

# Fire Safety Norms and Personal Well Being: A Critical Analysis of the Fire Safety Measures in Different Buildings

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## Introduction

Among the hazardous risks, Fire has been one of the oldest risks around us. It is the most destructive threat to human life and property. Fire accident in buildings, establishments such as hospitals, commercial houses and high rise buildings have been found flouting fire safety norms which ultimately resulting into major fire tragedies. To find the reasons, frequency and giving protection to all type of buildings became challenges to the professionals and investigations have revealed that in most cases, fire occurred due to sheer negligence.

With the scientific and technological developments the modern cities are becoming much advance with the presence of number of multi-storeyed buildings, malls, multiplexes etc. and hence giving rise to fire-problems. During the last one decade there was a vibrant growth in the constructions activities in India, especially in High Rise buildings. Thousands of High Rise buildings have already constructed in metros and major cities in India, and thousands are under construction. Because of its peculiar nature, fire in residential buildings in particular, high rise buildings become more complex and the salvaging operations become more difficult and sometimes even resulting in many deaths and huge property losses. History is full of fire tragedies at various places where mere negligence of fire safety norms have taken lives of thousands of people.

Some major Fire tragedies in India are; Bangalore Circus Fire (1981) (Death Toll: More than 92 People), Dabwali Fire Accident (1995) (Death Toll: 400 people), Uphaar Cinema Fire (1997) (Death Toll: 59 people), Erwadi Fire Incident (2001) (Death Toll: 28 inmates of a mental asylum), Srirangam Marriage Hall Fire (2004) (Death Toll: 57 people), Kumbakonam Fire Tragedy (2004) (Death Toll: 93 School children), Meerut Fire Tragedy (2006) Death Toll: 100

People), North-East Delhi Fire Tragedy (2011) (Death Toll: 14 Eunuchs died), AMRI Hospital Kolkata Fire Tragedy (2011) (Death Toll: 73 people), Sivakasi Factory Explosion (2012) (Death Toll: 40 people), Kolkata Market Fire (2013) (Death Toll: 19 people), Kerala Temple Fire Accident (2016) (Death Toll: 110 persons)<sup>1</sup>, Pulgaon Ammo Depot Fire (2016)<sup>2</sup> (Death toll: 16 People) and many more.

History shows that committees concerned with safety have developed many building regulations, codes and standards for the prevention of fire. The present paper is focused at the existing building regulatory system which is silent with respect to many of National Building Code 2005, provisions,

- 1 Ignatius Pereira "Fireworks show in Kerala goes awry, kills 107" The Hindu, April 10, 2016 Available at: <http://www.thehindu.com/news/national/kerala/live-kerala-kollam-temple-fire-several-dead/article8457603.ec> (Accessed on March 23, 2018).
- 2 Available at: <http://indianexpress.com/article/india/india-news-india/at-least-16-feared-dead-15-injured-in-massive-fire-in-pulgaon-arms-depot-2827732/> (Accessed on March 23, 2018).

in general and disaster resistant mitigation features, in particular. The main objective of the paper is relating to the existing norms as to Fire Prevention, Life Safety and Fire Protection in India and to identify those issues which are responsible for the different fire tragedies in India and to suggest and adopt adequate measures for plugging the loopholes.

### Elements Responsible For Fire Tragedies

A survey on fire tragedies clearly shows that major fire incidents are due to the electrical short-circuits. A short circuit is “an abnormal low resistance connection between two nodes of an electrical circuit intended to be at different voltages” and this results in an excessive electric current which has the potential to cause circuit damage, overheating, fire or explosion. Overloaded wires can also overheat and damage to the wires’ insulation or a fire.

The other reasons for fire outbreaks include:

- Obstruction-free exit points.
- Combustible materials and inflammable debris kept in the building close to the places of potential fire outbreak.
- Cigarettes, matches, flames from stoves/candles, firecrackers and over-heating of gadgets.
- Hot and dry season from March to June add to the possibility of fire as also the careless use of electrical equipment, naked wires and loose joints.
- Non Availability of Emergency lights and sign posts. Lack of proper Sound and Warning systems to convey the message in case of emergency. Lack of smoke detectors, fire alarm, fire extinguishers, water buckets and fire drills.

- Space constraints for the entry and effective operation of firefighting vehicles and non-availability of water for contributing fire.

### The Building And Fire Safety Regulations In India

#### Bureau Of Indian Standards

Bureau of Indian Standards has rendered invaluable service by producing large number of national standards, which are of direct relevance to the construction industry and some of them particular to the mitigation of disasters.<sup>3</sup> Fire Fighting Sectional Committee, CED 22 of BIS is engaged in formulation of Indian Standards on Fire Fighting equipments/extinguishers using water, carbon dioxide, foam, dry powder and halon as extinguishing agents. In view of the phasing out of halons as per Montreal Protocol, BIS has recently published various standards on halon alternatives. These are intended for use by the Fire brigades and other organizations.

BIS has formulated more than 100 standards on firefighting including standards on various types of fire tenders, fire engines, trailer pumps and high capacity portable pump sets etc. Fire Safety Sectional Committee, CED 36 of BIS has formulated a series of Indian Standards pertaining to General requirements and specific to various buildings & industries.<sup>4</sup>

Some of the important standards formulated by this Committee are as follows:<sup>5</sup>

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<sup>3</sup> Bureau of Indian Standard, Status Report on Standardization Efforts in the Area of Mitigation of Natural Hazards, 1 (Government of India Ministry of Home Affairs, National Disaster Management Division).

<sup>4</sup> *Ibid.*

<sup>5</sup> *Id.* at 9.

IS 1641:1988	Code of practice for fire safety of buildings (general) : General principles office grading and classification (first revision)
IS 1642:1989	Code of practice for fire safety of buildings (general) : Details of construction (first revision)
IS 1643:1988	Code of practice for fire safety of buildings (general) : Exposure hazard (first revision)
IS 1644:1988	Code of practice for fire safety of buildings (general) : Exit requirements and personal hazard (first revision)
IS 1646:1997	Code of practice for fire safety of buildings (general) : Electrical installations (second revision)
IS 3034:1993	Code of practice for fire safety of industrial buildings : Electrical generating and distributing stations (second revision)
IS 3079:1990	Code of practice for fire safety of industrial buildings : Cotton textile mills (first revision)
IS 8758:1993	Recommendations for fire precautionary measures in the construction of temporary structures and pandals (first revision)
IS 11457(Part 1):1985	Code of practice for fire safety of chemical industries : Part 1 Rubber and plastic
IS 11460:1985	Code of practice for fire safety of libraries and archives buildings
IS 12456:1988	Code of practice for fire protection of electronic data processing installation
IS 13694:1993	Code of practice for fire safety in iron and steel industries
IS 13716:1993	Code of practice for fire safety of hotels
IS 14435:1997	Code of practice for fire safety in educational institutions

## The National Building Code Of India (NBC), 2005

The National Building Code of India (NBC), 2005 is a national instrument that guides the

regulations for construction activity. It contains all the important aspects relevant for safe and orderly building development. The building that does not satisfy building code or violation of National building code will lead to penalty, cancellation of sanction or demolition of the building. The NBC gives detailed guidelines for Construction Materials, General Requirements for all buildings, Life Safety, Fire Protection, Specific Occupancy wise Requirements and specific requirements for buildings above 15 meters.<sup>6</sup>

The National Building Code 2016 (NBC) and separate building bye-laws lay down the guidelines and provisions for regulating and preventing fire in India. The NBC provides with the guidelines for victims as well as the firemen in case of an emergency and the bye-laws state the administrative powers of fire officials.<sup>7</sup>

Apart from lifts used by the residents of the building, the NBC provides for separate fire lifts in high rise buildings exclusively for firemen in case of an emergency. Automatic closing doors, a capacity not less than 545 kg (applicable for 8 persons), separate electric supply for the lift and in case of power failure- an automatically changeover to alternate supply are the few conditions which need to be fulfilled for the construction of a fire lift. Speed of the fire lift will be more than a regular lift, which could take the firemen from ground floor to the top floor within a span of a minute.<sup>8</sup>

6 The National Building Code of India (NBC), Bureau of Indian Standards, New Delhi (2005).

7 Sonakshi Awasthi , “What is the status of fire safety in your residential building? Here’s what the law says”, *The Indian Express*, June 23, 2017. Available at: <http://indianexpress.com/article/what-is/what-is-the-status-of-fire-safety-in-your-residential-building-4703494/> (Accessed on 23-03-2018).

8 *Ibid.*

NBC also provides regulations for the construction of staircases in buildings for the rampant use of stairwells during emergency situations. Brick staircases shall be constructed with ventilation at each landing and glazed and glass staircases must be fire resistant for minimum two hours. Heavy static water storage in the form of underground water should be made available in buildings to fight fire at the rate of 1000 liters per minute. The building should install automatic sprinklers in the basements used for car parking or storage occupancy exceeding 200m.<sup>9</sup>

Residential buildings shall be provided with two means of exit on the ground floor, out of which one should have an exit through the interior stairwell or a door for unobstructed travel to the street. Similar rules are applicable to educational buildings, institutional and assembly occupancies and business and industrial buildings.<sup>10</sup>

### **National Building Code (Part 4) – Fire Protection**

The ‘part 4’ of ‘National Building Code of India – 2005’ on ‘Fire & Life Safety’ covers the requirements for fire prevention & life safety in relation to fire and fire protection of buildings. As a major development, BIS has published NBC (Part 4) Fire Protection which includes comprehensive recommendation of minimum standards of fire protection.

It specifies the demarcation of fire zones, restrictions on construction of buildings in each fire zone, classification of buildings based on occupancy, types of building construction according to fire resistance of the structural and nonstructural components and other restrictions and requirements necessary to minimize danger to life from fire, smoke, fumes or panic before the building can be evacuated. The Code specifies

9 *Id.*  
10 *Id.*

construction, occupancy and protection features that are necessary to minimize danger to life and property from fire.<sup>11</sup>

Various State Governments and Local Bodies have incorporated many of the provisions of the National Building Code of India, 2005, in their own building regulations. Maharashtra state is an excellent example which has not only adopted the provisions of National Building Code but also made it mandatory in its Fire Prevention & Life Safety Measures Rules. The Maharashtra Fire Prevention and Life Safety Measures Rules 2009 are framed under the Maharashtra Fire Prevention and Life Safety Measures Act 2006.<sup>12</sup>

Apart from that Development Control Regulations for Mumbai 2016, Andhra Pradesh Building Rules 2012 and Master plan for Hyderabad Urban Development Area are other provisions regarding fire protection and safety in buildings. Among the existing laws regulating and preventing fire in the national capital are the Delhi Fire Service Act 2007 (Delhi Act of 2009) and Delhi Fire Service Rules 2010. These enactments were a replacement of Delhi Fire Service Prevention & Fire Safety Act, 1986, which now stands repealed.<sup>13</sup>

Defining building bye-laws, fire zone and including explosive and explosive substance, the Delhi Fire Service Act 2007 (Delhi Act of 2009) also lists the constitution of fire divisions and fire stations including appointments of fire directors and officials. The said Act and the Delhi Fire Service Rules 2010 deal with administrative powers of the fire service officers and their appointments.<sup>14</sup>

### **The National Crime Records Bureau**

11 *Supra* note 4 at 10.  
12 *Supra* note 1 at 106.  
13 *Supra* note 8.  
14 *Ibid.*

## DATA15

The National Crime Records Bureau Data indicates that a total of 113961 people lost their lives due to Fire Accidents from 2010 to 2014. This is an average of 62 deaths a day. Maharashtra alone accounted for 24293 deaths or 21.3% of all the deaths due to fire accidents. The data available with the National Crime Records Bureau (NCRB) indicates that fire accidents of all types caused more than 1.13 lakh deaths from 2010 to 2014, at a staggering average of 62 deaths per day.

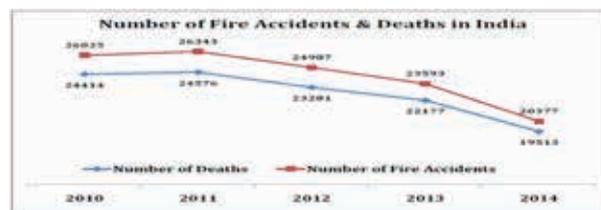
In its annual report 'Accidental Deaths & Suicides in India', NBRC, has listed various unnatural causes of death, fire accidents and related deaths. Between 2010 and 2014, a total of 1.21 lakh fire accidents of various types took place in the country claiming more than 1.13 lakh lives.

A total of 18,450 cases of fire accidents were reported in the country during 2015 which resulted in 17,700 deaths and injuries to 1,193 persons. In 19 States/UTs, 50.0% or more cases of fire accidents were reported in residential buildings or dwelling. A & N Island, Lakshadweep & Tripura (100% each), Uttarakhand (87.7%), Meghalaya (86.7%), Jharkhand (85.1%), Chandigarh (83.3%), Telangana (83%), Punjab (76.7%), Gujarat (74.4%) and Kerala (70.4%) were prominent States/UT in this category.<sup>16</sup>

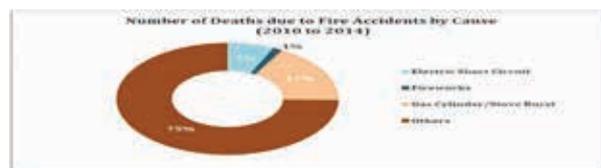
The NCRB categorizes deaths due to fire accidents into four broad groups. Deaths caused by Electric Short Circuit, by Fireworks, by

Gas Cylinder/Stove Burst and by any other cause. From 2010 to 2014, the number of deaths due to Electric Short Circuit was about 7743 or 7% of all the deaths. The number of deaths due to firework accidents like the one in Kollam was 1630 or just 1% of the total deaths. 17% or 19491 deaths were caused by burst of Gas Cylinder/Stove. Three fourths (75%) or 85081 deaths were caused by other reasons like fire in buses, trains, buildings etc.<sup>17</sup>

In each of the five years from 2010 to 2014, the percentage of women victims was more than 60%. For all the five years, the number of women victims was 75039 or 65.8% of all the deaths. The number of male victims on the other hand was 38917 or 34.2% of all the deaths. This percentage of women victims was as high as 66.6% in 2010.<sup>18</sup>



**Source:** Report of the National Crime Records Bureau (NCRB), Ministry of Home Affairs, Government of India (2010-2014). Available at: <https://factly.in/fire-accidents-caused-an-average-of-62-deaths-per-day-in-the-last-5-years/> (Accessed on 23-03-2018).



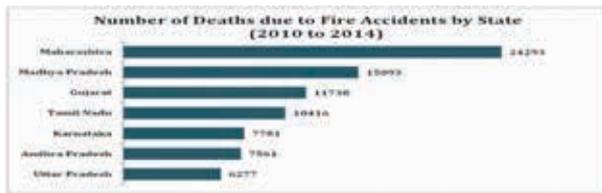
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- 15 Rakesh Dubbudu, "Fire Accidents caused an average of 62 deaths per day in the last 5 years", (April 13, 2016) Available at: <https://factly.in/fire-accidents-caused-an-average-of-62-deaths-per-day-in-the-last-5-years/> (Accessed on 23-03-2018).
- 16 Accidental Deaths & Suicides in India 2015, National Crime Records Bureau, Ministry of Home Affairs, Government of India at [vii]. Available at: <http://ncrb.gov.in/StatPublications/ADSI/ADSI2015/ads-i-2015-full-report.pdf> (Accessed on 23-03-2018).

- 17 *Supra* note 16.
- 18 *Ibid.*



**Source:** Report of the National Crime Records Bureau (NCRB), Ministry of Home Affairs, Government of India (2010-2014). Available at: <https://factly.in/fire-accidents-caused-an-average-of-62-deaths-per-day-in-the-last-5-years/> (Accessed on 23-03-2018).



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## Impediments In Fire Fighting And Ignorance Of Fire Safety Regulations In India<sup>19</sup>

- Unauthorized erections of temporary structures, such as pandals, tents, shamiana, etc. wherein electrical wires precariously hang on and are connected to the main in the adjacent building. No check is being conducted to observe electrical and fire safety standards. Fire extinguishers are seldom found at such places.
- A qualified or at least experienced electrician is rarely available in case of short circuit or other related matters. There is no adequate inspecting staff to visit and to keep a check on unauthorized acts/omissions or violations.

<sup>19</sup> Available at: [lawcommissionofindia.nic.in/reports/manmadedisaster.pdf](http://lawcommissionofindia.nic.in/reports/manmadedisaster.pdf) (2- 3) (Jul 20, 2012) (Visited on October 23, 2017).

- Lack of coordination among various regulatory agencies of Government to give permission for erecting such structures. No proper care and attention is being given while granting the permission for construction of building or license for occupation and for renewal.
- Ignorance of the concerned authorities like the Engineering staff, the Fire personnel and the Electrical Inspectors to ensure that the building is structurally sound and safe. No Regular visits by the concerned authorities to keep a check that any kind of combustible materials and inflammable debris are not kept in the building close to the places of potential fire outbreak.
- No regular check on the electrical installations and connections including wiring which is exposed to the risk of occurrence of short-circuit. No Periodical inspections to rectify the crucial defects and potential sources of danger though that is a mandate as per the rule book.
- No awareness and adequate training is imparted to the staff and occupants to use the fire-fighting kits and extinguishers in case of emergency. There is no training programme to the Fire and Building Inspectors or for Factories and Electrical Inspectors and Mine Safety Officers. Lack of sufficient number of Fire Stations with adequate trained personnel and upgraded fire combating equipment.
- The punishments prescribed by the laws governing various aspects of safety and maintenance are not adequate and in any case they are not deterrent enough to exact compliance. The Management can very well pay a meager amount of fine and

continue to violate the laws such as under the Cinematograph law.

- Building collapses occur on account of weak foundations as no sufficient care is taken while granting permissions or to inspect during the construction stage. The architect, contractor and engineer engaged by the builder never try to comply with the provisions of National Building Code.<sup>20</sup>

### **A Ground Level Survey Of Practical Implication Of Fire Safety Norms In Different Types Of Buildings - A Critical Analysis**

After a major fire accident in Kolkata's AMRI hospital in 2011, fire authorities conducted audits in many hospitals across the country. Fire safety audit of several major hospitals in Delhi and Mumbai revealed that more than half of the hospitals lack fire prevention measures. In case of high-rise buildings, the scenario is equally bad.

In February 2012, the fire department in Mumbai had issued notices to as many as 383 high-rise buildings for not complying with fire safety regulations. Several high-rise buildings, approximately 60 percent in Gurgaon, have not renewed their no-objection certificate from the fire department. In Jaipur, a tourist hub, more than 90 percent of the high-rise buildings have less than adequate fire fighting measures.

While responding to a right to information petition, Mumbai's fire department indicates that electrical short circuit and careless disposal of cigarettes/matches are important causes of fire in Mumbai. This is followed by flames from stoves/candles, firecrackers and over-heating of gadgets.<sup>21</sup>

<sup>20</sup> *Ibid.*

<sup>21</sup> India Risk Survey 22 (Pinkerton and Federation of Indian Chambers of Commerce and Industry (FICCI) 2012).

While focusing on the risk of fire, a section of corporate sector have made efforts to train their employees on fire safety aspects and jointly conducted fire safety mock drills on regular basis with the state fire departments. However, fire departments across the country are in imperative need of additional funds to modernize and upgrade their equipments as well as manpower skills. The most challenging part for the fire departments is to reach to the top of high-rise buildings for want of a necessary equipment to reach to the top.

The fire department of the Pune Municipal Corporation (PMC) has inducted a new imported fire tender at a cost of INR 110 million to tackle fire incidents in high-rise buildings. The fire tender, with 70 meter hydraulic platform has the capacity to douse fires at a height of 100 meters.<sup>22</sup>

In 2010-11, as many as 22,187 fire related calls were reported resulting in the death of 447 persons and injury to 2,613 persons across India. Heating systems and air-conditioning plants, especially in large and tall multi-storeyed buildings add to the fire hazard. The air-conditioning ducts offer easy path for fumes, gases and smoke to be conveyed to other parts of the building quickly and false ceilings of inflammable material also add to the hazard. In May-August of 2012, 9 major incidents of fire had been reported including the fire at Maharashtra Secretariat building in Mumbai on 21 June in which three people lost their lives.

In Mumbai, the financial capital of India, almost 75% of fire-related incidents occur because of short circuit caused by loose wiring. Data from Mumbai fire department revealed that from 2009-2012, out of 13,185 incidents of fire, as many as 9, 711 incidents were caused by defective electric

<sup>22</sup> India Risk Survey 23 (Pinkerton and Federation of Indian Chambers of Commerce and Industry (FICCI) 2012).

circuits in the city. Mumbai fire department revealed that short circuits which are the main cause of city fire, often take place in old buildings in densely populated areas and crowded markets.

Ahmedabad Municipal Corporation authorities stated that in the absence of heavy fines and penalties, societies and members of such complexes do not bother to conduct maintenance of their safety systems. This is the case with other Indian states as well.<sup>23</sup>

### **Concluding Remarks And Suggestions**

To combat and providing protection against the disasters like earthquake, cyclone and construction practices many countries have comprehensive national building code or national standards which are only recommendatory and do not have the mandatory status for their local application.

In India, National Building Code, 2005 lays down a set of minimum provisions designed to protect the safety of the public with regard to structural sufficiency, fire hazards and health aspects of buildings to be adopted or enacted for use by various departments, municipal administrations and public bodies. Unfortunately, the authorities concerned with the enforcement of such standards, often keep their eyes shut to

such violations and hence, endangered the lives of people.

The provisions contained in the Code regarding the Fire Prevention, Life Safety and Fire Protection should be adopted by State Government, local bodies, Public works department, other government construction departments and other construction agencies. The existing guidelines established by the international and national building codes relating to fire safety and protection are not complied with a stringent hand. Indian Laws on this particular subject are not at par with International Building and Fire Safety guidelines which are usually ignored during construction work.

A survey has revealed that most of the buildings are without Fire equipments. There are no proper arrangements for the Fire extinguishers, Fire alarms, Emergency exits, Lifts, Smoke detectors etc. to combat the fire incidents. Authorities should keep a check and time to time make a survey whether International standards and legal principles relating to Fire Safety and Protection are applied in India or not. Different seminars, surveys, Mock Drill training should also be conducted to find out the fire or ignition source, reasons for fire spread, reasons for life and property losses so as to find out effective solutions to avoid such kind of accidents in future.

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23 India Risk Survey, 24 (Pinkerton and Federation of Indian Chambers of Commerce and Industry (FICCI) (2013).