International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 08 | Aug 2022 www.irjet.net p-ISSN: 2395-0072

FIRE SAFETY OF AN EDUCATIONAL BUILDING

Sahaj Jain[1], Kedar Hankare[2], Gaurav Kumar Jha[3], Digvijay Ingole[4],Hrishikesh Bondre[5], Prof. Dr. Mrudula kulkarni[6]

[1-5]Student, Dept. of Civil Engineering, Dr. Vishwanath Karad MIT World PeaceUniversity, Maharashtra, India
[6]Professor, Dept. of Civil Engineering, Dr. Vishwanath Karad MIT World PeaceUniversity, Maharashtra, India

---

Abstract - *This report offers direction on INDIAN educational building guidelines applying to safety assurance against fires in the accompanying general regions: means of escape in case of fire; careful steps to prevent fire, Fire alarm framework and fire extinguishing and damage control. It includes revisions in the requirements for means of escape and the requirements aimed specifically at the designers of new construction. The utilization of fire-resistant construction in its capacity to confine the spread of smoke and fire. The manners in which fires can be forestalled through cautious design, the management, and maintenance practices; and thoughts for restricting fire harm. This examination planned to look at fire wellbeing measures and their suitability in instructive structures, the necessary measures are innovation based.Educational buildings are a type of government asset that should be protected, and they play an important role as a temporary community gathering place for children, teachers and communities. To ensure the complete safety for buildings, fire safety management must be properly implemented through the full commitment of the local government authorities, educational building authorities or the users and residents of the building.*

Key Words: **Educational Building, Fire Safety, Fire Management, Fire Resistant**

1. INTRODUCTION

As a part of the socio-economic development of the nation, consistent urbanization is gathering momentum in the nation. There has been huge growth within the range of constructions, particularly within the urban and encompassing areas, as well as high rise and special buildings. The ability of a building to identify, sustain, avert and reduce any damage to the building because of a sudden unexpected cause of fire refers to the fire safety of a building. The ability of a building to detect, withstand, prevent, and mitigate damage to building due to the cause of a sudden and unexpected fire is related to the fire safety of the building. The recent fire mishap at Serum Institute of India has gotten the attention of the media and public consideration, which specifies the requirement for upgraded fire anticipation, concealment and evacuation measures in the least response time. These fire perils are dependable in making significant harm to the tenants and their resources. This has given new difficulties to engineers and fire security specialist organizations to build up upgraded plans of structures and fire assurance strategies to lessen such misfortunes Bureau of Indian Standards published their first version of the National Building Code (NBC) in 1970 and then onwards it was revised subsequently. Part 4 of the latest NBC 2016 is managing the fire and life security in India. Also, different INDIAN STANDARDS are eluded for fire safety. The entire objective of this regulatory document is to ensure the achievement of basic standards of constructions, including fire and life safety in educational buildings. As thearchitecturaland structural designs of a building have a substantial effect on the fire safety of a building, hence fire protection systems for the buildings have been dividedinto active and passive kinds. The degree of fire can be limited by implementing the right fire security measures with the grouping of structures according to the nature of exercises sought after in the structure. The magnitude of the problem can be reduced only when the structures are designed, constructed, equipped, maintained and operated to save the life andproperty of their inhabitants.

NBC suggests for periodical fire security examination by the critical staff of the inhabitants of the structure to guarantee fire safety standards.

NBC recommends for journal fire safety inspection by the key personnel of the inhabitants of the building to ensure fire safety norms. For industrial buildings, statutory authorities require a fire audit by an external agency, depending on the type of activity and material used in the building. The Maharashtra Fire Prevention and Life Safety Measures Rules, 2009, made it mandatory for building owners and residents to conduct half – yearly fire safety audits and submits the report to the fire department authority. The National Building Code published by the Bureau ofIndian Standards (BIS) is the basic model code in India on matters related to building construction and fire safety.

2. CLASSIFICATION OF BUILDING BASEDON OCCUPANCY

General Classification-all buildings should be classified, according to the use or the type of occupancy in one of the following groups:

A:-Residential B:- Educational C:- InstitutionalD:- Assembly

E:- Business F:- MercantileG:- Industrial H:- Storage

J-: Hazardous

3. OCCUPANT LOAD

The design of a building's exit system is critical to ensuring everybody can safely evacuate in the event of a fire.

To determine the number of exits required, the width of the exits, and the number of people required in the building, it is necessary to estimate the occupant load. After referring IS 1644, to determine the exit requirements, the occupant load is calculated so as to anticipate the number of people to occupy a building room or space but the occupant load should not be less than the number mentioned in Table 1.

Table – 1 Occupant Load

S.NO	Group of occupancy (IS:1641-1988)	Occupant load, floor area in m2/person	
1	Residential	(A)	12.5
2	Educational	(B)	4
3	Institutional	(C)	15
4	Assembly	(D)	
	With fixed orloose seats and dance floors Without seating facilities including dining rooms		0.6 1.5
5	Mercantile	(F)	3
6	Business and industrial	(E and G)	10
7	Storage	(H)	30
8	Hazardous	(J)	10

4. CAPACITY OF EXITS

The National Building Code mentions the conditions of exit requirements for different occupancies. In this report its mentioned about the educational building.

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

The distance from any point to the final exit shall not be lower than 22.5 m for residential building while for others it shouldn't be less than 30m.

Table – 2 Travel Distance For Occupancy And Type Of Construction

S.NO	Group of occupancy (IS: 1641-1988)	Maximum travel construction (IS: 1642-1988)	
		Type 1 and 2	Type 3
		(m)	(m)
1	Educational	22.5	22.5

5. ARRANGEMENT OF EXIT

As per part-4 NBC, clear width less than 250 mm shallnot be measured for exit width.

The number of exit width needed for any occupancy is also calculated on the basis of exit width, on the assumptions that width of the person is 50cm.

6. HORIZONTAL EXIT

A horizontal exit shall be equipped with at-least one fire/ smoke self closing type door with minimum one hour fire resistance. Further, it is needed to have direct connectivity to the fire escape staircase for evacuation. For buildings of height more than 24m, refuge area of 15m2 or an area equivalent to 0.3m2 per person to accommodate the inhabitants of two successive floors, whichever is higher, shall be provided. The refuge area shall be provided on the fringe of the floor or preferably on a cantilever projection open to air with suitable railings. a) For floors above 24m and up to 39m, one refuge area should be provided on the floor immediately above 24 m.

b) For floors above 39m, one refuge area on the floor immediately above 39m and one after every 15m.

7. DOORWAYS

Specifications of exit doorways as per NBC are, width of exit doorways should be greater than 1m and should not be less than 2m for assembly halls. The height of door should be more than 2 m. The doors shall be opening-outwardly. Installment of overhead or sliding door shall be restricted. Each exit door should lead to a horizontal exit in an enclosed staircase or hallway or corridor, providing a continuous and protected exit.. Exit doorway shall not be less than 1m in width except assembly buildings where door width shall be not less than 2m.

8. STAIRCASE

All buildings with an area of more than 500 m2 on each floor and a height of more than 15 m must have at least two closed staircases. At least one of these must beinstalled in an exterior wall and open directly to the outside, an open space, or an open security area. In addition, the provision of alternative stairs or other provision must be contingent upon meeting travel distance requirement

9. CONTROL CENTRE

Control centers with an area of 16 m2 to 20 m2 should be installed in high-rise buildings and special buildings, where command and signaling equipment, power supply units and other fire protection substations shall be fitted. This should preferably be on the first floor. The control room must have an intercom and direct dial telephone facility. If possible, a direct hotline or other means of communication should be provided to the localfire brigade.

10. General Recommendations:

- Width of ramps and staircases should be as perstandards
- Ventilation and illumination should be adequate.
- Safety and emergency signage should be placed.
- Emergency plan and escape routes should bedisplayed.

- Refresher training to be conducted on regular basis.
- All employees should be given fire-fighting training.
- Mock drills should be conducted on regular intervals.
- All the ducts, openings should be properly sealed.
- A system for reporting and investigating incidentsneedsto be in place
- Training and awareness programs on specialsafetyrules, plant safety rules should also be conducted.
- There should be provision of pressurized staircases ifthe facility is centralized air conditioned.
- Escape routes should be always kept empty.
- All the fire fighting equipment's should bemaintainedperiodically.

Passive fire protection measures should be applied to increase fire resistant capacity of construction material.

11. NON OBJECTION CERTIFICATE

NOC for high rise Educational building is a move to ensure fire prevention, life safety, fire-safe design for buildings and to deal with the potential alarming hazard associated therewith, the Delhi Government has directed the fire department to inspect buildings having five or more floors. NOC from the Fire Department The Maharashtra Fire Prevention and Life Safety Measures Rules, 2009,made it mandatory for building owners and residents to conduct half – yearly fire safety audits and submits the report to the fire authority.

Fire Department NOCs are issued by their respective state fire departments that check the fire resistance of buildings and whether they are observable for fire-related accidents.

12. CASE STUDY

Building Name :- MIT WPU SCHOOL OF DESIGN

Group B

Sub division :- B2

Type of construction :- Type 1

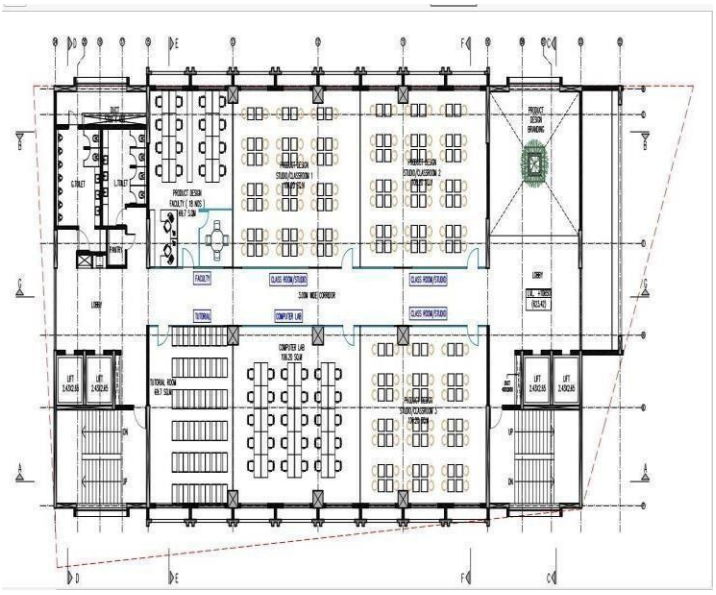

Fig-1: First floor plan

Table – 3 Occupant load

Occupant load	322
Occupants per unit exit width	25
Width based on occupant load	12.88 m
Width perstair based on occupant load	6.44 m

Table – 4 Capacity of exits

Checklist	
Distance of any point in the floor < 22.5 m from nearest exit	√
Minimum 2 staircases on each floor of area > 500 sq.m	√

Table – 5 Arrangement of exits

Name	Area (sq.m)	Load factor (m2/person)	Occupantload
Tutorial Room	69.7	1.9	37
Computer lab	106.20	4.6	23
Classroom 3	106.20	1.9	56
Product designfaculty	69.7	4	18
Classroom 1	106.20	1.9	56
Classroom 2	106.20	1.9	56
Product designbranding	59.67	4.6	13
corridor	92.55	4	24
Toilet	70.72	4	18
Lobby 1	32.95	4	9
Lobby 2	45.61	4	12
total			322

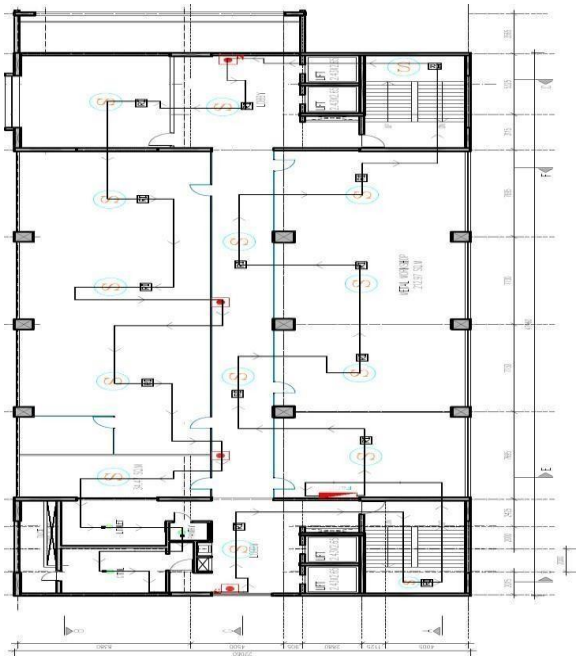

Fig-2: Proposed sitting of fire alarm system

LEGENDS	
S	SMOKE DETECTOR
H	HEAT DETECTOR
BELL	FIRE BELL
MCP	MANUAL CALL POINT (BREAK GLASS UNIT)
FACP	FIRE ALARM CONTROL PANEL

Fig- 3 Legends

13. CONCLUSION

Fire protection, timely safety measures, and preventative measures are just a few of the key factors that affect everyone today. As with the increasing number of fires in office buildings, hospitals and coaching centers, the Fire Department, under government direction, is conducting the necessary inspections of all buildings falling under the NBC Part 4 category to ensure further use in accordance with regulations. Seal them until Recommendation. Therefore, it is imperative that all users adhere strictly to fire safety regulations and procedures, both on paper and in practice, in order to avoid undesired occurrences and danger to life due to sudden fires.

REFERENCES:

- IS 1644 (1988): Code of practice for fire safety of buildings (general): Exit requirements and personal hazard [CED 36: FireSafety].
- IS 14435 (1997): Code of practice for fire safety ineducationalinstitutions[CED 36: Fire Safety].
- Venkatesh Kodur and Puneet Kumar , Muhammad Masood Rafi , Fire hazard in buildings: review, assessment and strategies for improving fire safety. Arpit S Vyas , Fire Safety as per National Building Code-2016. Department of Civil Engineering Thakur College of Engineerin gand Technology.

- Mahesh Chopade MIT World Peace University, Fire Suppression Systems for High Rise Buildings in India: ReviewArticle.
- Indian Standard CODE OF PRACTICE FOR FIRE SAFETY OF BUILDING(GENERAL): GENERAL PRINCIPLES OF FIRE GRADING AND CLASSIFICATION ,Fourth Reprint SEPTEMBER 2007.
- National Building Code of India Part 4 , Fire AndLifeSafety ,Bureau Of Indian Standards.
- IS1641-1988 Code of practice of fire safety ofBuilding