FOR BASIC REQUIREMENTS OF SCHOOL BUILDINGS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 February 1978, after the draft finalized by the Functional Requirements in Buildings Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 As a student moves from nursery to higher levels, the process of imparting education becomes more and more involved. This demands addition of a number of facilities to the basic class room unit depending upon the level and nature of the school. At present, in the absence of any uniform standards, there is marked variation in the educational facilities between various schools. Again in view of the changes in educational pattern as well as teaching aids adopted, it is necessary to introduce the relevant requirements in a national standard. The standard is, therefore, intended to lay down optimum requirements for school buildings, subject however to local conditions.

0.3 The purpose of this standard is not to offer design solutions for an educational facility but to lay down standards for both spatial and environmental needs of the basic class room and allied spaces.

0.4 The standard is also recommended for the renovation or expansion of facilities of the existing school buildings.

0.5 The process of education is subject to continuous changes and this standard would need periodic up-dating in order to keep pace with the changing situations.

0.6 In the preparation of this standard, assistance has been drawn from the following publication:

> School Buildings — Revised Norms and Specifications, Report of a Committee on School Buildings, Kendriya Vidyalaya Sangathan, New Delhi.

Assistance has also been taken from research work done at Central Buildings Research Institute, Roorkee.

0.7 This standard is one of a series of Indian Standards covering functional requirements in buildings. A list of standards published so far in the series is given on fourth cover page.

0.8 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.

1. SCOPE

1.1 This standard covers spatial, functional and environmental requirements of school buildings.

1.1.1 This standard does not cover requirements for boarding or residential schools.

2. TERMINOLOGY

2.1 Air Change per Hour — The ratio of the volume of outside air allowed into a room in one hour to the volume of the room.

2.2 Canteen — A place having facilities for cooking or warming of food, preferably attached to a place covered or uncovered where students and staff can assemble for meals or refreshment.

2.3 Common Room — A room primarily meant for use of students or staff during non-teaching school hours.

2.4 Decibel [dB(A)] — Sound levels as measured on a sound level meter with weighting network A.

2.5 Medical Inspection Room — A room intended for carrying medical examination or providing health care facility to the students and staff.

2.6 Pin-Board — A panel or surface of suitable material on which any display material can be temporarily fixed.

2.7 School Buildings — These shall include buildings used for school or day-care purposes, involving assembly for instruction, education or recreation up to higher secondary level.

2.8 School Hours — The time period in hours for which the school is open for teaching including recess period.

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

2.9 Use-Efficiency — It is the ratio of the actual use to the ideal use of space taken as percentage. It is expressed as:

$$\text{Use-efficiency} = \frac{\text{Area of space actually used} \times \text{Time used in hours} \times 100}{\text{Total area of space available} \times \text{School hours}}$$

NOTE — Use-efficiency is related to the organization of time table of the school.

3. GROUPING OF CLASS LEVELS

3.1 For the purpose of this standard, the class-levels have been grouped into five categories as given in Table 1. These categories take into account the age group and the level of education to be imparted.

TABLE 1 GROUPING OF CLASS LEVELS

Sl No.	Category	Age Group	Level
(1)	(2)	(3)	(4)
		years	
i)	Pre-school	3-5	Pre-Nursery, Nursery
ii)	Primary/Junior	5-10	I to IV/V
iii)	Secondary/Middle	10-13	V to VII or VIII
iv)	Higher Secondary (Old)	13-16	VIII/IX to XI
v)	Higher Secondary (New) (Ten plus two)		
	Level (i)	13-15	IX and X
	Level (ii)	15-17	XI and XII

4. CLASSROOMS

4.1 The basic unit of a school is classroom. The classroom, apart from satisfying the minimum requirements of space, fittings and furniture, shall be designed to meet the adequate functional and environmental requirements. The size of a classroom shall depend on the following:

a) Anthropometric dimensions of children and their space requirements;

b) Dimensions, arrangements of furniture and equipment and their incidence;

c) Number of students to be accommodated;

d) Types of activities to be carried out; and

e) Diverse seating arrangements essential for these activities.

4.1.1 The number of classrooms in a school and the number of sections per class should depend upon the size and level of school and use efficiency of spaces.

4.2 The classroom should be designed for the following number of student places:

a) *Nursery* — 20 to 25 student places

b) *Primary/Higher Secondary* — 40 student places

4.3 Area of Classroom — Area of classroom should be calculated on the basis of area needed per student place as given in Table 2.

4.3.1 Typical illustrations of primary and secondary classrooms with alternative furniture arrangements are shown in Fig. 1 to Fig. 4.

TABLE 2 USABLE FLOOR AREA OF CLASSROOMS

(*Clause* 4.3)

Sl No.	Category	No. of Student Places per Classroom	Gross Area of Classroom in m^2 per Student Place, *Min*
(1)	(2)	(3)	(4)
i)	Pre-school	20/25	2·00
ii)	Primary/Junior		
	i) With furniture	40	1·11
	ii) With squatting	40	0·74
iii)	Secondary/Higher Secondary	40	1·26

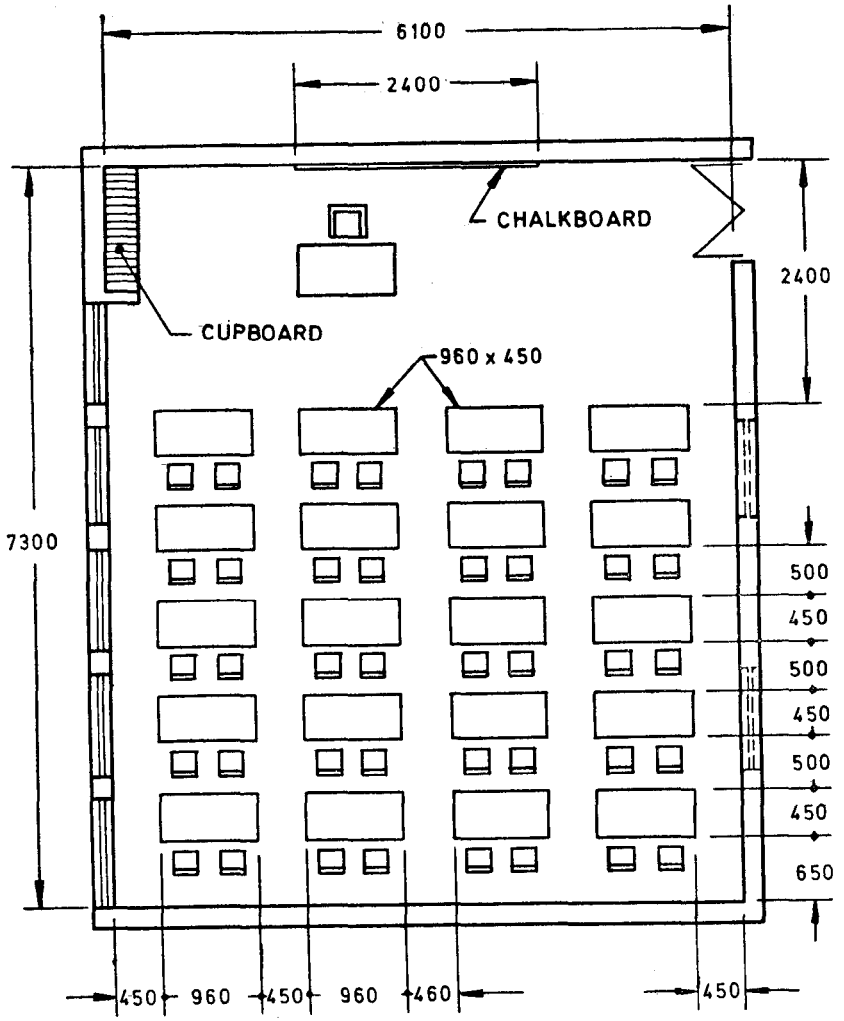
4.4 Class Room Fittings — Each classroom should be provided with the fittings as given in Table 3.

4.5 Essential Constructional Requirements

4.5.1 Height of the classroom should not be less than *3·00 m* measured at any point from the surface of the floor to the lowest point of the ceiling. The minimum headroom such as under the bottom of beams, fans and lights shall be 2·6 m measured vertically under such beam, fan or light.

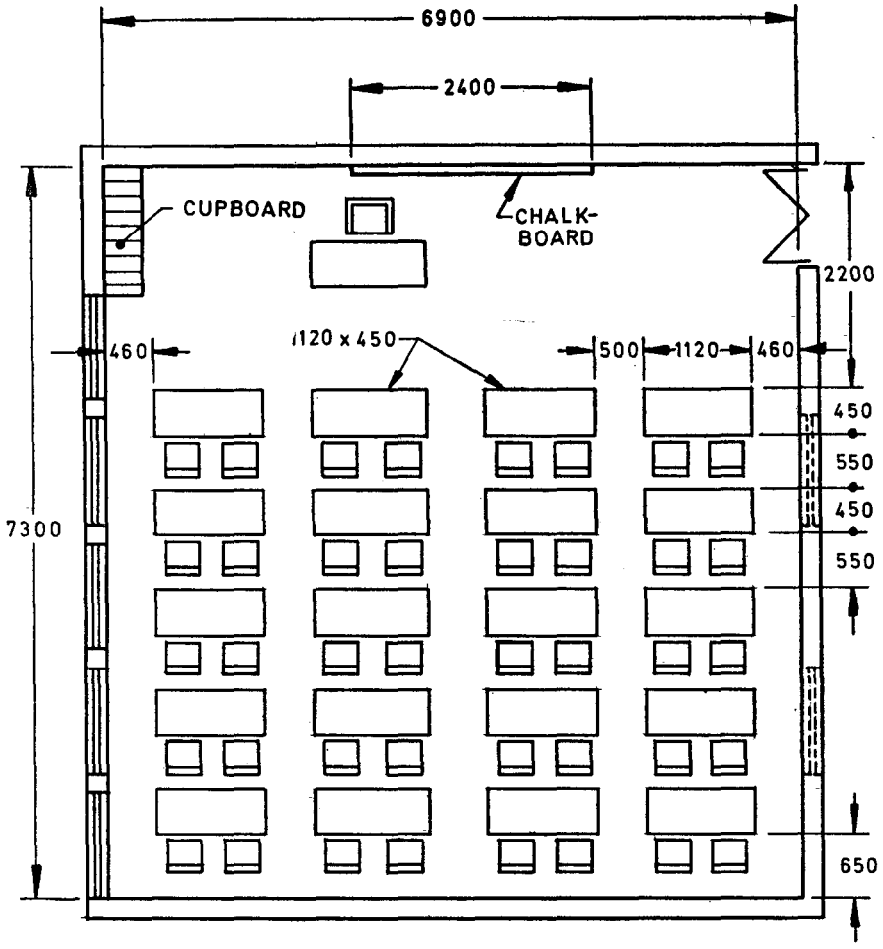
4.5.2 The proportion of the breadth (minimum dimension) to the length (maximum dimension) of the classroom should be not more than 1 : 1·5.

4.5.3 *Sill Heights* — The sill height for classrooms with furniture arrangement should be not more than 800 mm measured from finished floor level and that for the classrooms with squatting arrangement should be not more than 600 mm.



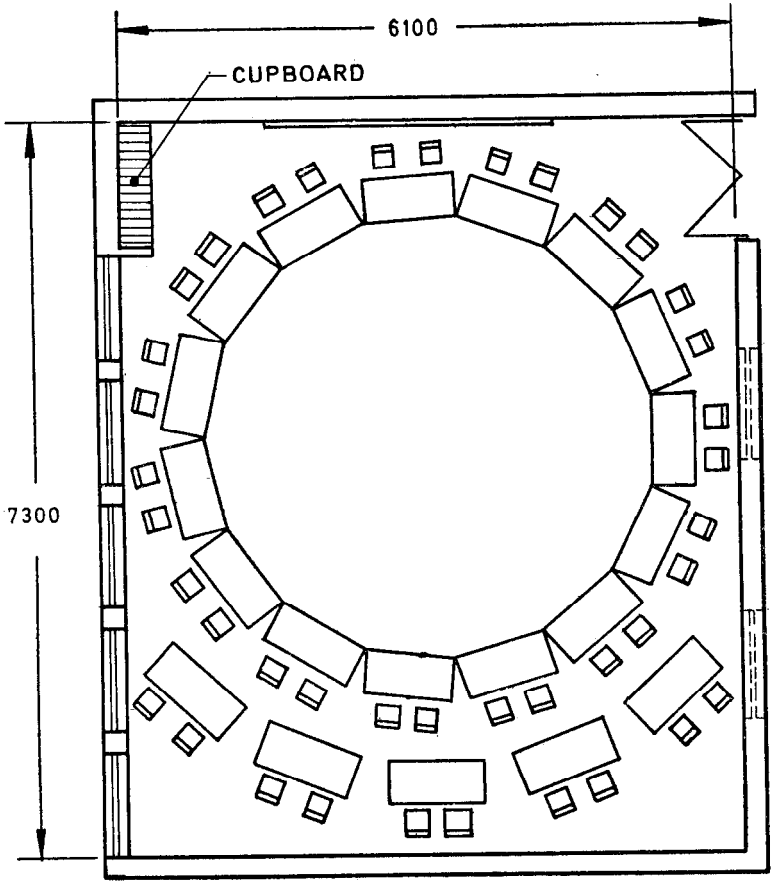
All dimensions in millimetres.

FIG. 1 TYPICAL ILLUSTRATION OF A PRIMARY CLASSROOM



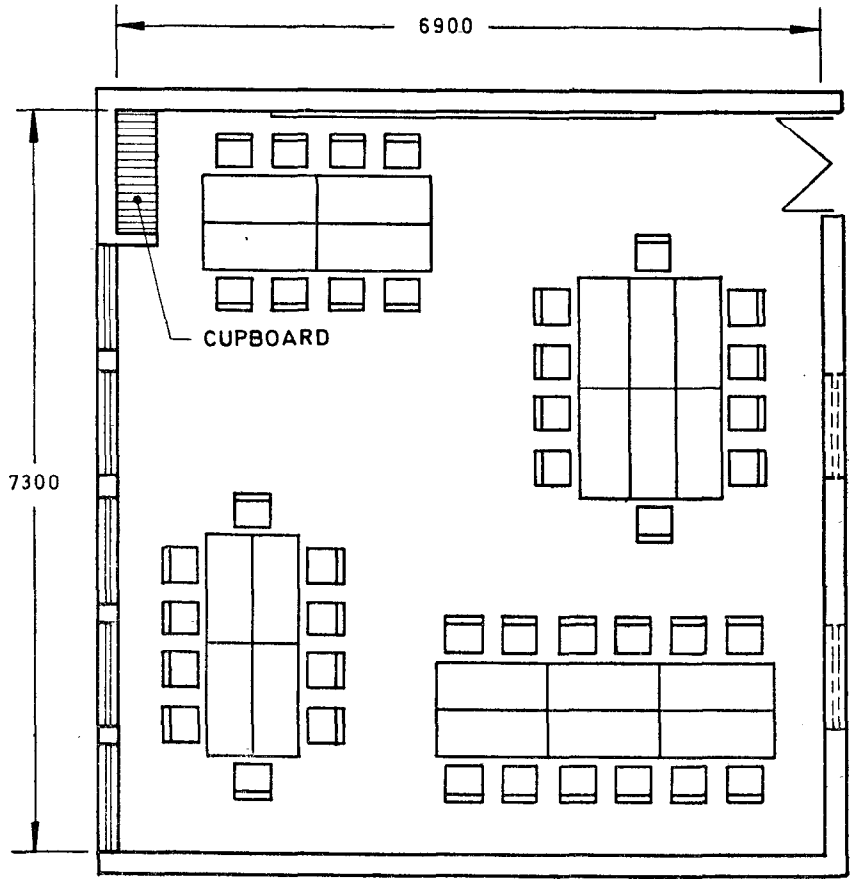
All dimensions in millimetres.

FIG. 2 TYPICAL ILLUSTRATION OF A SECONDARY/HIGHER SECONDARY CLASSROOM



All dimensions in millimetres.

FIG. 3 SKETCH SHOWING ALTERNATE ARRANGEMENT OF FURNITURE IN PRIMARY CLASSROOM



All dimensions in millimetres.

FIG. 4 SKETCH SHOWING ALTERNATE ARRANGEMENT OF FURNITURE IN SECONDARY/HIGHER SECONDARY CLASSROOM

4.5.4 Rooms shall have, for the admission of light and air, one or more apertures, such as windows and fanlights, opening directly to the external air or into an open verandah. The minimum aggregate areas (*see* Note) of such openings excluding doors inclusive of frames shall be not less than 20 percent of the floor area in case such apertures are located in one wall and not less than 15 percent of the floor area in case such apertures are located on both side walls at the same sill level.

NOTE — If a window is partly fixed, the openable area shall be counted.

4.5.5 The minimum clear distance between the chalkboard and front edge of the first row of desks when chalkboard is in use, shall be 2 200 mm.

TABLE 3 CLASSROOM FITTINGS

(*Clause* 4.4)

SL No.	FITTINGS	NUMBER OF UNITS	AREA	REMARKS
(1)	(2)	(3)	(4)	(5)
i)	*Essential Fittings*			
	a) Chalkboard	1	1 200 mm × 2 400 mm	Its base should be 800 mm above the floor/platform level. The location of the chalkboards should be on the walls adjacent to the window wall and placed such that the mid-vertical line of the board lies between one-half and two-thirds the depth of the room. This is to ensure that the glare due to windows at students' seat area is minimized.
	b) Cupboard	1	1·5 m^2	Its depth should not be less than 450 mm. It would serve as space for storage of maps, display materials, etc.
	c) Pin-Board	—	—	There should be one or more near the chalkboard area or on the side walls to display maps, charts, students work, etc.

(*Continued*)

TABLE 3 CLASSROOM FITTINGS — *Contd*

Sl No.	Fittings	Number of Units	Area	Remarks
(1)	(2)	(3)	(4)	(5)
ii)	*Fittings When Needed*			
	a) Fans	3	1 200 mm diameter	Arrangement of fans and lights in a classroom is shown in Fig. 5
	b) Light Points	4	—	
	c) Students' Desks	Depends upon the number of seats to be provided and whether the desks are single or double		
iii)	*Desirable Fittings*			
	a) Wooden Picture Rail	1	Length = Length of wall	The rail should be provided on the wall opposite to windows or opposite to chalkboard
	b) Students' Lockers	1 for each student	—	A locker for each student may be provided in case such an arrangement in students' desks is not possible

5. OTHER TEACHING SPACES

5.1 The recommended areas required for other teaching spaces are given in Table 4.

5.2 The number of such teaching spaces should depend upon the enrolment (size), category, curriculum and use-efficiency of the school.

5.3 Science Laboratories — The size of the science laboratories depends on the following:

a) Dimensions of children and their space requirements,

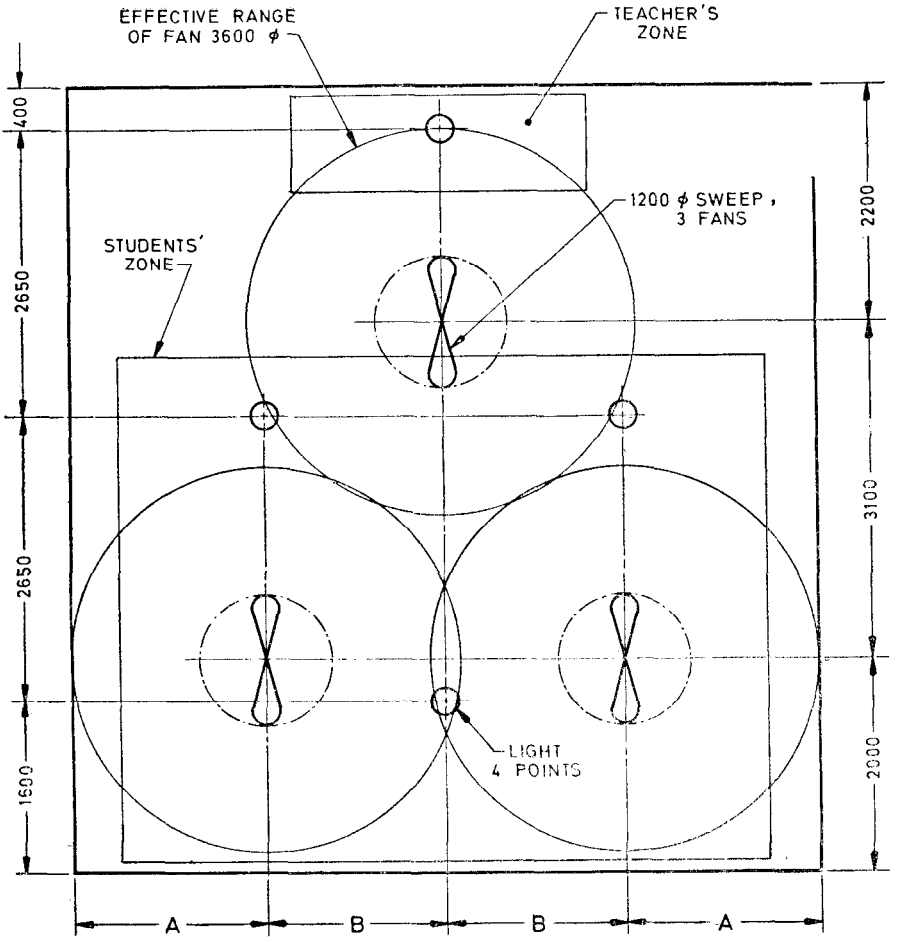
b) Flexibility of arrangement and multiuse of spaces,

c) Usefulness of the wall area, and

d) Interrelationship of auxiliary spaces.

5.3.1 The science laboratories should be designed for 24 seats.

5.3.2 The science theory rooms related to laboratories should be designed on the basis of norms for a classroom for higher secondary classes.



All dimensions in millimetres.

Class room	*A*	*B*
Primary	1 600	1 450
Secondary	1 800	1 650

FIG. 5 TYPICAL ARRANGEMENT SHOWING FAN AND LIGHT POINTS IN PRIMARY AND SECONDARY CLASSROOMS

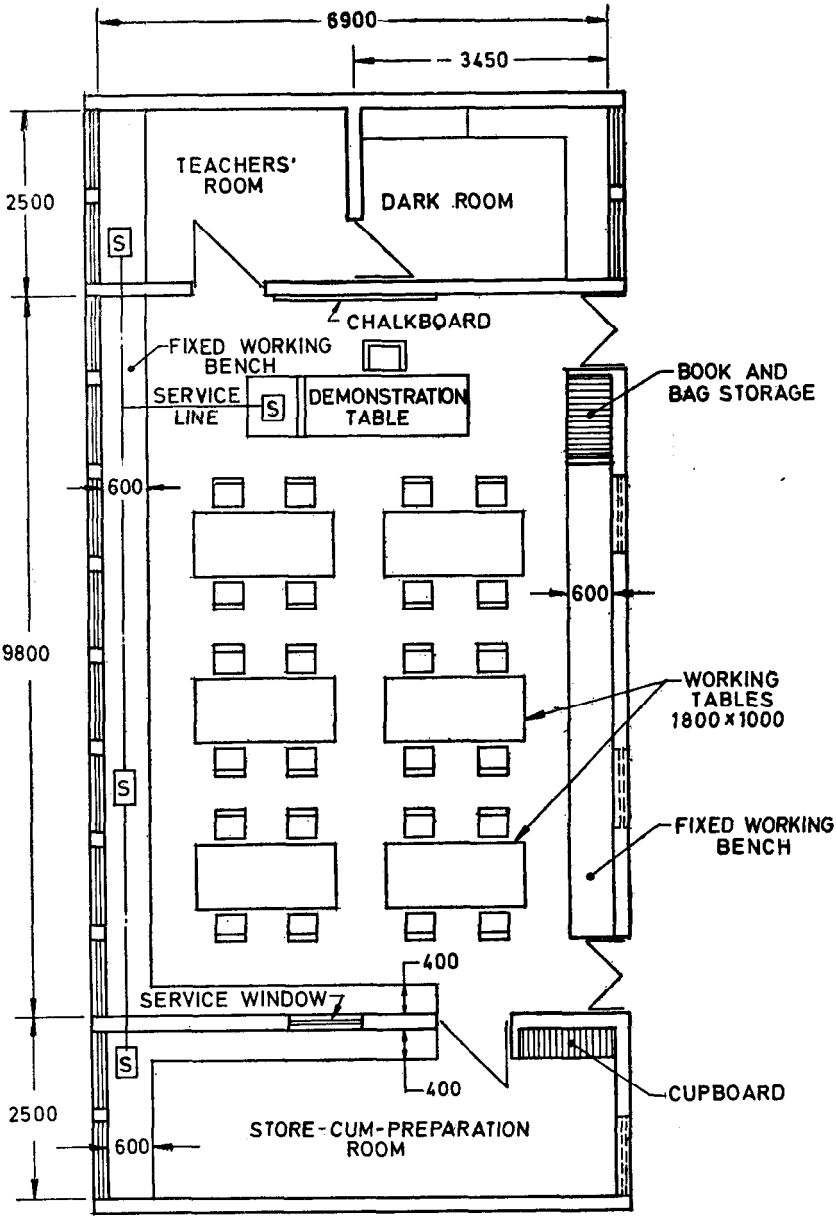
TABLE 4 TEACHING SPACES OTHER THAN CLASSROOMS

(*Clause* 5.1)

Sl No.	Rooms	Distribution of Area	Total Area
(1)	(2)	(3)	(4)
		m^2	m^2
i)	*Physics Laboratory*		96
	a) Laboratory	65	
	b) Store-cum-preparation room	15	
	c) Teacher's space/room	8	
	d) Dark room	8	
ii)	*Chemistry Laboratory*		96
	a) Laboratory	65	
	b) Store-cum-preparation room	15	
	c) Teacher's space/room	8	
	d) Balance room	8	
iii)	*Biology Laboratory*		96
	a) Laboratory	65	
	b) Store-cum-preparation room	15	
	c) Teacher's space/room	8	
	d) Museum	8	
iv)	*Domestic Science Laboratory*		89
	a) Laboratory	65	
	b) Store	8	
	c) Teacher's space/room	8	
	d) Museum	8	
v)	*Social Science Room*	65	65
vi)	*Art Room*	65	65
vii)	*Crafts Room*	65	65
viii)	*Activity Room*	65	65
ix)	*Science Theory Room*	50	50

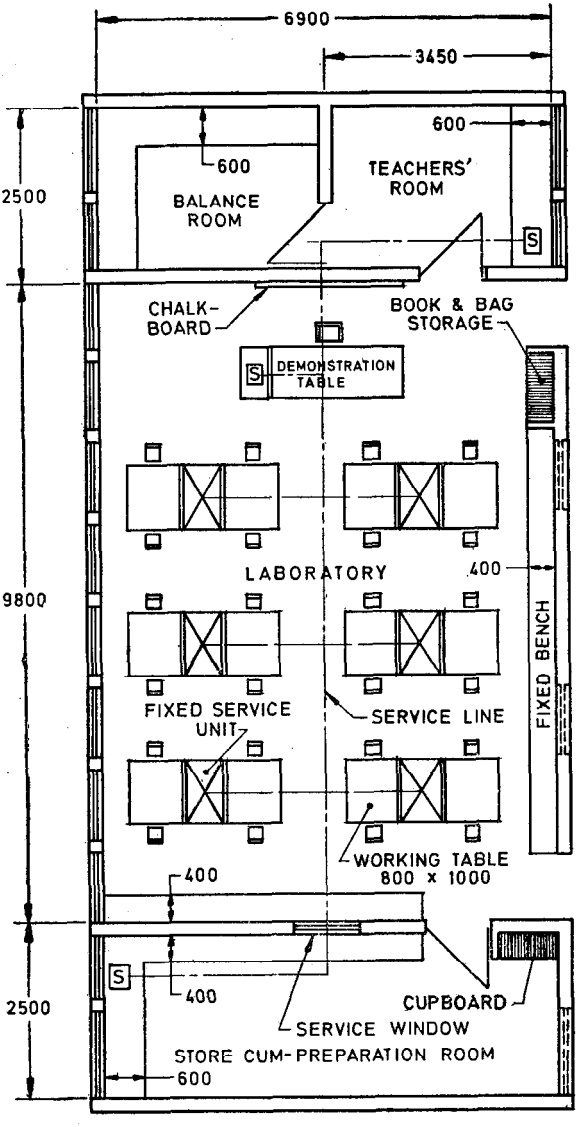
5.3.3 The typical illustrations of the fittings in the physics and chemistry laboratories are shown in Fig. 6 and Fig. 7 respectively.

5.3.4 The arrangement of the fan and light points in the laboratories is illustrated in Fig. 8.



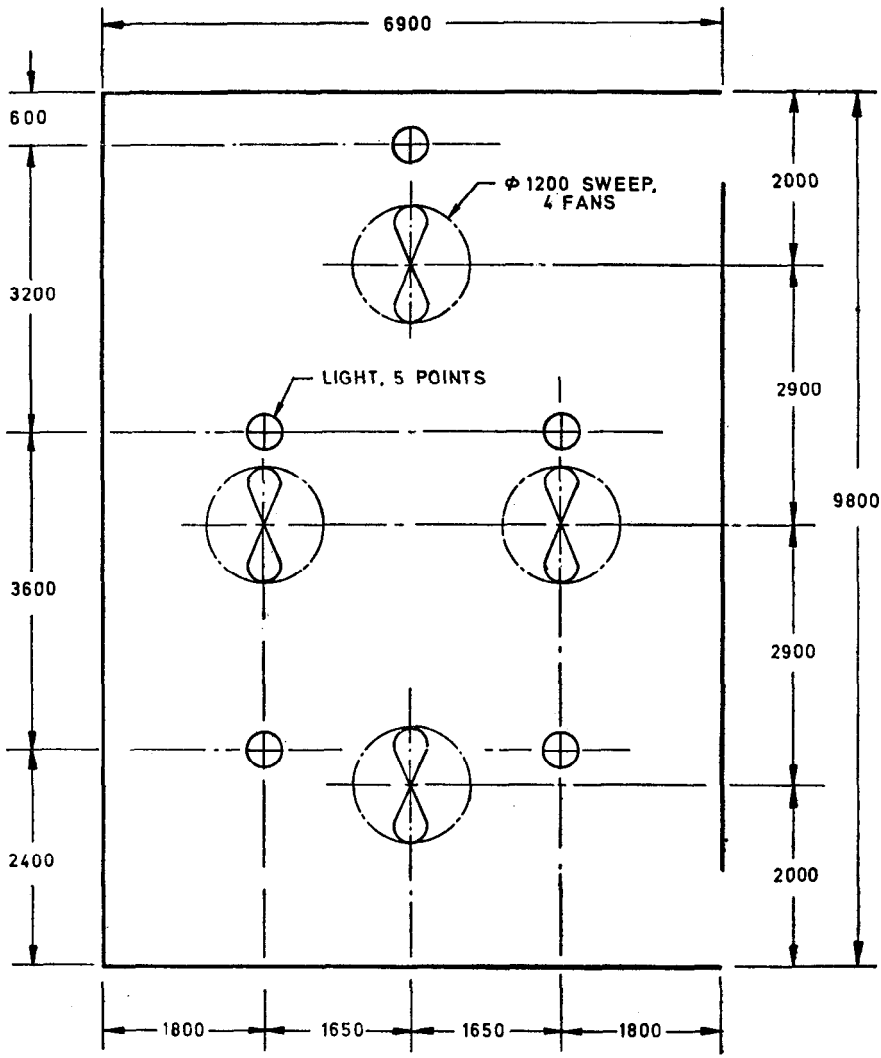
All dimensions in millimetres.

FIG. 6 TYPICAL ILLUSTRATION OF A PHYSICS LABORATORY



All dimensions in millimetres.

FIG. 7 TYPICAL ILLUSTRATION OF A CHEMISTRY LABORATORY



All dimensions in millimetres.

FIG. 8 TYPICAL ARRANGEMENT OF FAN AND LIGHT POINTS IN A LABORATORY

5.4 The social science room, art room, crafts room and activity room may be designed for 40 students but the area required for these rooms [*see* Sl No. (V to VIII) of Table 4] should be more than the area for the ordinary classroom for 40 students, in order to accommodate the teaching equipment, models and activities pertaining to particular subjects.

5.5 Workshops or Vocational Training Facilities — With the introduction of 10 + 2 system, workshops/facilities to impart vocational training shall be provided in schools being covered under this system. The nature and number of such workshops/facilities shall depend upon the curriculum a particular school chooses to follow. The vocational courses may be divided in the following two categories:

a) Courses which need only a classroom each for imparting instructions (*see* Appendix A), and

b) Courses which need a laboratory or a workshop each in addition to a classroom (*see* Appendix A).

5.5.1 The size of the laboratories or workshops required for various vocational courses should be the same as that of science laboratories given in Table 4.

5.5.2 The provision of the fittings and fixtures in the workshops or laboratories for vocational courses in a school shall depend upon the nature of the courses being conducted.

6. FUNCTIONAL REQUIREMENTS

6.1 The level of illumination for various visual tasks shall be as given in Table 5.

TABLE 5 ILLUMINATION LEVELS ON WORK AREAS FOR SCHOOL BUILDINGS

Sl No.	Visual Task	Illumination Level
(1)	(2)	(3)
		lux
i)	Classroom desk top, chalkboards	150-300
ii)	Laboratories/Workshops	200-300
iii)	Library-reading tables	150-300
iv)	Drawing, typing	300
v)	Toilets	150
vi)	Manual training	150

6.2 Maximum acceptable noise levels in classrooms and other teaching spaces due to external sources should be 40 dB(A) or equivalent to NC-35.

6.3 Level of ventilation in the classrooms and other teaching areas shall be six air changes per hour.

6.4 The orientation of the building should be in conformity to IS : 7662 (Part I)-1974*.

7. ADMINISTRATIVE SPACES

7.1 Pre-school and Primary School — An area of about 10 m^2 may be provided for a room for headmistress/headmaster of the school.

7.1.1 Another area of 10 m^2 may be provided for general storage.

7.2 Secondary and Higher Secondary Schools — The provision of areas for the rooms for the Principal, Vice-Principal, general office, etc, shall depend upon the total enrolment in the school. The minimum areas for the various administrative purposes for two categories of enrolment number are given in Table 6 for guidance.

7.2.1 *Principal's Room* — The size of the room for the principal of the school may be governed by the space needed for parents' meeting, waiting space and space for toilets.

7.2.2 *Vice-Principal's Room* — Generally the control of examination and records of the school is looked after by the vice-principal. The space for his room may be decided taking these factors into account. In case there is no vice-principal of the school, the area for the above function may be provided suitably.

7.2.3 *General Office* — Apart from the working space for general office staff, it should provide space for fee collection, student's contact, parent's contact, etc.

7.2.4 *Teaching Staff Area* — Staff common room which may contain facilities for lockers for all teachers, office tables and chairs, easy chairs and a separate toilet facility for staff should be provided in all secondary and higher secondary schools.

8. STUDENTS' SPACES

8.1 When designing a school, provision of indoor areas for student activities appropriate to the level of school as given in Table 7 shall be considered.

8.2 There should be provision of spaces for indoor games either separate or as a part of spaces provided at Sl No. (i), (vii) and (x) of Table 7.

*Recommendations for orientation of buildings, Part I Non-industrial buildings.

TABLE 6 RECOMMENDED ADMINISTRATIVE AREAS FOR SECONDARY/HIGHER SECONDARY SCHOOLS

(*Clause* 7.2)

Sl No.	Enrolment Number	Principal's Room	Vice-Principal's Room	General Office	Storage Area	Teaching Staff Area Including Staff Common Room
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		m^2	m^2	m^2	m^2	m^2
		Min	*Min*	*Min*	*Min*	*Min*
1.	Up to 960	19	29	29	50	1·8 m^2 per teacher (for 60% of teaching staff)
2.	From 960 to 1 920	19	33	45	65	1·8 m^2 per teacher (for 60% of teaching staff)

9. CIRCULATION AREAS

9.1 Circulation areas such as corridors, entrance halls, staircases, etc, in the school buildings with double loaded and single loaded corridors shall not be more than 18 percent and 24 percent of the total covered area of the building respectively.

10. OUTDOOR AREAS

10.1 Outdoor areas for a school such as playgrounds, open air assembly, parking, etc, shall depend upon the following:

a) The size of the school, and

b) The location of the school, that is:

1) Urban,
2) Suburban, or
3) Rural.

10.2 For outdoor spaces under lawns, courtyards, etc, an area of 1 m^2 per student should be provided.

10.3 It is desirable to make a provision for play fields for all categories of schools. The following areas should be adequate for playing games like cricket, football, hockey and other Indian games:

a) Pre-School 1 000 m^2

b) Primary School 4 000 m^2, and

c) Secondary/Higher Secondary School 15 000 m^2

These spaces may be shared by a few schools in high density areas for purpose of land economy. Regional game preferences and local topography shall, however, determine the extent and nature of play fields.

TABLE 7 INDOOR AREAS FOR VARIOUS STUDENTS' ACTIVITIES

(*Clauses* 8.1 *and* 8.2)

Sl No.	Room	Area	Remarks
(1)	(2)	(3)	(4)
		m^2	
i)	Common Rooms	0·1 per student (*Min* 25 m^2, *Max* 100 m^2)	Boys common room should contain arrangements for sitting or squatting and it may be combined or be a part of canteen itself. Girls common room should contain in addition a bench or a coach for lying down
ii)	Canteen	0·1 per student (*Min* 25 m^2; *Max* 100 m^2)	—
iii)	NCC/ACC/Scout/ Guide	One room for each, 11·0 m^2 area	—
iv)	Medical Inspection Room	20 to 30	It should contain facilities such as a table, a chair, an examination bed, a medicine chest and a wash basin
v)	Book/Stationery Shop	30 to 50	—
vi)	Library	0·1 per student (*Min* 50 m^2; *Max* 150 m^2)	Regarding primary elements in the design of school library buildings, IS : 8338-1976* may be referred
vii)	Students' Club and House Offices	30 to 50	—
viii)	PET Room (Physical Education and Teaching Room)	45	—
ix)	Toilets	0·2 per student	Regarding provision of various fittings in toilets, Table 9 may be referred.
x)	Multiuse Hall (Optional)	0·65 per student for 50% of the strength (excluding stages)	—
		(*Min*: 14 m × 28 m × 5·5 m)	Without stage
		(*Max*: 18 m × 36 m × 6 m)	

*Recommendations for primary elements in the design of school library buildings.

10.4 It should be possible to extend the teaching areas in the open space beyond the classrooms and for this purpose such open spaces should be designed to provide for chalkboards, raised platforms and outside sitting arrangements.

10.5 Parking areas for the following should be provided when designing a school building:

a) Cycles	At the rate of	1·1 m² per cycle
b) Scooters	,,	3 m² per scooter
c) Cars	,,	25 m² per car
d) Buses	,,	60 m² per bus

NOTE — The designer should ascertain the percentage of students/staff using different types of vehicles and the number of service vehicles coming to the school and calculate the parking area to be provided on the basis of the figures given above.

11. OVERALL AREA OF SCHOOL

11.1 The built-up area of school and the overall area of the plot should be calculated according to provisions given in **4**, **5**, **7**, **9** and Table 8 (which gives category-wise the various facilities to be provided), and building regulations. However, as a rough guide the following values may be taken when planning a school.

	For Primary School	For Secondary + Higher Secondary School	For Primary + Secondary + Higher Secondary School
a) Built-up area (on all floors) per student place:			
1) For a school having four sections per class	1·80 m²	3·40 m²	2·60 m²
2) For a school having two sections per class	1·80 m²	4·60 m²	3·20 m²
	(The area per student place will decrease when number of sections per class increase and vice-versa)		
b) Plot area other than play fields	2 to 3 times the built-up area (on all floors) depending upon the number of storeys		
c) Play fields	According to provisions in **10.3**		

TABLE 8 PROVISION OF VARIOUS AREAS IN SCHOOLS OF DIFFERENT CATEGORIES

(*Clause* 11.1)

Sl No.	Category	Curricular						Co-curricular							Administrative					Extra-Curricular
		Class room	Art/ drawing	Labs	Social Science/ Geography Room	Science Room	Craft Room	Library	Canteen	Toilet	NCC Room	Medical Room	Book Shop	Students Common Room	Principal's Room	Vice-Principal's Room	Office	Staff Common Room	General Store	Play Grounds
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1.	Nursery	√	—	—	—	—	√	—	—	√	—	Facility may be accommodated in the areas for general store	—	—	√	—	—	—	√	√
2.	Primary	√	—	—	√	—	√	√	—	√	—		—	—	√	—	—	—	√	√
3.	Secondary	√	√	—	√	√	√	√	√	√	√	√	√	√	√	—	√	√	√	√
4.	Higher Secondary	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

√ Indicates area needed.

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11.2 Set-Back Lines — In the absence of local building byelaws the minimum set-backs of the building from the boundaries shall be as follows:

a) Front set-back 15 metres

b) Side set-back 6 metres

12. SELECTION OF SITE

12.1 While selecting the site of school buildings, the following points should be kept in mind:

a) Easy accessibility from residential areas;

b) Site should be away from heavy traffic roads, rivers, ponds, railway tracks, etc;

c) Site should be away from high tension lines;

d) The land should not be of made-up ground unless precautions have been taken for stabilization;

e) Site should ensure a good natural drainage; and

f) The site should preferably be at a quiet place away from places generating noise and pollution, such as cinemas, factories and shopping centres.

13. EFFECT OF LANDSCAPE ELEMENTS

13.1 While planning the school building, the importance of landscape elements such as open areas, to increase the comfort conditions inside the building and also in the surrounding environment, should be kept in mind.

13.2 Plants, hedges and shrubs planted immediately outside the classroom windows where such windows are the principal source of natural light and ventilation should not protrude beyond the sill level.

13.3 The rows of tall or shady trees should be at right angles to the source of light to the building in order to avoid glare in the rooms. At the same time the tall and shady trees, walls, or any obstruction in front of the classroom windows should be at a distance to ensure adequate amount of lighting and ventilation. This distance may be taken equal to the height of the building.

14. EXIT REQUIREMENTS

14.1 General — The following general requirements shall apply to exits:

a) All exits shall be free of obstructions;

b) Exits shall be clearly visible and the routes to reach the exit shall be clearly marked and sign posted to guide the students to the floor concerned;

c) All exit ways shall be properly illuminated; and

d) Exits shall be so arranged that they may be reached without passing through another occupied unit.

14.2 Types of Exits

14.2.1 Exits shall be either of horizontal or vertical type. An exit may be a doorway, corridor, an internal or external staircase, ramps or verandahs and/or terraces which have access to the street or to the roof of a building. An exit may also include a horizontal exit leading to an adjoining building at the same level.

14.2.2 Lifts and escalators shall not be considered as exits.

14.3 Number and Size of Exits — The requisite number and size of various exits shall be provided, based on the number of students and staff in each room area and floor, capacity of exits, travel distance and height of buildings according to provisions in **14.3.1** to **14.3.4**.

14.3.1 *Arrangement of Exits* — Exits shall be so located that the distance from an exit to the most remote point in the floor area served by them, measured along the line of travel shall in no case be greater than 30 metres, except that where sprinklers are installed throughout a building the maximum distance of travel to an exit may be increased by 50 percent.

14.3.1.1 Wherever more than one exit is required for a floor of building, exits shall be placed as remote from each other as possible. All the exits shall be accessible from entire floor area at all floor levels.

14.3.2 *Capacity of Exits* — The capacity of exits (doors and stairways) indicating the number of persons that could be safely evacuated through a unit exit width of 50 cm shall be as given below:

a) Stairways 25 Numbers
b) Doors 75 Numbers

14.3.3 There shall be a minimum of two staircases and one of them shall be an enclosed stairway and the other shall be on the external walls of buildings and shall open directly to the exterior, interior open space or to any open place of safety.

14.3.4 Notwithstanding the detailed provision for exits as above the minimum width for stairways shall be 2·00 metres.

14.4 Other Requirements of Individual Exits — The detailed requirements of individual exits are given in **14.4.1** to **14.4.6**.

14.4.1 *Doorways*

14.4.1.1 Every exit doorway shall open into an enclosed stairway, a horizontal exit, on a corridor or passage way providing continuous and protected means of egress.

14.4.1.2 No exit doorway shall be less than 100 cm in width. Doorways shall be not less than 200 cm in height. Doorways for bathrooms, water-closet, etc, shall be not less than 75 cm wide.

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

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

14.4.2 *Stairways*

14.4.2.1 Interior stairs shall be constructed of non-combustible materials throughout.

14.4.2.2 Interior staircase shall be constructed as a self-contained unit with at least one side adjacent to an external wall and shall be completely enclosed.

14.4.2.3 A staircase shall not be arranged round a lift shaft unless the latter is entirely enclosed by a material of fire resistance rating as that for type of construction itself.

14.4.2.4 Hollow combustible construction shall not be permitted.

14.4.2.5 The minimum tread shall be 30 cm. The treads shall be constructed and maintained in a manner to prevent slipping.

14.4.2.6 The maximum height of riser shall be 15 cm. They shall be limited to 12 per flight.

14.4.2.7 Handrails shall be provided with a minimum height of 90 cm from the centre of the tread.

14.4.2.8 The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2·2 m.

14.4.3 *Fire Escape or External Stairs* — For buildings above 15 m in height fire escape stairs shall be provided subject to the following conditions:

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

b) All fire escapes shall be directly connected to the ground.

c) Entrance to fire escape shall be separate and remote from the internal staircase.

d) The route to fire escape shall be free of obstructions at all times, except a doorway leading to the fire escape which shall have the required fire resistance.

e) Fire escape shall be constructed of non-combustible materials.

f) Fire escape stairs shall have straight flight not less than 75 cm wide with 15 cm treads and risers not more than 19 cm. The number of risers shall be limited to 16 per flight.

g) Handrails shall be of a height not less than 90 cm.

14.4.4 *Spiral Stairs (Fire Escape)* — The use of spiral staircase shall be limited to low occupant load and to a building of height 9 m, unless they are connected to platforms, such as balconies and terraces to allow escapes to pause.

A spiral fire escape shall be not less than 150 cm in diameter and shall be designed to give adequate headroom.

14.4.5 *Ramps*

14.4.5.1 Ramps with a slope of not more than 1 in 10 may be substituted for and shall comply with all the applicable requirements of required stairways as to enclosure, capacity and limiting dimensions. Ramps shall be surfaced with approved non-slipping materials.

14.4.5.2 Handrails shall be provided on both sides of the ramp.

14.4.5.3 Ramps shall lead directly to outside open space at ground level or courtyards or safe places.

14.4.6 *Corridors*

14.4.6.1 The minimum width of a corridor shall not be less than 150 cm and actual width shall be calculated based on the provisions given in **14.3.1** and **14.3.2**, as for doorways.

14.4.6.2 In case of more than one main staircase of the building interconnected by a corridor or other enclosed space, there shall be at least one smoke-stop door across the corridor or enclosed space between the doors in the enclosing walls of any two staircases.

15. FIRE PROTECTION REQUIREMENTS

15.1 The school buildings shall be designed for safety against fire in conformity to IS : 2406-1963*.

*Code of practice for fire safety of non-industrial buildings.

15.2 Adequate first-aid fire fighting equipment shall be provided at suitable positions like corridors, lobbies, halls and outside the building in accordance with IS : 2217-1963*.

15.2.1 The first-aid fire fighting equipment shall be installed and maintained in accordance with IS : 2190-1971†.

15.3 Approved manually operated fire alarm facilities shall be provided in every school building in accordance with Appendix B. Such facilities shall be tested daily during the school term.

16. WATER SUPPLY AND SANITARY REQUIREMENTS

16.1 Water Supply Requirements — The arrangements should be made to supply 45 litres of water per head per day in school buildings apart from the requirements of water for fire fighting. The laying and distribution of water supply system should be according to provisions given in IS : 2065-1972‡.

16.2 Sanitary Requirements — The requirements for the fitments for drainage and sanitation in schools should be in accordance with Table 9.

16.3 The selection, installation and maintenance of sanitary appliances should be in accordance with IS : 2064-1973§.

*Recommendations for providing first-aid fire fighting arrangements in public buildings.

†Code of practice for selection, installation and maintenance of portable first-aid fire appliance (*first revision*).

‡Code of practice for water supply in buildings (*first revision*).

§Code of practice for selection, installation and maintenance of sanitary appliances (*first revision*).

TABLE 9 SANITARY FITTINGS FOR SCHOOLS

(*Clause* 16.2)

Sl No.	Fitments	Pre-Schools	Schools Other Than Pre-Schools	
			For Boys	For Girls
(1)	(2)	(3)	(4)	(5)
1.	Water-closets	1 per 15 pupils or part thereof	1 per 40 pupils or part thereof	1 per 40 pupils or part thereof
		← 1 per 30 members of staff or part thereof →		
2.	Ablution taps	1 in each water-closet	1 in each water-closet	1 in each water-closet
		1 water tap with draining arrangements shall be provided for every 50 pupils or part thereof in the vicinity of water-closets and urinals		
3.	Urinals	—	1 per 20 pupils or part thereof	Squatting plate urinals 1 per 20 pupils or part thereof
		← 1 per 30 members of staff or part thereof →		
4.	Wash basins	1 per 15 pupils or part thereof	1 per 40 pupils or part thereof	1 per 40 pupils or part thereof
		← 1 per 30 members of staff or part thereof →		
5.	Baths	1 bath-sink per 40 pupils or part thereof	—	—
6.	Drinking water fountains	← 1 for every 50 pupils or part thereof →		
7.	Cleaner's sink	← 1 per floor, *Min* →		

APPENDIX A

(*Clause* 5.5)

LIST OF VOCATIONAL COURSES

A-1. COURSES WHICH DO NOT REQUIRE WORKSHOPS

A-1.1 Commerce and Business Related Vocations

a) Office Management & Secretarial Practice
b) Stenography
c) Accountancy and Auditing
d) Banking and Insurance
e) Data and Key Punching Processes
f) Marketing and Salesmanship
g) Materials Management

A-1.2 Education

a) Pre-Primary Teacher Training
b) Primary School Teacher Training
c) Physical Education Teacher (Junior) Training
d) Library Assistant Training

A-2. COURSES WHICH REQUIRE WORKSHOPS

A-2.1 Agricultural Vocations

a) Dairying
b) Poultry
c) Fisheries
d) Forest Products
e) Basic Course in Fruit & Vegetable Growing
f) Agriculture
g) Small Farm Management
h) Agro Based Industries — Small processing units of paddy, wheat, oats and millets, bread, biscuits and cakes
j) Agro Based Industries — Waste utilization — by-products — Paper making, manufacture of straw board out of straw and sugar cane bagasse
k) Agro Based Industries — Re-cycling of animal waste
m) Farm Machines and Engineering

A-2.2 Engineering and Technical Vocations

a) Basic Electrical Technology
b) Basic Electronic Technology
c) Basic Air-conditioning and Refrigeration Technology
d) Automobile Servicing and Maintenance
e) Elementary Sanitary Technology
f) Laboratory Technician's Course
g) Furniture Design and Manufacture
h) Textile Bleaching, Dyeing and Finishing
j) Leather Goods Technology

A-2.3 Vocations Relating to Home Science

a) Food Processing and Preservation
b) Baking and Confectionery
c) Nutrition and Food Preparation
d) Canteen Management (Small Scale)
e) Dress Designing and Making
f) Textiles and Designs

A-2.4 Health and Para-Medical

a) Multipurpose Health Workers
b) Junior Medical Social Workers
c) Pharmacist's Course
d) Optometry

A-2.5 Miscellaneous Vocations

a) Tourism
b) Photography
c) Graphic Arts
d) Commercial Arts
e) Music

APPENDIX B

(*Clause* 15.3)

ALARM SYSTEMS

B-1. GENERAL

B-1.1 Where buildings are divided by separating walls into separate fire sections with adequate safeguards against fire spread from one section to another, each section may be considered a separate building for the purposes of application of fire alarm system requirements based on size of building or population.

B-1.2 All alarm systems and equipment shall be of approved types suitable for the purpose for which installed.

B-1.3 Alarms systems shall be under the supervision of a responsible person who shall cause proper tests to be made at specified intervals and have general charge of all alterations and additions.

B-1.4 Fire alarm signalling equipment shall be restored to service as promptly as possible after each test or alarm, and shall be kept in normal conditions for operation. Equipment requiring rewinding or replenishing shall be rewound or replenished as promptly as possible after each test or alarm.

B-1.5 All manually operated sending stations and alarm sounding devices in a single system shall be of the same general type.

B-2. ALARM SENDING STATIONS

B-2.1 Manually operated sending stations shall be provided near all main exits and in the natural path of escape from fire, at readily accessible points which are not likely to be obstructed.

B-2.2 Sending stations shall be so located that from any part of the building not more than 60 m will have to be traversed in order to reach a sending station on the same floor or 30 m and one flight of stairs to reach a sending station upon another floor located in the natural path of escape from fire.

B-3. SOUNDING DEVICES

B-3.1 Required sounding devices shall be used for fire alarm purpose only.

B-3.2 Alarm sounding devices shall be provided of such character and so distributed as to be effectively heard in every room above all other sounds.

B-3.3 Alarm sounding devices shall be distinctive in pitch and quality from all other sounding devices.

B-3.4 Code signals indicating where the alarm originates shall not be used except to such extent or as specifically authorized by the authority.

B-3.5 Systems shall be so arranged that no manual intervention will be required, following the actuation of a sending station, for causing effective response of all required sounding devices. No facilities shall be provided whereby it is possible to control or modify such response.

INDIAN STANDARDS

ON

FUNCTIONAL REQUIREMENTS IN BUILDINGS

IS:

1950-1962 Code of practice for sound insulation of non-industrial buildings (Reaffirmed 1977)

2440-1975 Code of practice for daylighting of buildings (*second revision*)

2526-1963 Code of practice for acoustical design of auditoriums and conference halls

3103-1975 Code of practice for industrial ventilation (*first revision*)

3362-1977 Code of practice for natural ventilation of residential buildings (*first revision*)

3483-1965 Code of practice for noise reduction in industrial buildings

3792-1966 Guide for heat insulation of non-industrial buildings

4954-1968 Recommendations for noise abatement in town planning (Reaffirmed 1977)

4963-1968 Recommendations for buildings and facilities for the physically handicapped

5499-1969 Code of practice for construction of underground air-raid shelters in natural soil

6060-1971 Code of practice for daylighting of factory buildings

6074-1971 Code for functional requirements of hotels, restaurants and other food service establishments

7662 (Part I)-1974 Recommendations for orientation of buildings: Part I Non-industrial buildings

7942-1976 Code of practice for daylighting of educational buildings

8827-1978 Recommendations for basic requirements of school buildings

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