

## **A REVIEW ON FACTORS AFFECTING SAFETY PERFORMANCE FOR CONSTRUCTION PROJECTS**

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*Abstract: This research aims to appraise the find out the index for safety performance in construction project. The preliminary data for this research was collected through a literature review and the use of a questionnaire survey targeted at some contractors in some projects in India. Few experts were interviewed and their opinions were taken to identify factors which affect safety performance in construction projects. As the outcome, total 60 factors that affect safety performance may be encountered in a construction project were identified. The collected data was included information regarding “Administrative and management, Role of Government and engineering societies, project nature, Historic, Human and Psychological Climate, Organizational structure, Safety Inspection, Safety meetings, record and report, Incentive, Safety Educating and Training, and medical facilities”. An approach is suggested to carry out ranking of these safety performance factors by Significance index (SI) technique. It is hoped that the findings of the paper will help the stakeholders to act on critical safety performance factor and further try to improve performance of their projects.*

**Keywords:** Construction Project, Safety Work, Safety performance Index, Significance index.

### **INTRODUCTION**

A conceptual research framework was generally developed to perform a study of the project management performance from the contractor perspective. The contractors are involved in this study to validate the research approach. Finding of the study can help construction companies to learn from the best practices of other and carry out continuous improvement. The objectives of this study are; to identify the current safety performance in building construction project, to evaluate the performance of construction project included regarding Administrative and management, Role of Government and engineering societies, project nature, Historic, Human and Psychological Climate, Organizational structure, Safety Inspection, Safety meetings, record and report, Incentive, Safety Educating and Training, and medical facilities.

The construction industry is a one of the most hazardous industries throughout the world, Accidents and injuries can bring great losses to individuals, organizations and societies, “Safety is not a luxury but a necessity”, and can prevent unnecessary loss of property, injury, or death. According to the business Dictionary, safety is defined as a

relative freedom from danger, risk, or threat of harm, injury, or loss of personnel and/or property, whether caused deliberately or by accident. In this study, safety means try to prevent the “danger”, “accidents”, “harm”, and “injury to the person” involved in construction activities.

Safety and health of workers and the protection of environment have been of great concern during the recent years to many parties involved in the construction process in many countries around the world leading to a number of laws and regulations enacted by these countries following the recommendations of international organizations such as International Labour Organization (ILO), world health organization, international organization for standardization among others (Richard et al, 2000). The International Labour Organization Conference of 1985 in Geneva stated that: “work should take place in a safe and healthy working environment and that conditions of work should be consistent with workers human dignity and that occupational health and safety policies must be established at both government and enterprise level.”

## LITERATURE REVIEW

According to Westerns Process of a safety management includes important factors such as a politics, organization, management practices, procedures, monitoring and auditing. The overall of studies contained Safety Elements reported that a many of the Safety factors are more general in nature and tend to not be easily measured”, such as: “safety policy, safety organization, inspecting hazardous conditions, plant and equipment maintenance, safety promotion, high risk times, organization collective values, individual competence and management behavior. These are all important Safety elements but they need to be arranged in such tract as to be measurable in order to use the implementation of Safety Factors as a possible foreteller of safe working environment.

There are many bonds of trade connected in a construction project. Hence they principle responsibilities for safety and health are upon the contractor, but they each employer is a responsible for applying measures relating through workers under their control, The construction industry Requirements are attention of everyone involved. It requires the government, trade unions, sectors associations, developers, architects, engineers; contractors are required to play their role.

The historical factors are evaluate by the background and characteristics of the individual, such as ‘age’ and ‘experience’. The economic factor is determined by the monetary values which are associated with safety such as, hazard pay. The psychological factor is assessed by the safety behavior of fellow workers on site including supervisors. The technical and procedural factors are assessed by the provision of training and handling of safety equipment on site. There are suggesting a benchmark of construction safety should be six dominant groups of factors: ‘management commitment, management measures, implementation, project nature, individual involvement and economic investment. Management commitment’ is a most dominant factor that affects construction safety performance and consists of implementing organizational safety policies, assigning safety responsibilities for all levels.

## FACTORS AFFECTING SAFETY PERFORMANCE

As the total 60 factors that affect safety performance may be encountered in a construction projects were identified. The factors for safety performance are then classified into ten groups. The groups of factors affecting safety performance are shown in following below.

### 1. Administrative and management

Top management should consider safety as equally important as other aspects in the organization, such as production and profit. There is also a need for safety awareness of company's top management. it is crucial for top management to encourage all employees to follow safety procedures and implement initiatives to improve their safety performance. In order to demonstrate their commitment towards safety, top management needs to provide necessary resources, money, tools, and equipment, for employees to work safely and to monitor safety. Management related factors are listed below:

- Safety awareness of company's top management
- Conduction of safety policy review
- Safety awareness of project managers
- Issuing & implementation of in house safety rules, safety program or manuals including emergency plan & procedure
- Availability a clear company safety policy
- Management's attitude towards employee's welfare

### 2. Role of Government and engineering societies

Government should encourage, through significant incentives and recognition, voluntary employer programs for excelling in safety and health achievement. Government standards setting must be conducted with efficiency, maximizing use of public input and available data to develop and publish reasonable standards in a timely manner. Government enforcement should be fair and consistent. Penalties should not be set as a budgeted government revenue source, but should be based on the seriousness of noncompliance. Government related factors are listed below:

- Issuing of safety laws, standards, regulations & legislations
- Rigorous enforcement of safety regulations

### 3. Project Nature

Project Nature factor in different geographical location may vary in term of producing differential effects on safety performance so organizational also keep updating and response to requirements imposed by the changing environment. Geographical location, weather condition related to poor visibility and night works have a significant impact on work at night. The construction industry is a complex with a number of stakeholders working together to complete the construction project. This complex system also some information being passed from one team (construction) to another, which is need for risk assessment and communication. In the meantime, the physical space, the working procedure (site operation), tools and methods used and resources available are factors influencing risk assessment and communication. Project nature related factors are listed below:

- Size of the project
- Ratio of site area to building area
- Planning and organizing the site (layout) - work environment

- Cost of the project
- Planning and scheduling of the project
- Application of new technology in construction
- Type of owner
- Complexity of the design

#### **4. Historic, human and psychological climate**

The historical factors are assessed by the background and characteristics of the individual, such as age and experience. Work accident experience is positively linked with external attribution and unsafe behaviors but negatively linked with internal attributions. People with work accident experience tend to attribute the cause of accident to the external environment, and are likely to have unsafe behaviors. The safety behavior is represented as to employee risk-taking behavior and compliance to safety rules and procedures beliefs, attitudes and perceptions of responsibility and control. The behavior base on safety refers to the behaviors which lead to reduction of risk behaviors and as a result reduce accidents and injuries. Historic, human and psychological climate related factors are listed below:

- Employee age
- Employee experience
- Employee education
- Employee safety training received
- Employee marital status
- Level of modularization
- Employee safety awareness, knowledge and involvement
- Employee accident experience
- Employees language and communication barriers
- Employees culture background
- Relation between the management and employees on the site
- Relation between the supervisor and employees on the site
- Interrelation between the employees on the site
- Increased job-related pressure on workers
- Excessive overtime work for employees

#### **5. Organizational structure**

Companies can take many approaches to developing and implementing safety programs. Some programs focus more on the application of safety rules through an accountability system. Other programs provide safety education/training to enhance employees' safety awareness, attitude and commitment through a cultural intervention. Improvements in organizational structure, organizational importance of safety, safety responsibility and accountability, communication, management behavior, employee involvement, and employee responses and behavior can help improve safety performance. Organizational related factors are listed below:

- Number of layers of management
- Percentage of new Employees on sit
- Definition of safety responsibility
- Number of safety supervisors
- Authority of safety supervisor

- Number of Employees on site
- Size of the crew
- Number of subcontractors
- Co-ordination, control and management of sub-contractors
- Involvement of top management
- Team turnover (team stability).

### **6. Safety Inspections**

Regular safety inspections help management that the safe work practices are being maintained. By having your employees assist with the safety inspection, awareness remains high and employees learn more about safety hazards. Construction sites require constant monitoring and observations to keep ahead of safety issues.

The use of safety inspections has been shown to have a positive effect on a company's loss control initiative. In fact companies who perform safety inspections have fewer accidents incidents than companies that do not perform inspections. Safety inspection related factors are listed below:

- Safety inspection by government Authorities
- Safety inspection by management
- Safety inspection by safety supervisor

### **7. Safety Meetings, Records and Reports**

Safety meetings provide a chance to present new safety training and information. They also offer a chance for workers to review previously learned information. Without safety meetings, workers can be lulled by routines and slowly decrease their alertness and attention to safety as they perform the same tasks day after day. They benefit from being reminded how to stay safe and why safety methods are needed. And also the information provided through recording and reporting enables the enforcing authorities to identify where and how risks arise, and to investigate serious accidents. Safety Meetings, Records and Reports related factors are listed below:

- Conducting regular toolbox meetings (safety meetings) by safety supervisor
- Conducting safety meeting before each activity begins
- Attendance of Safety meetings by management
- Recording and reporting of daily safety issues

### **8. Incentive**

Incentives factor is one of the determinants that motivate workers to behave in a desired manner to safety regulations on site. It can be viewed a psychological approach that rewards workers for their adhered routine on site. Combination of reward and punishment can be regarded as a strategy that inculcates safe behaviors among workers on site. Incentive related factors are listed below:

- Implementation of safety rewards
- Implementation of safety fines
- Implementation of disciplinary actions

### **9. Safety Education and Training**

Safety Educating and Training defines as a process that enables people to acquire new knowledge, learn new skills, and perform behaviors in a new way. Further distinguishes between training and development by stating that training refers to the acquisition of 'specific

skills or knowledge’, ‘displaying poster’, ‘issuing of safety booklet’ and ‘development refers’ to the improvement of intellectual and emotional ability needed to perform better at a specific work. Safety education and training related factors are listed below:

- Conducting safety training and orientation
- Issuing of safety booklets
- Talk by management on safety
- Displaying safety posters
- Training for first aid for all employee

## **10. Medical Facilities**

The main purpose of measuring health and safety performance is to provide information on the progress and ‘current status of the strategies’, ‘processes’ and activities employed to ‘control health’ and ‘safety risks’. Health and safety are defined as the degrees to which the general conditions promote the completion of a project without major accidents or injuries. Throughout the world, construction industry is known as one of the most hazardous activities. Medical facilities related factors are listed below:

- Availability of medical advice
- Availability of adequate facilities for first aid treatment
- Conducting periodically random drug testing

## **SUMMARY**

Present study outlines the major factors affecting to safety performance in construction projects in Indian context. Based on literature study and from interview of experts, sixty factors were identified under ten major groups. Further methodology is suggested to work out critical factors from available various techniques to identify most crucial factor which affect to the safety performance in building construction project.

## **REFERENCES**

- [01] Benjamin Boahene Akomah and Emmanuel Nana Jackson “FACTORS AFFECTING THE PERFORMANCE OF CONTRACTORS ON BUILDING CONSTRUCTION PROJECTS: CENTRAL REGION, GHANA” International Journal Of Innovative Research & Development, ISSN 2278 – 0211, September, 2016, Vol 5 Issue 10.
- [02] Edwin Sawacha, Shamil Naoum and Daniel Fong “FACTORS AFFECTING SAFETY PERFORMANCE ON CONSTRUCTION SITES “International Journal of Project Management, U.K. Vol. 17, No. 5.
- [03] Fang. D. P., Xie, F., Huang, X. Y., and Li, H. “FACTOR ANALYSIS-BASED STUDIES ON CONSTRUCTION WORKPLACE SAFETY MANAGEMENT IN CHINA”, International Journal of Project Management, 2004 Vol. 22, No.1, pp. 43-49.
- [04] Fung, Ivan W.H., Tam, C.M. Tung, Karen C.F., and Man, Ads S.K. “SAFETY CULTURAL DIVERGENCES AMONG MANAGEMENT, SUPERVISORY AND WORKER GROUPS IN HONG KONG CONSTRUCTION INDUSTRY”, International Journal of Project Management, 2005 Vol. 23, No. 7.
- [05] Ibrahim Abdul-Rashid, Hesham Bassioni and Faez Bawazeer “FACTORS AFFECTING SAFETY PERFORMANCE IN LARGE CONSTRUCTION CONTRACTORS IN

- EGYPT” 23rd Annual ARCOM Conference, “Association of Researchers in Construction Management”. 3-5 September 2007, Belfast, UK.
- [06] Jiayuan Wang, Patrick X.W. Zoua, Penny P. Li “CRITICAL FACTORS AND PATHS INFLUENCING CONSTRUCTION WORKERS’ SAFETY RISK TOLERANCES” Accident Analysis and Prevention (2015) AAP-3988; No. of Pages 13.
- [07] Kanchana Priyadarshani, Gayani Karunasena And Sajani Jayasuriyal “CONSTRUCTION SAFETY ASSESSMENT FRAMEWORK FOR DEVELOPING COUNTRIES: A CASE STUDY OF SRI LANKA” Journal Of Construction In Developing Countries, 18(1), 33–51, 2013.
- [08] Kines, P., Andersen, L. P. S., Spangerberg, S., Mikkelsen, K. L., Dyreborg, J., and Zohar, D. “IMPROVING CONSTRUCTION SITE SAFETY THROUGH LEADER-BASED VERBAL SAFETY COMMUNICATION”. Journal of Safety Research, 41(5), 399-406.,2010.
- [09] K. Mouleeswaran. Student, “EVALUATION OF SAFETY PERFORMANCE LEVEL OF CONSTRUCTION FIRMS IN AND AROUND ERODE ZONE” International Journal Of Innovative Research In Science, Engineering And Technology An ISO 3297: 2007 Certified Organization, Volume 3, Special Issue 1, January 2014.
- [10] Luis Fernando Alarcóna, Diego Acuña, Sven Diethelm, Eugenio Pellicerc “STRATEGIES FOR IMPROVING SAFETY PERFORMANCE IN CONSTRUCTION FIRMS” Accident Analysis And Prevention 94 (2016) 107–118.
- [11] Mearns, K and Yule, S (2009) ” THE ROLE OF NATIONAL CULTURE IN DETERMINING SAFETY PERFORMANCE: CHALLENGES FOR THE GLOBAL OIL AND GAS INDUSTRY”, Safety Science(2009), Vol 47:6, pp 777-785.
- [12] Mihirkumar Naik “DEVELOPMENT OF CONTRACTOR’S PERFORMANCE INDEX IN CONSTRUCTION WORK”.
- [13] Riham El-nagar, Hossam Hosny and Hamed S Askar “DEVELOPMENT OF A SAFETY PERFORMANCE INDEX FOR CONSTRUCTION PROJECTS IN EGYPT” American Journal of Civil Engineering and Architecture, 2015, Vol. 3 No. 5, 182-192.
- [14] Rateb J. Sweis, Sharaf M. Bisharat, Lorina Bisharat, Ghaleb Sweis “FACTORS AFFECTING CONTRACTOR PERFORMANCE ON PUBLIC CONSTRUCTION PROJECTS” Life Science Journal 2014.
- [15] Sadi A., Al-Khalil, Mohammed, and Al-Hazmi Muhammad. “CAUSES OF DELAY IN LARGE BUILDING CONSTRUCTION PROJECTS”, Journal of management in engineering, 1995 Vol. 11, No. 2, pp. 45-50.
- [16] Teo, E.A.L., Ling, F.T.Y., and Chong, A.F.W. “FRAMEWORK FOR PROJECT MANAGERS TO MANAGE CONSTRUCTION SAFETY”, International Journal of Project Management, Vol. 23, No. 4, pp. 329-341.(2005)