



USE OF ERGONOMICS RISK ASSESSMENT TOOLS ON CONSTRUCTION SITE

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Abstract: Construction industry is one of the 7th industry with high risk exposure. The prevalent problem with construction industry in recent years is the health of construction workers. In residential construction sites workers daily activities includes Material handling, prolonged standing, bending, etc. this leads to musculoskeletal disorders (MSD's). Some techniques are required to identify and control WRMSDs. Ergonomics involves the interaction between human, technology and organization in the purpose of optimizing well-being, health and performance. The aim of research is performing ergonomics risk assessment based on which ergonomics risk factors in building construction site is obtained and to give an overview of ergonomic risks at workplace by some of the observational methods that can be used for assessment. Through ergonomics risk assessment tools such as checklist (questionnaire), REBA (Rapid Entire Body Assessment) and QEC (Quick Exposure Check) data is collected. Risk rank order for activities are determined by RII (Relative Importance Index). Comparison of tool QEC and REBA is done and analysis is done in SPSS. The result showed that most workers are at higher and medium risk on residential construction site. Based on the analysis and findings task need to redesigned and reassessed so that it can be safely carried out. In an appendix we have included a brief presentation of these methods together with the work sheet (if available) and the reference source of the observational method.

Keywords - construction, ergonomics risk assessment, QEC, REBA, RII, SPSS.

I. Introduction

Ergonomics is derived from two Greek words “ERGON” which means “work” and “NOMOS” that means laws or principles, hence literally Ergonomics means the laws of work (Sanders, 2004). Ergonomics is the way you use your body to work and fitting the task or job to you in reducing your risk of injury. These musculoskeletal injuries develop slowly occur over time in the soft tissues of your body like the tendons, nerves, ligaments, muscles and joints. These injuries are called musculoskeletal disorders or MSDs. Risk for MSD increases with these hazards: 1) Repetition- muscles used repeatedly or same tasks; 2) High Force- high muscle power used in lifting & gripping; 3) Awkward Postures- joints bending out of normal position; 4) Contact Stress- pressure pressed on small body area (examples: knee, palm, or forearm); 5) Vibration- from equipment or power tools; 6) environment; and 7) pull/push. Ergonomics helps in protecting body from injuries and using it to make activities much easier for body. Ergonomics is the science that plans and designs tasks to fit workers. Ergonomics deals with human expectations, characteristics, and behaviours in the design of the jobs where people doing their work daily. Basic ergonomics risk factors includes repetition, force, awkward and static postures, mental and physical stresses. In construction industry huge number of Work Related Musculoskeletal Disorders (injuries) are occurring and it is necessary to carry out the ergonomics risk assessment to find risk factors and to study jobs at early stages of construction.

1.1 General

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Ergonomics is the way you use your body to work and fitting the task or job to you in reducing your risk of injury. These musculoskeletal injuries develop slowly occur over time in the soft tissues of your body like the tendons, nerves, ligaments, muscles and joints. These injuries are called musculoskeletal disorders or MSDs. Risk for MSD increases with these hazards: 1) Repetition- muscles used repeatedly or same tasks; 2) High Force- high muscle power used in lifting & gripping; 3) Awkward Postures- joints bending out of normal position; 4) Contact Stress- pressure pressed on small body area (examples: knee, palm, or forearm); 5) Vibration- from equipment or power tools; 6) environment; and 7) pull/push. Ergonomics helps in protecting body from injuries and using it to make activities much easier for body. Ergonomics is the science that plans and designs tasks to fit workers. Ergonomics deals with human expectations, characteristics, and behaviours in the design of the jobs where people doing their work daily. Basic ergonomics risk factors includes repetition, force, awkward and static postures, mental and physical stresses.

1.2 Ergonomics issues in Construction Industry

Ergonomics problems are present in every field surrounding us. In any work you take like hotel, office, industrial, etc. ergonomic issues are present. Ergonomics is also related to construction workers doing the tasks on the construction sites. Construction workers are continuously stooping, bending, twisting, and squatting which leads to MSDs in body of workers. Construction is a field of work that is requires very physical demand. Many risk factors on construction sites affects Indian construction workers. Construction workers have to move heavy materials, control machines, monitor processes, as well as repair equipment. There is insufficient studies in construction work system, presumably because of high task variability, changing work environments, irregular work periods, and the transient nature of construction occupations. Also, in high physical demand construction jobs, physical as well as psychosocial work-related factors are the most vital factors associated with work abilities. As construction work differs depending on site conditions, differences in work system, type of building, variation in work methods and other factors, these variations could either decrease or increase workers exposure to various risk factors occurring occupationally, such as trips and slips that depends on several contributing factors such as working surfaces, work conditions, environmental conditions, etc. The construction industry consists of many jobs each with its own specific demands for requirements. The need for recovery after work is a sign of occupationally-induced fatigue and a predictor of adverse health effects.

1.3 Need of study

In construction industry huge number of Work Related Musculoskeletal Disorders (injuries) are occurring and it is necessary to carry out the ergonomics risk assessment to find risk factors and to study jobs at early stages of construction.

1.4 Objectives of study

- 1. Determine ergonomics risk factors associated with construction industry -**
A detail study on aspect of how ergonomic is associated with construction industry will be carried out during the project.
- 2. Determine MSD for construction workers –**
To determine the risk factor and health related disorders associated to labours and help them to recover.
- 3. Assessment of ergonomics risk –**
To assign the labours with different work in which the use of the injured body part will not take in action while working on site which will increase the efficiency and precision of work.
- 4. Comparison of risk assessment tool i.e. REBA and QEC –**
To compare the risk assessment using REBA and QEC table.
- 5. Propose suggestion and control to reduce ergonomics injuries –**
To conclude the suggestions to reduce the ergonomics injuries on site.

1.5 Problem statement

Construction workers performing activities are challenging Due to changeability, diversity and dynamic features of construction and building industry. Extensive scope of the works and complexity of the projects in construction industry make the workers to be exposed to disabilities, illnesses, injuries or even deaths. Construction industry is one of the seven occupations with the highest incident rate. Work related musculoskeletal disorders (WRMSDs) is normal among various workers and huge amount of money is wasted because of it. Construction industry is one of the seven occupation with highest accident rate. For construction workers, musculoskeletal injuries in construction work are among the most significant risk zones for Construction workers. There is a continuous development in Indian construction industry, so there is fast development. The job of worker is affected by changing marketing,

new technologies and strategies of production. This leads to WRMSDs among construction workers. Ergonomics helps in control and minimizing musculoskeletal disorders and hence construction procedure is also improved. Therefore, ergonomics is necessary for style of work and makes workplace safer for workers.

1.6 Summary

In this chapter, we have studied what is ergonomics, issues in construction industry, the need for study, what are the different objectives and the problem statement of our project is discussed. Details regarding the work carried out by different researchers for study of ergonomics risk assessment are dealt in next chapter.

II. METHODOLOGY

2.1 General

This chapter presents method for performing ergonomics risk assessment and the flow of work. Also various methods for assessments such as Questionnaire, REBA and QEC are discussed.

II.2 Methodology of work

1. Phase 1 - Introduction Stage: Defining of the need of study and the objective of the need is done in this stage also the problem statements were identified

2. Phase 2 - Literature Review: Based on the topic selection, research aim, scope of study the gathering of information is done. The research papers, expert opinion, information from previous studies were collected. The result and the conclusion of the previous studies were examined.

3. Phase 3 - Data Collection:

The data for the ergonomics risk assessment is collected through checklist (questionnaire) and observation based method for ergonomics risk. The observation based method used here is REBA (Rapid Entire Body Assessment) and QEC (Quick Exposure Check). The checklist data were related to discomfort in body parts, ergonomics risk factors and body movement (discomfort). Through observation method REBA the posture analysis risk exposure was done. Through QEC we collect observers and workers assessment and risk exposure level.

List Of Questioner –

1. For seating and standing stationary task does the back remain in static position most of the time?
2. Is the maximum weighed is manually handled by you?
3. On average, how much time do you per day on this task?
4. When performing this task, is the maximum force exerted by one hand?
5. At work due you use vibration tools?
6. Do you have any difficulty in completing the work?
7. When performing the task, is the head/neck bend or twisted?

4. Phase 4 - Analysis and Result:

Identifying ergonomics risk factors and analysing data i.e. assessing risk factor also using Statistical Package for Social Science (SPSS) software and Microsoft excel data for analysis will be done in this stage.

Use of relative importance index (RII) to study factors affecting exposure to risk factor and to propose suggestion for reduction in ergonomics injuries on building construction site.

5. Phase 5 - Conclusion and Recommendation:

Conclusion of the study providing suggestions to reduce ergonomics injuries in building construction site.

III. Figures and TABLES

4.1 Rapid Entire Body Assessment (REBA)

Score	Level of MSD risk
1	Negligible risk, No action required.
2-3	Low risk, Change may be needed.
4-7	Medium risk, Further investigation, Change soon.
8-10	High risk, Investigate and implement change.
11	Very high risk, Implement change.

Table1 - Score and Level of MSD risk for REBA

4.2 Quick Exposure Check (QEC)

Score	Exposure Level			
	Low	Moderate	High	Very High
Back	8-15	16-22	23-29	29-40
Back	10-20	21-30	31-40	41-56
Shoulder / Arm	10-20	21-30	31-40	41-56
Wrist / Hand	10-20	21-30	31-40	41-46
Neck	10-20	8-10	12-14	16-18

Table2 - Score and Exposure Level for QEC

IV. Conclusion

Ergonomics a risk assessment helps to carry out a survey related to the musculoskeletal injuries occurred to the labours due to continuous work in construction sites which helps us to assigned the different work for the labours in which the injured part of the labour is not in use, which helps in increasing the precision of work and efficiency of work increases.

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