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AN EMPERICAL STUDY ON ACCIDENTS AND HAZARDS IN CONSTRUCTION OF BUILDINGS

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ABSTRACT
Construction sites are among the most hazardous workplaces, with a significantly high number of reported fatalities compared to other industries. The essential risks associated with construction work stop from various factors, including the nature of tasks and the environments in which they are performed. This article aims to examine the causes of construction site accidents, and hazards based on researcher's study. Research highlights that workers' unsafe behaviors play a pivotal role in causing most accidents. Such behaviors often arise from inadequate training, negligence, or failure to follow safety protocols. Among the most frequently reported dangers, falls from heights stand out as a leading cause of fatalities, often resulting from the absence of proper safety equipment or failure to follow to height safety measures. Additionally, the improper handling of materials poses significant risks, leading to injuries ranging from minor to severe. The use of heavy machinery and equipment, while essential for construction activities, also introduces considerable hazards due to mechanical failures, operator errors, or insufficient maintenance. Addressing these risks requires stringent enforcement of safety guidelines, comprehensive worker training, and regular inspections to mitigate potential dangers and ensure a safer working environment.

I. INTRODUCTION
For every country, the construction sector is significant on both an economic and social level. By providing jobs and infrastructure, it is essential to achieving socioeconomic development goals. Nevertheless, the business is acknowledged globally as being dangerous despite its significance [1], [2]. Due to the daily fatalities on construction sites, activists argue that the national as well as state governments should enhance safety inspections and guarantee that construction workers get social security benefits to which they are legally entitled [3], [4]. The construction business is the second most dangerous in India, with a mean of near 38 fatal accidents per day, while being one of the greatest employment sectors. In 2019, "the Indian Institute of Technology (IIT) Delhi" conducted a research which found that the most common causes of work-related fatalities in the construction sector include falls, electrocutions, and collapsed scaffolding and walls. According to another study conducted in 2016 by academics from IIT Delhi and "the National Institute of Technology Surat", around 25% of all workplace accident deaths in India are thought to be related to the construction sector.

A. Construction hazards
Any circumstance that endangers someone's life, wellness, assets, the environment, integrity, etc. is considered a hazard. In contrast to hazards, risks indicate the possibility that a certain circumstance, like a hazard, might result in damage [5], [6]. From a perspective of health and safety, a hazard is a situation that has the potential to damage a person's physical abilities or have negative health effects [7], [8]. Anything that might compromise the success of the project's tasks or the project overall is considered a danger in a project environment. In the same way, businesses, endeavours, tangible assets, the environment, and society all confront risks [9], [10]. The majority of risks are latent or

prospective, but when a dangerous circumstance becomes "effective," it may result in an incident, an accident, or even a catastrophe [11], [12].

B. Types of hazards and accidents in construction.

- Working with tools and equipment.
- Working with heavy plant and machinery.
- Working at height.
- Working with live electricity.
- Lifting operations.
- Exposure to chemicals.
- Material and manual handling.
- Structural collapse and falling debris.
- Loud noise.
- Hand arm vibration syndrome.
- Slips, trips and falls.
- Sharp objects.
- Working in confined spaces.
- Fire.
- Hot work.

C. Types of Construction Site Accidents

- **Height-Related Accidents:** Accidents that cause catastrophic injury or death include falling from a height or ladder, being hit by falling items, and scaffold collapses. Slips and trips often occur when an obstruction, such as debris or materials, is in the path of the worker. Another reason for working on uneven ground is certain slips and trips.
- **Demolition Accidents:** The intentional destruction, dismantling, or wrecking of a building, generally for the goal of rehabilitation or the construction of a new structure, is referred to as demolition. Destroying structures that are no longer needed is a sensitive operation that has to be carefully planned and carried out. Demolition need for extreme accuracy, even if it could seem straightforward to someone who is unfamiliar with the building sector. In other words, you don't just "know down" the structure. Additionally, when some businesses neglect to guarantee that accuracy, demolition procedures result in worker and neighbour fatalities.
- **Material and Manual Handling:** On building sites, equipment and materials are continuously lifted and transported, either by hand or by machinery. There is some danger involved with handling in every case. Appropriate training must be given when tasks require manual handling. If an employee needs use lifting devices, they must get training on how to use it and pass a test to ensure they can operate it safely.

Figure 1 Height-Related Accidents

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"Source - https://www.plantmachineryvehicles.com/cloud/2021/07/08/IfVJAJQe-working-at-height-accident-1200x801.jpg"

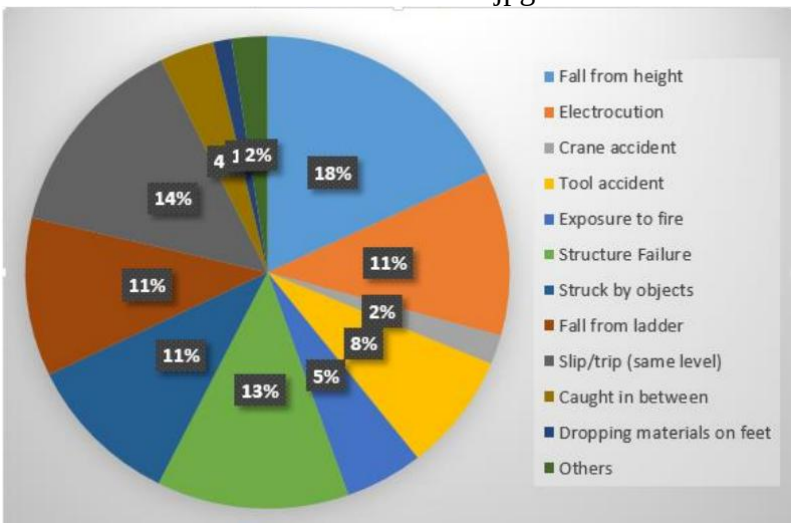

Figure 2 Causes of construction accidents [13] (KishoreS & Suman, 2022)

D. Impact of accidents on workers

Physical injuries: - construction sites accidents can be result in a dangerous physical injury. It can be cuts, bruises, sprains, strains, leg and hand fractures, critical head trauma, and burns. These all required extensive treatment so the rehabilitation can be on time.

Permanent disabilities: - it can lead to long term or permanent disabilities, it can be:-

- loss of limb
- paralysis
- brain injury

All these are the major injuries which can be a profound impact for the workers potential to work and also perform and involved in multiple daily initiates.

Emotional trauma:

- It can include majorly
- Anxiety
- Depression
- Post-traumatic stress disorder

Workers can have some of the minor experience of fear, helplessness and nightmares after witnessing or involved in the serious accident on the work place. [14]

II. LITERATURE REVIEW

(V. Vikas, and S. P. Ilango et al., 2015) [15] The construction industry's rapid expansion in India has led to increased competition among construction companies for contracts, which has been accomplished at the price of workers' safety and well-being. Consequently, it is important to recognise the many reasons and impacts of accidents on construction areas as well as suggest strategies for lowering them. This research looks at the main reasons why accidents happen on construction sites and offers solutions to reduce them. Some of the context of this study, such as implementing a safety policy, using safety equipment and supplies, providing training on safety measures and accident prevention techniques, maintaining a safe working environment, and enforcing safety regulations, must be implemented by management of construction companies in order to ensure safety and minimise the number of accidents that occur on construction sites.

(Tunji-Olayeni et al., 2018) [16] The construction site offers unfavorable working conditions, subjecting employees to one of the most hostile work environments. Purposive sampling was used to pick thirty-five (35) craftspeople from a variety of construction spots in one of the most populated cities in sub-Saharan Africa, and they were given a structured questionnaire to complete. Tables, pie

charts, and stacked bar chats are used to display the collection of descriptive facts. Craftsmen's cardiovascular, respiratory, and musculoskeletal systems were shown to be often affected by occupational health issues on building sites. Through data analysis, the impact of occupational health risks on craftsmen and building project performance may be ascertained. Furthermore, the examination of survey data might reveal contractors' dedication to occupational health and safety (OHS).

(Osei-Asibey et al., 2021) [17] The purpose of this research is to investigate, from the perspectives of important stakeholders, the reasons behind accidents and hazards in Ghana's construction industry (GCI), as well as the laws and legislation pertaining to accident-related remedies. In-depth in-person interviews were conducted as part of a qualitative research approach. Seven people participated in the data saturation principle interview, including consultants, contractors, construction workers, and suppliers/manufacturers. Purposive sampling was used to choose interview subjects, and content analysis was used to examine the data. Common law responsibilities of the Employer, who is the Contractor, with a responsibility to ensure that suitable measures are made for the works to be carried out safely, were highlighted as one of the five main causes of accidents and hazards that are crucial to remedying. The study's conclusions provide the contractor and other stakeholders enough information about their roles, responsibilities, and tasks to guarantee better CHS practice implementation. The research looked at the legal foundation and repercussions for the reasons for accidents and dangers in the construction sector. Given that the present study took into account major construction organizations, it is advised that comparable research be carried out with small and medium-sized businesses.

(Nigeria *et al.*, 2014) [8] As Nigeria's construction sector grows, there is more rivalry among construction companies to complete projects, which is accomplished at the cost of the safety and well-being of the workers. As a result, it is important to recognize the many reasons why accidents occur on construction sites, their effects, and potential solutions to lower the number of accidents. This research looks at the main reasons why accidents happen and offers solutions for reducing them on building sites. Descriptive statistics tools including frequency, mean, percentage, and relative significance index were used for the analysis, along with a specially created questionnaire. Nigerian construction companies may be divided into three categories: multinational corporations, large-scale indigenous construction companies, and small-scale indigenous construction companies. According to studies, the primary cause of accidents on construction sites is carelessness; workers are also often the victims of these incidents; and the main consequence of these mishaps is the loss of project execution time. Management of construction firms must undertake and implement some of the context of this study, such as implementing a safety policy, using safety items and gear, providing training on safety measures and accident prevention techniques, ensuring a safe working environment, and enforcing safety rules, in order to ensure safety and minimize the occurrence of accidents on construction sites.

(Muhamad Zaini et al., 2020) [5] Cranes are used more and more when erecting high-rise structures, expansive residential complexes or urban development. Regardless of the project's size, crane utilization is widespread and crucial in the construction sector. When lifting huge weights is required, cranes often employ cable and pulley to provide a mechanical advantage. The ability to transport materials of various sizes is one of their many possible uses on the building site. Effective crane control and adherence to safety regulations are the operator's responsibilities. Failure to properly practice crane maintenance standards and procedures will result in property damage, injury, and loss of life. This research aims to determine the reasons of crane accidents at building sites in Malaysia since these incidents occur annually. This document summarizes the statistics and causes of crane accidents from the most referenced studies with the stated goal. Therefore, the causes of accidents identified by earlier researchers will be emphasized. The study's findings show that the main reasons for crane accidents at Malaysian building sites are operational and technical issues. The

construction industry will benefit from this paper's exploration, particularly in the area of crane monitoring for improved safety performance and regulations at all building sites.
D. Manase et al., 2004) [18] The construction sector has one of the worst safety records, with an average of 150 fatalities and 20,000 injuries recorded to the Health and Safety Executive annually. Despite the existence of laws and regulations, this tendency is still increasing. The fundamental causes of accidents are still poorly understood, despite the fact that some of their causes are recognized. The existing data is insufficient to describe the underlying interacting elements that contribute to construction site accidents. Henceforth, the purpose of this study strategy is to improve the explanation of accident causation. It suggests creating a system that offers a solid foundation for determining the cause of accidents. It also aims to provide a number of instruments for risk analysis and evaluation. These solutions are built on the latest advancements in virtual reality (VR) and 3D geographic information systems (GIS). The creation of analytical tools that use 3D GIS to visualize incidents on site would help industry stakeholders discover locations for effective preventative measures as well as dangers. In the end, it will lead to the creation of preventative health and safety regulations that will help the construction sector lower the number of accidents that occur on building sites.
(Liy et al., 2016) [19] The construction business has five times as many fatalities as other industries, according to statistics from the Occupational Safety and Health Act of 1994. In 2013, there were 294 fall-related deaths out of a total of 796 construction-related deaths. Therefore, it is imperative that this issue be mitigated. The underlying reasons of fall risks on construction sites have been the subject of a research. As a result, the purpose of this study is to identify and emphasize the fall risks that are most often seen at building sites nowadays, as well as the contributing factors and best ways to mitigate them. In order to gather data, a questionnaire survey was sent to construction companies in the Kuching region. After that, the Likert scaling technique was used to analyses the data. The results of this research show that the majority of fall risks are caused by scaffolding and roof collapses, with communication barriers being the primary source of fall hazards. Additionally, poll respondents indicated that the most effective way to lower fall risks is to do weekly workplace inspections using a checklist and to notify impacted employees of the checklist's results. Conclusion: In order to reduce fall accidents in Kuching, the issue of fall risks might be resolved, and the study's results would be useful for future research and pertinent references.
(Almaskati et al., 2024) [20] A key component of safety management is hazard identification, which may help lower the frequency and severity of work-related accidents on building projects. While some of the risks have been recognized and assessed by researchers, not all of them have been thoroughly examined, and none have been categorized by industry. By taking into account hazard identification via a systematic synthesis of the current literature, this work aims to close that research gap. Following a thorough evaluation of the literature, 236 articles were judged suitable for further examination. Following their identification, 18 safety risks were divided into four categories according to their physiological effects, ordered by the number of citations, and categorized by sector. The findings showed that the most often reported dangers that were most likely to affect all industries were falls from heights, material handling, and heavy equipment. The majority of dangers may be reduced by using personal protective equipment, as well as by providing enough training and supervision, according to the mitigation measures that were found.
(Kanchana et al., 2015) [21] Globally, the construction business has grown significantly, especially in the last several decades. The safety of both the buildings and the workers is crucial for the construction venture to be successful. From the beginning of the design process until the project is finished and turned over, safety concerns must be taken into account. Both expert and unskilled workers employed in the construction sector are susceptible to health hazards and accidents on building sites. Safe working conditions, which are severely lacking in Indian construction enterprises, need effective coordination between contractors, customers, and employees. Despite the existence of labour safety regulations, building sites continue to see a high number of accidents. The

management's dedication to employee health and safety is likewise lacking. To comprehend the reasons behind accidents, preventative measures, and the creation of a safe work environment, a thorough literature review was conducted. The findings of a questionnaire survey that was given to different groups of construction workers in the Kerala area are presented in this study. The frequency of accidents, workers' nativity, total working hours, work shifts, and types of injuries that occur on both small and big construction sites are all thoroughly examined and discussed in this study.

III. CONCLUSION

The construction industry is widely regarded as one of the most hazardous sectors due to the high incidence of accidents, illnesses, and safety hazards on job sites. This determined risk has become a growing concern for all participants involved in construction projects. Research reveals that many of these accidents stop from inadequate safety practices and a lack of observance to safety standards. A significant factor is workers' negligence in using personal protective equipment (PPE), often coupled with insufficient knowledge and awareness of site safety protocols. Small-scale construction sites, in particular, face heightened risks due to limited resources and oversight. Framework and working platforms have been identified as leading contributors to accidents, with falls being the most frequently reported cause of injuries and fatalities. These incidents typically result from unstable structures, improper use of equipment, and failure to secure working areas. Enhancing safety in construction demands a proactive approach, including rigorous enforcement of safety regulations, comprehensive worker training, and regular site inspections to minimize risks and foster a culture of safety.

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