



ISSN 2278 – 0211 (Online)

Precaution for Safety in Building Construction Sites; a Case of Enugu Metropolis, Enugu State, Nigeria

Orji Solomon E.

Technologist, Department of Building, Enugu State University of science and Technology, Enugu State, Nigeria

Nwachukwu Lilian N.

Senior Technical Instructor, Department of Building, Institute of Management and Technology, Enugu, Enugu State, Nigeria

Agu Eric. E.

Principal Lecturer, Department of Building, Institute of Management and Technology, Enugu, Enugu State, Nigeria

Abstract:

Safety is an inevitable aspect of construction. This is so because the only time an employee performs an assigned duty is when the employee is in a good health condition and is sure of a safe working environment. This paper explores the different types of safety precautions that can be taken in advance to promote the health and safety conditions of construction workers particularly in building construction sites. It was achieved through the review of existing literature and the use of survey. The literature reviewed the different types of safety precautions that can be taken in a building construction site to help promote the safety of workers while the field survey used questionnaires to elicit the frequency of usage on site. This was administered through convenience sampling techniques within Enugu metropolis in Enugu state. The descriptive analysis tools were used for the analysis and the findings revealed that most of the construction professionals in Enugu metropolis carryout their construction work with good and quality materials but they do not provide safety net on scaffold to prevent against falls. Conclusion was reached and recommendation based on the findings were made in the paper.

Keywords: Safety Precautions, Building Construction sites, Enugu Metropolis

1. Introduction

Construction projects involve numerous unpredictable and complex processes and as such are plagued with risk. Renuka, Umarari, and Kamal (2014), associated the risky nature of the industry with the complexity and strategic nature of construction business which requires numerous project stakeholders. In line with this assertion, Helander (1991) cited in Okoli, Halima, Umar, and Zakari (2015) submitted that the construction industry is faced with high risk of fatal injuries considering the internal and external factors like the environment, the work itself and the continuous change in the composition of the construction team. This exposes the workers to unforeseen and unaccustomed hazard. The industry for this reason has been affirmed to record accident fatality rate that doubles that of all other sectors average (Lovell, 2014).

There is no risk free construction (Makui et al; 2009 cited in Oyewobi, Ibrahim and Ganiyu 2012); the hazard associated with construction sites according to Ahmed and Yahaya (2006) can result to injury or loss to the site operative from engaging in risky site activities. Hence, one of the major factors that should be considered when engaging in construction work is the health and safety of the workers who are the key resource that yield higher productivity and greater efficiency for any project (Chan, 2012). Since the industry is prone to hazard, safety is an investment that provides real benefits (Cesarini, Hall, and Kupiec, 2013) because a safe work environment helps to keep skilled labour on the job as well as project on track by removing or reducing hazards that can result to accidents and subsequently lead to delay and litigation.

Unfortunately, the construction industry has a poor reputation in risk analysis when compared to other industries (Laryea and Hughes, 2008; Chan, 2012). This may be due to the fact that it is often difficult to determine the cause and effect, dependence and correlations or that direct dividends with such engagement are not easily perceptible (Orji, Nwachukwu, and Enebe 2016). Be that as it may, it is highly important to consider issues of safety at the early life of any project in order to optimize project performance. The aim of the study is therefore to highlight some precautions necessary for maintaining safe environment for work and the workers and to examine the frequency of usage of these precautions particularly in building construction sites with a view to improving the health and safety of construction workers in Enugu metropolis.

2. Literature

According to Orji (2014), Safety is an inevitable aspect of construction because the only time an employee performs his or her duty is when the employee is in a good health condition and is sure of a safe working environment. Hazard is a physical or chemical state that has the potential to injure or cause impairment to the health and safety of construction workers. They exist in different forms and are often activated by careless actions.

Construction pools its workforce from a shallow reservoir of skilled workers and limitless number of unskilled workers who have little or no formal training on safety practices. These and other factors combine to activate some latent hazards to cause serious accidents on sites. On the other hand, the bulk of the workforce population must be accounted for in any construction project; this can be achieved by providing a safe and conducive environment for work. Safety can only be reached by removing or mitigating the risk or hazard that can result to an accident. In support of this assertion, Prashar and Bansal (2006) listed how hazards can either be eliminated or mitigated as follows:

- Eliminate the source of the hazard
- Reduce the hazard at the source
- Substitute a less hazardous equivalent
- Remove the employee from the hazard
- Isolate the hazard
- Provide employee training
- Use appropriate personal protective equipment
- Dilute the hazard (i.e ventilate the hazardous substance)
- Apply appropriate management strategies
- Practice good housekeeping.

Similarly, Construction Safety Association of Ontario (2008) cited in Orji (2014) listed and emphasized on the use of safety gear (personal protective equipment) while working on site. According to the association, the personal protective equipment is designed to protect against safety and health hazards in a construction site and they include:

1. Eye Protection: the eyes are protected with goggles or spectacles while working on site to prevent impact from flying particles, splashes or molten metal or their liquids, dust and radiation.
2. Respiratory System Protection: the respiratory system is protected with a dust mask and breathing apparatus to prevent hazards from gases, vapours, fumes, mist and dust. The breathing apparatus is divided into two namely, air-purifying respirator and supplied air-respirator.
3. Face Protection: the face is protected with a face shield. Face shield is a device that includes a transparent window or visor to shield the face and eyes from impact, splash, heat, radiation, dust and glare. Face shield includes welding helmet which protect both the face and the head from falling objects, welding hand shield, hoods and respiratory face piece.
4. Head Protection: Head protection is mainly for the top. The head is protected from falling or flying objects from a height and the equipment used is the general purpose industrial safety helmet.
5. Ear Protection: the ears are protected with ear plugs or ear muffs to prevent the ears from noise or unnecessary sound.
6. Hand Protection: Hand protection is very important as most of the work relies on the use of hands. The equipment used for protecting the hand is the purposely made hand glove and/or cleansing cream.
7. Foot Protection: The foot is protected from falling objects and stepping on sharp objects. Safety boots or shoes with metal toe protection and a steel insole protection is appropriate to protect foot while working on site.
8. Body/Skin Protection: The common hazard that needs to be prevented are rain, sun, sleet or hail, toxic and corrosive chemicals that can damage the skin. Protective clothing that is appropriate for the work and weather condition should be worn while working on site to prevent these hazards from damaging the body or skin
9. Fall Protection: the hazards here are associated with the use of scaffold, ladders etc. The equipment used for this protection are; the safety belt, safety net, fall arrest device, fixed anchorage for industrial safety belts, and harness fall arrest device.

2.1. Safety Policy and Training

Developing a safety policy for an organization is the bedrock of safety culture; safety policies are embodiment of what an organization is committed to in terms of its workers safety. According to Prashar and Bansal (2006), it is the basis for every successful safety program and could help to avoid the consequences of construction site accidents. Safety policy ensures that employees know what is expected of them before they embark on any construction work. A written safety policy is the beginning of any safety program and a good policy should be able to address the following:

- The objectives of the program
- Person responsible for various safety practices and training
- Consequences of not following already established procedures
- Reporting of unsafe conditions
- Reporting of accidents
- List of specific safety rules and regulation and
- List of safety hazards to look out for

On the other hand, safety training helps to develop the key competencies that enable individuals to perform current or future jobs. It is seen as an activity that is concerned with making employee more articulate and efficient in the performance of their current task or in preparation for a new type of job to meet the dynamic needs of the organization (Abdulazeez, Umar, and Abdussalam, 2015).

They further submitted that the need for skill development in the construction industry is imperative due to the variability and complex nature of construction projects which requires continuous supply of trained and skilled personnel to match the numerous challenges often encountered.

Similarly, Oladiran, Ogunsanmi, and Soyingbe (2008) emphasized that construction site workers should be adequately trained in hazard identification and control, and method of encouraging safety practices. Safety trainings must lay emphasis on the projects safety policy, review of past activities, discuss the causes of accident on site and plan for new methods of preventing future occurrence. The training should be provided in the language well understood by the workers.

3. Methodology

A research methodology of literature and field survey was used to achieve the objectives of this research. The literature survey was used to identify some safety precautions that can be taken in advance to promote the health and safety of construction workers, while the field survey involving 30 building construction sites within Enugu metropolis were used to investigate the precautionary measures in place and their frequency of usage. A well-structured questionnaire was designed and administered to building construction professionals on selected projects within Enugu metropolis.

3.1. Data Analysis Procedure

The questions were placed on a 3 point Likert scale, the data analysis therefore employed the following steps:

Computation of the Mean using the average formula

$$\bar{x} = \frac{\sum fx}{\sum f}$$

Where \bar{x} = Mean

x = points on the Likert's scale (1,2 and 3)

f = frequency of the respondents

Computation of the relative important index (RII) using the formula;

$$RII = \frac{\bar{x}}{K}$$

Where K = highest point on the Likert scale (in this case is 3)

Ranking of the items based on their RII values. The item with the highest RII value is ranked first, the next is ranked second and so on.

3.2. Data Analysis and Presentation

Precautionary measure	Frequency	Percentage (%)
Always	12	40.00
Sometimes	13	43.33
Never	5	16.67
Total	30	100

Table 1: Provision of safety precautions on site

Source: Field survey 2015

Safety precautions	Frequency of usage (f) (x)/Response			$\sum f$	\bar{x}	RII	Rank
	3	2	1				
provision of hard hat	6	10	14	30	1.73	0.58	7 th
provision of protective clothing	3	8	19	30	1.47	0.49	9 th
provision of safety boot	9	14	7	30	2.07	0.69	5 th
provision of hand glove	6	18	6	30	2.00	0.67	6 th
provision of ear muff/plug	-	3	26	29	1.10	0.37	12 th
provision of safety belt	1	5	24	30	1.23	0.41	11 th
provision of goggle/face shield spectacle	-	14	15	29	1.48	0.49	9 th
provision of safety net on scaffold	-	2	25	27	1.07	0.36	13 th
inspection of equipment before use	25	4	1	30	2.80	0.93	2 nd
use of design made by professionals	22	8	-	30	2.73	0.91	3 rd
protection of the respiratory system	6	9	15	30	1.70	0.57	8 th
use of quality material	27	3	-	30	2.90	0.97	1 st
use of qualified persons for construction work	22	7	2	30	2.73	0.91	3 rd

Table 2: Different types of safety precautions used on site

Source: Field survey 2015

Key: 1 = Never; 2 = Sometimes; 3 = Always.

3.3. Discussion of Results

3.3.1. Provision of Safety Precautions on Site

Table 1 shows the response to the provision of safety precautions on site. It can be observed that 12 respondents (40.00%) claimed to always provide precautionary measures for safety of construction workers on site, 13 respondents (43.33%) provides it sometimes while 5 respondents (16.67%) never provided safety precautions on site. The figure therefore, indicates that construction professionals know the importance of avoiding or mitigating hazards on site to promote the health and safety of the workers.

3.3.2. Different Types of Safety Precautions Used on Site

It can be seen from table 2 that the use of quality materials was rated high, which indicates that most of the building production managers in Enugu metropolis carryout their construction work with good and quality materials. Similarly, inspection of equipment before use, use of design made by professionals and use of qualified persons for construction work were rated second and third respectively. This shows the level of civilization and technological advancement to complex techniques in building construction works in Enugu metropolis. Provision of safety net on scaffold is the least used among other measures which suggest that contractors in Enugu metropolis are not really committed to providing safety measures for their workers when working on scaffold. However the respondents were of the opinion that safety precautions taken in advance to mitigate or avoid hazard is the best way to promote the health and safety condition of construction workers on site.

4. Conclusions and Recommendations

The construction industry is considered the most risky of all industries because it is associated with inherent dangerous working environment. Safety measures provided in advance to protect construction workers on site is a positive step to mitigating the impact of hazards on workers. This study, therefore reveal:

- The different types of safety precautions that can be taken in a building construction site
- The types and frequency of safety precautions used on site in Enugu metropolis.
- That use of quality material was rated high while provision of safety net was rated the lowest
- That most of the building construction professionals in Enugu metropolis know the importance of safety and advocates for precautionary measures in advance to mitigate or avoid hazards.

Hence, to promote safety in building construction site. The study therefore recommends as follows:

- Construction professionals should enforce total compliance to safety rules on site.
- The use of good and quality material for building construction work should be maintained in top gear
- The use of personal protective equipment should be enforced on all the workers.
- Sites should be tidied up of littered objects to maintain good house keeping
- Safety officers should be employed on site to plan, and ensure adherence to safety precautions
- The production of any building should be carried out by a registered builder with the aid of skilled artisans.

5. References

- i. Abdulazeez, A.D., Umar, M.B., and Abdussalam, D. (2015) Appraisal of the factors militating against craft skill training in the north-western Nigeria. *The professional Builder, Journal of the Nigerian Institute of building*. Vol. 6, No. 1 March, 2015. Pp 8-9
- ii. Ahmed, d.I, and Yahaya, M.I (2010), legal considerations and risks management in the building industry; proceedings of the Nigeria Institute of Building at the 40th Annual Conference/AGM. July, 7th – 11th, Asaba Delta State. P4
- iii. Cerani, G., Hall, G. and Kupiec, M. (2013). *Building a Proactive Safety Culture in the Construction Industry*. ACE, USA
- iv. Chan, E. (2012). *A Safety Culture in Construction Business*. *Journal of Research in International Business and Management* Vol. 2, no. 13.
- v. Construction Safety Association of Ontario, (2008). *Construction Health and Safety Manual*: 21 Voyagar Court South, Etobicoke, Ontario Canada.
- vi. Dada, J. (2010). *Strategies for Mitigating Risk in Construction Projects*. A paper presented at the 40th conference and Annual General Meeting of the Nigerian Institute of Building, July, 7th – 11th 2010, Asaba, Delta State.
- vii. Helandar, M.G. (1991), *Safety hazards and Motivation for safe work in the construction industry*. *International Journal of Industrial Ergonomics*, 8 (1991) 205 – 223. Elsevier
- viii. Laryea, S. and Hughes, W. (2008). “How contractors price risk in bids: theory and practice” *Construction Management and Economics*, Vol. 137, no 4.
- ix. Lovell C. (2014). *Health and Safety Risks in Construction*. Retrieved on 1/1/16 from www.alcumusgroup.com/top-10-health-safety-risk-in-construction/
- x. Okoli, O.G., Halinia, O.C., Umar, D.Y. and Zakari M.S (2015). Appraisal of Occupational health hazard on site Operative in some selected construction companies in Abuja: the Professional Builder. *Journal of the Nigerian Institute of Building*. Vol. 6, No. 1 March, 2015
- xi. Oladiran, O.J, Ogunsami, O.E., and Soyngbe, A.A (2008). Control measures of accidents: Nigerian Building projects’ case: Proceedings of CIB-2008-Transformation through construction, 15th – 17th November, Dubai.
- xii. Orji, S.E. (2014) *Appraisal of Construction Hazards and Safety Precautions in Enugu Metropolis*. M.Sc Thesis, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. Online available, retrieved November 3rd, 2015 from <https://naudijifalcibray.wordpress.com> pp. 1- 6
- xiii. Orji S.E., Nwachukwu, L.N., and Enebe, E.C (2016). Hazard in building construction sites and safety precautions in Enugu metropolis, Enugu state. *Imperial Journal of Interdisciplinary Research (IJIR)*. Vol. 2, Issue-1, 2016
- xiv. Oyewobi, L.O., Ibrahim, A.D. and Ganiyu, B.O. (2012). Evaluating the Impact of Risk on Contractor’s Tender Figure in Public Buildings Projects in Northern Nigeria. *Journal of Engineering, Project and Production Management*. Vol. 2, no. 1
- xv. Prashar, A., and Bansal, P. (2006). *Industrial Safety and Environment* (1st Edition pp. 36 -41), Delhi. S.K. Katarian and Sons
- xvi. Renuka, S.M., Umarani, C. and Kamal, S. (2014). A Review on Critical Risk Factors in the Life Cycle of Construction Projects. *Journal of Civil Engineering Research*. Vol. 4, no. 24