

# AN ASSESSMENT OF THE PRESENT FIRE SAFETY STATUS OF PUBLIC BUILDINGS IN INDIA

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## ABSTRACT

*The fire properties of public buildings in western Maharashtra have been summaries based on the fact that there are contradiction between what is required for public buildings in the fire code and the real application in practice, difficulties in fire protection planning of public buildings have been analyzed.*

**Keywords:** Fire Rating, Audit, IS Code, Fire Questionnaire, Building Assessment

## I INTRODUCTION

Fire safety is an inherent part of any construction activity, wherein it is necessary to provide the suitable arrangement for the proper control and mitigation of any fire outbreak which may take place due to intentional or accidental reasons. In developing or underdeveloped countries, since the demand of a residence is much higher than in the developed countries, many times it is observed that the fire safety is given very less importance, which can result in devastating consequences. In the Indian context, fire safety has been prescribed as a critical parameter in building construction, especially public buildings. The conditions have been defined in the Indian Standard Codes in the form of Fire Safety codes for public buildings. However, the scenario in India today depicts a very different picture, wherein, fire safety precautions are not only by – passed, but in some cases, ignored in totality. Naturally, fire related accidents are on the rise in the country, and the growth in the numbers is a matter of severe concern. No norms exist today to check the proper construction practices in terms of fire safety today. This paper conducts an analysis of the present status of fire safety status in India.

## II CHARACTERISTICS OF PUBLIC BUILDINGS FIRE

### 2.1 High Fire Occurrences

We know oxygen is important to catch fire anywhere, but it cannot become a source of fire. Source of ignition, sources of fuel and source of oxygen are three different things. Every material having some calorific value can catch fire if source of ignition comes in contact with it,. In order to properly and correctly identify the fire sources actual past examples prove to be a better references rather than contemporary theory. After studying such no of incidents in India from articles, papers and journals the sources are listed below:

- cooking equipment, hot ducting, flues and filters;
- smokers' material, e.g. cigarettes, matches and lighters;
- electrical, gas or oil-fired heaters (fixed or portable), room heaters;
- hot processes, e.g. welding by contractors;

- faulty or misused electrical equipment;
- light fittings and lighting equipment, e.g. halogen lamps or display lighting;
- hot surfaces and obstruction of equipment ventilation;
- central heating boilers;
- naked flames, e.g. candles or gas or liquid-fuelled open-flame equipment;
- flares, fireworks and pyrotechnics; and
- Arson.

### **2.1.1 Quick spread of fire and smoke**

If fire breaks out in building, it mainly spreads through combustible material on surface of buildings and then comes to inside. On other hand, spreads from origin of source to interior of building and then through lift lobbies and corridors from downstairs and finally inside out. In less than 30 seconds a small flame can get completely get out of control and turn into a major fire. It only takes minutes for thick black smoke to fill a building unit. In minutes, unit can be engulfed in flames. You won't have time to grab valuables because fire spreads too quickly and the smoke is too thick. There is only time to escape.

### **2.1.2 Hazards**

The major hazards which take place due to the breakup of fire in the public buildings can result in the destruction of life and property in a very short period of time. Not only can this be dangerous, but at the same instance can result in the following types of critical hazards.

1. Personal hazard
2. Exposure hazard and
3. Damage hazard.

The heavy concentration of smoke and toxic gases like CO, NO<sub>x</sub> cause safe evacuation of people and put them in danger. According to statistics of India and Japan the life hazard due to suffocation in the fire can be as high as 80% due to complicated lay out, use of advanced materials, absence of proper evacuation means etc.

The best example of such a fire can be the one which took place on 22<sup>nd</sup> June 2012 in Maharashtra Mantralaya Building in Mumbai due to short circuit. Fire broke out at 2.40 pm at fourth floor and spread up to seven floor. Two individuals suffered death and sixteen's were injured, 2000 computers were destroyed and 4.8 crore pages of government files were missing. In such cases of fire break out in public buildings, it is impossible to calculate the damage hazards in terms of money.

## **2.2 Analysis of implementation of fire protection planning of public building as per Fire Codes**

Public buildings are large enough and also multifunctional to serve the purpose for which they built. During the construction of such buildings new techniques, materials are employed which brings more difficulties in its fire protection design.

### **2.2.1 Current norms in Is Codes**

Different I S codes of fire has following recommendations for various types of public buildings

Fire prevention: It includes following criteria's -Requirements common to all Occupancies

- Classification of Buildings (9)
- Fire Zones (3)
- Types of Construction (4)
- Requirements common to all Occupancies
- Heating/Smoke venting
- Surface and Interior Finish
- Glazing/Casement/Skylights/Louvers
- Passive systems
- 

### **2.2.2 Life Safety**

General Exit requirements ,occupant load, Capacities of Exits ,Arrangements of Exits, Number of Exits, Doorways ,Corridors, horizontal Exits, Internal Staircases ,External Staircases, Pressurization of escape routes, Ramps, Refuge Area, Fire Lifts/Fire Tower, Emergency escape lighting/ Illumination, Fire detection and Warning

### **2.2.3 Fire protection**

Extinguishers, Dry riser, wet riser, down comer, Automatic sprinkler installations, Manual fire alarm system Automatic alarm system, Terrace tank, Ground level pump. To check implementation of these norms in Western Maharashtra the questionnaire based on above norms is developed for public buildings and a fire audit is carried out taking 20 public buildings from Kolhapur and Sangli district. On the basis of this audit report it is clear that even less than 40% of norms are actually implemented which are automatically followed due to strict implementation of bye laws.

## **2.3 Difficulties in fire mitigation of public buildings**

### **2.3.1 Safe evacuation**

Fire codes require that the linear distance between any point in the educational buildings should not be less than 30m. The end of the staircase shall be provided with exit directly leading to outdoor or shall be enlarged. But in practice it is not enough for public buildings to provide emergency staircases only at the peripheries of building because public buildings are quietly long. Therefore more stairs shall be provided at the middle of buildings.

### **2.3.2 Fire compartmentalization**

Fire code states that any public building having basement should provide with fire compartments having no openings in that. But when fire compartments are installed, number of exits, staircases, and escape routes are increased. Actually fire compartments are very difficult to adopt because large area will be affected and function of building will be completely limited.

Apart from the IS Codes and National Building Code Part IV, none of the organizations / authorities have paid sincere attention towards the development of specific fire safety norms. The standard practice being followed by most of the civil engineers involves the minimal utilization of the IS Code Norms for certification of the

building. However, no stringent rules are in place for restricting the permission process based on non – compliance of fire safety rules in public buildings. Only, the Metro City Municipalities pay some amount of attention for the compliance of certain fire safety regulation, but this is not the overall case. Due to this contradiction, it is difficult to correlate the type of measures which need to be taken up to ensure that these regulations are followed in all locations without any discretion.

#### **IV FIRE SAFETY ISSUES IN INDIA:**

##### **4.1 In – House Fire Safety Education**

The present practice of fire safety in India involves educating the class of people involved with hazardous operation with respect to measures to be taken in case of fire occurrence. The same practice is followed in the Fire Fighting Department. However, no measures are taken for creating a class of people in the building administration itself, which will have a sound knowledgebase regarding the control or mitigation of fire related hazards from the planning stage of the building itself. By this, not only will the building be planned as a fire – proof construction, but at the same time, will ensure that the fire – safety measures are incorporated in the plan, execution and commissioning of the structure at all stages. This reduces the cost of re – furnishing and re – building which may be required if the norms and regulations are to be executed after the completion of the building.

##### **4.2 Cost Economics Management**

Every project incurs large amount of capital investment and also certain amount of recurring expenditure. Therefore, developers always tend to bypass certain parts of the regulations which may lead the following

- Increased investments
- Decreased carpet area available for sale
- Increased sales prices leading to reluctant buyers.
- Decrease in overall profit margin
- Increase labor cost
- Requirement of skilled laborers, which are few.
- Requirement of experienced fire – safety consultants, which are expensive.
- Increased complexity of building architecture.
- Increased cost of building maintenance and repairs.

All of these render the developers in a difficult niche, wherein they cannot cope with the costs that are to be incurred. Therefore, it is necessary to encourage developers to adopt these suggestions, which can be done by giving proper subsidiary benefits to such progressive developers so that this attitude may be dispersed.

##### **4.3 Building Materials**

Building materials which are internally used in the beautification of the building are of various materials, and every material may not be examined from the fire safety angle. Naturally, these building material are not specified in the IS Codes because of rapid changes in the materials available. Therefore it is now necessary that specific regulation development on types of building materials which may be the probable causes of fire hazards in the construction projects and development of a detailed listing of such materials which can provide a

guideline for the procurement of the fire – safe material, and this can be again included in the planning stage itself, further reducing the excessive costing.

#### **4.4 Fire Rating Norms Contradiction**

Fire rating of a building is defined as “The amount of time required for a building / structure to collapse from a fire outbreak.” However, when the IS Codes were observed, no directions regarding the process of study of fire rating of building be conduction. Due to this, post construction, no standard regulations are found, which may help to understand / derive the fire rating of an existing building. This is necessary due to the simple fact that, if we are to apply the norms of fire safety in a constructed building, basic data regarding the fire rating be developed. And this can be done only when standard procedures based on Local Conditions be developed. Hence, a suggestion is made that, a standard procedure development for Fire Rating Auditing be taken up for creating of a benchmark for fire safety implementation.

#### **4.5 Absence Of Specific Norms**

Norms are in place for fire safety of industrial structures and petroleum based industries. However, an absence of norms specific to public buildings and planning stage norms for project approval are completely absent. It is therefore recommended that standard norms be developed by the Government Authorities for proper incorporation of fire safety measures in the planning stage of the construction projects for Public Buildings.

#### **4.6 General Awareness Development**

Fire safety is a very critical issue which needs to be taken up from household level. Not only should fire safety education be incorporated in the school learning, but also at the same time, it is necessary that the entrepreneurs be included in the education process as well. Though general awareness is in place, very little awareness is in place for the specific processes and requirement because of which, critical measures for strict fire safety measures may be applied.

#### **4.7 Correlation Between Fire Safety By – Laws**

Though IS Codes are in place for the building construction, different organizations have different building requirements and different safety requirements. Due to these contradictions, constructors always face a dilemma regarding the process of construction to follow standard norms. Some of the organizational norms require the installation of firefighting devices in specific numbers but for the same, the others may not even consider fire safety as a part of their audit. Due to this contradiction, many a times, though the by – laws have been followed, they may not be as per the standard norms as per the observations of an alternative organization. Thus, there is a requirement of standardization of the norms from all the angles, which will be applicable for any and every standards development committees and will be taken as same.

### **V CONCLUSIONS**

It is seen that the construction and design engineers lack the outlook of planning the building from fire safety point of view. When compared the designs with those prescribed by the IS Codes, it is observed that these norms were not followed critically, and provisions for fire safety like Fire Separating walls, provisions for Proper Fire Escapes, Doors and windows having suitable width and height, ramps, fire alarm systems, water

sprinkler systems etc., which have a crucial role in fire hazard mitigation, are not in place. Furthermore, use of non – combustible materials in the construction of the buildings is not seen. Finally, it can be said that the IS Codes provide the technical background for the proper and systematic design of the dwellings from the Fire safety point of view. However, it is vital that the people who operate, live or work in these places need to made more aware regarding the different dangers that they are exposed to as a result of unsafe behavioural patterns. Further, it is necessary that the government bodies, which are responsible for the proper control and guidance for observing all the regulations strictly, should ensure that the fire rating given to a building is thoroughly checked and each measure for fire safety examined so that it does not cause public risk. Also, the government needs to set up proper measures so that those who find themselves above the law and are prone to by – passing the rules are brought to justice.

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