ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.6

Hazard Identification of Cranes and their Control Measures

S.Shanmuga Raja[1], J.Gunasekaran[2]
ME Student (Industrial Safety Engineering)[1], Assistant Professor[2]
Department of Mechanical Engineering
Cauvery College of Engineering and Technology, Trichy, India

Abstract:
Cranes are a central components in engineering industries and are associated with large number of hazards with its operations in shop floors and also there are different types of lifting machinery available depending upon design, technology and nature of work, so it is also make difficulties to operates such type of lifting machinery in shop floors There are different types of lifting machinery available in industries in one shop like overhead cranes, semi gantry cranes, forklifts, pick and carry cranes (hydra) which is erected by different manufacturer increases risk associated with it, depending upon the design and technology which make changes in safety devices, motions, braking systems, remote controls, in lifting machinery day to day which became danger to operate by same operator's As the operators were shifted from one crane to another, there was a high chance of making mistakes during moving the controls, which might have resulted in severe accidents, due to lack of training, experience and education of operator's especially during periods of high workload. This project reviews the hazards associated with lifting machinery in their operations in heavy engineering industry in which 64 different types of lifting machinery available, capacities ranging from 200 kg to 450 ton with the help of safety inspection and questionnaire study, and also their low cost solutions have been recommended which may not became unnecessary burden on the top management of maintenance costs with rarely available spare parts. All these had a toll on the factory's economy and growth.

Key Words: Crane safety, Safety inspection, Lifting machinery, Hazard identification

1. INTRODUCTION

The lifting machineries are the most widely used for lift, shift and placement of large and heavy loads in work shop in engineering industries by which raising, lowering and movement of heavy loads from one place to another place is performed at many times in the whole working day by operator's. to perform such types of operations in shop floor electric overhead travelling cranes, semi gantry cranes, forklifts and pick and carry cranes are used depending upon the nature of operations to be performed. EOT and semi gantry cranes includes main three motion LT longitudinal travelling, CT cross travelling and UP-DOWN hoist motion but they can transfer heavy loads only the exiting rail track which is depending upon the floor area other than it forklifts and pick and carry cranes are used to shift loads from one shop floor to another because they can travel on rubber tire. each and every working day some common types of unsafe act is occurs, because there are different types of cranes are available in one shop floor each floor contains 5 to 6 lifting machinery at different locations and only one or two operator's are available to operates all these machinery so it creates high chance of making mistakes during moving the controls, which might have resulted in severe accidents, due to lack of training, experience and education of operator's and also the machinery operates with the help of remote control or pendent, each machinery has different types of control buttons at different locations whenever operator's is shifted from one to another they face difficulties to operates the machinery. Thus it becomes more dangerous situation. This risk is not limited only to those directly involved in lifting operations, as evidence by several recent crane accidents in which pedestrians were killed. Lifting machinery has some common hazards in each and every working day but the action required to minimize them is neglected by the management to achieved production on time it is resulting in injuries or fatality. To keep pace with rapid industrialization several design modifications in lifting machinery have been made, but most attention has been given to the capacity of handling more loads of deferent shapes and sizes. The crane designs give very little importance on the ergonomics of operation of these cranes. Each and every lifting machinery have their own advantages and also some hazards associated with them in order to eliminate the hazards associated with them hazard identification is carried out in a engineering industry but there are many techniques are available to identify the hazards in lifting machinery the use of safety inspection and questionnaire study is recommended.

2. PROBLEM IDENTIFICATION

By using checklist of lifting machinery and A multiple choice-type questionnaire was constructed, to find out hazards lifting machinery.

1. Lake of knowledge and training of operator's regarding particular machinery which they operators.
2. Different types of cranes from different manufactures are installed in factory have their design differ from each other that creates the difficulty to operate the machinery to operators.
3. Cranes have their different types of remote some manufactures provide long travel (LT) at the top and Cross travel (CT) at middle and UP AND DOWN motion at bottom, in some cranes are pendent operated and some is remote operated. This complicated and differ design of pendent/ remote creates disturbance to operators.
4. Lake of direction marking on cranes and their pendent operators don't knows how to operates a single direction LT, CT or up and Down have to use all push one by one buttons to check the right button by which he wants to move the crane

there is a hazard armed, when crane carries load major accident may occurs.
5. Fork lift and Mobiles cranes are lifting the load under the load chart which shows the actual SWL at different configurations which display in SLI safe load indicator, but in hydra and fork lift SLI is nit provided by some manufactures.
6. In each motion of crane having safety limit switches to stop the motion under the limit, Anti two blocking, CT, LT, Anti-collision, Hooters, Warning Lights etc which are electrical devices. ANSI recommends that the use of this device should be considered a damage prevention measure only. These devices are not failing safe secondary devices to be designed and installed.
7. The National Safety Council has attributed 90% of mobile crane accidents to "operator error" There is no universally accepted certification or licensing of crane operators. There is no daily checklist record or inspection procedure to inspect all check points of cranes before use. Heavy loads were carried by cranes in very busy workshops, where most workers did not use safety helmets, nor were there effective warning bells to alert workers to the movement of the crane. Moreover, due to the un ergonomic design of the crane cabins, the crane operators had very poor visibility of the loads, the lifting device and the shop floor. As a result, any mistake during maneuvering the controls could lead to severe accidents.
8. Another problem was arrived in plant 64 different types (installed by 6 different manufactures) of lifting machinery available, as compare to it only 12 operator's are available to operates the crane so that over workload is given to operator's to achieve production they face difficulties to operates different pendent
9. Use of reversing motion to stop the cranes. While brake is loose is may became one of the hazardous condition when two or three cranes operates in same track.

3. CAUSES OF CRANE ACCIDENTS

Each year, workers in New York are injured or killed in crane related accidents. Recently, there seem to be more crane accidents than ever before. It is important to know the main causes of crane related accidents so that workers are better informed about important safety precautions. A little knowledge may prevent a lot of accidents.

3.1 CAUSES OF CRANE ACCIDENTS

3.1.1 Crane buckling or collapsing

All cranes have weight limits to ensure that the crane will not tip over. To counterbalance the weight, cranes use counterweight and out-rigging systems. If the maximum weight is exceeded the crane will be in danger of either buckling or the boom may collapse.

3.1.2. Improper Crane Assembly

One of the biggest reasons that a boom collapses is improper assembly. Specifically if the crane does not have the proper blocking (wood or metal supports) to stabilize the load, the unbalanced load will move and may lead to the crane collapsing.

3.1.3. Improper employee training

Operators who do not have the proper training in crane operation and safety procedures may lead to crane accidents. Employers should make sure employees are trained and have completed OSHA safety courses specifically related to crane operations. In addition, employers should take extra safety precautions to warn workers and maintain a safe distance from the crane operation and other work being performed on the jobsite.

3.1.4 Mechanical Failures

Routine crane maintenance should be followed to prevent accidents due to mechanical failure. Crane components should be oiled on a regular basis and components with excessive wear should be repaired and replaced right away.

3.1.5 Contact with overhead power lines

Electrocution from contact with overhead power lines is a leading cause of crane related accidents. Both the crane operator and workers in the crane basket should be aware of the placement of power lines surrounding the worksite. Before work commences the current to active power lines should be shut off to prevent electrocution from accidental contact with live wires.

3.1.6 Flawed or Infrequent Inspections

Timely, consistent inspections by experienced and well-trained inspectors can wholly prevent tragic accidents. Employers with a mandate to get the job done are often disinterested in a thorough, time-consuming inspection. They'd much prefer someone come in and spend five useless minutes, approving the crane and allowing the work to continue. This kind of lax approach to safety costs lives. Inspectors must be vigilant in making sure any crane they clear to work is truly safe. If they do, the number of tragic crane accidents will be reduced dramatically.

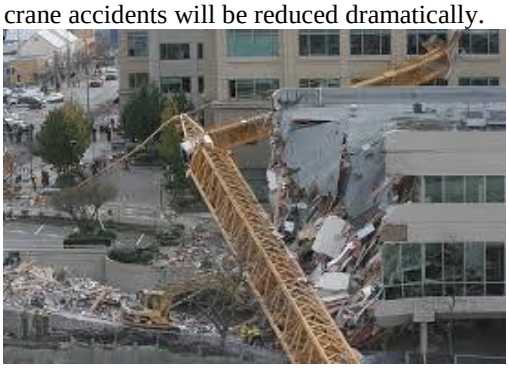

Figure 3.1 crane accidents

3.2 CRANE TYPES

3.2.1 Tower cranes

Tower cranes are familiar sights on high rise construction projects and in seaports, rising as much as 300 feet into the sky. They consist of a mast and a large rotating and lifting arm. They are designed to lift very heavy loads of steel, concrete, other construction equipment as well as freight containers in seaport operations. Unlike their mobile counterparts, they are assembled on site for long term or permanent use. They perform their task with the use of a rotating arm, or jib, and a trolley and hook block that runs back and forth. The motion of the tower crane is controlled by an operator located in a cab at the conjuncture of the tower and jib. Over 1000 fatalities have occurred from tower crane related accidents since 2000, worldwide.

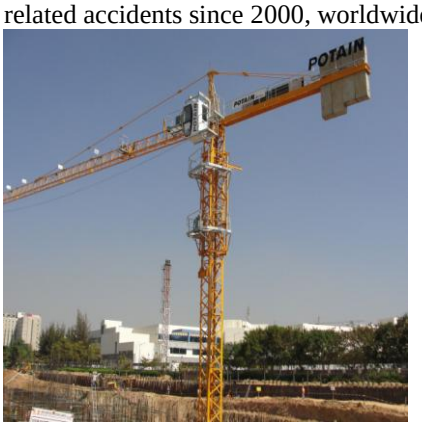

Figure 3.2 Tower crane accidents

3.2.2 Crawler cranes

These are tall cranes with folded lattice arms that are hauled by truck to the site. Once assembled and operating they seem to defy gravity. Although the possibility of one crashing to the ground causing extensive damage and injury does exist most injuries are caused by workers on the ground being stuck by an improperly handled load.

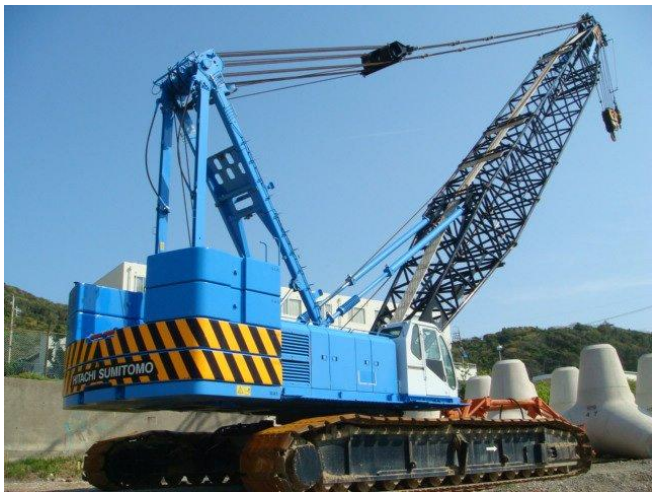

Figure 3.3 Crawler crane accidents

3.2.3 Hydraulic mobile cranes

These cranes travel independently on either tires or treads and are often referred to as all terrain cranes. They have telescoping arms and generally extend to only a couple of stories. These small cranes are responsible for more injuries than their larger counterparts as they are used more frequently and are often in close proximity to workers. Other types of cranes include sky cranes which are helicopters used to lift and transport heavy loads over long distances. Floating cranes are used on barges for bridge, dam and port construction. Side lifting cranes are designed for loading rail cars or trucks with parallel hoists.

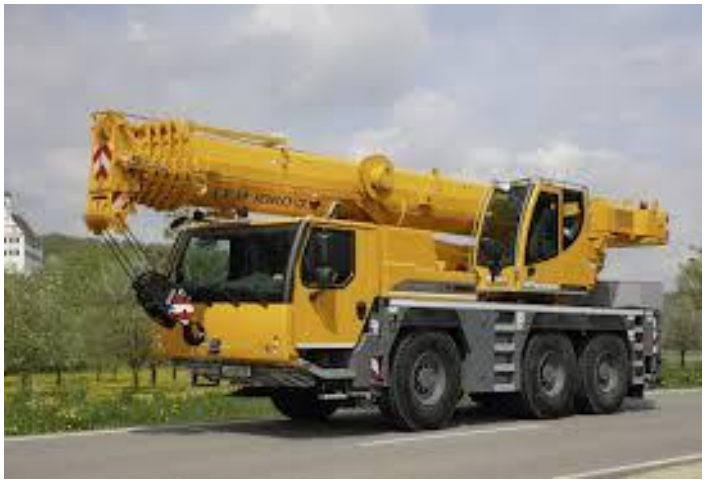

Figure 3.4 Hydraulic crane accidents

Cranes accidents commonly occur due to the following causes:

- Exceeding the cranes manufactures specifications or operating outside of its intended use.
- Hazardous weather conditions
- Improper assembly or setup
- Falling or dropped materials
- Operator error
- Lack of safety training

A large percentage of crane accidents are preventable through the implementation of proper safety procedures and adequate training of crane operators and workers who are in proximity of the cranes operation. Human error is responsible for 90% of crane accidents. As much as 80% is due to operation beyond the cranes capacity.

4. HAZARDS AND PREVENTIVE MEASURES

4.1 CRANE ACCIDENTS ANALYSIS AND PREVENTIVE MEASURES

In the mechanical world, cranes are frequently to be seen in construction areas, in mining, logging, steel factory, plastic plant, warehouse and other applications for material handling. There is no exaggerating that industry cranes are the workhorses which have increased productivity and economic growth in their own ways. However, behind the splendid contribution made by various cranes, there are sacrifices caused by crane accidents. In order to avoid crane accidents from happening, the probable causes are analyzed and preventive measures are recommended for your reference. There are multiple hazards that can arise regarding cranes in general. Many accidents involve large lift systems like tower cranes and mobile cranes. But hazards do exist with all types of cranes—including overhead cranes—and in all facets of crane operation. (Overhead cranes are defined by OSHA 1910.179(a) (8) as a crane with a movable bridge carrying a movable or fixed hoisting mechanism, and traveling on an overhead fixed runway structure.) Analysis of overhead crane accidents reveals three common safety hazards that every company using overhead lift systems should be aware of to keep their workers safe. It's important to be familiar with these hazards and learn to recognize them in the workplace in order to avoid them. The three most common hazards involving overhead cranes include electrical hazards, overloading, and materials falling/slipping from overhead hoists. The following analysis of each hazard provides a description, potential risks, reasons why accidents occur, preventative measures to avoid them, and applicable OSHA requirements. One commonality that all three hazards share is the qualifications of crane operators. It is the responsibility of the crane owner and job supervisor to ensure that crane operators are competent and qualified to do the job.

4.2 THREE MAJOR HAZARDS AND PREVENTIVE MEASURES

Three major hazards for crane accidents and preventive measure

1. Electrical hazards
2. Overloading
3. Materials falling

4.2.1 Electrical hazards

According to OSHA, nearly 50 percent of overhead crane accidents are the result of machinery coming into contact with a power source during operation. Power line contact is literally defined as the inadvertent contact of any metal part of a crane with a high-voltage power line. Power line contact most often occurs when the crane is moving materials nearby or under energized power lines and the hoist line or boom touches one of them. Usually, the person who is electrocuted is touching the crane when it comes into contact with the power line. But, the danger is not just limited to the operator. It extends to all personnel in the vicinity.

A single contact with power lines can result in multiple deaths and injuries. Each year nearly 200 people die from power line contact and about three times as many are seriously injured. Most victims are guiding the load at the time of contact, but risks extend to everyone present at a job site.

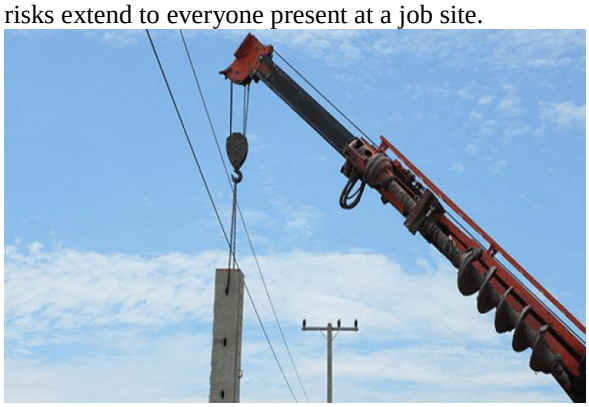

Figure 4.1 Electrical Hazards in Crane Accidents

Power line contacts most often occur because safety planning isn't considered and preventative measures haven't been taken to avoid hazards. Planning is one of the biggest accident deterrents available. To start, it's important to establish who is in charge of prejob safety planning before any cranes arrive at a worksite. Furthermore, cranes should be kept away from unsafe working areas; OSHA and ANSI both outline safe distances operators must maintain from a power source when working at a job site. Areas that are considered hazardous are referred to as danger zones, and crane operators should be clearly notified of all potential danger zones. The area within a 10-foot radius of a power line is considered an unsafe work area or danger zone and it must be clearly marked on the ground by insulated barriers, fences, tape, etc. This will help create visual clues for workers to ensure that the crane is always positioned so that the boom and hoist line can't intrude in the danger zone.

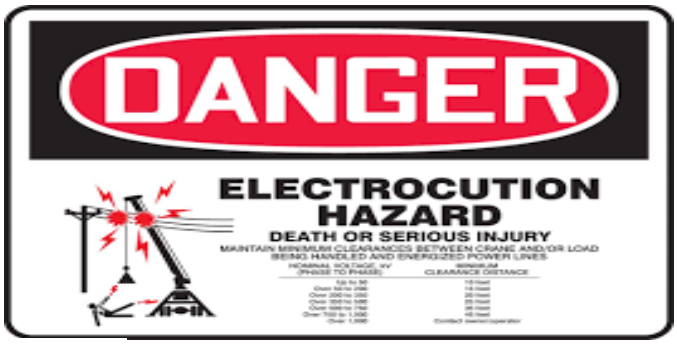

Figure 4.2 Electrical Hazards symbol

OSHA also regulates that overhead crane operators use precautions when work ing near power lines even outside of the 10-foot radius. This means, operators should consider all power lines as energized until the electric company tells him or her otherwise. Operators should also maintain a safe speed when operating near power lines. Crane booms or truck-mounted trolleys using an electrical remote control system for loading and unloading can also be very dangerous. If the boom contacts a power line, the operator holding the control box is usually electrocuted instantly. This type of equipment should never be used near power lines. A non-conductive, pneumatic or radio remote control system is a much safer choice when working near power lines.Overall, it's important for operators and workers to receive the appropriate training to avoid danger zones where electrocution can occur. Operators should have workers observing nearby to assist them whenever it is difficult to visually maintain the necessary clearance. Be sure that any ladders, tools, and systems are non-conductive, and ask the electric company to de-energize and ground power lines or install insulation whenever people are working near them.

4.2.2 Overloading

According to OSHA, 80 percent of all crane upsets and structural failures can be attributed to exceeding the crane's operational capacity. When a crane is overloaded, it is subject to structural stresses that may cause irreversible damage. Swinging or sudden dropping of the load, using defective components, hoisting a load beyond capacity, dragging a load and side-loading a boom can all cause overloading.

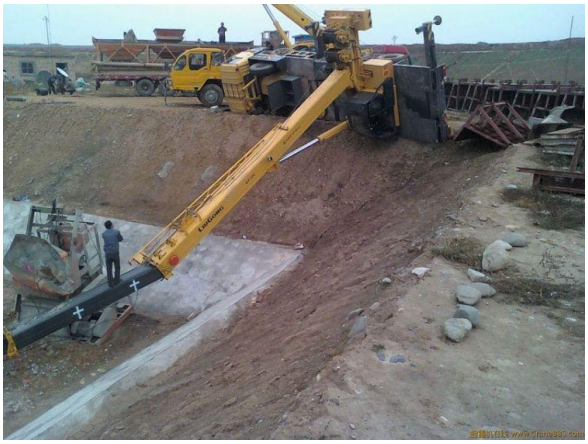

Figure 4.3 overloading in crane accident

OSHA estimates that one crane upset occurs for every 10,000 hours of crane use. Nearly 80 percent of these upsets can be attributed to predictable human error when the operator inadvertently exceeds the crane's lifting capacity. Overloading most often occurs when poorly trained personnel are allowed to operate cranes. Oftentimes, operators mistakenly believe they are able to rely on their instinct or experience to determine whether a load is too heavy. It's crucial that any crane operator know the weight of a load and the capacity of the crane. Using technologies such as load-measuring systems for training and planning can greatly reduce the hazard of overloading and operator incompetency.

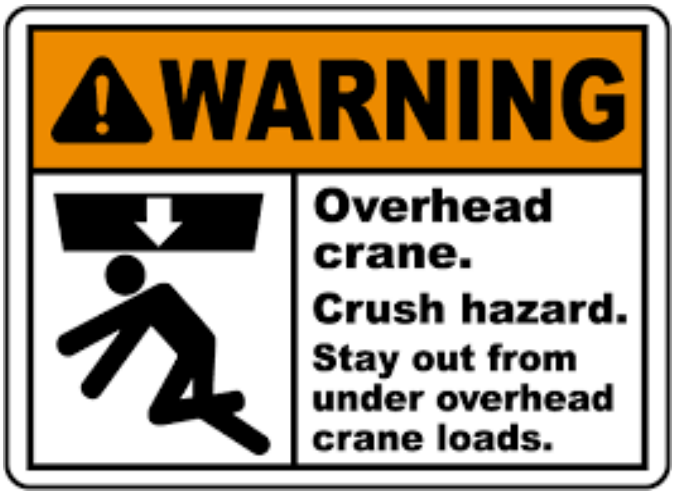

Figure 4.4 overloading in crane accident symbol

OSHA requires workers to provide formal training for all crane operators, but operator certification is only required for operators using equipment with a maximum manufacturer-rated capacity of 2,000 pounds or less. Employees who are not qualified are only permitted to operate equipment as operators-

in-training with a certified trainer. Formal training should ensure a working knowledge of crane load charts, and on-the-job training is a great preventative measure if the trainer is qualified. Overall, most crane safety programs outline competent personnel requirements, and it's a good idea to become familiar with them. Cranes have become more sophisticated, with the ability to lift heavier loads further and faster than ever before. Today's operator must be well trained and have a clear understanding of load dynamics, lifting capacities at various configurations, and the conditions under which such lifting capacities are valid.

4.2.3 Material Falling

Falling materials is a major concern at any work place or job site using overhead cranes. Visual impairment, two-blocking, slipping, mechanical failure, or operator incompetency can all result in serious injuries or fatalities. If materials are not properly secured, for instance, the load can slip and land on workers in the vicinity or cause major damage to property. For larger or mobile cranes, undesired movement of material can pinch or crush workers involved in the rigging process. Statistics show that nearly 20 people died in 2012 as a result of accidents with overhead hoists. That's because the loads being lifted by overhead hoists tend to be fairly heavy and cause serious damage if dropped. Slings and attachments that aren't secured properly can be a major safety hazard, and when objects begin to slip, they will eventually crash to the floor below. One way to reduce the risk of falling materials is to perform regular maintenance of hoists. Load testing maintenance ensures that you know how many pounds the hoist can handle, and it helps to maintain good working condition. Maintenance should always be treated seriously when it comes to heavy machinery. If a moving part on an overhead crane wears out or breaks the hoist, it can cause serious damage. Performing regular maintenance ensures the hoist and overhead crane remain in good working order and that all operations run smoothly.

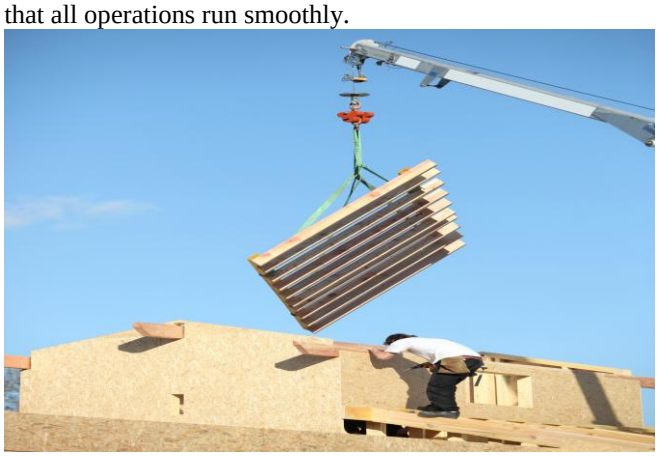

Figure 4.5 Material Falling

Aside from maintenance, improper securing of the load or the slings that carry the load is one of the leading causes of accidents with overhead hoists and cranes. If the load or sling holding the load isn't properly secured, the objects can slip out, tip, and eventually crash to the ground below. Mechanical failure can also cause machinery to malfunction unexpectedly and drop a heavy load. To reduce the risk, OSHA mandates that operators make daily crane inspections. When mechanical problems do arise, operators should use the lockout/tagout procedure to prevent accidental startup or movement of the crane until the problem has been repaired. Employees working around overhead cranes should always wear proper head, foot, hand, and eye protection. The crane operator and any workers below should also be aware of his/her surroundings and never walk under a lift. A crane operator must always lower a load to the ground before leaving the lift or during idle times. When moving items, he or she should never raise the load higher than required for clearance. When operating a hoist, properly trained employees in the vicinity should understand that they are working in a dangerous area. Installing "Hoist Danger" signs around the work area will help to alert employees that a hoist is operating over their heads. Workers should be trained to stay clear of the hoist, and they should never walk beneath loads suspended in the air. Likewise, suspended loads should never be moved over employees and personnel should never be lifted or transported on a hoist. Careful operation of the hoist is another important safety factor to consider whenever overhead cranes are used. The person responsible for managing the hoist should be well trained and qualified. Moving the crane too quickly and jerking the hoist when it's bearing a heavy load can be hazardous to the crane operator and workers nearby. Changing or reversing direction should be done slowly and carefully. Reversing direction can cause heavy loads to spill, and swinging the load is very risky. Operators and controllers must maintain 100 percent focus on the task at hand to avoid potentially dangerous situations.

4.3 PREVENTIVE MEASURES

Human error is the most common cause of crane accidents. This extends to both crane operators and those workers responsible for maintenance and safety procedures. Accidents often occur when crane maintenance and operating procedures don't keep up with the increasing risks and demands placed on the crane. Many accidents result from a breakdown in communication between the project manager, site supervisor, the operator and the workers on the ground. Accidents also occur when workers fail to follow safe work practices and procedures. While a crane may appear to be a simple device, its operation involves complex physics. You don't need to be an engineer to operate cranes safely, but everyone involved with their operation should be aware of and follow some basic steps for safe operation. Here are the steps I recommend

1. Complete an Inspection. Verifying that the crane has received its annual inspection is only the first required step. It's critical to check the operating functions daily to ensureall components are working properly. Experienced and inexperienced operators are often surprised to discover they may have inadvertently pushed the crane beyond its limits and damaged key components of the crane that could lead to failure.
2. Always complete a Field Level Hazard Assessment. A Field Level Hazard Assessment is the process where you: Identify site & job specific hazards, Evaluate the risk associated with the hazards identified, and Eliminate or control the hazards prior to and during the work task.
3. Complete a plan. Each lift is different from another, and it's important to review all hazards, the load weight capacities, integrity of the equipment, the possible effect of wind, and other factors. The operator, riggers, and other workers involved with the lift must be part of that planning process.
4. Follow the Plan. Far too often accidents occur when the agreed upon plan is not followed or enforced.
5. Know your Ground Conditions. The most powerful, carefully rigged crane is only as strong and stable as the surface upon which it stands. You need to know the classification for the soil or other material under the crane, and adjust your setup and load limits accordingly. While many

cranes are equipped with outriggers, extending them doesn't necessarily mean that you've provided a stable surface. It's important to know the load weight and how that is affected by the conditions of your jobsite. The crane's load chart can help you determine whether your lift will be safe.

6. Know your Radius. The counterweight and boom travel within a specific arc is called the swing radius. It's important to ensure that the area within that radius is barricaded off. It is critically important to establish a control zone for those authorized to work in the immediate area. Constantly check the area throughout the day to ensure that there are no objects the boom might strike. If obstacles are introduced, be sure that the operator and other workers are aware of the obstacle and the plan for avoiding it.

7. Use your crane properly. Cranes are engineered for vertical lifting. That doesn't stop some crews from trying to use them for side loading or other improper activities. Using a crane to drag something across the ground or from under an obstacle puts extreme stress on the boom, the turntable, and all the structural members. It could potentially weaken key components and lead to their failure.

8. Communication. Whether you use radios, air horns, hand signals, or some other method, there needs to be clear communication between the operator and the other workers. That's especially critical when a crane is making a lift in which the operator cannot see the load. Don't assume that everyone knows how instructions will be communicated. Make sure everyone understands the system and follows it. (See Communicate the Plan)

9. Stay Focused. Everyone associated with a crane needs to stay alert and focused on the job at hand – especially on critical or difficult lifts. The lack of focus is a common cause of work related accidents, incidents and serious near-miss events.

5. DATA ANALYSIS

5.1 DATA ANALYSIS

In this project, the method been used to collect the data are questionnaire survey, interview with expert panels and case studies.

5.2 QUESTIONNAIRE SURVEY

A total of 30 sets of questionnaire was then distributed to the contractors and engineers at the selected site, 30 responses were received within the desired period which is equal to 100% of the total rate of responses. The data obtained can provide effective information to achieve the objectives of this study.

5.2.1 To evaluate the hazard level associates with crane usage in construction

These surveys have identified several numbers of personal information in order to help interpret the results. Figure shows the gender and range of age target respondents. This survey only select professional members at site construction with different or variety of their job sectors as shown in Figure. This question also include respondents' experience in managing site and crane in construction with type of involvement with crane and type of crane involved as in Figure.

5.2.2 To Investigate Main Cause of Crane Accident

This section consist of three parts, which are factor that leads to crane failure, human error that lead to crane failure and mechanical failure that lead to crane failure. This question is further divided into two parts which are for mobile cranes and for tower cranes. All respondents have to answer all questions for mobile and tower crane parts.

5.2.3 To Propose Recommendation to Minimize Crane Failure in Construction

This section consist of four parts, which are impact of crane failure and accident to construction, recommendations based on human error to minimize crane failure and accident in construction, recommendations based on mechanical failure to minimize crane failure and accident in construction and open ended question on the respondents' opinion based on the recommendations to minimize crane failure and in construction. This question is further divided into two parts which are for mobile cranes and for tower cranes. All respondents have to answer all questions for mobile and tower crane parts.

6. RECOMMENDATIONS

On the basis of the results and discussions, a number of very low-cost, easily implementable, Ergonomics solutions of the existing problems were recommended to the factory management for implementation to improve the working conditions, work methods, efficiency, productivity, occupational safety and health of the crane operators. Hazards identification of lifting machinery have been performed with the help of questionnaire study and checklist inspection and control measure on the basis of these two methodology have been given. Hazard cannot be completely eliminated until we are not able to take continuously review the work environment and work practices to control or prevent workplace hazards. Some efficient ways to prevent and control hazards are

1. Regularly and thoroughly maintain of electrical, mechanical equipments.
2. Ensure that hazard correction procedures are in place and thoroughly inspections are performed periodically.
3. Ensure that everyone knows how to use and maintain personal protective equipment, lifting gears, and emergency related equipments.
4. Make sure that everyone understands and follows safe work procedures
5. Ensure that, when needed, there is a medical program tailored to your organization to help prevent workplace hazards and exposures
6. Workers should be educated, and training should be provided time to time regarding the particular work and if there is any modification take place.
7. In future when new lifting machinery are installed in industry lever should be ergonomically designed and effectiveness of safety devices to be improved.
8. One more consideration also taken in to account that is the length of the pendent wire should be appropriate level of height of the operator which helps to improve the ergonomically conditions.
9. Periodically inspection as well as the load testing must be carried out of lifting machinery to check the stability and physical conditions of lifting machinery.
10. Changing of operator from one crane to another should be avoided as much as possible.
11. Proper direction marking to be maintained by permanent marking or painting on pendent or remote once in a week by which difficulty is reduced.
12. Daily checklist to be filled by operator's which helps to other shift operator's to assist the crane problem if any. Preventive maintenance to be carried out once in 15 days

interval in which limit switches and brakes are must be operationally checked.
13. The position of the wire of pendent also adjusts it usually front at the chest of the operator's.
14. Other means of safety devices which are not electrical are recommended likes buffer and stoppers at the end of the Cross Travel and Long Travel motion and wheel guards for anti two blocking marking to be done by some means by which the last position of hoist is marked so that the operator's knows about the limitations.
15. Load testing must be carried out once in a year of crane, welded joints of crane structure must be checked by NDT methods.
16. Change the position of operator's from one crane to another must be avoided, simplify control buttons of remotes related to another by which the machinery is easily operate To overcome this, it was recommended that the crane operators should be placed into Three different groups (A, B, C) must always be operated by the associated group of operators and they must not be interchanged.

7. CONCLUSION

The questionnaire study is the best way to take the response of personals in any organization regarding any type of condition by which it is easy to assess the present influence of the particular program. It is the only way to eliminate the accidents is Identify the Hazards to assess the associated controls with the cranes and to bring the hazard to tolerable level. Lifting activity because of the very nature of the operation, complexity of the systems, procedures and methods always involves some amount of hazards. Hazard identification is carried out with the help of checklist methodology it is the point to point throughout survey of particular task which is design first and then performed easily by any non experienced person of the for identification of undesirable events that can leads to a hazard, the analysis of hazard mechanism by which this undesirable event could occur and usually the estimation of extent, magnitude and likelihood of harmful effects. It is widely accepted within industry in general that the various techniques of Hazard Identification contribute greatly toward improvements in the safety of complex operations and cranes.

8. REFERENCE

[1].Hyun Wook YEO, Jeong Sam HAN and Hyun Dong YOO "The Mobile Crane-Related Industrial Accident Caused by the Failures of Bolts" Volume 12, Number 20 (2017) pp. 9327-9332

[2].Vinay Dubey Rajiv Premi "Hazard Identification of cranes and their control measures" (2016) Volume 4, Issue 1 | ISSN: 2321-9939.

[3]. Mohammad Kamarul Arifin Mohamad Ali, Mohamad Ibrahim Mohamad "Crane Failure and Accident in Construction" (2016) Volume 12, pp. 63-12.

[4].Chung-Suk Cho, Francis Boafo, Young-Ji Byon and Hyunjoo Kim "Impact analysis of the new OSHA cranes and derricks regulations on craneoperation safety" (2017), Volume 21, Issue 1, pp 54–66

[5].Heap Yih Chong and Thuan Siang Low "Accidents in Malaysian Construction Industry" (2015) Vol. 20, No. 3, 503–513

[6]. Ehsan Gharaie, Helen Lingard and Tracy Cooke "Causes of Fatal Accidents Involving Cranes in the Australian Construction Industry" (2015) vol.15 (2), pp 1-12.

[7].T. Muralitharan and T. Elangovan "Safety and Analysis in Material Handling of Construction Industry" (2015) vol 23 (3): 523-528

[8].Selvam A, Krithika Priyadarshini "Safety Management and Hazards Control Measures in Construction" (2014) PP 97-101

[9]. Kadiri Z.O; Nden T; Avre G.K; Oladipo T.O; Edom A: Samuel P.O; Ananso G.N "Causes and Effects of Accidents on Construction Sites" (2014) Volume 11, Issue 5, PP 66-72

[10].Tarek Zayed¤, Najwa Abbas "Crane Safety in Construction Sites" (2013) Vol 2, No 2, pp 88-97

[11].M. H. Arslan* and M. Y. Kaltakci "Analysis of a Tower Crane Accident" (2013) volume 2, Issue 4, pp 287-293

[12].Seung-Kyum Choi "Failure analysis of connecting bolts in collapsed tower crane" (2012) volume 36, Issue 3, Pages 228–241