

# **Fire Emergency Response Mechanism in Commercial Buildings in Karachi**

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## **Abstract**

The fire is a type of emergency followed by a path of destruction that occurs spontaneously at a job site or working office with no warning whatsoever; damaging and eradicating every resource in the sight. To prevent such damages and property loss while protecting the employees from fire requires a fire emergency response mechanism. However, most of the firms are blinded by their successful performance, neglecting the safety and protection of their workforce. This study examines the current level of response mechanism practices conducted in commercial buildings in Pakistan during fire incident, where the results indicate that fire proofing components and evacuation plans usually do exist in majority of commercial buildings, however, their effectiveness did not meet the required standards due to the lack of inspection and endorsement enforced by the fire protection authorities existing within Pakistan.

## **Keywords**

Fire, destruction, safety and protection, fire-proofing components and evacuation plans.

## **1. Introduction**

When usually a fire starts at workplace, it deteriorates everything in the surrounding quickly as well as spreading rapidly across the same floor and on other floors, making it unsafe for the occupants to reside and leave the area as soon as possible. However, the problem is that the most of the buildings are not fire proof and people working in such building possess no awareness about the fire response mechanism in addition to the other human factors such as chaotic nature and vast number of occupants in a confined space, making it further difficult for them to exit the fire zone premises (Philip, 2013).

The Karachi city is known to be the main financial center for Pakistan where the majority of commercial buildings lack prerequisite fire emergency plan which posture critical threat to the occupants. Several demanding and severe situations were seen in the past 5 to 10 years in Karachi, this city has faced several

incidents like on 27th March 2011, dozens of shops in the historical Empress Market, Saddar, Karachi, were destroyed in the fire which had broken out. 25 percent of the market had been affected; however, the loss might have been minimized, if building was equipped with any fire safety systems.

Similarly, as shown in figure 1, garment factory fire in Baldia town, Karachi in 2012, reported about more than 260 people to have died because of the limited emergency exit means.



**Figure 1: Fire accident at garment factory in Baldia town, Karachi (2012)**

The limited emergency exit means in the factory includes only one accessible mean of exit while all the other doors were locked. This calamity escalated due to the lack of fire drills which are required to be maintained annually.

In addition, a 22 year old jobless man kept on dangling at a window for about 10-15 minutes on November 28, 2012 because of fire smoke occurred in his house. Thus, deficiency of knowledge about the escaping routes and how to respond in that situation forced him to jump off the eighth floor in hope to breathe fresh air, succumbing to his injuries.

The Karachi city have approximately 43-45 fire engines/ tenders along with 23 fire stations spread throughout the city including the fire emergency response center located near Hawks bay. But, it requires them few minutes to reach the point of incident, so unless our commercial buildings such as shopping malls and plaza are not equipped with suitable fire protection system and provisions, the fire fighters are unable to provide extensive service to the fire victims.

## **2. Modes of Operation**

A pre-requisite fire safety plan prepared by fire safety management involves two modes of operations, normal mode and emergency mode of operation.

### **2.1 Normal Mode of Operation**

A normal mode of operation focuses on three components: maintenance plan, staff training plan and fire

prevention plan (Wahyu et al., 2014; Yueh et al., 2012; Tseng, 2011). A maintenance plan includes the annual evaluation and repairing of fire hydrants such as extinguishers, sprinklers, fire detectors and alarms (active system) while also repairing any damages in the escape route and fire doors (passive system). Whereas, the staff training plan includes the selection of a fire warden responsible for supervising the staff members, description of appointed staff duties, usage of fire hydrants and guiding occupants to safety (Yueh, 2012; Tseng, 2011). Similarly, the fire prevention plan includes identification, maintenance and restricting the usage of combustible items such as electrical appliances and waste matter (Wahyu et al., 2014; Xiuyu, 2012).

## 2.2 Emergency Mode of Operation

The emergency mode of operation includes the fire action plan which involves reporting of fire brigade, slowing the progress of fire spreading until fire ambulance arrives and assisting them in putting out the fire (Xiuyu, 2012).

## 3. Types of Fire Fighting Equipment

According to American standards, National Fire Protection Association (NFPA) has classified the fire fueling sources into following categories or classes according to which the fire-fighting equipment are categorized:

**Table 1: Fire fueling sources categorized in various classes.**

| Fire Classes | Fire Fueling Sources        |
|--------------|-----------------------------|
| Class A      | Ordinary Combustibles       |
| Class B      | Flammable liquids and gases |
| Class C      | Electrical equipment        |
| Class D      | Combustible metals          |
| Class K      | Cooking oil or fats         |

The few types of firefighting equipment used for suppressing the fire fueling sources are:

### 3.1 Fire Extinguishers

Fire extinguishers are usually used for putting out small scale fires for a brief moment at the beginning of a fire. The table 2 identifies different types of extinguishers each suitable for certain type of classes.

**Table 2: Different types of fire extinguishers and their associated fire classes and purposes**

| Types of Fire Extinguishers        | Types of Fire Classes | Purposes   |
|------------------------------------|-----------------------|--|
| Multi-Purpose Dry Chemical Powder, | Class A,B & C         | Schools, Universities, laboratories, hospitals, offices etc. |
| Carbon Dioxide (CO <sub>2</sub> )  | Class B & C           | Electrical appliances and computers                          |
| Halotron (I)                       | Class A, B, C & E     | Telecommunication areas and textile mills                    |
| Aqueous Film Forming Foam          | Class A & B           | Industries, petrol pumps, garages and workshops              |
|                                    |                       | Warehouses, textile mills, schools,                          |

In Karachi, 73% of the respondents have knowledge concerning extinguishers. However, their knowledge is limited to a certain extent where only 26% respondents were familiar with water type and 20% were familiar with CO<sub>2</sub> type extinguishers while 20% were aware of foam type extinguishers. The rest had no awareness regarding the other types of fire extinguishers. They also had no handling experience or training given in case of any fire emergency, which can be extremely severe when faced with such any incident (Xia et al., 2013).

### 3.2 Fire Hydrants

Fire hydrants are used to extinguish fires by releasing pressurized water, constructed on pavements at a certain distance from curb and installed at every 500 ft. (Liu, 2010). A gate valve is present on water supply pipeline where the outlet size varies ranging from 2 ½ to 4 ½ inches in diameter (Nan et al., 2014). These hydrants requires an extensive amount of water connected to the main water pipeline, but since due to scarcity in most parts of Pakistan, the plan of installing fire hydrants was never approved for the urban development in Pakistan.

### 3.3 Fire Sprinkler System

It is a small diameter water distribution pipe system attached to multiple sprinklers installed at particular distances to cover a certain circular area which activates upon detection of items emitting heat exceeding its temperature beyond predetermined limit (Kelvin, 2014). Most of the recent commercial buildings in Karachi are equipped with different types of fire sprinkler system as shown in table 3.

**Table 3: Different types of fire sprinkler system, their activation procedures and usage areas**

| Types of Fire Sprinkler System | Type of Activation  | Usage areas                          |
|--------------------------------|---|--------------------------------------|
| Wet Pipe System                | Automatic water discharging upon heat detection               | Hot areas                            |
| Dry Pipe System                | Manually manipulating air to forcibly discharge water         | Mountainous regions                  |
| Deluge System                  | Manually opening piping system to allow flow of water in bulk | Water scarce areas at low altitude   |
| Water mist system              | Compressed gas or high pressure pumps are used                | Water scarce areas at high altitudes |

Due to the lack of knowledge regarding the different types of system, occupants are unable to manually operate or utilize those fire sprinkler systems (Kelvin, 2014; Yulong, 2012).

## 4. Survey Analysis

This study shows variant opinions taken into considerations from the discussions made with the respondents in regards to fire safety in commercial buildings.

### 4.1 Objective and Scope

This study evaluates the current state of fire emergency response mechanism and fire safety provisions being deviated from the standard fire safety measures in the fully-functional high-rise commercial buildings in regards to reducing the possibility of any future casualties that may occur due to fire accidents.

## **4.2 Target Audience**

The target audience for the survey was focused on fire warden or incharge or concerned personnel in all types of commercial buildings which include multiple shopping malls and plazas, various hospitals, educational institutes and especially the work-offices located on the main arterial road such as Shahrah-e-Faisal.

## **4.3 Outcome**

In Karachi, the respondents were queried about their current knowledge regarding fire-fighting equipment where out of 86% respondents, who responded positively, 73% had knowledge about extinguishers placed on the edges and corners of walls, 14% were aware of sprinklers been installed on ceilings to be automatically activated upon any heat emittance and only 8% were familiar with hose pipes which according to them are framed in the glass box, never been used in the fire drills as an ancient artifact. Thus, 73% respondents that have knowledge concerning extinguishers is limited to a certain extent where only 26% respondents were familiar with water type extinguishers used in various educational institutes such as schools and universities as well as in textile mills and their warehouses. Similarly, 20% respondents were familiar with CO<sub>2</sub> type extinguishers being used in computer laboratories while 20% were aware of foam type extinguishers found at all petrol pumps. The rest had no awareness regarding the other types of fire extinguishers.

More than 60% buildings in Karachi are older than 30 years and 17% commercial buildings are recently built in past 5-10 years. Yet, 73% of the buildings whether they are old or new are equipped with a fire alarm system and fire exit gate where 63% of the occupants are aware of leaving the fire zone premises on the buzz of the alarm while 13% occupants feel an obligation to call the fire department at a risk of their own life before leaving the fire accumulated area.

About 66% of the respondents in Karachi are aware that their workplace or organization is equipped with necessary fire evacuation response plan. Yet, only 68% believe that the fire-fighting equipment is poorly maintained and ethically not suitable to be functional. Subsequently, the 93% of the workers or occupants, who responded, have no experience in handling the fire extinguishing equipment, showing the lack of training provided its occupants as pledged by the organizations to the fire regulatory authorities for upholding the fire drills with great integrity and honesty.

This lack of training moves us to another issue where 60% of the organizations conduct fire drills annually focused only on evacuating the building and no skill learning on using the fire-fighting equipment which is far from being frequent for a new employee who recently joined the organization. That is why, 54% of the employees, specifically the middle aged or older people, believe that organizations conduct fire drills only because they are enforced by the fire protection agencies due to the codes and regulations. Thus, they find these fire drills to be exhausting with zero learning focused primarily on satisfying the regulatory bodies for approving their organization's fire safety plans and funds, whereas the young generations are enthusiastic and anxious to learn and obey such adventurous fire drills once in a while, only to be disappointed and agree on the opinions of their seniors in the end.

An approximate of 33% of the organizations in the Karachi reviews the fire emergency plans every 6 months while 13% of the organizations review them in 1-year. The rest have either neglected these responsibilities or does not have a certain protocol to follow and revise, giving a probability that 40% of the buildings have no codes of practice while 22% of these buildings follow codes of NFPA and 13% of

them follow OSHA codes, where 83% of the respondents believe the fact that city fire safety plans are focused on evacuating all occupants immediately from the entire building.

There is also an alternate method of enforcing the fire protection by selecting a fire warden or manager designated to maintain and enforce the fire safety plans and drills on the occupants, which includes hospitals and malls on a prior list where 43% of the targeted organizations have fire wardens or managers appointed to their commercial buildings.

## **5. Conclusions and Recommendations**

The conclusions and recommendations pertaining to this study have been defined explicitly below:

### **5.1 Conclusions**

The study covered current status of safety and training conducted regarding the fire emergency response mechanism in commercial buildings of Karachi, along with concepts among the occupants about emergency in case of fire and whether the installed fire protection systems are being effectively delivered or not. Few of the conclusions have been stated below as:

Fire emergency plan is present in the majority of buildings of Karachi to a certain extent. However, the real problem lies in observing and maintaining the specific fire building codes at organizational level, whereas the state or enforcing authorities does not seem vigilant enough to monitor these regulations through strict inspection of the building.

Almost organizations consider their fire safety mechanism as an efficient one, including the health policy statements issued to most of the employees, yet majority of people have zero motivation in attending fire drills conducted on yearly basis.

The effectiveness of the fire safety plans is not up to standards and with no action taken at the time of incident may lead to increment in the severity of the damage such as possible financial collapse and multiple casualties. There is absence of maintained and updated fire proof components in the building.

### **5.2 Recommendations**

Based on the corollary of this study, it is suggested that in Karachi, counteractive approach is needed, and following remedies should be undertaken:

- National Fire Department is required to explicate a strategic staffing plan that may focus on inspecting the current and new commercial buildings in Karachi at a regular basis.
- Require automatic sprinkler in new buildings and NFPA should enforce upon installing fire-fighting equipment in existing buildings.
- Require preparation of fire codes at state level which should be enforced by NFPA and other fire regulatory bodies to all commercial buildings.
- Application of fire proofing materials and structures is required in new buildings.
- A fire safety warden or manager must be appointed for each building holding responsibility for taking actions in the cases of two modes of operation whether it is normal or emergency.

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