



Risk and Safety hazards involved in material handling construction projects

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Abstract

This study is carried out with the objective of improvement of lives of the workmen working in material handling construction projects during construction. Construction Management is a part of Project Management and it's a most important task during implementation of Construction Projects. In Construction Projects there are several Risk and safety Factors are involved which can be identified and rectify measures can be planned. The construction industry is growing tremendously and spread over the world. In this study we will focus on particular Construction Projects of Materials Handling which is generally an integral part of any large scale industry. We have gone through the several studies on Construction but we rarely found any study especially for Material Handling Project specific. Therefore it is decided to study on these areas. In Materials handling Project construction of Silo, warehouses, Conveyor Galleries and Railway Platforms are involved. By road Transport also a part of Material handling Project. Millions of people are lost their life due to safety laps in Construction Project and in which Material Handling Project have significant role. Also several accidents are occurring in the construction Projects and due which millions of peoples are injured and hospitalized every day. Several Govt. & Non Govt. organisations are made their rules and regulations of Safety but still in case of implementation it is lacking. Particularly in Material Handling Project any proper guideline is not available for safety hazards. Therefore we will thoroughly study and will make a blueprint on this issue and remedies will suggest.

Keywords: Risk, Safety, Material handling, construction projects

1.0. Introduction:

Large-scale enterprises depend on material handling construction projects, which include building silos, warehouses, conveyor galleries, railroad platforms, and road transport infrastructure. Despite their significance, there aren't many particular studies that concentrate on the safety risks that these initiatives entail. By thoroughly analyzing the hazards and safety considerations related to material handling building projects and suggesting corrective actions, this research seeks to close that gap. The efficient execution of construction projects is largely dependent on construction management, an essential part of project management. However, there are several dangers and safety hazards in the construction sector that might endanger workers' health and safety. Every

year, safety errors in construction projects claim millions of lives; material handling projects account for a large portion of these deaths. Although rules and recommendations for building safety have been created by governmental and non-governmental groups, their execution frequently fails. There aren't many particular regulations designed to handle the particular safety risks that material handling operations bring. Our goal in conducting this study is to thoroughly examine the safety risks associated with material handling building projects. . Our ultimate objective is to create a thorough plan for raising safety requirements in material handling projects so that construction workers' lives and wellbeing are protected. By tackling the particular safety issues associated with material handling projects, we can help make construction workers' working environments safer and more secure, which will eventually improve their quality of life. Because of a few related special characteristics, including the challenging building process, transient organizational structures, shifting work locations, an uncontrollable work environment, and worker behavior, the nature of hazards on construction sites is recognized to be distinct [1]. According to Heinrich's Domino hypothesis, dangerous situations and human mistake are the main causes of accidents. It is also well known that risky practices or human mistake were determined to be the cause of 88% of preventable mishaps. A different kind of intervention should be used by safety management policy to lower the death rates on building sites. Innovative safety concepts should be implemented by supervisors of employees from diverse cultural backgrounds in the workplace to promote safe behavior, which in turn lowers the accident and injury rate [2]. When comparing high-risk domestic and foreign initiatives, it becomes clear that the latter are riskier due to the involvement of workers from other nations, each of which has its own language, system, and norms [3]. Because of its practical importance, risk management is thus taken into consideration on building sites. Additionally, in order to make the best judgments possible for sustainable development, one must be fully informed on the dangers and hazards that might endanger the environment [4]. A key component of the safety management system is safety performance evaluation, which is carried out by measuring and analyzing incident-related data statistically [5]. The main cause of the building project's subpar performance is the lack of focus on risk assessment. This leads to ineffective results throughout both the planning and implementation phases [6]. As a result, examining a construction site's safety performance tends to improve both the safe work environment and its culture. A number of previously published studies have examined behavior-based studies, or BBS, in the construction industry. The researchers came to the conclusion that worker risks contributed to significant injuries [7], [8].

2.0. Literature Review:

Under some circumstances, these elements may effectively raise the chance of risk-promoting an occupational accident [9]. In order to ascertain the reasons behind accidents, a questionnaire survey is distributed to construction site workers, craftsmen, supervisors/foremen, and engineers/architects from both large and small enterprises. Seventy samples were gathered for the survey using questionnaires. The parameters used in the creation of the questions included things like mishandling safety equipment, being irresponsible or reckless, using scaffolds or machinery improperly, using defective ladders, disregarding safety regulations, objects falling from tall buildings, and hazardous working environments. Under some circumstances, these elements may effectively raise the chance of risk-promoting an occupational accident [9]. In order to ascertain the reasons

behind accidents, a questionnaire survey is distributed to construction site workers, craftsmen, supervisors/foremen, and engineers/architects from both large and small enterprises. Seventy samples were gathered for the survey using questionnaires. The parameters used in the creation of the questions included things like mishandling safety equipment, being irresponsible or reckless, using scaffolds or machinery improperly, using defective ladders, disregarding safety regulations, objects falling from tall buildings, and hazardous working environments. . Poorly identified soil structure, a poor work schedule, malfunctioning equipment, worker absenteeism, worker performance, ineffective management of personnel, supplies, and material resources, low-quality building materials, upholding standards, and a disorganized work environment are among the risk factors associated with construction sites [14]. The Individual Professional Risk (IPR) is assessed using the scoring and surveying approach. The risk assessment (RA) in the scoring system can be produced by taking objective measurements of real parameters and comparing them to sanitary criteria. However, the self-perception of workers who are at risk throughout the production process is used in the survey approach. In light of statistical data, the likelihood of industrial injuries, and worker occupational illnesses, the retrospective occupation risk technique was employed.. After assigning a risk rating, it was determined that jobs involving gas and electric welding posed a high danger, while the remaining jobs were classified as medium risk [15]. The risk theory of the Cost of Safety (COS) and the Analytical Hierarchy Process (AHP) were given priority in another investigation. Using AHP has the advantage of validating expert decisions and reducing their variance. The consistency ratio was determined by looking at the greatest eigenvalues of the eigenvectors, and the AHP scale was utilized to anticipate the effect of the risk. According to the findings, tripping and falls, fires, and explosions rank highest among the risks [16]. A new model was presented to estimate the risk using the same parent model of risk assessment, but with three primary categories, in order to reach a scientific judgment for various site layout situations.

3.0. Methodology:

In the construction sector, safety management systems are efficient in mitigating occupational dangers and reducing the likelihood of accidents and property damage. [20]. A questionnaire survey is designed to assess the efficacy of the safety management system. It asks questions on the supervisor's attitudes, the use of personal protective equipment (PPE), the complexity of the construction, the use of heavy machinery, etc. A statistics program called Statistical Product and Service Solutions (SPSS) was used to examine the data. The provision of personal protective equipment (PPE) by the employer, restrictions on the subcontractor's safety behavior, and subcontractor coordination and control were shown to be the top three criteria that reflect safety on construction sites [21]. To assess the current safety environment for the management of safety and health, a case study methodology was used. It was determined that worker comments should always be embraced by the safety officer and that safety should never be sacrificed because of a deadline. Employee commitment to safety will only rise in the event that safety management is successful [22]. The construction sector may reduce occupational risks and lower the risk of property damage and injury by using an efficient safety management system [20]. A questionnaire survey is designed to assess the efficacy of the safety management system. It asks questions on the supervisor's attitudes, the use of personal protective equipment (PPE), the complexity of the

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4.0. Risk and safety Hazards:

To protect worker safety, material handling construction projects provide a number of risks and hazards that must be addressed. These risks include, among others: Heavy machinery accidents can occur when workers handle machines like cranes, forklifts, and conveyors improperly. These machines are often used by workers and can cause serious injuries. Falling Objects: If appropriate safety measures are not followed, materials being lifted or moved may fall and injure workers below. Falls from Heights: If safety precautions like guardrails and fall prevention systems are not in place, workers who are obliged to operate at heights—such as on scaffolding or raised platforms—may fall. Slips, trips, and falls: If adequate housekeeping procedures are not followed, construction sites, which are frequently uneven and littered with supplies, can provide a risk of slips, trips, and falls. Exposure to Hazardous Materials: If correct handling techniques are not followed, several building materials may provide a health risk, including the possibility of chemical burns, breathing problems, or skin irritation. Fire Hazards: Construction sites may have combustible materials or equipment that, if improperly managed, might start fires and endanger surrounding structures as well as workers. Crush Injuries: If appropriate safety precautions are not taken, workers may be trapped between moving elements of equipment or between materials, which might result in a crush injury. I. Give employees thorough instruction on emergency procedures, equipment functioning, and safe work habits. Provide unambiguous routes of communication so that events and safety concerns may be reported right away. Review and update safety procedures on a regular basis to comply with legal requirements and industry standards. Encourage contractors, subcontractors, and employees to adopt a culture of safety consciousness and responsibility Construction project managers may enhance worker well-being and lessen the chance of accidents and injuries on material handling construction sites by proactively addressing these risks and safety concerns.

5.0. Result and Discussion:

Given the inherent dangers associated with material handling construction projects, it is imperative that attention be paid to enhancing worker safety. . Falling Objects: When silos, warehouses, and conveyor galleries are being built, there is a chance that something will fall from a height and injure workers below. Slips, trips, and falls: Building sites are frequently unlevel and overflowing with debris, which increases the possibility of slips, trips, and falls, particularly on transit routes and railroad platforms. Material Handling Injuries: Workers may get musculoskeletal injuries as a result of improper lifting practices or handling large objects without the necessary equipment. Transportation Risks: When transporting products by road, there is a chance of accidents, especially if safety precautions are not taken to secure cargoes. Structural Failures: Poor design or upkeep of buildings such as silos or warehouses can result in collapses or other structural problems that put adjacent workers in danger. Hazards of Fire and Explosion: Projects involving the handling of materials may contain combustible or flammable elements, which raises the possibility of fires or explosions if appropriate safety measures are not followed. Creating thorough safety policies and procedures is crucial to addressing these risks and enhancing safety in material handling construction projects. This might consist of: putting in place frequent safety training

programs for employees to make sure they understand possible dangers and how to reduce them. Supplying the proper personal protection equipment (PPE), such as gloves, safety goggles, hard helmets, and bright apparel, to employees. Establishing precise channels of communication and reporting guidelines for on-site occurrences or safety issues. Enforcing stringent compliance with safety standards and recommendations by means of routine oversight and guidance. Collaborating to create standardized safety procedures unique to material handling building projects with industry associations and necessary authorities. It is feasible to enhance the lives and well-being of workers participating in material handling construction projects and lower the frequency of accidents and injuries by placing a high priority on safety and putting proactive measures in place to limit hazards. Your study's obvious goal is to increase the wellbeing and safety of labourers engaged in material handling building projects. You're correct to draw attention to the significance of construction management in terms of risk and safety considerations in project management. It is important that you concentrate on material handling projects including building silos, warehouses, conveyor galleries, train stations, and vehicles for transportation. These projects are essential to many different businesses, but if safety precautions are not taken, there may be serious hazards involved. It's admirable that you're drawing attention to the dearth of focused research on material handling projects, given their significance and frequent occurrence in the building sector. Safety breaches put millions of lives at risk, causing injuries and fatalities. Even if regulations exist, they are frequently not implemented properly, especially when it comes to material handling initiatives. It is essential that your strategy look closely at safety risks in material handling projects and create solutions. By doing this, you may help close the safety guidelines' gaps and raise the bar for general safety in the construction sector. Your design and recommended solutions will probably be helpful tools for governmental and non-governmental entities that oversee and regulate building projects. Overall, by addressing a crucial problem and offering workable ideas to improve worker safety in material handling projects, your study seeks to significantly advance the subject of construction management.

6.0. Analysis of site safety performance:

A software tool is built to assess the safety performance of building sites. Eleven unique worldwide construction sites were chosen, and 168 observable variables over 16 latent dimensions were analyzed. To determine the virtual weights of the observable variables, a questionnaire is created. The questionnaire was sent to safety professionals who had worked for at least ten years. A basic model with 48 observed variables and a comprehensive model with 168 observed variables were presented. In each of the 11 building sites, both models were validated. The path coefficients of the second-order factor structural model are used to calculate the safety performances for the unobservable variables. It is observed that less than one-third of the whole model's duration was used on average to complete the assessment forms. For each of the eleven construction sites, the safety performance index results were compared. Higher filling and simple execution were represented by the shorter model. In relation to the entire model, the findings were obtained earlier and with a respectable degree of accuracy. Therefore, every construction industry's site safety performance may be ascertained using this safety evaluation index tool [31]. Using SPSS and AMOS, researchers examine the relationship between construction sites' safety performance, psychological stress, and safety atmosphere. In order to ascertain the impact, 837

questionnaires in total were gathered. Six elements were included in the proposal for the safety climate: role overload, safety knowledge, job pressure, supervisor opinion, management responsibility for safety, and coworker opinion. The individual resilience and six proposed safety climate parameters were analyzed using the SEM approach in relation to physical safety outcomes and occupational stress. As a result, 6% of the risky behaviors and 7% of the physical symptoms indicated variations in the safety climate. Additionally, 9% of risky behaviors, 17% of physical symptoms, and 3% of stress symptoms all related to an individual's resilience. Individual resilience therefore affects one's ability to manage pressure from the workplace. The findings highlighted the need to include both human and organizational aspects when assessing safety performance [32]. Here, the human elements are divided into five categories: dangerous work events, unsafe acts' preconditions, unsafe supervision and monitoring, unfavorable organizational effects, and unfavorable environmental effects. Organizational and environmental aspects were taken into consideration in addition to the human component. Safety performance of the HFACS hybrid model was next ascertained by employing the Bayesian – network (BN) model [33]. The safety climate model is suggested as a means of gauging the effectiveness of the location where it is assessed using Delphi survey and structured interview techniques. The research hypothesis proposes four dimensions: safety engagement, safety compliance, safety climate, personally communicated injuries and near misses. To investigate the causal link between the various safety performance and safety climate components, SEM is advised [34]. Generally speaking, a checklist including questions about site safety is used to assess the site's safety performance. Typically, a walk-around audit is used to do this; while this is a conventional procedure, task-specific factors also affect site safety. Therefore, the aforementioned procedures have been applied in order to include all relevant parameters and obtain a general overview of the site.

7.0. Machine learning and safety:

For the researchers, the use of artificial intelligence to construction management is a new field. A significant part of safety management is played by artificial neural networks (ANNs). . When it comes to larger construction sites with over 100 workers, artificial neural networks (ANNs) can forecast the outcome based on user interest. This model uses safety behavior, safety risk level, near misses, incidents, and deaths as inputs, and safety performance as an output. This study included 339 data sets in total, all of which were derived from expert opinion. The data were ranged from 0 to 1 using normalizing to lessen the dominance between the variables. It is recommended to evaluate the safety performance using a multi-layer perceptron with back propagation (5-4-1), which produced encouraging findings. It is discovered that an ANN can handle a lot of data while doing well in a variety of predictions. Artificial intelligence is clearly important in prediction and may sometimes outperform human specialists in this regard, as demonstrated by its many applications. ANN is utilized to improve the decision-making of engineers and safety supervisors in both daily operations and long-term planning. An important function of artificial neural networks (ANN) at construction sites is the prediction of project performance, worker performance, and accidents [36]. Clustering is also efficiently carried out using machine learning algorithms [37].

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9.0. References:

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