

Contractor's Perspective of Injuries Pattern in Fall from Height and Mitigation Measures at the Construction Site in Malaysia

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Abstract: Due to the high number of accidents and injuries, the construction industry has been labeled as one of the most dangerous. One of the most common construction site accidents is falling from a height. As a result, the goal of this research is to discover fall from height mitigation strategies that can be implemented on construction sites in Malaysia by identifying the elements that cause falls from height and studying the pattern of injuries caused by falls from height on construction sites. To verify the objective, questionnaires were distributed to 26 contractors of grade 7 in Wilayah Persekutuan Putrajaya who are registered with the Construction Industry Development Board (CIDB) in the field of construction, and the data were analyzed using descriptive statistics using the Statistical Package for Social Science (SPSS). With a mean score of (>4.00), the finding implies that unstable equipment and lack of ability are the major causes of falls from height. Meanwhile, fatalities from falling from a height were the most common casualties on the construction site, with a mean score (4.60). The construction industry will gain a greater knowledge of the importance of fall prevention measures on construction sites as a result of the findings.

Keywords: Fall From Height, Patten of Injuries, Mitigation Measure

1. Introduction

Malaysia's building industry is critical to the country's economic development. On the other hand, the annual increase in the number of deaths and accidents on construction sites is quite concerning. Working in the construction industry is seen as a potentially hazardous occupation. Meanwhile, compared to other industries, the construction sector's accident rate has been increasing day by day. Many people working in the construction industry are injured or killed every year as a result of construction site accidents. Furthermore, construction projects can be harmed by frequent accidents on construction sites if proper mitigation measures are taken, but non-developing countries are disproportionately affected by construction site accidents due to a lack of defined safety norms. As a result, construction site

accidents can harm project performance, such as causing delays in project completion, raising project costs, and reducing project productivity [5]. Due to the reduction in useable land area in Malaysia, demand for multi-story construction projects has increased, as has the number of deaths and accidents resulting from falls from high places. Construction companies should implement safety measures and build a safety management system to lower the death rate and accidents of existing workers on the job site [1]. According to the Department of Occupational Safety and Health (DOSH) records from 2017, 2018, and 2019, the number of accidents cases in Malaysia has climbed each year with 3635, 5031, and 7984 respectively.

According to Sanni-Anibire et al. [8] the type of accident that frequently occurs on-site is a fall from a high place. According to earlier studies, Malaysia is likewise one of the countries affected by this problem. Falling incidents from the high area on construction sites have also become a serious issue, according to the researchers, contributing to an increase in the number of deaths and injuries in the construction industry. According to the Occupational Safety and Health Act of 1994 (OSHA), (75%) of deaths on construction sites are caused by falling accidents. From 2004 to 2009, the most common cause of death at work in the construction industry was falling from a height (34%), followed by being struck by a falling object (25%). Accidents on this construction site might jeopardize not only the worker's safety and health but also the construction company's responsibility for the construction's safety because it has a financial element. Accidents and health repercussions have a significant financial impact on the construction sector. As a result, if you want to create successful management in your firm, you need to avoid it by appropriately implementing safety elements in construction. Due to the variety of jobs and harsh working circumstances in the construction sector, safety should be a basic requirement while working on a construction site. The dangers that represent a threat to workers' safety and health during the preparation and execution of building projects must be highlighted. As a result, the goal of this research is to design a fall mitigation method that can be used on building sites in Malaysia.

2. Methodology

2.1 Literature review

A comprehensive theoretical foundation was carried out through online databases such as Google Scholar, Dimensions, Science Direct, Academia, and the online library of the Universiti Tun Hussein Onn Malaysia to establish the basis for the research and get an understanding of the contractor's perspective of injuries pattern due to fall from height and mitigation measures. Simple keywords like fall from height, causes that induce falling from a height, the pattern of injuries caused by falling from a height, and mitigation strategies for falling from height at the construction site were used in the initial search. Journal, theses, and books are some of the sources that have been used in the literature review. The sources were then chosen by reading the titles and abstracts of articles that were related to the study's issue and were published 5 years ago. The study's problem statement was determined through a review of the collected literature, which stated that falling from height can result in a fatality or serious injury to a construction worker and that the number of cases will increase if mitigation measures are not implemented at the construction site.

2.2 Pilot study

In the pilot study, 10 people from the industry are experts in the field of construction to ensure the relevance of the questionnaire posed to respondents and to estimate the reliability and validity of the study instrument which has been formed. The questionnaire was divided into four sections namely parts I, II, III, and IV. The demographic question was in part I and concerned with the type of role, education level, and work experience. Then, part II of the questionnaire was focused on the factors that caused falls from height at the construction sites while part III is about the pattern of injuries due to falling

from a height at the construction sites. Lastly, part IV was the third objective of this study which is more to the aim of this research where is to determine the mitigation measure of falling from a height at the construction site.

2.3 Data analysis

This is the step in which all of the collected data is processed and analyzed, and the result is examined, discussed, validated, and summarised. The core questions, which required responders to agree to the study's terms and conditions, were followed by four questions that collected demographic data about the participants. The study's remaining questions were separated into three portions, each of which required participants to rate a set of factors indicated in the theoretical framework. Google Forms was chosen as the primary platform for creating and disseminating the questionnaire and facilitating survey submissions. After the survey's response time ended, the responses were entered into Statistical Package for Social Science (SPSS) to assess the questionnaire's validity and calculate the mean score and standard deviation for the three study objectives.

3. Results and Discussion

3.1 The factor that caused falls from height at the construction sites

Table 1 demonstrates that the mean value of each component that causes falling from height at the construction site is more than 3, indicating that neutral, agree, and strongly agree responses are more common than strongly disagree and disagree responses. Due to the mean value of 4.60 and 4.00, it can be observed that the majority of respondents think that equipment stability and adequacy in skilled personnel contribute a lot to the component that causes fall accidents at the construction site. The most important element in the occurrence of fall accidents at the construction site, according to Liy et al. [4] is unstable scaffold equipment, while Schoenfisch et al. [9] claim that scaffold contributed 33% to fall from height incidents. Second, other factors such as adequacy of training, the efficiency of safety management, workplace condition, adequacy in knowledge, and implementation of a safety culture at the workplace have a mean value of 3 to 4, indicating that the respondents neither disagree nor agree that it can be a factor that causes falling from height at a construction site, but it has a chance of contributing to a fall from height accident if it is not taken into account. According to Chi et al. [2], the main cause of 88% of construction accidents is dangerous worker behavior, such as not wearing sufficient personal protection equipment, which can result in harmful working circumstances at the construction site. Finally, the factor of standard operating procedure (SOP) at the workplace and proper use of personal protective equipment (PPE) shows the lowest mean value, which is below 3.5, because all construction sites are now required to follow SOP and use PPE.

Table 1: The mean and standard deviation score for the factor that caused falls from height at the construction sites

No	The factor that causes falling from height at the construction site	Mean	SD
1	Proper use in personal protective equipment (PPE)	3.20	1.15
2	Adequacy of training	3.67	0.98
3	The efficiency of safety management	3.67	0.90

4	Workplace condition	3.80	0.68
5	Stability in the equipment (Platform, Scaffolding, etc)	4.30	0.49
6	Weather condition	3.50	0.52
7	Adequacy in knowledge	3.70	0.98
8	Implementation in safety culture at workplace	3.60	0.99
9	Adequacy in skill workers	4.00	0.76
10	Standard operation practice (SOP) at the workplace	3.40	0.99

3.2 The pattern of injuries due to falling from a height at the construction site

Table 2 reveals that the majority of respondents felt that minor and major injuries are the most typical patterns of injuries caused by falling from a height at a construction site, while fatality is the most serious injury that will endanger the safety and health of construction workers. According to Hatamabadi et al. [3], 36.1% of minor injuries among construction workers can be attributed to their failure to use safety equipment while working at height on the construction site. A fractured, leg, ankle, or ribs are examples of minor injuries. After a fatality, significant injuries have the second highest mean value, and this pattern of injuries can result in lasting disabilities such as serious brain injuries or paralysis from the waist down [10]. Finally, fatalities are the most common injuries among construction workers as a result of falling from a height on the construction site. According to Muhamad Zaini et al. [6] falls from heights accounted for injuries, while Robson et al. [7] construction deaths accounted for 38% of falls from height events.

Table 2: The mean and standard deviation score for the pattern of injuries due to falls from height at the construction sites

No	The pattern of injuries due to falling from height at the construction site	Mean	SD
1	Minor Injuries	3.93	0.68
2	Major Injuries	4.00	0.62
3	Fatality	4.60	0.50

3.3 The mitigation measures of falling from height at the construction site

The mean and standard deviation scores for 10 mitigation measures of falling from height at the construction site are shown in table 3 below. The average mean for each item is close to 5, indicating that the majority of respondents answered agree or strongly agree. The company should send their employees to safety training to provide safety instruction about the usage of personal fall protection such as body bellies and body harnesses, as well as to ensure that their employees can recognize fall

hazards when working at height. Then, enhancing safety performance by focusing on risky behavior on the construction site was also one of the most widely agreed mitigating approaches. In other words, the responder believes that the most important issue for construction employees is safety training and performance. Second, the respondent almost agrees with this mitigation measure where effective maintenance necessitates frequent inspection of equipment used to work at height, such as scaffolds, platforms, ladders, and aerial lifts because the equipment's instability contributes significantly to the factor that causes falling from a height at a construction site. Last but not least, respondents agreed that the mitigation measure, which has a modest average mean score, can be used by the employer to safeguard the safety and health of construction employees, particularly when they fall from a height at the construction site. Finally, the mitigation measure that requires companies to verify that employees have legitimate certified skills in the field of construction has the lowest average mean score of 4.13, but it isn't considered one of the mitigation measures because the mean value is the closest to 5. In other words, while the respondents agree with this mitigation measure, all construction employees now have proper certified skills before working in the construction field.

Table 3: The mean and standard deviation score for mitigation measures of falling from height at the construction site

No	The mitigation measures of falling from height at the construction site	Mean	SD
1	The employer needs to ensure that they provide sufficient personal fall protection and this equipment needs to be tested before use.	4.40	0.74
2	The employer needs to send their employees to safety training to provide safety education regarding the uses of personal fall protection such as body belly and body harnesses and to ensure that their employees can identify the fall hazards when working at height.	4.67	0.49
3	The responsible person needs to observe their workers when working at high elevation and give a penalty to workers that failed to obey the safety rules	4.53	0.52
4	Improve safety performance by focusing on unsafe behavior at the construction site.	4.67	0.49
5	Effective maintenance requires frequent inspection of equipment used to work at height such as scaffolds, platforms, ladders, aerial. lifts.	4.60	0.51
6	Know proper site conditions and worker behavior need modifications based on weather.	4.33	0.49
7	The employer needs to organize knowledge sharing about safety knowledge in the construction sector.	4.53	0.52

8	The employer needs to adapt among the employees a good safety culture and management practices	4.33	0.49
9	Employers need to ensure employees have valid certified skills in the field of construction	4.13	0.83
10	The top management needs to understand very well the standard operating procedure and the penalty will be given for those who do not follow the SOP	4.40	0.51

4. Conclusion

The researchers can identify the elements that induce falls from height at construction sites as a consequence of this investigation. According to the findings, there are two elements with the highest average mean score, both of which have a significant risk of contributing to falls from a height at the construction site. The equipment is stable, and the competence level is adequate. The other components, obtaining the average mean value, might also be regarded as a factor in construction workers falling from a height due to the respondent's response being neither disagree nor agree. Then, because it has the lowest mean value among the other factors, suitable personal protective equipment should be recognized as a factor that causes falls from a height at the construction site. The study's second goal is to look into the pattern of injuries caused by falling from a height at construction sites. Due to the mean value being close to 5, the majority of the respondents answered agree and strongly agree. That indicated that when a construction worker falls from a height, all three types of injuries, minor injuries, and fatalities, have the highest risk of occurring. Finally, by defining the two objectives listed above, the third purpose of finding the mitigating methods for falls from a height at construction sites can be accomplished. As a consequence of the findings, the mitigation actions listed in Table 3 have the best chance of being implemented at a construction site in Malaysia to ensure the safety and health of construction workers. Therefore, to improve this study in the future, certain suggestions must be considered to obtain more research information. To gain more information on falling from a height accident at a construction site, it is suggested that more innovative research methods and other sources of data be used for future research, while interviews with experts in the field of construction should be conducted to ensure that the information required is more accurate.

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