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Assessment of health risk factors with the help of Relative Importance index

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Abstract: The research was conducted in six main stages. The first stage included identifying the research problem, setting out the dissertation's aim and objectives and developing the research plan. The second phase included reviewing the literature related to risk assessment, health risk and risk management. The third stage was developing the questionnaire to investigate the risk factors that causes the health risk as well as the activities which causes the more occurrences of risk events. Fourth phase includes the statistical analysis for questionnaire was done by using relative importance index (R.I.I.) and weighted mean method. The fifth phase was finding out the remedial measures for the risk factors and activities based on the results obtained from the field survey and literature review. Finally in the last phase i.e. phase six conclusions of research and recommendations were then drafted.

I. INTRODUCTION

In India, construction industry is one of the important & fastest growing industries, employing large number of peoples on worksite involved in wide range of activities subjected to the chances of encountering occupational health risk to the workforce involved. Many workers suffer various occupational injuries/hazards at the construction work sites starting from mild to as serious as fatality. The construction companies are incurring lot of loss in terms of monetary and manpower. Assessing occupational risk is found reported at various important major projects and now with increased awareness, the construction field is no exception.

According to ILO 2003, 'work-related fatalities in India estimates for 3, 10,067, the accidents in construction industry are mainly due to the factors such as:

1 Large number of small firms and self-employed workers
2 Shorter duration of construction activities at sites
3 High-turnover of workers
4 Large number of seasonal and migrant workers not familiar with construction activities.
5 Many different trades and occupations involved in construction activity.

The focus and attention in this research are given to find out the risk factors which effects on the health of workers and total project.

II. LITERATURE REVIEW

The "risk" conception derives from Italian language. In general meaning the risk can be defined as "action that endangers something what has a value". The risk is often identifies with a threat or danger, with something that may stop an intentional aim achievement. Risk has been defined in a variety of ways in literatures, among which are the following:

- According to Polish dictionary the risk is defined as 'possibility of defeat, loss, undertaking which result is unreliable, doubtful'.
- In 1901 A.H. Willet affirmed that 'risk is something objective connected with subjective uncertainty'.
- In the thirties O. Lange defined risk as 'uncertainty able to quantifier'.
- In 2007 J. Bizon Gorecka presented the risk definition as: 'risk for economic organizations needs is defined as a

product of probability of event appearance and effects of its influence on processes in organization'. (A. Kania, M. Spilka, G. Cieśliński, 2012)

- Risk has been traditionally defined as a 'measure of the probability and severity of adverse effects' (Haimes, 2009).
- Rowel (1982) provides that 'risk is related to hazard whereby risk becomes the hazard level (hazard severity) combined with the likeliho-+
- od of the hazard leading to hazard consequence'.
- Valsamakis et al (2004) define 'risk as a variation in actual outcome from the expected one, which implies the presence of uncertainty'.
- Webster's dictionary defines risk as ''the possibility of loss, injury, disadvantage, or destruction.''

The general concept of all definitions of risk provides that 'risk is a danger of unwanted and unfortunate events'.

III. METHODOLOGY

3.1 QUESTIONNAIRE DESIGN AND CONTENT

For this research, data is collected from experts & previous literatures

3.3.1. Primary Data:

a. Questionnaire design:-

- Questionnaire survey/field survey is conducted by distribution & collection of forms from experts for

a. Identification of important factors causing hazards on site,
b. Probabilities of various hazards on construction site during construction activities,
c. Impact of risky events/consequences during construction & its probabilities, etc.

- Questionnaires were prepared to get above stated data from expert personnel's in the field of construction. 2 data sheets/forms were prepared.

a. 1st form contains 12 factors & possible situations under each factor. Situations were ranked from worst situation to best situation. Experts have to reply according to their experience. According to their experience ranking was done.

Sr. No	Factors	Ratings				
		1	2	3	4	5
a	**Worker Instinct**					
1	Irresponsible Workers					
2	Lazy movements due to lack of training					
3	Satisfactory response to action					
4	Quick response					
b	**Workers Capabilities**					
1	New worker without skills					

2	New worker with some skills					
3	Average Worker					
4	Experienced Worker					
c	**Communication**					
1	If no Communication					
2	Less communication					
3	Average communication					
4	Good Communication					
5	Excellent communication					
d	**Supervision**					
1	Work carried out without supervision					
2	Satisfactory supervision					
3	Excellent Supervision					

Sr. No	Factors	Ratings

Sr. No	Factors	Ratings				
		1	2	3	4	5
E	**Workers Health**					
1	Sick Workers					
2	Older adults/Child workers					
3	Workers with satisfactory health					
4	Workers with string health					
F	**Site Conditions & housekeeping**					
1	Poor House keeping					
2	Properly arranged but at inconvenient location					

3	Materials are placed with proper inventory & good Housekeeping					
G	**Quality of Materials**					
1	Inferior quality of materials					
2	Fair quality of materials					
3	Good quality ofmaterials					
4	Very good quality of materials					

H	**Usability of tools and equipments**					
1	Improper tools and Equipments					
2	Tools and equipments that can be adjusted to do the task					
3	Adequate & Sophisticated tools and Equipments					

Sr. No	**Factors**	**Ratings**				
		1	**2**	**3**	**4**	**5**
I	**Conditions of tools &equipments**					
1	Old tools &equipments					
2	Tools and equipments in use					
3	New tools and Equipments with proper maintenance					
4	Highly maintained tools &Equipments					
J	**Risk Management**					
1	No consideration of risk aspects					
2	Few Steps for risk mitigation					
3	Risk mitigation plan is ready					
K	**Safety culture**					
1	No safety awareness among the workers					
2	Workers undergone safety training but unavailability of PPE					
3	Workforce is aware about safety norms & use of PPE					
4	Workforce is trained to use PPE					
5	Workforce is highly motivated toward safety aspect, always use PPE& strict safety controls practiced					
l	**Project Management**					
1	Project is poorly managed					

Sr. No	**Factors**	**Ratings**				
		1	**2**	**3**	**4**	**5**

2	Project Management is used but unprofessionally					
3	Project is professionally handled with the help of project management tools					
4	Excellent project co- ordination &management with the latest tools					

Sample questionnaire for probabilities of risk event occurrence

Sr. No.	Activity	Probabilities of Risk Events occurrences										
		0	1	2	3	4	5	6	7	8	9	10
1	Excavation											
2	Foundation											
3	RCC frame structure											
4	Brickwork & Plastering											
6	Plumbing											
7	Floor Finishes											
8	Painting											

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3.1. DATA MEASUREMENT

3.1.1. Data measurement for finding the risk factors

Data collected from experts in the form of questionnaires are firstly collected by using Relative Importance Index method.

Relative Importance Index

Relative Importance Index method helps to determine the relative importance of the each factors affecting to occupational health risk. Then five-point scale consist of,

1) 1 - very low impact
2) 2 - Low impact
3) 3 - Average impact
4) 4 - High impact
5) 5 - Very high impact

Before giving the questionnaire to the expert personal, following information was described.

1. This questionnaire contains twelve groups.
2. Each group contains 3 to 4 questions.
3. The personal just have to give rating by making tick into the box.
4. Each questions carries only one answers
5. Use five point scale

3.4.2 Weighted mean method:-

Weighted mean method is used to analyze probability values taken from expert's responses

$P_{mean} = \sum(P_i \text{ X } n_i) / \sum n_i$

Where,

$P_{mean-\ Weighted\ mean}$

Pi- Probability

ni-No of respondents.

IV. RESULTS AND DISCUSSION

Top Ten Risk Factors

Factors	R.I.I.
Irresponsible Workers	**0.9250**
New worker without skills	**0.9125**
If no Communication	**0..875**
No safety awareness among the workers	**0.925**
Project is poorly managed	**0.875**
Lazy movements due to lack of training	**0.825**
Improper tools and Equipments	**0.850**
Older adults/Child workers	**0.850**
Inferior quality of materials	**0.8250**
Old tools &equipments	**0.8250**

Top Three activites

	Factors	Weighted mean
1	RCC frame structure	**8.688**
2	Excavation	**6.563**
3	Brickwork & Plastering	**4.250**

V. RECOMMENDATION AND SUGGESTIONS

In this project more effort was given to find out the basic risks factors and risk occurring activities. In this project, after finding the risk factors, their ranking was done. So that it will give idea about the factors causing the highest risk during construction. Similarly by making of ranking of activities which causes the more occurrences of risky events, we will come to know the activities which cause more risky events. As suggested above, if proper solutions are find out to mitigate these risk factors and activities then management will be able to complete that particular projects with effectively and by taking proper precautions regarding the health of their workers. Recommendation for further study is that use of software for more accurate ranking and a proper interlinking of risks and activities.

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