

Risk Assessment and Management in Construction Industries

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Abstract: This paper aims to deal with construction industry risks. It deals with all type of construction industry types such as small house, malls, and huge buildings. Many accidents can be happened in the sites, so it is important that appropriate measure are taken into consideration to help in curbing the menace to improve safety in the working environment both within and the surrounding. The researchers concluded that the risks which can be avoided should be avoided to reduce the number of accidents that happen in the working environment. Rules and regulations that are clear and well understood by the workers are important in eliminating or reducing hazards experienced within the working environment. With adequate training and strict policies put in place, it is possible to deal with the risks at the workplace. The management should take responsibility and consider it as a necessity to introduce adequate measures and policies that can govern all activities undertaken in construction sites.

Keywords: Risk Assessment, Risk Management, Construction Industry.

I. RISK ASSESSMENT IN CONSTRUCTION INDUSTRIES

A. Introduction

The construction industry is one of the major industries that are directly involved in development. Construction industry covers a wide range of various activities right from the large scale to small scale for example construction of small houses and construction of malls which is large scale. During the process construction, there are various mechanisms that are involved or rather used to assist in various construction activities like the cranes, trucks, forklift which are heavy machinery and small tools such as a hammer, chisel among others are all causes of minor and major accidents. There are various cases that arise that are injury related and even fatal death in the construction

industry, due to carelessness in handling machinery, or due to lack of servicing and repair of spoilt or broken machinery. These have been the reasons that have influenced injuries and even deaths among workers and non-workers like pedestrian within the construction areas. Over the past years, there have been reported cases of serious injuries and death in the construction sites [1]. And because of the increased incidences of such, it is important that appropriate measures are taken into consideration to help in curbing the menace to improve safety in the working environment both within and the surrounding.

B. Incident Scenario

It was late last year on 9th the month of November when an incident occurred in one of the nearby construction sites which caused someone's life. Cranes are machines used to lift heavy materials from one point of construction to another and it's mostly used in large scale construction and they can be dangerous if one is not keen during the operations. The crane operator was not well trained on how to operate the crane and he had no idea about the loading limits of the crane. There was an overload on the crane and in the process the buckle and the boom collapsed and hit a fellow worker who was standing by leaving him with fractures and on the head, unfortunately, there was no first aid kit that could be used to help in dressing the wounds and stopping the bleeding before calling an ambulance. Due to excessive bleeding experienced by the patient he died upon reaching the hospital. Report based on the incidents.

C. Context of the Incident

This paper will summarize the incident which happened in one of the constructions sites as stated above on 9th November 2016. The incident was caused by one of the crane operators, during his operations at the construction site which left one of the workers dead.

D. Details of the Incident

The crane operator was not well versed with crane operations for example he has no idea on how much load the crane is supposed to carry, when the crane was about to take off both the tackle and the boom collapsed and hit one of the workers who was standing by leaving him bleeding and lying helplessly on the ground. Some of the coworkers who oversaw the incident shouted at the crane operator alerting him that he should stop the machine to avoid any more movements that could create more harm. The site had no first aid kit and the other option was to call for an ambulance since it was an emergency. The site manager called the emergency line for an ambulance and within a few minutes the emergency services arrived and did first aid on the patient to stabilize him but upon reaching the hospital he passed away.

II. ANALYSIS

The primary cause of the incident was by an overload on the crane. The crane was overloaded beyond its capacity and this led to boom and buckle collapsing. The secondary cause of the incident is lack of adequate training of the crane operator. Due to inadequate training, he was not able to know if the crane was overloaded.

III. RECOMMENDATION

- Everyone has a responsibility to play to ensure that safety at the workplace is a priority for the sake of avoiding accidents that could cost someone's life. The crane operator needed to be well trained before taking and operating the machinery and also he should have been more careful while operating the machinery to make sure that no one is hurt or injured during the operation.
- Carelessness among the workers has led to various workers getting injured and even the pedestrians passing along the construction sites [2]. It is important that every individual involved should be the first to take precaution in all the steps and activities involved in the construction to avoid incidents that could have been avoided.
- All the workers should undergo training on safety and precaution measures to help in curbing accidents that happen during the operations.
- All persons operating machinery at the construction site should undergo tests that ensure competency and understanding of the machinery operations.

IV. RISK ASSESSMENT

E. Identify the Hazards

1) Accidental Hazards

- Being lifted or falling from a height
- Being crushed between objects
- Being trapped in a locked space
- Electrical devices and static electricity
- Objects falling over
- Objects being dropped
- Slipping

F. Those who are directly affected

- Workers involved directly in construction are directly affected in that they could be lifted or fall from a height, they can be crushed or trapped between the objects and slipping due to slippery or greased floors.
- Machine operators can get electrocuted because of shock from the machinery due to overheating and or poor maintenance.
- People who may be passing by the construction site can be hurt by objects falling over, or objects being dropped.

G. Risk Evaluation

Using the qualitative data collection to identify which risks need immediate attention and solution, risks that are moderate and those that require minimum attention. Quantitative analysis is used in data collection for the risk evaluation because it is not time-consuming and gives easy to read and analyze results.

Risk	Risk Rating	Who is Affected
I	Very high	Workers
ii	High	Workers
iii	High	Workers
iv	High	Machine Operators
v	Very high	Public
vi	Very High	Public
vii	Low	Workers

It is evident that there is no adequate measures were put in place to govern the workforce and avoid accidents that may occur at the construction site. However, it is mandatory by

the government that all sites of construction follow the requirements to ensure safety precautions or measures at the sites of construction. There are also laws and rules that protect and govern those who are working in the construction industry. From the data collected, it is important to note that;

- Training is done to all those who are involved in the construction sites to make sure that they are aware of the requirements to enhance safety.
- The management should provide protective equipment such as clothing, footwear among others.
- Provision of welfare facilities like first aid and washing facilities for removal of contamination.
- Having meetings every morning to remind everybody of their responsibilities and the safety measures each individual should take to avoid accidents and related injuries.

H. Findings and Implementations

After doing a research by the distribution of questionnaires and analyzing the findings, above data indicates that a majority of the identified accidental hazards has an adverse effect on both the workers and those individuals who are close or passing close to construction sites. The above data indicates that the construction site can definitely be dangerous and risky for the workers and others who are near construction sites [3]. The risk evaluation indicates that most of the accidental hazards experienced in the construction sites are either caused by individuals or the machines [4]. The workers in the construction sites are either careless, ignorant or do not have adequate knowledge on safety and risk management at the construction site, or either the machine operators are not well trained on machine operations and they do not regularly service or repair machines and this is a risk to both the workers and pedestrians who may be passing by the construction sites. However, the accidental hazards can also be caused by construction managers and engineer's carelessness by not providing workers with reflector jackets and putting on signs and boards that are visible to indicate that it is a construction site. These risk and hazards have been, however, eliminated through:

- Training the entire staffs and all the personnel involved.
- Placing boards and indicators showing that is a construction site and no trespass by the public.
- All staffs working at the construction site have been given protective clothing like helmets, boots,

reflectors, apron among others and must wear them during work.

- The machine operators have adequately been trained to ensure that they are well versed in the machines they are operating and should have an assistant.
- The machines will be serviced and maintained after every week to ensure no breakage or leakage is experienced.
- To avoid machines overheating, they will be used for a given period of time with breaks in between.
- The emergency services are on standby in case of an emergency.

I. Review

The risk assessment will act as a guide to ensure that safety in the construction site is given a priority. The rules and regulations should be adhered to by everyone working on the construction site. however, due to changes in practice and the introduction of new machines at the construction site, the adjustment of the rules will be made more often to make sure that risk and hazards can be eliminated and if not so reduced [5].

V. Accident Investigation

J. Responding

After the incident happened the immediate action taken was to help the worker get an immediate treatment since the injury was serious and demanded medical attention. His family and other workers were all enlightened on the incident. The work at the site stopped and the crime scene was set out of bounds for any individual for the purpose of security and investigation. The CCTV footage was taken to ensure that there is evidence that the incident happened at that particular place and to help in the investigative report. The Local Authority was informed of the incident to make sure that they are aware of the incident and to pave way for investigation into the matter in order to find the root cause of the accident.

K. Analyzing Causes

The causes of the accident were personnel, management, environment, task and material causes, as shown in figure (1). The investigation will use Heinrich's domino theory to explain the accidental root causes [6].

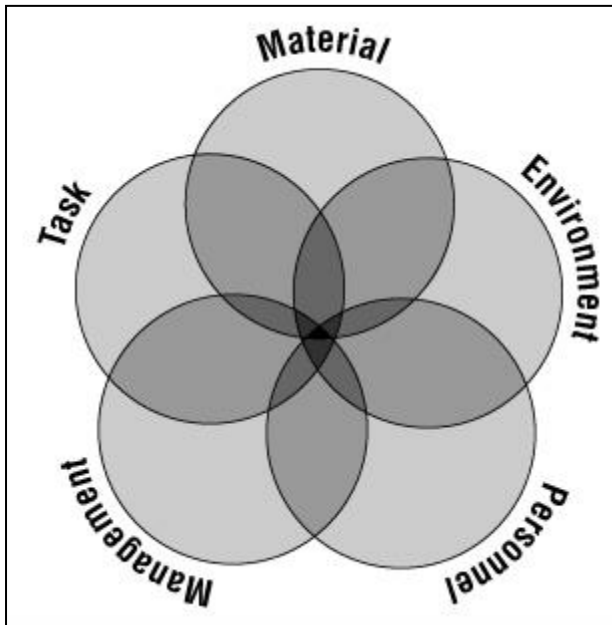


Fig. 1: Analyzing Causes

1) *Task*

The task was being carried out on a construction site which was not really safe because there were no indications to show that work was in progress. Secondly, none of the workers were wearing protective clothing. Third, the harsh weather conditions could have contributed to the accident due to fatigue and overheating.

2) *Material*

The crane was functioning well without any significant problem but because the machine was overused without giving interval breaks to allow for cooling and this caused the engine to overheat. However, the crane operator was not wearing protective equipment to protect him from the harsh conditions. The crane operator was also not keen to ensure that the crane was overloaded, maybe because he did not do his calculations well and this led to the collapse of the buckle and boom hence causing an accident.

3) *Work Environment*

The weather conditions at the working site during the operations when the accident happened, was extremely hot and this could have led to dehydration and fatigue of the operator. The noise caused by other machinery at the construction site could have led to obstruction, however, there was adequate light and the crane operator was able to see if the load was in excess.

4) *Personnel*

Despite the fact that the safe operation procedure was followed, the workers who were loading the crane were not

well experienced and so they had no idea of the amount of load that was to be loaded on the crane. The crane operator is experienced in operating crane but the crane he was using was of a different model, which was different with other models in terms of the amount of load it carries so he had no training on operating the new model. Due to the pressure at work to meet the deadline, the workers have been working day and night for just a few hours rest and this could have also contributed as a cause to the accident [7].

5) *Management*

It is possible to conclude that the safety rules at work were not well understood because of the communication channel used and lack of orientation to the rules and regulations and safety precautions that should be adhered to. There was no supervision at the site at the time the incident happened, the workers were left to work on their own, and if by any chance the supervisor was around he would have advised on the amount of load on the crane. The workers are not well trained in their areas of specialty hence they lack the knowledge required for the working environment. The management has never highlighted or developed any procedure or risk assessment to ensure safety in the working environment hence increased risk and hazards in the working environment.

L. Data and Facts

1) *Physical Evidence*

The incident happened during the day at 2 p.m in the afternoon. During the incident of the fatal accident, the deceased was standing close to the crane after helping in loading while the rest were a distance away from the crane. At that time no supervisor was around to ensure that the correct safety procedure was used. The buckle and boom of the crane collapsed when it was 6 meters high.

2) *Interview*

All those who witnessed the incident were called for questioning on the incident, despite some of them not willing to witness on the incident they, were promised privacy and no disclosure of identity. Each and every witness was treated with respect and no pressure was initiated during the process. The witnesses were called in at separate intervals for investigation and questioning. The crane operator was also investigated to answer, what happened and why. The conducted interview had both closed and opened emended questions to ensure that adequate information was collected.

M. Report of the Findings

1) Accidental Report Detail

At approximately 2.00 pm in the afternoon on 9th November, an employee of Mayer's construction limited was hit on the head by a loaded crane which collapsed. The employee was standing close to the machine when it was taking off and no one could notice him since he was not wearing any reflective cloth. The buckle and boom of the crane collapsed and hit him on the head since he was standing right below the crane while it was taking off. The other employees heard a loud scream and found him lying down in a pool of blood. Unfortunately, there was no first aid kit and the supervisor contacted emergency services. One of the workers reported that he heard the crane operator complaining of the technicalities he experienced with the new machine. The employee was rushed to Westgate hospital, and at 4.30 p.m. he was pronounced dead. The local authority reported the cause of death as crane overload, and this was influenced by lack of proper work procedures, safeguards and lack of personal protective equipment. The employer was accused of violating the code and conduct that governs the individuals and activities carried out at the construction sites.

N. Analysis and Recommendations

According to the investigation, there are various factors that contributed to the incident which happened. First, it was the duty of the supervisor to be at the site to make sure that all the activities carried out at the site are carried out appropriately to ensure that all activities are undertaken at the site follow the right procedure. The crane operator was also found not fit to operate the machinery because he lacked adequate knowledge on how to operate and handle the machine as it was a new model with different operating system. He was also fatigued due to lack of enough rest and dehydration from the harsh environmental condition and this could have triggered the causes of the fatal accident. However, all workers at the site are responsible to make sure that their working environment is safe from risks that can be avoided. The management has the full responsibility of making sure that all the workers are well trained in their various areas of expertise and that if any new machinery is introduced the machine operators must be prior trained to operate the machines. Before any operations are done in the site management should make sure that workers are physically, mentally and emotionally ready to undertake the task at the construction site [8]. This can be done by making sure that all the workers have enough rest before embarking on the activities and shifts can be good to ensure that the deadlines are met [9].

VI. Changes Made

- The supervisor is always on the site and making sure that proper work procedure is followed.
- Training has been done for all workers to enhance competency in their areas of expertise to ensure that work is done within the required standards.
- There is a weekly checkup for workers to confirm their physical, psychological fitness for the job.
- The posters put in place are also important since it provides cautions and warnings within the construction site.

VII. Conclusion

Risks that can be avoided should be avoided to reduce the number of accidents that happen in the working environment. Rules and regulations that are clear and well understood by the workers are important in eliminating or reducing hazards experienced within the working environment. With adequate training and strict policies put in place, it is possible to deal with the risks at the workplace. The management should take responsibility and consider it as a necessity to introduce adequate measures and policies that can govern all activities undertaken in construction sites. However, it is a collective responsibility of everyone to ensure that the environment is safe, secure and free from risks that could lead to injuries and unexpected demise or death. To ensure that the construction environment is safe, everyone should take charge of taking care of their workmates by reminding them of what is expected of them in order to achieve the goal together as a team.

VIII. DECLARATION

All authors disclosed no conflicts of interest.

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