

FIRE SAFETY AT HIGH-RISE SHOPPING MALLS AT DHANMONDI, DHAKA AND APPLICATION OF SAFETY AUDIT AS A PREVENTIVE MEASURE

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Abstract: In our country safety is a common urge from almost every corner. We breathe in a society where we have to struggle for our basic issues like safety. Fire at different shopping malls is the clear evidence that safety at high-rise shopping malls was poorly measured. But a minimum courtesy from the concerned authority could mitigate this problem at the optimum level. This paper tries to depict the safety condition at high-rise shopping malls at Dhanmondi, Dhaka as well as to emphasize on safety audit to avert fire risk. Lack of formal safety audit department among the high-rise shopping malls at Dhanmondi is one of the major findings of the study. That's why, efficient use of safety audit on behalf of the market management can be an effective tool to solve this problem.

Key words: Safety Audit, High-Rise Shopping Malls, Safety Audit Techniques.

1. Introduction

Safety is more than just a condition where a human is free from hurt, injury or losses. Grimaldi & Simmonds (1975) defined safety as “reliable control of harm”. According to this approach, the minimum level in occupational safety is achieved when the frequency and severity of occupational accidents are at an acceptable level. From a technical and organizational point of view, safety can be understood as a characteristic of a system, a similar property as quality, dependability (Roland & Moriarty, 1983). Safety audit is a process of identifying and assessing the overall safety conditions and safety programs of an organization. It also assesses the management philosophy towards the working condition of workers and employees.

We always think about the safety condition of our Readymade Garments Industry but it is very rare to address this issue to our shopping malls which are located at different locations in Bangladesh. Almost every day huge number of owners, employees and customers of different shops gather at different shopping malls in Dhaka City. We hardly think about the safety of our lives at shopping malls. But at any moment our lives may be at risk. In 2009, the Fire at Basundhara City once again confirmed our vulnerability in extinguishing devastating fire if occurred in high rise, multistoried building or skyscraper. In 2007, we had also a huge fire in Bangladesh Steel and Engineering Corporation (BSEC) Bhaban, a large and multistoried building at Karwanbazar, and we had seen our shortcomings though our Fire Fighting officers and Staff had shown great

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courage, strength in handling such unfortunate events bravely despite lots of limitations. This devastating catastrophic onslaught fire has once again proved how poor and ineffective we are in handling such calamities. This study is an attempt to depict the fire safety provision at high-rise shopping malls in Dhanmondi, Dhaka and elucidate the magnitude of safety audit to ensure safety at high-rise shopping malls.

2. Objectives of the Study

The objectives of the study are divided into two categories; one is general objective and another is specific objective which are given below:

- a. General Objective:** The main objective of the study is to portray the condition and importance of safety audit in our high-rise shopping malls at Dhanmondi, Dhaka.
- b. Specific Objectives:** Specific objectives are summarized below:
 - i. To know about safety audit.
 - ii. To know different methods of safety audit.
 - iii. To understand the fire risk associated with the high-rise shopping malls at Dhanmondi, Dhaka.
 - iv. To identify some limitations in the present condition of fire- safety at the high-rise shopping malls in Dhanmondi, Dhaka.
 - v. To make some recommendations to overcome these problems.

3. Methodology of the Study

This is an exploratory type of research. The necessary information for this paper is collected from primary and secondary sources. The overall process of methodology has been given below:

Sources of Data

- a. Primary Sources of data:** Data have been collected from the high-rise shopping malls located at Dhanmondi, Dhaka.

Target population: All the high-rise shopping malls at Dhanmondi, Dhaka.

Sample organizations: six high-rise shopping malls located at Dhanmondi, Dhaka have been chosen as sample. Here, high-rise means at least six-storied building.

Sampling method: Convenience sampling method has been used to select the sample.

Primary Data Collection Method

Thirty shopkeepers of six high-rise shopping malls at Dhanmondi, Dhaka were interviewed with a structured questionnaire. The questionnaire comprises three parts. The first part consists of eleven questions out of which only one question is open ended and rests of the questions are close ended. In the second part, it consists of sixteen queries which all are relevant to the reflection of the actual safety provision at the high-rise shopping malls in Dhanmondi, Dhaka.

b. Secondary Sources of Data: Secondary sources are summarized below:

- Different Published Report and University Journals
- Internet
- Relevant Books

4. The Safety Audit

A safety audit is a proactive process by which an organization is able to continually evaluate and monitor the progress of its safety and health programs. Audits are designed to rate an organization's total safety and health program, identify its strengths and weakness, show where improvements are required, and obtain commitment and target dates for correcting problems. In addition to assessing safety violations and work conditions, an audit assesses senior management's philosophy and attitude towards safety. It also serves as a visible process that management can execute to demonstrate to employees that they are interested in their safety. Thus, it is a part of the company's general management activities to ensure quality and environmental management systems throughout the organization. It is also a morale builder. Employee involvement and self-interest provide positive contributions to the audit process and to the overall organization.

4.1 Objectives of Safety Audit

The primary objectives of a safety audit are to:

- a) Confirm that safety, health, fire, and/or environmental program activities and controls are in place and functioning.
- b) Verify that the facility is in compliance with internal benchmarks, consensus standards, and/or government regulations.
- c) Assess past and current practices to identify and correct safety impediments which, if left unresolved, may result in personal injuries, property damages, or business interruption.

4.2 Types of Safety Audit

Safety auditing has many definitions. Some people use a very broad definition, implying that the scope of safety auditing includes virtually all safety management activities, while others have adopted more focused technical approaches. The following categorization of Glendon (1995) clarifies the types of safety audits:

- a. Safety audits on *specific topics*, for example, human factors or hazardous substances.
- b. *Plant technical audit* covering special work tasks, and done by both local and special staff.
- c. *The site technical audit* covering special work tasks, and done by both local and special staff.
- d. *Compliance audits* (or verification audits) to establish whether the relevant legal requirements are met.
- e. *Validation audits* which deal with the scope and design of the audit. They focus, for example, on whether the right kinds of subsystems have been adopted, and

whether the correct types of monitoring methods are in use. Together, validation and verification audits comprise the management safety audit.

- f. The *management safety audit (or area safety audit)* which covers general safety matters, and involves local staff and perhaps specialist auditing staff as well.

4.3 Reliability of the Auditor

A safety audit can be performed either “internally” where the company’s own personal reviews the performance, or “externally” where the assessment is done by a trained expert from outside the organization. Clerinx & Langenbergh (1994) point out that a danger of internal safety audits is that the effort is made only for the judgment, and not to increase the level of health and safety. In the long term, this can harm the improvement and continuing effort activities.

Byrom (1994) points out that the audit team members and the leader should be independent of the area being audited and should have the necessary combination of experience and knowledge. Similarly, the ISO 10011-1 (1990) standard mentions that auditors should be free from bias and influences which could affect objectively. Finally, Glendon et al. (1992) have found that careful selection of the audit team is an essential contributor to successful results.

The audits conducted by different auditors should reach similar results when the same operation is audited under the same conditions. Good consistency means that there is no bias between the auditors. Consistency among auditors can be improved, for example, by arranging auditor training, auditor performance comparisons, and reviews of audit reports, performance appraisals, and rotation of auditors between audit teams (ISO 10011-3, 1991).

4.4 Safety Audit Techniques

Three stages can be distinguished from an audit process: 1) preparation, 2) on-site activity, and 3) follow-up. The size of a company, branch of activity, the type of hazards, etc. determine how detailed each step is taken. The activities in the different stages and steps are discussed in the following paragraphs as described by Steen (1996), Byrom (1994), and Cooper (1998).

a. The Preparation

The preparation of an audit is dependent on the size and complexity of the organization, the range and nature of the hazards and risks to be controlled, and the effectiveness of the existing safety and health management system. It includes the determination on the scope of the audit, for example will it cover the whole safety and health management system or only parts of it. The scope also influences on the size and composition of the audit team. Information on the organization’s structure and the key people in it should be available. Questions need to be prepared in order to improve the understanding of the management system, documentation, etc. An exploratory visit to the site is often beneficial.

b. On-Site Activity

An opening meeting is normally the first activity when the audit team arrives the site. In this meeting, the key persons of the unit to be audited have the opportunity to meet the auditors, and the auditors can explain their objectives, approach, and the overall audit process.

The on-site process can be divided into the following steps 1) understanding the management system, 2) assessing the strengths and weakness, 3) gathering the audit data, 4) evaluating the data, and 5) reporting the audit findings.

The first step includes developing an understanding of the company's processes, internal management and technical controls, the hierarchical organization, staff responsibilities, compliance parameters, and any current or past problems.

The purpose of the second step is to help determine the focus of the audit. Where the internal controls are found to be sufficient, the auditor can concentrate on determining whether the control systems function effectively on a constant basis. On the other hand, if the internal system is inadequate to ensure the desired results, the system itself should be examined more carefully.

In step three, the audit data is collected by interviewing, observing, and verifying. The interview process starts usually from the top management and continues progressively to lower levels. Observation should include both the physical premises and the employee behavior, including the work methods and possible risk taking. Verification includes examination of the records and other relevant documents.

In the fourth step, the gathered data are evaluated to identify the audit findings. The findings are reviewed against the safety management system criteria to determine their significance. A negative finding is called nonconformity.

In the final step, the audit team holds an exit meeting, where the management should have an initial view of the audit team's findings. Both positive and negative findings should be presented, and any ambiguities about the findings should be clarified.

c. Follow-up

When the on-site work is complete, the audit team should begin the preparation of the audit report. A normal practice is that the audit team first prepares a draft report, has the report reviewed, and then issues the final report. The purpose of the review is to assure that the report is clear, concise and accurate, rather than to modify the audit team's findings. The audited facility should prepare an action plan immediately after the submission of the final report. The action plan should indicate what is to be done, who is responsible for doing it, and when it is to be completed. Often the auditor receives a copy of the action plan. Sometimes the auditor is asked to review the plan to ensure the aims are what the auditor had intended, and in some cases the auditor also monitors the completion of the plan. Whatever the procedure is, it must be remembered that it is always the responsibility of the operating management, and not the auditors, to write and implement the action plan.

4.5 Management Safety Audit Tools

Checklists were the first tools developed for assessing safety management systems. These were followed by simple yes-no type audit methods and the next step was the creation of complicated quantified audit tools (Petersen, 1989). Today, safety audit tools usually include a list of safety activities to be assessed, and the criteria for the evaluation. The activities are typically grouped under headings like “organization”, “risk control” or “reporting”. Safety audit tools are typically developed by health and safety authorities, by private consulting companies, or by universities and other research institutions. One of the earliest tools was developed by Diekemper & Spartz in 1970. Since then several other methods have been reported, for example ISRS (ISR 1978), CHASE (Glendon et al., 1992), SafetyMap (SafetyMap...1995), Self-audit handbook (1995).

Some audit tools are combined health, safety, and environmental assessment methods. The SHE-audit (1996) of the Association of Swedish Chemical Industries is an example of these methods. An example of a partial safety audit method is the Responsible Care program developed for hazard management in chemical industry. All quality award programs also assess some areas of safety management.

4.6 The Safety Audit Participants and Documentation

There is no industry standard that indicates who should conduct safety audits but first and foremost, senior management must support and participate in the safety audit process. They should endorse the process verbally and in writing to all employees. This lets employees know that senior management is serious about safety audits and is committed to allocating appropriate resources. A large organization may use a safety director to implement and oversee the entire audit program. In other organization, a team approach is used, mixing facility and line managers, supervisors, engineering personnel and employees from various departments. Finally, an outside organization can conduct the audit. Government agencies, engineering firms, insurance carriers and safety consultants are commonly used. For a fruitful safety audit program, all participants must have a fundamental understanding of the safety audit process and to fulfill this requirement the participants have to be trained up. The safety director and facility manager are good candidates to develop and conduct training programs.

The safety audit must be documented in two major portions; one is safety audit checklists and the other is the final report. The checklist covers general safety programs and regulatory compliance; facilities and equipment; and specific hazards and operations. On the other hand, the final report, identifies the safety audit findings, makes observations and recommendations to remedy deficiencies, and should highlight serious and repeat observations. The final report should be communicated to management in a timely manner. Upon the review of the final report, management must take the next logical step to correct any safety hazards the audit process reveals (www.thehartford.com).

5. Safety Condition at High-rise Shopping Malls in Dhaka City: This section highlights the worst scenario of safety condition at different high-rise shopping malls in Dhaka city.

5.1 Fire at Multiplan Centre on Saturday, April 20, 2013

A restaurant, fast-food shop and several computer and electronics accessories shops were gutted when a devastating fire broke out at Multiplan Centre, popularly known as Computer Market, at Elephant Road area in the Dhaka city Saturday morning. According to the eyewitness, the fire originated from an unknown source at around 10:30am at the 3rd floor of the 14-story Multiplan Centre popularly known as Computer Market, and immediately engulfed the 4th and 5th floor. All kinds of vehicular movements remained suspended following the incident for more than two hours causing enormous sufferings of the city dwellers. (www.the independent bd.com)

“A total of 14 fire fighting vehicles from Palashi, Lalbagh, Mohammadpur, Headquarters and Tejgaon fire stations rushed to the scene and managed to douse the flames after more than two and half an hour’s frantic efforts at around 12:45pm,” Major Mohammad Mahboob, Director (Operation and Maintenance) of Fire Service and Civil Defence told The Independent.

“Primarily we observed, the fire mainly damaged the fast food restaurant housed on the third floor of the market from where the fire might have originated and a computer shop at the fifth floor of the market, but the other shops of the market are safe although the blaze spread to the tenth floor of the building through the electric wire,” Mahboob said adding that an investigation committee would be formed shortly about the incident and after that, we would be able to give details about the incident. (www.the independent bd.com)

A section of shop keepers and employees of the market alleged that the fire originated just after the shopkeepers of the market started to open their shops at around 10:00am as the news spread most of the people came out from the market but some 15 to 20 people failed to come out and take shelter at the rooftop as they could not find any fire extinguisher at that time.

Inspector General of Police Hasan Mahmud Khondoker told the reporters that this is not violence, it is an accidental incident. The members of the market owners association and law enforcers would estimate the losses. However, the law enforcers would investigate into the incident to find out any negligence of the authority behind the reason of the fire, he added.

Toufik Hasan, president of Multiplan Market Owners association told The Independent, “As per my collected information we came to know that the fire might be originated from a cylinder of a kitchen of Bismillah fast-food or electric short circuit.” “Without counting and visiting the whole gutted market we can’t estimate the loss as more than 1,000 electric and computer accessories shops are housed on the market,” Hasan added. But, some shop owners alleged that the building owner is responsible for these losses because he did not install sufficient fire fighting equipments in the market. Only for this the employees failed to douse the flame first time when the fire originated at the kitchen of

the fast food shop. The security guard locked the market until 6.00 pm on the day, as it was full with gas, which was used by fire fighters to douse the fire. The shops owners failed to enter into the shop till Saturday evening, for that reason they also failed to estimate the actual losses. (www.theindependentbd.com)

5.2 Blaze at Bashundhara City on Friday, March 13, 2009

A raging blaze on Friday, March 13, 2009 reduced the upper levels of the capital's Bashundhara City shopping complex to a skeleton, killing at least seven people and injuring 20 others.

Ill-equipped to douse high-rise flames, the fire fighters could do little as the fire that broke out on the 17th floor at around 1:45pm swallowed up two floors above and three below. Since Fire Service and Civil Defence's only aerial ladder cannot gain access beyond 13th floor, six floors of the 20-storey mall-cum-office tower remained out of the fire fighters' reach to be left in ruins. Black plumes of smoke from the high rise spiraled upward, while blazing windowpanes, furniture and other objects rained down on the pavement. (w.w.w.thedailystar.net)

Of those dead, Baki Billa, a member of Bashundhara's own firefighting department, slipped and fell trying to climb down a rope. Three others however made safe landing while an air force chopper rescued another fireman from the rooftop. The injured were rushed to nearby clinics and hospitals and treated for burns and smoke inhalation

Director General (DG) of Fire Service Brig Gen Abu Naim Mohammad Shahidullah said cause of the fire could not yet be known. Some of the shop-owners at the mall however said short-circuit might be responsible. State Minister for Home Tanjim Ahmed Sohel said the fire could not be put out due to lack of proper firefighting equipment. "The fire brigade should have at least five ladders, while they have only one," he observed.(w.w.w.thedailystar.net)

5.3 Fire at BSEC Bhaban on Monday, February 26, 2007

A devastating fire broke out at the Bangladesh Steel and Engineering Corporation (BSEC) Bhaban at Karwan Bazaar in the capital at about 10.15am on 26 February 2007. Within minutes the fire engulfed the entire floor and gradually started to spread to the upper floors, trapping hundreds of people inside. There were fire extinguishers on almost all the floors but none dared to use them. Finding no fire lift but a switched off lift, people from the first to the eleventh floors mad rushed to the central staircase to go out off the building. The first batch of fire-fighters came in from the Tejgaon fire station after half an hour of ignition. Twenty-five fire-fighting units from different fire stations and worked frantically for more than six hours to bring the fire under control. Acute shortage of water and inadequate equipment hampered the rescue operation, by the firemen who had to bring in water from the nearby WASA Bhaban and the Sonargaon Hotel. The army and the air force commissioned three helicopters to rescue dozens of people stranded on the rooftop of the building. The idea of airlifting them was eventually abandoned as the rotors of the helicopters fanned the fire. Three persons were killed and more than 100 injured in this incidence. NTV, RTV offices totally burnt and went off air. Several

witnesses said the fire originated from electric oven; while some others said it was sourced from electric short-circuit. (www.banglanews24.com)

6. Findings from the Questionnaire Survey

Table 1: Condition of high-rise shopping malls in terms of safety (on the basis of survey)

Questions	Yes	No
Is market management responsible to ensure market safety?	100%	-
Do you know the emergency phone number of nearest fire service station?	33.33%	66.67%
Is indication for lift at each floor available?	16.67%	83.33%
Is there any emergency exit with sufficient space?	100% (5 feet)	-
Is there any indication for emergency exit at each floor?	10%	90%
Are Fire Extinguishers available at each floor?	100%	-
Is there any first aid box?	16.67%	83.33%
Is there any emergency ladder?	-	100%
Is there automatic fire risk indicator?	33.33%	66.67%
Is there Fire Hose Rack available at each floor?	100%	-
Is there any fire proof jacket?	-	100%
Is Fire Service Station Phone number available at each floor?	33.33%	66.67%

Source: Field Survey

After the survey it is found that the market management is 100% responsible to ensure market safety. The study reveals that only 33.33% of the shopkeepers knew the emergency phone number of nearest fire brigade office. Indication for lift and emergency exit at each floor were not remarkable which were found 16.67% and 10% respectively. There was no response regarding emergency ladder and fire proof jacket whereas sufficient spaces (on an average 5 feet) for emergency exit at each floor were available in all the high-rise shopping malls.

Table 2: Condition of high-rise shopping malls in terms of safety (on the basis of shopkeepers' response)

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Market management is serious to ensure market safety	16.67%	-	-	83.33%	-
Fire extinguishers are properly maintained	16.67%	16.67%	-	16.67%	50%
Expert users of fire extinguishers are available at all the times	-	16.67%	-	83.33%	-
Fire drilling is organized frequently	66.67%	16.67%	-	16.67%	-
Lifts' maintenance is carried out on a regular basis	-	33.33%	-	33.33%	33.33%
Generator backup is available at all the times	-	16.67%	-	33.33%	50%

Source: Field Survey

It is evident from the above table that 83.33% shopkeepers of high-rise shopping malls agreed that market management was serious to ensure market safety. 50% shop keepers strongly agreed that the fire extinguishers were properly maintained whereas 66.67% strongly disagreed that fire drilling was organized frequently. 33.33% disagreed that lifts' maintenance was carried out on a regular basis as well as 50% strongly agreed that generator backup was available at all the times

7. Findings of the Study

From the questionnaire survey, the opinions of the respondents regarding safety were found. The major findings are listed below:

1. Market management did not organize fire drilling on a regular basis.
2. Expert users of fire extinguishers were not available at all times.
3. Fire extinguishers were not properly maintained.
4. 66.67% of shopkeepers did not know the emergency phone number of the nearest fire brigade office.
5. Indication for emergency exit was not found at 90% shopping malls in Dhaka city.
6. Almost in all the shopping malls, there were no first aid boxes, emergency ladders and fire proof jackets.
7. The automatic fire risk indicator was not found in all shopping malls.
8. There was no formal safety audit department in all shopping malls.
9. Underground reservoirs were mostly undersized for holding adequate water for fire fighting.

10. The Fire Service and Civil Defense (FSCD) authority at Dhaka stations had only two hydraulic ladders which can hose water up to the 14th floor of a building at best.
11. The Fire Service and Civil Defense (FSCD) authority did not have helicopters equipped to put off flames in high rises.
12. Fire fighting detectors and equipments were seldom tested and checked as routine work.

8. Recommendations of the Study

Based on the findings, some recommendations which are made to improve the situation are listed below:

1. Management must ensure fire safety features effectively (fire alarms, sprinklers, voice communication procedures, evacuation plan and how to respond to an alarm and fire fighting facilities, etc) on each floor in the shopping mall.
2. Market management can establish a separate safety audit department in the shopping mall by hiring fire safety experts.
3. Safety audit personnel will regularly review the safety condition in the shopping mall to find out any flaws if present.
4. Safety audit department will ensure regular fire drilling with all the relevant persons.
5. Safety audit department will indicate at each floor the locations of all available exit stairs in case the nearest one is blocked by fire or smoke.
6. Market management always make it sure that all exit and stairwell doors are clearly marked, not locked or blocked by security bars and clear of clutter.
7. Market management may inform some important instructions about how to escape from fire to all with wall sticker, such as “use the stairs to get out- never use the elevator”.
8. Respective authority should provide adequate training of firefighting staff both in Government and respective shopping malls.
9. Market management must ensure standard size of underground reservoirs for holding adequate water for fire fighting.
10. Respective authority should ensure the enhancement of technical knowledge in this regard for all the staff both in Government and respective shopping malls.
11. The Fire Service and Civil Defense (FSCD) authority must be well equipped with at least one helicopter to put off flames in high rises.
12. The FSCD authority must ensure more hydraulic ladders which will be able to hose water up to the 20th floor of a building at best.

9. Conclusion

It is the responsibility of the market managements to ensure safe and secured shopping malls for their market personnel as well as their valued customers. Effective application of safety audit can minimize this risk at an optimum level. Safety audit department will regularly review the safety condition in the shopping mall. If there is any irregularity, it should be addressed to the market management to resolve the problem. Furthermore,

there should be a provision to penalize the shopping mall owners if they violate the safety laws and regulations.

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Appendix

List of Shopping Malls and Addresses

Name of the Shopping Mall	Location
Plaza A R	Sobhanbag, Dhanmondi, Dhaka
Bashundhara shopping mall	Panthapath, Dhanmondi, Dhaka
Zenetic plaza	27 No, Dhanmondi, Dhaka
Rapa plaza	27 No, Dhanmondi, Dhaka
Metro Shopping Mall	Sukrabad, Dhanmondi, Dhaka
Anam Rangs Plaza	Satmosjid Road, Dhanmondi, Dhaka