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CRANE ACCIDENTS AT CONSTRUCTION SITE: CAUSES AND SOLUTION

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Abstract:

Cranes, the lifting and handling equipment are vital in construction industry because without these machineries, construction cannot be done on time because some materials need to be use these machines to lift the materials. There are many accident failures in the construction area therefore the aim of this research is to find out the factors of crane fatalities at construction sites. The objectives of this research are to identify the causes of crane fatalities in the construction area, to determine the impacts of crane accidents towards workers and contractors and also to recommend the effective ways to prevent the accidents at construction area. To achieve these objectives, the data of this research has been collected through quantitative method by distributing questionnaires to the contractors and analyzed by SPSS version 23. The results found that the factors which causes the crane fatalities are the lack of maintenance of crane, and the security wire condition of the cranes. The impacts of crane accidents contribution towards the highest risk of death and attitude of workers about ignorance of safety, it is compulsory for company to provide safety and health training are the effective ways to prevent the accidents.

Keywords: Crane; Causes of Accidents; Safety and Management

1.0 INTRODUCTION

A tower crane is a tall machine used for moving heavy objects by suspending them from a projecting arm. The increasing industrialization of construction emphasizes the centrality of crane as the main transportation equipment on site (Raviv et al., 2016). The most injuries and deaths from crane accidents can be attributed to several basic hazards. Zayed and Abbas (2013) stated the misuse makes crane's accidents one of the more severe and highly visible construction accidents. The mostly causes of death are falls and tip-over or collapse at construction area. Some of cases happen beyond the site boundaries and fallen onto public. (McCan, 2003) identified 399 deaths between 1992-1999: 42% from boom-supported lifts, 26% from suspended scaffolds, 19% from scissor lifts, 5% from crane platforms and 7% from unapproved lifts".

According to Oxford Dictionary (2015), accidents are defined as an unfortunate incident that happened unexpectedly and unintentionally. Main causes of cranes accidents happen are crane buckling or collapsing. All cranes have weight limits to ensure that crane will not tip over. The crane will be in danger if the maximum weight is exceeded. It will buckling or the boom may collapsed. Using a counterweight or out-rigging system can help to counterbalance of the cranes. Studies by Aneziris et al. (2008) revealed that the crane activities are responsible for 4% of the reported accidents. In addition, the statistic of accidents happening in Malaysia. Records of DOSH (2014) indicated there is a total of 187 construction sites in Malaysia during the period of 2011-2013.

Even though, there are other reasons that make the crane accident happen such as crane operator skills and experience, the lack of repetitive maintaining performance also possibility to crane's accident due to lack of maintenance of machineries. Fang et al. (2016) stated that operator errors happened because of human frailties for example distraction, exhausted, lack of experience or inadequate time to react to an unexpected event. Therefore, the study is aiming for this research is to find out the factors of crane

fatalities at construction site, determining the causes of crane fatalities in the construction area, the impact of crane accident towards construction worker and contractor and the effective ways to avoid the accident at construction area.

1.1 Problem Statement

The problems that is going to be focused in this paper is regarding to the accidents faced by the contractors in construction site. According to Edward et al. (2016) two people died on spot when the pile driver tipped over onto a busy road and crushing their car in Setia Alam. They found the ground at the site may have waterlogged or despite it is carrying the capacity that decreasing after the rain. The Department of Occupational, Safety and Health is doing some investigation on the accident, and they said the cranes should also be maintained and always tested before the workers especially operators use the machineries at construction site. Moreover, another cases of crane's accident happen to a woman at Bukit Bintang, Kuala Lumpur. The crane hook at construction site fell on her car and causes death. The Star (2016) reported that the witness identified a narrow miss when a steel pipe fell from a crane at a construction sites besides Wisma Bernama on his car as he was leaving the office compound.

Secondly, the problems that is going to be focused are the lack of maintaining causes to accidents. Accidents involving cranes at construction sites could possibly be due to contractors hiring local or foreign workers illegally (The Star, 2016). Besides that, the crane's operator did not have enough training or capability to handle the various machineries especially cranes. Therefore, there should have an adequate safety training for all construction workers and personnel on site to raise their awareness level about safety. Lastly, the problem is crane falling down and tipped over. According to Malay Mail Paper (2018) that the accident happen when a foreign construction site worker was killed while three others seriously injured after they were struck by falling crane component in Seksyen 7 Shah Alam.

2.0 LITERATURE REVIEW

2.1 Cranes

A tower crane is the largest machine that are used in construction sites. There are many types of crane which are the tower crane, mobile crane, crawler-mounted latticework boom crane, Commercial Truck-mounted crane with Hydraulic Boom, Hoist and others. Crane are involved in up to one-third of all construction and maintenance fatalities (Neitzel et al., 2001).

2.2 Causes Of Crane's Accident

According to Nagrale (2013) construction of High Rise Buildings it has been found that some delays such delays in material supply by tower crane at higher levels are impossible to redeem. It might disturbing the process of construction. There are various cases occur when the crane tip-over and falling down in construction area or may disturbing the public. Zrnac et al. (2011) identified the failures of the crane's structural parts unavoidably lead to serious damages or total collapses. The hazards which increase the risk of collapse event are numerous and can include poorly designed foundations, operating in high winds, and lack of maintenance, inexperienced crane operators and underrated crane capacity. Klinger (2014) state that those wind induced vibrations of profiles with specific cross section geometry which are motion induced and therefore self-exciting are called "galloping vibrations".

2.3 Safety Management

Improper employee training also may lead to crane accidents. Employers should makes sure the employee are having completed OSHA safety courses specifically related to crane operations. Kadiri et al. (2013) state that the failures on the part construction workers, errors in judgements, lack of concentration at work, lack of awareness on the danger surrounding the activities and safety requirements. DOSH (2005) explain that PPE as any equipment worn by a person at work to protect him against risk to safety and health. There are any additional accessory designed to protect him while performing task. According to

Ahmad (2008) that is important to provide PPE at construction sites. The reason is crucial to prevent accident happens at construction area and contractors need to take an action with PPE to the worker.

2.4 *Solution in safety management*

According to Ahmad (2008) things can prevent the workers from repeating their offences and they should be penalised. According to Zayed and Abbas (2013) the workers that oblige with the safety work procedures and always prioritize safety before starting their task should be awarded.

3.0 METHODOLOGY

There are two types' data to be collected which were primary data and secondary data in this study. The primary data was gathered from quantitative approach which is by distributing questionnaires. For the secondary data collection method contains review of the literature like journals, papers, manual and guidelines also from relevant websites. The questionnaire was distributed to respondent which is contractor who had experienced with the high rise project. This study focuses on the crane hazard that happen at construction site whether employee had serious injured, permanent disability and fatal. The type of crane in this study specific for tower crane at high rise project. The type of this research was random sampling. A total of 70 of questionnaires was distributed to the respondent. The sample was picked randomly from contractor that had been involved in high rise building and represent the contractor, project manager and site supervisor. The questionnaire was distribute to the respondent by hand and email. The data was analysis by using the Statistical Package for Social Science version 23 and presented in frequency and descriptive such as charts and histogram.

4.0 ANALYSIS AND FINDINGS

All the data will be collected and the analysis will be made to get the findings of the study, whether it will achieve the objective or not. Data gathered from the questionnaires will be analyzed by using Statistical Package for Social Sciences (SPSS) Software Version 23.0.

4.1 *Identify the causes of crane fatalities in the construction area.*

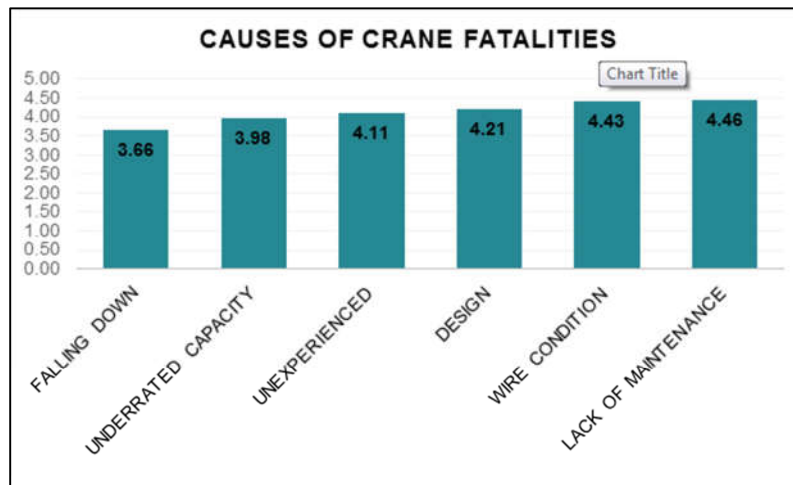


Figure 1: causes of crane fatalities in the construction area

Figure 1 shows that the highest ranking is 4.46 goes to the lack of maintenance with 62.5% of respondent strongly agree that the lack of maintenance can contribute the causes of crane fatalities. Secondly, the ranking of 4.43 comes from the security wire condition of crane with 51.8% of respondent strongly agree and share the same value with the poorly designed foundation crane which is 51.8% of respondent that strongly agree however the ranking is 4.21. Followed by the fourth ranking of 4.11 with 48.2% of

respondent strongly agree which is inexperienced crane operator, and the fifth ranking is 3.98 comes from the underrated capacity of crane which the 37.5% of respondent agree. Lastly, the ranking is 3.66 goes to crane falling down with 26.8% of respondent strongly agree. These factor are the biggest causes of crane accidents among the other factor therefore Zrnica et al. (2011) mentioned that the failures of crane's structural part necessarily lead to damages and contribute to accident.

4.2 Determine the impact of crane accidents towards workers and contractor.

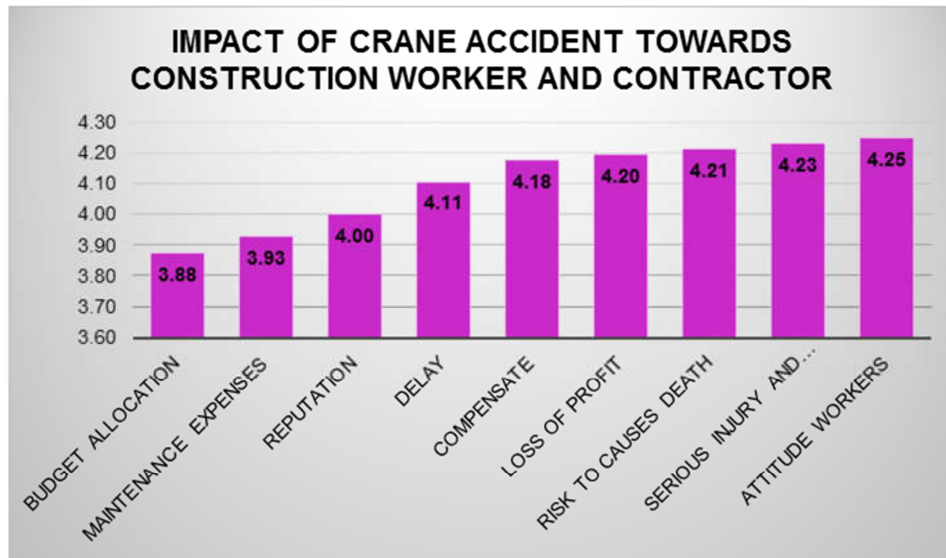


Figure 2: the impact of crane accident towards workers and contractor

Figure 2 shows the impact of crane accident towards workers and contractor goes to highest ranking 4.25 which is attitude of workers about ignorance of safety with 55.4% of respondent's strongly agree and 32.1% of respondent agree. Secondly, the ranking of 4.23 which is serious injury and permanent disability with 4.46% of respondent strongly agree and 42.9% of respondent agree. Next, the ranking of 4.21 comes from the risk to causes death with 60.7% strongly agree and 21.4% agree and the fourth ranking of 4.20 goes to loss of profit due to crane accident with 39.3 of respondent that strongly agree. Then, the ranking of 4.18 goes to compensate the unfortunate worker with 41.1% of respondent strongly agree. The ranking is 4.11 comes from the delay of progress of project with 46.6%. The ranking of 4.00 which is reputation of company was affected because of impact of crane accident with the 37.5% of respondent answered strongly agree and the ranking of maintenance expenses is 3.93 which 33.9% of respondent strongly agree that maintenance expenses effected if the crane accident happen due to repair the machineries (kadiri et.al, 2014). Lastly, the ranking of 3.88 goes to budget allocation due to injuries worker with 28.6% of respondent strongly agree. These effect of crane fatalities occur due to lead the biggest impact to the construction worker and contractors.

4.3 Recommend the effective ways to prevent the accident at construction area

Figure 3 shows that the highest ranking of 4.41 goes to provide safety and health training with 60.7% of respondent strongly agree share the same ranking with awareness with hazard goes to 66.1% of respondent strongly agree that there are main point the workers need to take action. The third ranking is 4.32 comes from professional services with 51.8% of respondent strongly agree and 39.3% of the respondent agree. Then, the ranking of 4.29 comes from inadequate of knowledge is handling crane because according to hughe and mussnug (1997) mentioned that there are few employees have ignorance, skills and competencies and failed to accomplish task on time. The ranking of 4.25 comes from insufficient safety regulation with 50% of respondent strongly agree and the ranking of 4.21 goes to the

worker need to follow the rules of safety to prevent the hazard with 51.8% of respondent strongly agree. Lastly, the other respondent also agree the training of safety and health become a compulsory to all contractor's companies therefore training programs is important to improve productivity and quality. Moreover training can help the workers to boost their self-confidence and increase the performance at work (Sadaf et.al, 2014).

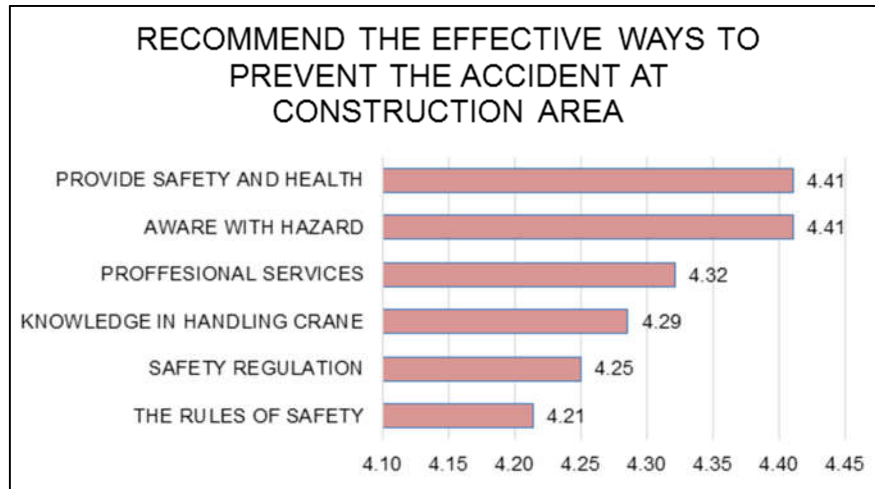


Figure 3: Recommend the effective ways to prevent the accident at construction area

5.0 CONCLUSION

In conclusion, the result of causes of crane fatalities are identified as the biggest factor of the crane fatalities such as lack of maintenance of crane, security of condition of wire ropes and poorly designed of crane foundation. The inspection of crane's structural, crane designed must be able to avoid the crane fatalities. Then, the impact of cranes accident occur therefore the attitude workers about ignorance of safety precaution, contribute to highest risk of causes of death, and also serious injuries and permanent disability. Lastly, the employer need to ensure to run the safety and health training and safety practices to the workers even though the workers must to aware with dangerous at construction site. In addition, the employer shall to deliver the professional services to motivate the employee about safety precaution.

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