

Review on “Analysis of Emergency Management System for High-Rise Building Projects”

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Abstract- Accidents in high-rise building construction projects are unplanned incidences involving movement of persons, objects or materials which are result in injuries, damages and losses to properties or people and to reduce these proper safety and emergency management is needed in construction industry. Emergency preparedness is a well-known concept in protecting workers' safety and health. Emergency management is the creation of plans through which communities reduce vulnerability to hazards and cope with disasters. It does not avert or eliminate the threats; instead, it focuses on creating plans to decrease the effect of disasters. Failure to create a plan could lead to human mortality, lost revenue, and damage to assets. Construction industry plays an important role in our national economy, but the construction process of the construction project always have a variety of accidents, harming the business, social and public safety and interests. As to the various disasters or emergencies in construction project caused by natural and unnatural factors, this paper examines the literature analysis of emergency management system for various high-rise building projects, and proposed safety and emergency management problems, emergency response plan for high-rise building construction projects, simulation of fire and evacuation in high-rise building.

Keywords- High-rise Building, Emergency Management, Fire Evacuation in High-rise Building

I. INTRODUCTION

Emergencies and disasters can strike anywhere and at any time bringing workplace injuries and illnesses with them. Employers and workers may be required to deal with an emergency when it is least expected and proper planning *before* an emergency is necessary to respond effectively. A workplace emergency is a situation that threatens workers, customers, or the public; disrupts or shuts down operations; or causes physical or environmental damage. Emergencies may be natural or man-made, and may include hurricanes, tornadoes, earthquakes, floods, wildfires, winter weather, chemical spills or releases, disease outbreaks, releases of biological agents, explosions involving nuclear or

radiological sources, and many other hazards. Many types of emergencies can be anticipated in the planning process, which can help employers and workers plan for other unpredictable situations. For the emergency management the proper care should be taken by the construction industry as well as, the government should take energetic contribution to complete this route. Construction accidents can be condensed just by identifying the root causes of accidents, which is possible by accident investigation techniques such as theories of accident causation and human errors. As per the survey in India the most of construction industries especially in rural areas are do not have safety and emergency department in there firm. In some construction industries safety and emergency responsibilities is just given to individuals who do not possess proper knowledge and experience in this field also there are safety and emergency provision made but implementation of these provisions are not found which can prevent accidents. The safety graph of construction industry is always poor. This work, reports on an initial survey of a subject that has not yet been sufficiently researched in the India and for which little evidence is available. The findings presented here should not be seen as conclusive, but rather as a foundation for further research and for the development of practical initiatives to encourage Emergency Management within industry practices.

II. LITERATURE SURVEY

Cláudio Sapateiro *et al.* (2009) have proposed an approach which takes the perspective that an emergency response tool may guide the response effort. The tool adopted a conceptual model grounded on existing situation awareness models and research work done with High Reliability Organizations. The model structures the emergency management process in a set of dimensions that should be collaboratively correlated by the involved participants in order to mitigate the disruptive situation. An instantiation of the proposed approach is also described in the paper, focusing on IT service desk teams addressing emergency incidents that may compromise business continuity. [1]

The fire accidents in high-rise buildings using the accident tree analysis method and the principal theory of

safety system engineering was analyzed by Chen Haitao *et al.* (2010) ; the primary causes of fire accident were showed in detail, the important degree of the basic incidents were arranged. Based on the result, the countermeasures were explained from technology and management methods, which provide a security for the high-rise building fires. Also, the fire evacuation was discussed when the fires in the high-rise building happen. Lastly, the stairs and elevator evacuation model was proposed. [2]

Leonidas G. Anthopoulos *et al.* (2012) proposed an effective disaster recovery model for construction projects. Authors aimed to structure a generic model that consists of principles and processes, which can recover a construction project after a disaster effect. Various terms (i.e., hazard and risk analysis, safety planning and disaster) and the international project management standards are explored for the purpose of this paper and accurate existing disaster recovery frameworks and models were investigated. The outcomes of this analysis were used for the composition of the proposed model. [3]

A study was conducted by S.V.S. Raja Prasad *et al.* (2012) in a construction organization involved in construction of 2*660MW thermal power plant in India by using combination of optimization techniques like shortest route algorithm for identifying optimal paths and depending on the capacities of assembly points ,the employees are allocated to different assembly points by using transportation model .In a case of a major emergency, the minimal spanning tree technique was used to identify the shortest route for a specific assembly point. [4]

Adam Cowlard *at el.* (2013) seeks to highlight the critical elements of a fire safety strategy for tall buildings and thus attempt to highlight some specific global performance objectives. A survey of tall building fire investigations was conducted in order to assess the effectiveness of current designs in meeting the objectives, and the current state-of-the-art of fire safety design guidance for tall structures was also analyzed on these terms. The correct definition of the design fire for open plan compartments is identified as the critical knowledge gap that must be addressed in order to achieve tall building performance objectives and to provide truly innovative, robust fire safety for these unique structures. [5]
Safety and Emergency management (SEM) guideline Model for effective safety management was used by Rohit Laxman Tudayekar *et al.* (2014). Data collected through questionnaire survey was analyzed with four residential sites and SEM guideline model developed which is of great help for safety of engineer and trainer. [6]

A surprising number of challenges are not construction issues but must be addressed and managed by the construction manager (CM) to ensure project success. And this has been shown by Er. Shrishail Shirur *et al.* (2014). Some of the construction issues include workforce considerations, safety, time constraints, and the changing nature of the work. Non-construction challenges that CMs face that are part of the business landscape include legal issues, government regulations, environmental concerns, and socio-political pressures. It is critical that the CM understands the demanding realities that he or she faces in the planning and control of construction operations. [7]

An Emergency Management System (EMS), which enables smart phone based ad-hoc communications at disaster times over Wi-Fi was studied by Rehka Jadhav *et al.* (2014). A person in an emergency or anybody at the emergency site will call the EMS at avail service. Location Coordinates were has been sending on each request. The system works on the principles of client-Server system, wherein the server responds to the requests of the Clients. They have implemented the EMS Client Application, Rescue Application and Server. They tested the System using several real Android Phones with GPS on phone, clients communicating over Wi-Fi. [8]

Mohamed Marzouk *et al.* (2016) presents a framework that utilizes building information modeling (BIM) and computer simulation to plan the evacuation of labors in construction sites during project execution and to visualize evacuation times of labors at emergency conditions at any time from project duration. A case study was worked out to demonstrate a simulation of emergency evacuation from a housing building during its construction to demonstrate the use of the proposed framework. [9]

Mr. Rahul B. Kesarkar *et al.* (2016) has shown effective use of Safety and Emergency Management Model on construction sites. Data was collected by visiting the number of sites and by preparing the questionnaire. A questionnaire survey was conducted on large Construction by visiting the number of sites and the collected data was analyzed to rank the safety performance and to develop a new model. [10]

The estimates of fatal accidents of construction sector for all states in India have been carried out by Dilipkumar Arvindkumar Patel *et al.* (2016). These estimates were based on reliable information derived for the construction sector of National Capital Territory (NCT) Delhi region using different sources. The quantum of construction work in all states were differentiated based on their data on cement consumption using linear inter and extrapolation methods. In line with this estimate the minimum number of people that would have died

annually in Indian construction sector from 2008 to 2012 was 11,614. The estimates presented, would help in drawing attention of all stakeholders to take remedial measures. [11] Yu-ting E *et al.* (2016) focuses on the high-rise building's fire safety problems, through the analysis and comparison of domestic and overseas high-rise building's differences on fire protection facilities construction and management, and discusses on strengthening domestic high-rise building's fire safety countermeasures. [12]

Makarand P. Garole *et al.* (2017) focused on efficient use of safety and emergency management on a construction site. It has been observed that many of the construction projects are not working with respect to safety and emergency management which is the primary cause of a major number of accidents. Also study demonstrates the importance of safety and health in construction and highlights the factors affecting safety on construction projects. The benefits of safety and health improvement include: reduced accident costs, increased productivity, improved human relations and enhanced firms image. [13]

According to Prashant A/L Tharmarajan (2007), fire safety management has become an integral aspect in the daily operations of high-rise buildings. The objectives of his study were to identify the aspects of fire safety management that influences fire safety of high-rise building users; to establish the most critical of these aspects; and to identify methods to improve fire safety of high-rise building users. From the study, it was determined that the three most critical aspects of fire safety management are the education and training of high-rise building users in fire safety; the implementation of fire and evacuation drill procedures; and to provide clear signage indicating exit routes and location of fire safety equipment. [14]

III. METHODOLOGY OF WORK

1. Extensive literature surveys has been carried out by referring books, technical research papers, journals etc. to understand the basic concepts about the topic.
2. Next step is to identify the need of the research or fulfillment of research gap.
3. Collection of data required for efficient emergency management system for the high-rise building construction projects. This data collection is based on questionnaire survey and in-depth interviews with a variety of industry stakeholders.
4. Analytical work is to be done. It means that analysis of data collected above is carried out i.e. details obtained from the above work are formulated and then comparative

study of this data is to be done with the ideal emergency management system.

5. Analyze whether emergency response procedure is useful or not for the construction industry. Finally interpretation of results is to be done and conclusions are to be made.

IV. DISCUSSION

This paper aimed at presenting literature relevant to analysis of emergency management system for high-rise building projects. Prashant A/L Tharmarajan (2007) found that statistics used to analyze the background of the respondents and a Likert's Scale of five ordinal measures was used to identify the aspects of Fire Safety Management that influences fire safety of high-rise building users, the most critical of these aspects and the methods to improve fire safety of high-rise building users. Cláudio Sapateiro *et al.* (2009) proposed an emergency response model grounded on the construction of shared SA. Considering the existing research on Situation Awareness (SA), the proposed model focused on organizing Situation Elements (SEs) through Situation Dimensions (SDs) that may be semantically interrelated through the proposed Situation Matrixes (SMs), in order to make sense of the ongoing situation. According to Chen Haitao *et al.* (2010) the factors that probably result in the fire, the scientific, objective, targeted safety countermeasures are proposed from the safety technology and management, which can afford the decision-making foundation effectively. S.V.S. Raja Prasad *et al.* (2012) showed that optimum paths developed in a network model are useful in reducing the response time and also effective way of reporting at assembly points. Transportation models are useful for developing strategies for effective way of reporting at respective assembly points and also for developing a strategy to establish new assembly points. Adam Cowlard *et al.* (2013) concluded that the unique challenge that tall buildings present are too far removed from the basis on which prescriptive requirements were founded. Thus inevitably, performance based design becomes essential. A performance based design is only relevant given a complete assessment of the problem *i.e.* the goals that the design must achieve.

SEM model is helpful for motivation towards the safety and it increases the company profit due to less accidents. It can be implement from ground to top level of management. This has been concluded by Rohit Laxman Tudayekar *et al.* (2014). The challenges listed in the report given by Er. Shrishail Shirur *et al.* (2014) include situations and conditions that must be proactively managed by the CM to ensure project success. Many of these challenges are a direct result of construction operations, while others are result of indirect, peripheral activities. Yu-ting E *et al.* (2016) simply

analyzes and compares the domestic and overseas current fire safety status, finding the problems existing in high-rise building's fire safety work, proposing the solution countermeasure in view of the corresponding problem, which has certain directive significance to the future work of the high-rise buildings in our country and promotes the development of high-rise building fire protection cause. Suggested model by Makarand P. Garole et al. (2017) of each activity gives precaution of safety on construction sites under risks and hazards. The checklist of each activity avoids the occurrence of the accidents.

V. CONCLUSION

From the above review it is concluded that lot of research have been carried out on the analysis of Emergency Management System for high-rise building projects. For the analysis purpose, the basic information and data is to be collected by using questionnaire survey and in-depth interviews with the various industry stakeholders. The main objective is to provide a system and resources to deal with emergencies to protect people, property and the environment and to minimize adverse impacts on people, property and the environment. The guidance is relevant to all construction projects, small and large, and aimed at all with a role in developing, managing and applying safety standards on site. Construction fire safety needs to be managed from the earliest stages of design and procurement and needs to address the risks both to site workers and to site neighbors. Human intervention is particularly important during the evacuation, evacuation of human intervention that is the boot, each floor with one quantitative evacuation guide in favor of improving utilization efficiency of two evacuation stairs, preventing panic jams, evacuation of high-rise building fire emergency exercises are beneficial to personnel ordered to evacuate.

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