

Study of Fire Fighting System in Public Building

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Abstract:- Among different types of occupancies, a commercial highrise building presents a greater challenge to fire protection due to its functionality, complexity and economic value. The key objective of the present paper was to examine the situation of physical (as opposed to non-physical)fire protection systems in fourteen randomly selected commercial highrise buildings in the Nairobi CBD for fire safety optimization. Methods used include; physical observations, document review andinterviews. A multi-attribute evaluation model/approach was applied to establish sufficiency and/or suitability of fire protection systems in the light of the national regulations and approved standards. The study findings show that, save for the facilities of the disabled and the firefighting/evacuation lifts, other fire protection systems are mainly provided in the buildings. However, insufficient maintenance and/or unsuitable elements renders their safety performance low. The results of the analysis showed that portable fire extinguishers had the highest performance with 78.57% of the buildings sufficiently and suitably in terms of number, locations, servicing etc., while 0% of the building was sufficiently and/or suitably installed with a sprinkler system i.e. they all exhibited some deficiency in terms of coverage and maintenance issues. This could be associated with the cost factor. The results of other systems were as follows: Fire detection and alarm (14.29%); Escape route (50%); Emergency lighting (64.29%); Smoke control System (50.00%); Compartmentation (64.29%), Riser mains, hose reels and hydrants (64.29%); Fire Brigade access and facilities (64.29%); Safety signs and notices (7.14%); Portable fire extinguishers and Fire assembly points (28.57%). In view of the findings, it's recommended that increased efforts in inspection and maintenance of fire protection systems are considered to address the identified shortfalls throughout the project life. Provision for firefighting/evacuation lifts and facilities for the disabled persons should be consideredduring design of the commercial high-rise buildings.

Keywords:- *Fire Protection Systems, Maintenance, Provision, Optimization, High rise buildings.*

I. INTRODUCTION

Fire and smoke are among the major reasons of the accidental casualties [1]. Fire detection is important as the fire causes serious damages to both human life and non-living assets. Most of houses lack the fire alarm systems that causes the resident a serious risk on fire breakout in homes [2]. The fire breakout can also occur in absence of the residents. Most of fire alarm system, available in market, are in wired connection mode. This type of system needs installation and investment and have its own limitations. It also does not meet the new automatic smart home's requirements [3]. Thus, an intelligent wireless fire alarm system is needed to be developed with lower maintenance along with safer and easier. The methodology is discussed in the next section.

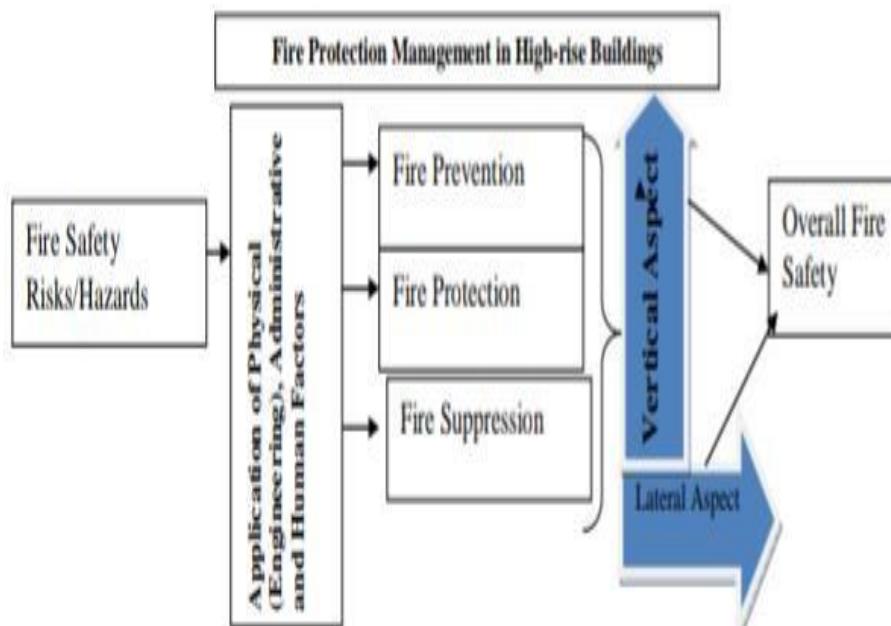


Figure 1.0: Systems Approach for Fire safety Management, (modified from P. Rama Murthy (2006) by author),

II. FIRE PROTECTION SYSTEMS

Conceptually, optimal fire protection can only be achieved through integration of three key fire safety elements. These are fire prevention, protection, and suppression. The concept in figure 1.0 below is used to demonstrate how an integrated fire safety planning and management system can be used to offer an overall fire safety in commercial high-rise buildings as illustrated below. Fire prevention and suppression are concerned with control of fire from taking place and extinguishment respectively. Fire protection is a mechanism involving both fire prevention and suppression at design and occupation of a building. Normally, each of the three fire safety elements exhibit three critical safety controls i.e. physical control, management control and human control in fire safety management.

Automatic water sprinkler: The legal provision for provision of automatic water suppression system is contained in the National Planning and Building Regulations, 2014, regulation SS 37. The Regulation requires that, with some exceptions, any building exceeding 30 meters in height or a basement storey more than 500m² or in any other storey which exceeds 500 m² in total floor area and such storey is not provided with breakable or openable panels be installed with an approved sprinkler system.

Fire detection and alarm system: The key statutory requirements for fire detection and alarm systems are found in the provisions of Fire Risk Reduction Rules, 2007, under rule No. 26 and No 28 and in the National Planning and Buildings 2014, regulation SS32.

Escape route: In the National Planning and Building Regulation, 2014 the requirement for provision escape route is contained in regulation SS18.1. The regulation requires that all buildings be provided with one or more escape routes that can be used in case of fire or other emergencies. The regulations also provide for the specifications for appropriate lighting and ventilation of such escape routes and stairways. The escape route should be well maintained, free of any obstructions, well light and provided with essential furniture to aid in movement and visibility of the route.

Emergency lighting: The building regulations require that, an independent supply of power is provided to provide energy for lighting during emergencies as per Reg.SS31 in the National Planning and Building Regulations, 2014.

Smoke control system: The Factories and Other Places of Work (Fire Risk Reduction) rules, Rule No 18 and regulation SS43 of the National Planning and Building, 2014 provide for provision of such facilities for control of smoke and/or fumes in workplaces or occupancies.

mains, hose reels and hydrants: The provision for riser mains, hose reels and hydrants for fire purposes are contained in various regulations in the National Planning and Building Regulations, 2014. Regulation SS34.1 requires that rational design of a fire installation make provision for water to be supplied in the quantity and at the pressure and rate of flow in accordance with BS 5306: Part 1 to 7 of Regulation SS35.1 provides for hoses installation in any building of two or more storeys in height or in any single storey building of more than 250m² in floor area at a rate of 1 hose reel for every 500m² or part thereof of floor area of any storey. Regulation SS36.1 requires that they are provided in any building exceeding 12 m in height. The Fire Risk Reduction rules, Rule No 29 (1) requires that occupiers provide means of extinguishing fire at the workplace, while Section (4) requires that, where fire hose reels are provided and occupiers ensure that there is at least one fire hose reel are within the radius of 30 meters.

Facilities for the disabled: The National Building Regulations, 2014 provide for provision of firefighting and evacuation lifts and specifies the requirements for stretchers that can be used by persons with disability or the injured during emergency as provided under regulation SS50.1. Further, regulation SS 67.4 requires that every owner or occupier of a building shall have shall have arrangements for the evacuation of persons with special needs from a building in the event of a fire or other hazardous materials emergency. The Persons with Disabilities Act, 2003 provide for accessibility and movements of the disabled in workplaces and public buildings such as hand rails, visual signs etc.

Fire brigade access and facilities: The provision for fire brigade access and facilities are provided in regulation SS57, Section (1) of the regulation requires that no building should be erected on any site unless such site is provided with suitable access for the purposes of firefighting and rescue by the Fire Services of the local authority.

Fire safety signs and notices: The National Planning and Building Regulations, 2010 provide clear guidelines on requisite specification for fire safety signs and notices under regulation SS30 and regulation SS46. Regulation SS30.1 subsection (a) requires that any building having emergency routes be clearly marked and signposted to indicate the direction to be travelled in the case of any emergency.

Fire Extinguishers: These are first-aid fire extinguishers which are installed in the building for emergency purposes. They include among other portable CO₂, dry chemical and powder, foam and water extinguishers strategically sited within the building premises. It is a legal requirement under the Fire Risk Reduction, rule 29 (1) to provide firefighting appliances includes, among others, fire extinguishers. Rule 30 subsection (1) requires that every occupier ensure that all means of extinguishing fire are properly maintained and provides the requirements for inspection and testing, record keeping and timing of examination and testing. Rule 31 provides specific requirements for distribution of the various types of fire extinguishers in workplace.

Fire assembly point: The essence of a fire assembly point for emergency is to provide a place where head count of the persons who are involved in the fire is done. It also used as a temporary station where people who are injured can be offered first aid or can be picked for more attention to the hospital by rescue personnel. The requirement for fire assembly point is provided in Rule No 24 of the Factories and Other Places of Work (Fire Risk Reduction) rules, 2007. The rule requires every occupier identify a location in the workplace where every worker shall assemble in the event of a fire.

III . RESULTS

SR.NO	DESCRIPTION	PUBLIC BUILDINGS	RESIDENTIAL BUILDINGS
1	overhead tank capacity	3000 litre	25000 litres
2	Booster pump capacity	1000lit/min	900lit/min
3	Sprinkler	Required, if area is more than 200m ²	Required, if area is more than 200m ²
4	First aid horse reel	Required	Required
5	Side and rear open space (setback) to be left around a building (minimum)	6m	4.5 m
6	Number of staircase	Mini. 2	Mini. 2
7	Minimum width of stair	2 m	1.5 m

IV.CONCLUSION

communities can and will self-organize to take action to reduce the risk of catastrophic wildfire, if appropriate support is provided. In addition to defensible space around homes, shaded fuel breaks are needed to extend greater fire safety for neighborhoods. A network of shaded fuel breaks will extend greater fire safety for our communities, cities, and towns.

Building shall be planned, designed and constructed to ensure fire safety and this shall be done in accordance with fire protection of national code of India, unless otherwise specified in these rules.

A fire alarm is a device that detects the presence of fire and atmospheric changes relating to smoke. In some cases, a fire alarm is a part of a complete security system, in addition to a burglary protection system. The fire alarm operates to alert people to evacuate a location in which a fire or smoke accumulation is present

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