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ScienceDirect

Procedia Manufacturing 3 (2015) 4338 – 4341

Procedia MANUFACTURING

6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015

Ergonomic Evaluation of Scaffold Building

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Abstract

The present study evaluated the ergonomic hazards that are associated with scaffold building/erecting for one of the local construction companies and proposed recommendations for solution/control measures to mitigate those hazards. Ergonomic hazards were identified based on field observation and conversation with workers, superintendents/foremen, and managers. REBA (Rapid Entire Body Assessment) was used to estimate the risks of entire-body injuries and disorders. Building/erecting scaffolds requires lifting/carrying heavy and bulky materials, awkward postures (e.g., reaching and holding overhead, and kneeling on the scaffolds), and repetitive motions (e.g., hammering the cuplocks). Exposure to these hazards lead to a high risk of musculoskeletal injuries and disorders, especially to the back and shoulder, for scaffold builders. Discussion among the researcher and the pertinent personnel of the company was made during presentation of the research findings, so recommendations for control measures could be better communicated. The recommendations include, but are not limited to: installing scaffold hoist pulley system or other hoist assistance systems, training provided to all field personnel on ergonomics of scaffold building/erecting, proper work-rest scheduling, and workplace stretching program.

Peer-review under responsibility of AHFE Conference

Keywords: Ergonomic Hazards; Scaffold Building.

1. Introduction

According to ILO [1], scaffold building/erecting is to provide work platforms on building, industrial and other sites, for temporary structures such as stages and catwalks, and for the purpose of painting, repairing, seating,

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Peer-review under responsibility of AHFE Conference
doi:10.1016/j.promfg.2015.07.427

disguising building facades, etc. Scaffold builders check the construction requirements from drawings and written instructions, select materials and set ground levels; fit together steel pipes, support braces and clamps to form bases for scaffolds; lift and position sections of scaffolding and bolt pipes together to build up scaffolding; place planks over horizontal bars to create platforms; check levels in scaffolding structures; use prefabricated scaffolding when available; and dismantle scaffolding at the completion of a job [1].

Scaffold building/erecting and dismantling is one of the toughest jobs in the construction industry [2]. Erecting and dismantling scaffolds requires reaching and lifting, awkward postures (such as twisting and holding overhead, bending), and using force (when attaching cross braces and damaged parts, for example). Exposure to these hazards lead to a high risk of musculoskeletal injuries and disorders, especially to the back and shoulder, for scaffold builders.

The present study exhibited a model of "practice to research to practice." It started with the local construction company's proactive effort to implement sound ergonomics program to address workplace ergonomic hazards and issues. The researcher was invited to employ appropriate research methods to quantify the ergonomic hazards associated with scaffold building. Then, the results of ergonomic evaluation were presented to the pertinent personnel of the company for dissemination of the research findings as well as for identification of the recommendations for control measures.

2. Methods

In the present study, the local construction company's scaffold builders erecting scaffolds at Shell Chemical's Norco facility in Louisiana, USA, were evaluated. Field observation and conversation with workers, superintendents/foremen, and managers, were made on Monday August 11, 2014 from 8:00 AM to 4:00 PM.

REBA (Rapid Entire Body Assessment) was used to estimate the risks of entire-body injuries and disorders [3]. REBA uses a scoring system: Score A - Neck, Trunk, and Legs Posture Score + Load/Force Score; Score B - Upper Arm/Shoulder, Lower Arm/Elbow, and Wrist Posture Score + Coupling Score; and Score C - Score A + Score B. The final REBA Score is determined by adding an Activity Score to Score C, which denotes a certain action level responsible for the estimated risk level. REBA has five action levels where a higher level indicates a higher risk level and requires more and further assessment.

After the field evaluation was complete, the researcher discussed the research findings with the pertinent company personnel, so recommendations for control measures could be better communicated.

3. Results

3.1. Ergonomic hazards

Building/erecting scaffolds required lifting/carrying heavy and bulky materials, awkward postures (e.g., reaching and holding overhead, and kneeling on the scaffolds), and repetitive motions (e.g., hammering the cuplocks). The REBA score was 6, which indicated a medium risk and further investigation and changes need to be implemented soon. Some of the scaffold builders also had improper work-rest scheduling.

Manual lifting and carrying of scaffolding parts and materials are a big part of the work, especially for helpers who usually have fewer craft skills and experiences. Scaffold builders are also required to manually move/transport the scaffolding materials while they are on the scaffolds. The risk of falling from heights greatly increases due to the stability issues. According to the scaffolding material weight sheet provided by the company, many materials weigh more than 25 lbs and some more than 51 lbs which is the safe limit as suggested by National Institute of Occupational Safety and Health (NIOSH). They often have to use awkward postures including elevating arms and twisting trunk in order to reach the materials.

Workers use awkward postures of different body parts while doing most of the scaffold building work. Often the existing structure at the facility provided a very limited access for scaffold builders. For example, one of the workers kneeled on the scaffold plank with a severe flexion of trunk to hammer screws into the scaffold planks. In another crew, the leadman had to squeeze in and out through a very small opening which caused him to crawl.