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Ergonomics Methods to Improve Safety in Construction Industry

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Abstract - *Construction industry is one of the highly risky industries with more number of accident and injuries. Many construction companies have difficulty in providing a safe working environment for their employees. Musculoskeletal disorders are one of the major injury that occur on the construction site. This type of injury can affect the health of the people. So, there is a need to provide a safe working environment to the employees on the worksite. The purpose of this research is to identify the ergonomics risk factors on the construction site. This was done by site visit and asking questionnaire from the employees of the construction industry. Mainly four types of the injuries are found i.e. Lacerations, Lumbar Spine, Upper Extremities and Eye Injury due to the risk factors like awkward posture, repetition, vibration, static posture, force, contact stress and extreme temperature. This research also focus on the the control measures to minimize and eliminate the risk factors on the construction sites to improve safety by applying ergonomics methods.*

Key Words: Ergonomics, Construction, ERF, Safety, WMSD.

1.INTRODUCTION

This thesis researched about construction injuries provided the areas of focus. The four most occurring injuries were used in order to improve the safety associated with these injuries.The best example alternatives for lacerations, lumbar spine, eye, and upper extremity injuries were chosen in order to help employees have a safer work environment.

2. LACERATIONS

Lacerations are cuts or deep tears in the skin. In the construction sector lacerations occur mostly on fingers and hands. This can become an enormous problem on the site slowing down workers and creating a messy situation. Lacerations are the most frequent injuries that occur in construction. Although these injuries may seem minor, but it causes skin diseases. Without the proper safely equipment employees can become badly injured.

Lacerations is one of the most frequently accident at the workplace and although it may seem like a simple fix, it is essential to purchase the right equipment to provide safety. The two alternatives chosen were gloves and cutters. Two types of the most appropriate gloves were found for the worksite. The 360-coverage and palm and finger gloves were the best alternatives. These two gloves both have level 5 cut resistance in order to prevent cuts and deep tears from occurring. The difference between the two gloves is that the 360-coverage glove has the cut resistance over the entire hand with a liquid resistant finish, while the palm and finger glove only has resistance on the palm and palm side of the fingertips. The palm and finger glove allows for better dexterity and comfort making it more appropriate for jobs that entail rigorous hand activity in small places. The best type of cutters for the construction environment would be ones with automatic relock spring and guard protection from the blade. It would also be important to make sure that the cutters are for both right and left handed individuals in order to accommodate employees that are left handed. These solutions will help reduce the amount of lacerations on the site from careless activity.

What to do?

In order to prevent laceration injuries on the job site it is necessary to have employees wearing the right gloves and carrying the right cutting equipment. With gloves that are cut resistant, it will prevent deep tares from occurring. Choosing between 360 coverage gloves versus only palm and finger coverage gloves, companies can determine the best options depending on the job being done. The 360-coverage glove allows for level 5 cut resistance over the entire hand, but the liquid resistant finish makes the gloves less flexible. The palm and finger coverage gloves allow for the same cut resistance only on the palms and fingers, but allows for dexterity and comfort. These gloves are the best choice because of their protective ability.

Construction workers need cutting tools to perform various activities on the job site. In order to have a safe cutter, the workforce should be using cutters that have an automatic relock spring as well as guard protection from the blade. These cutters would be best if they were able to be used by either hand making it easier for workers that are left handed.

3. LUMBAR SPINE

The next most common injury is lumbar spine injuries. A lumbar spine injury consists of general sprains and non-specific back pains. Many positions like bending, stooping,

kneeling, or squatting are required in the construction job and can cause pain in the lower back. Ligaments can become stretched and discs can get squeezed. It is important to pay close attention to the twisting that the body must conduct in order to reduce back stress.

These injuries would be very important to address because of the large number of accidents that occur from material handling. The example solutions for this particular category were bit extension shaft, kneeling creeper, and stand-up screw gun. The bit extension shaft can be bought in many different sizes in order to screw hard to reach places. It helps reduce stress on the arm, neck, shoulder, and back. This tool allows for the arms to be closer to the side of the body, while using the bicep muscles instead of the shoulder. Although the bit extension reduces stress, the action of looking up can still provide neck strain to the individual. The extension shaft allows for a variety of unique drilling and easy reach of inaccessible screws making it a perfect tool for the job site. The next solution that would reduce back stress is the kneeling creeper. The kneeling creeper is a seat as well as a knee placement to work on ground level activities comfortably. The foam kneepads allow for a more comfortable working environment, while the seat provides secure seating. The kneeling creeper detaches easily for convenient storage and travel to different locations. The last solution is a stand up screw gun. The stand up screw gun allows for reduction of lower back injuries because of the standing ability. It also provides a consistent screw depth without wobbling. Another tool that is used in comparison with the stand up screw gun is the powder actuated fastening tool. This tool is fast efficient and can be used in any weather condition. Although the powder actuated fastening tool is very effective, it requires hearing protection and is not ideal for small jobs. Only for companies that drill extensively, would this tool be a good investment. These alternatives provide some solutions to lumbar spine problems.

What to do?

To decrease the chances of having workers become injured in this category, it is important to purchase the right equipment to provide the best safety. One such tool is a bit extension shaft. This tool attaches to a drill in order to allow for a variety of unique drilling and easy accessibility to hard to reach screws. This extension shaft permits the arms to stay closer to the side and allows for the use of the bicep muscle instead of the shoulder. The reduction in stress on the arm, neck, shoulder and back is essential in injury reduction. Although the strain of looking up can become harmful to the neck, it should be done carefully in order to not bring about this problem.

Another tool that reduces lower back stress is the kneeling creeper. The kneeling creeper has two uses, one as a seat and another as a knee placement for low groundwork. The foam kneepads allow for comfort when working in low areas. It also provides convenient detachability for storage as well as travel to different sites.

4. UPPER EXTREMITIES

Another common construction site accident was upper extremities. These accidents could be reduced with tools such as spring assisted drywall-finishing tools, extension poles for powder actuated tools, and rebar tying tools. The spring-assisted drywall-finishing tool provides about 75% of the force needed to push the compound on the wall. It reduces the chance of muscle or joint injury. The spring assisted finishing tool cuts down the strain associated with pushing in corners as well as flat areas. This tool would be ideal for small companies. This alternative was better for smaller companies than the pneumatic drywall finishing system. Even though the pneumatic system allowed for less pain and a faster finish, it was restrictive to movement while working and was not practical for small finishing jobs. The pneumatic drywall finishing system would cost a lot of money and would not be as efficient for smaller companies who do not drywall on a regular basis. Another solution is the extension tool for powder-actuated tools. The extension tool reduces the risk of hand, arm, and shoulder injury. It also allows for less recoil shock and lower noise exposure. The extension pole has less setup time since ladders and scaffolds are not needed. The adjustable height of the pole allows it to conform to any job site for convince. Finally the last tool is the rebar-tying tool. This tool is good for companies that are mostly creating foundations with concrete. This tool lowers the risk of hand and wrist injuries. It allows for quick rebar tying and easy change of tool direction. The tool can tie rebar in about 1.6 seconds. All in all these tools are a few solution methods that a small company can take in order to improve upper extremity injuries.

An upper extremity injury consists of a few types of injuries. These injuries include contusions on hands and fingers, sprains in wrist and fingers, pain in joints, and crushing injuries. Although this injury category contains a variety of different types of injuries mainly to hands and fingers, it can easily be controlled with the right measures.

What to do?

To prevent upper extremity injuries on the job site it is necessary to buy the right materials for employees. Many contractors use flat and corner mud boxes in order to finish drywalls, but these tools require a lot of force and strength. This force causes fatigue as well as injuries in wrists and arms. By using a spring assisted finishing tool, it will eliminate most of the force and pushing employees have to do. It cuts down the strain significantly reducing the number of injuries.

Many employees have to reach in high places in order to use powder-actuated tools. The reaching can cause injuries to hands, arms, and shoulders. By having an extension pole for the powder actuated tools it will reduce the risk of injuries as well as reduce the recoil shock. The extension pole will lower noise exposure as well have less set up time associated with ladders and scaffolds. The adjustable height of the pole allows it to be perfect match for any job.

Tying rebar is a very hand intensive job. It requires fast hand movements as well as being bent at stooped positions. This increases wrist and hand problems in construction workers. By using a rebar-tying tool it reduces the risk of injuries and removes the quick hand movements that are necessary. It also allows for easy change of tool direction making it easier to get into hard to reach places. The rebar-tying tool is a great addition on the job site to get fast rebar ties.

5. EYES

The last injury is the eyes. The eyes are a very delicate part of the body and need to be treated with great care. The examples of alternatives that would best fit construction companies were goggles and face shield. The goggles need to have full side protection that seals out dust and airborne particles with high impact requirements. It should also protect against UV rays as well as prevent fogging. By purchasing the proper type of goggles that are against the face, it can prevent any objects from hitting the employee's eyes. Since these goggles are hugging the face it will eliminate slippage and carelessness of the eye protection. The face shields should follow class 6A requirements. This requirement states that the face shield should have impact, piercing, splash, head, and glare protection. By following these guidelines the eyes will not become a major injury at the job site.

Eye injuries are very serious and can cause great damage to the worker. Eye injuries include inflammation, abrasion, or scratches from foreign objects. Because of the sensitivity of the eyes, it is very important to make sure that the proper protection gear is used at all times.

What to do?

In order to protect the eyes from injuries it is important to maintain full coverage from any kind of object. The two kinds of alternatives could be goggles and face shields. The goggles should have full side protection and hug the employees face. The seal will keep out dust and airborne particles from entering into the employee's eyes. The goggles should also protect against UV rays as well as prevent fogging. By purchasing goggles with high impact requirements it can be easier to reduce injuries. The face shield that should be purchased should follow class 6A guidelines. This would mean that the face shield has high impact, piercing, splash, head, and glare protection. By purchasing these two types of protection equipment for workers, it will greatly reduce injuries if used properly and consistently.

6. CONCLUSIONS

Small companies have a difficult time being able to keep up with all the new regulations as well as the proper safety equipment. Without designated safety personnel, it can become difficult to keep up training and education. This manual can provide small companies a few alternatives to particular injuries and the guidance necessary to implement an efficient safety plan. By providing a safe working environment, construction managers will be able to increase company health, moral, and build a strong supporting team.

The most important thing for small companies is to become aware of the most frequent injuries: lacerations, lumbar spine, upper extremities, and eyes. The analysis showed that in a year roughly about one to three injuries could occur in any of the top most frequent categories. The frequency of injuries also increases insurance rates forcing employers to pay well above the cost of the injury. This provided the evidence necessary to validate the importance of protection equipment. The companies should take the provided information associated with cost of injury and look at the plausibility of using any of the provided alternatives in their businesses.

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