

# CONSTRUCTION SITES WORK ENVIRONMENT

By

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## **Abstract**

“To err is Human” . The basis of the discussion of the Man-machine Interface is due to imperfection of the human. Any human being make mistakes. Mistakes make at construction sites could be fatal. The management of the safety of the sites is important aspect in the construction industry in ensuring the safety of the people involve in the sites.

The management should consider workers as their assets. They need to ensure that the tasks fit the workers and even make is user-friendly. There would be grave consequences when the tasks do not fit the workers. The high cost of design failures should be another basis for the proper interface between man and machine or between man and the work environment.

The basic principles of ergonomics will assist in giving some insight of the matter. Human are different, human have limitations and human have predictable reactions. These three basic limitations of the human beings should be the basis of the management of the construction sites.

## **Introduction**

The basis of man-machine interface is very important in ensuring the efficiency of the work carried out and the safety and comfort of the person carrying out the task. The construction sites as the work environment have been receiving less attention in the ergonomic aspect, although some measures and regulations had been imposed to ensure safety for the workers. The research shows that there are still a lot of rooms for improvement in the most basic activities and workspaces during the activity of constructions.

The management has important role to play in preventing work place ergonomic problems.

## **The Research Methodology**

The research is done through observing and when possible interviewing the workers in the construction sites. The analysis is also done through secondary data that are never published in any academic journals whether local or international.

## **Observations and Discussion**

Physically, construction sites are the least attractive work environments. The long and sharp iron reinforcement bars, the timbers of all shapes and sizes, the scaffoldings which is forever changing in shapes to accommodate the tasks involve, the necessary machineries not to mention the hot sun or the pouring rains.

Explanation of a few tasks and how the workers are involved in carrying the task give some insight of the extent of basic ergonomic related to the situation

Table I

The task	Work-related problem	Ergonomic & risk factor
The wheel-barrowing up and down the scaffolding for transporting concrete to the next floor.	Complain of the back pains and upper arms	Repetitive and forceful exertions movement
The digging & breaking of the hard ground using machinery that vibrate	The whole body	Whole body vibrations
The concrete-mixing using the simple machinery	Upper limb, arms and back	Repetitive movements
Making the formwork	Bending and hammering	Repetitive movement
Walking on the site carrying construction materials	Slippery after raining or the uneven ground in dry weather	Injury to the limp if they fell down

As shown in Table-I, the repetitive bending, hammering and stretching of the arms and upper parts of the body will cause discomfort and pain to most parts of the upper limb of the workers. There a lot more activities carried out in any conventional construction sites. The tasks or activities in the above are taken to build analogies for the discussion.

The repetitive works will result in CTD, which the ergonomist terms as Cumulative Trauma Disorder of the effected parts of the body.

What should be done? Do the workers just able to bear the pain and consider as part of the job, as long as it brings the weekly wages, silence is the work culture to confirm?

Workers need to be heard. Productivity plays important role in this aspect of ergonomic. The management of 'those pain and stresses' is directly related to productivity of workers.

Since management plays active role in pain and stress reduction and prevention, proactive approaches which is preventive measures is necessary. The old cliché "prevention is better than cure" is relevant.

Relating ergonomic in stress management is to go back to the basis of ergonomic. As claimed by Macleod[1995], human beings are different: the human limitations and predictable reactions should be the criteria for those involve in the management of human and the task.

There are many recommended workstation standard in many ergonomic textbooks. The tasks in the construction sites are different from those mentioned in the texts in the sense

that the workers are not staying put in one space/workstation or in one bodily position, instead they constantly move from squatting, bending, sitting or standing depending on the tasks involve. Those recommended workstation measurements could still be used as the basis, but it involves more creativity in solving the stresses related to the tasks.

The conventional approach in the construction industry is using Critical Path Method in managing the activities of construction. The management therefore is recommended to consider ergonomic factors during the planning process; they have to include the necessary ergonomic factors when preparing the Critical Path schedule.

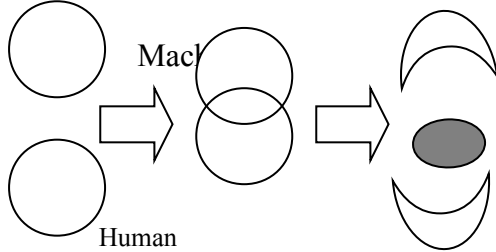
One of the factors to consider is the CTD, which affect the workers. The management has the responsibility to monitor in order to reduce the CTD of their workers. The right duration of time of a particular task, and then an alternative task to provide relieve of the affected limp must be one of the important parts in the Critical Path planning process.

It is important to have a professional in ergonomic as part of the management team, either in-house or a consultant from outside. The ergonomist will advice the management team regarding all aspect of ergonomic: such as identifying risk factors, analyzing the task and material handlings, warning signs at 'danger' areas etc. The ergonomist will play major role in advising the team with regard to design strategies especially fitting the task to the capabilities and limitation of the workers.

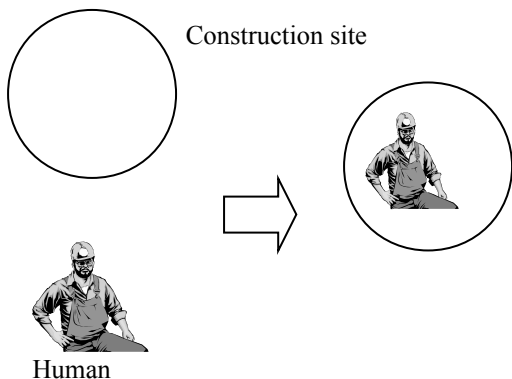
Besides the proactive approach in preventing physical damages to the workers, their physical work place must also be looked into. As Table I shown, the area for potential danger are always present.

Just as comparison between Etherton's [1986] diagrammatic representation of the states of a

dangerous human-machine energy exchange and man and the site environment:



And compare the above diagram with the following:



The diagram indicates whenever man interacts with his work place, his whole physical self is inside the environment. When there is danger in the workplace it involve the man as a whole, not just certain physical parts as in the industrial work place.

Such environment needs a great deal of attention in term of safety and comfort of those workers.

According to Shamsuddin[2000], Misnan[1997], S. Muthukaruppan[1996] and Yasin, M.Z. [1996], most contractors do not understand in depth about the site management procedure. To date there is no proper management procedure. There are only guidelines in the contract form, which was produced by PAM [Association of Malaysia Architect] and IEM. The guidelines are not comprehensive and effective enough to cover the safety aspects in the construction sites. Moreover most contractors do not follow the procedure thoroughly.

M.F.Salleh[1996] reported that accidental and death occurred at an alarming rate. For 1274 accidents that happened, 44% involved death. Due to such alarming death rate, in 1994 the government made some effort by implementing Health and Safety Act 1994. It

consists of policies to ensure health and safety for those involve in the construction sites.

The majorities of the construction workers never read or have the knowledge about the Acts. Those workers who read never really understand the Acts due to very difficult terminologies used. Even the majority of the managers never discuss or use the Acts to ensure the safety of those involve in the sites. Wherever briefing about the site safety was held, only 25% of the management and 25% of the workers were present [Shamsuddin, 2000], although Salleh[1996] claimed that the 1994 Safety Acts was to ensure full commitment from the management about the safety of their workers. He claimed that it was very difficult to talk to the construction workers because majority of the workers are foreigners who do not understand English and local language. He added that those who were able to communicate were 'scared' to reveal any information, which would be considered sensitive by the management, and they will eventually lose the job.

There are indications on the sites that shows that the Acts are 'carried out': by having the posters about the Acts put on the sites' notice boards and fine are imposed on those who violate the site safety regulations.

Salleh[1996] revealed the reasons for the accidents to happen on the construction sites:

- Negligence and mistake by the workers
- The environment not safe enough for the workers
- Workers not adhering to the safety regulations
- Workers have little experience or training on the tasks at hand
- Workers frequently shifting works
- No close supervision
- The weather [heavy rain and storm]
- The physical aggressiveness or physical strength is very low due to the old age of the workers
- Having few safety gargets
- The attitude of the workers – they do not think that safety regulation is important.
- No co operation from the sub contractors
- The attitude of the managers. They do not really care about the safety. Maximizing the profits as their main focus.
- The cost of the safety gargets thought to be expensive.
- Workers feel that it is not convenient to put on those safety gargets.
- The management has the opinion that the safety regulations delay the works on sites.
- The sites which are too large to control
- No workers society to protect them.
- Those responsible in the implementation do not take action against those who break the regulations.

Obviously to curb or reduce the number of accidents in the construction sites those reasons in the above list must be tackled. The list also indicates that there is still a lot to be done in implementing safety on sites to ensure ergonomic safety.

Since sites management is also parts of the ergonomic issue, therefore it is emphasized that ergonomic should be included when site planning are at its early development.

The observation shows that although there are existing regulations for safety, still there are three major aspects that need to be tackle by various groups who are involved in the construction sites. These groups are 1] the workers, 2] the management and 3] the law implementers, that is the policy makers [the government]

The workers have to be made aware of their responsibility on the sites because their attitude towards safety would determine the end productivity. In any construction sites, before work begins on day one, the workers must:

Have to understand the physical layout of the sites. The sites characteristics – whether the sites are just flat lands or slopes. Then when construction begins, the physical layout is going to change dramatically especially when digging for the foundations etc. Again the characteristics are going to change when the multi storey floors begin to take shape.

The appropriate sizes and dimension of the sites.

The circulation pattern, which changes according to the building construction stages.

How space adjacencies relate to the workers activities

The reasons why the equipments or machineries are places the way they are.

The surface characteristics that influence the workers activities.

The available specification/regulation standard.

The factors above will only be effectively implemented when the management is fully responsible. The responsibility of the management includes:

The systematic observation of the activities and the whereabouts of the workers during work.

Providing the workers with safe and hygienic place to live. [This is another aspect of a major research] A good and safe place to live will lead to increase productivity, which is the major concern for the management.

The worker's factor and the management 's factor can only work when there is serious commitment from the policy maker that is the government. The government

has to do more than establishing the Acts. The enforcement of the Acts has to be taken seriously.

## Conclusion

The safety consideration on the construction sites play major role in discussion the ergonomic issue. The weakness in the implementation of the safety regulations in the practical term, prevent the increase in safety performance on the site, thus increase the risks of the unwanted accidents.

Some suggestions which need to be taken seriously are:

Education on the Safety. The need to ensure that there is greater awareness on all levels involve on site construction work environment. The awareness needs to be address in formal and informal education process.

Professional in safety as part of the construction team. Safety aspect has to be monitored by a team specializing in site safety. The team could come from the government body or independent consulting team specializing in site safety. Their present have to be made compulsory on sites at all working time.

The up to date technology. The use of the up to date technology must be in parallel with the safety operational system on the sites.

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