

## **State of the Art and Reliability of Health and Safety Techniques used on Construction Sites in Ondo State<sup>1</sup>**

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### **ABSTRACT**

The state of health and safety on construction sites has been regarded as alarming when compared with what is applicable in developed economies. Most accidents can be avoided by implementing stringent health and safety protocols, however, the reliability of some of these protocols have been questioned as they are not been improved with new technologies and workflow brought by new innovations in the construction industry. It is with this background, that this study investigated the state of the art of health and safety on construction projects in Akure, Ondo state, Nigeria by identifying current practices and the reliability of the current safety methods in use. To elucidate the objectives of the research, the survey method employed was through the use of questionnaires. Ten projects were selected through convenience sampling and 87 respondents comprising construction workers, consultants and contractors participated in the study. Descriptive statistical tools was with the aid of measures of central tendency. The study revealed that the construction hazards majorly experienced on construction sites are; accidental falls of workers, handling accidents during machine or tools operation, accident from falling objects and involvement in strenuous movements amongst others. Also, it was found that though safety techniques such as use of safety shoes, site cleanness, checking of tools, use of safety helmet, provision of first aid facilities, provision of workers training and use of nose covers are not frequently used, they are still regarded as reliable. The study concluded that while construction projects are birthed frequently, health and safety issues are rarely paid attention to.

**Keywords:** Construction Sites, Health and Safety, Reliability.

### **BACKGROUND TO THE STUDY**

Construction sector is viewed as a service industry. It generates substantial employment and provides growth impetus to other manufacturing sectors like cement, bitumen, iron and steel, chemicals, bricks, paints, tiles etc. (Abd-Hamid, Azizan, Sorooshian, 2015). Construction is a high risk business, which is a classic dilemma haunting every participant in the business. Its uniqueness, relevance, importance, technicality is thereby not farfetched from its nature which Ahmad, Manan and Turi (2018) described as uncertain, complex and in need of effective safety and health management system. Ahmad et al (2018) observed that with the advancement in

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technology, employees on construction sites are bound to follow safety procedures and guidelines on construction projects but most construction accidents occurring in recent times has exposed the lacuna in safety practices on construction projects. It then becomes pertinent to ask how reliable the safety cultures in this industry is since it forms a focal point in our collective economic development and therefore requires much attention in formulating effective health management and insurance method. By capturing the perception on the factors that can influence the safety performance on building sites, this study attempts to shed light to the management into taking account on these factors as means of managing safety on sites proactively and effectively (Lee&Yusmin, 2012).

Oreoluwa and Olasunkanmi (2018) stated that it is important that an emphasis on safety be recognized or even be accepted as being a principle means by which injuries can be reduced. If safety is emphasized, the occurrence of injuries can be expected to be low and, conversely, if no emphasis is placed on safety, the occurrence of injuries can be expected to be high. The Economic benefit stated above also shows what will be lost if human safety techniques in the Industry are not taken importantly. The Economic contributions of the construction industry have been observed to dwindle of late which might not be farfetched from the high rate of human fatalities and the discouragement it gives to investors. If left unchecked, this unreliable safety measures will not only bring about economic loss but also affect the growth rate of investment in the socio-economic development of the country as a whole.

Human safety when put into consideration will ensure the construction site has good design; good planning and uses tried and tested safety techniques. Poorly implemented human safety techniques, design and management can result in accidents, illness and even death (Ansah & Sorooshian 2017).

### **State of Art of Human Safety and Health In The Nigerian Construction Sector**

(Chris, 2008) classified that construction industry has always suffered from poor image, for instance, high cost, poor quality, corruption and hazardous working condition. Safety should be put on first priority before instructing a worker or a group of people to work or to carry out activities in hazardous condition or environment. The safety of workers comes first in any ideal work environment; this should therefore be of paramount importance to any construction company that wants to continue its operations.

The high technology character of the industry results in two major impacts on the occupation safety and health of construction workers on site. In the first instance the high levels of technology applied in the machines and process used required that special precautions must be taken to protect the workers on site. In some instance, physical barriers to protect workers can adequately guard the hazards. However, on many sites, the machines and processes involved require the workers to learn a comprehensive set of procedural steps for their safe operations. This requirement implies that the workers must possess a significant level of understanding regarding the technology involved and the extensive practice in following the procedural steps necessary for safe operation (Adenuga 2007).

## **Accident on Construction Sites**

An accident is an “event that happens unexpectedly and causes damage, injury, etc.” to a person or property.” (Cowie, 1989). The Occupational Health and Safety Act, Act 85, 1993 defines an accident as “an event arising out of and in the course of an employee's employment and resulting in a personal injury, illness or the death of the employee. Bhange (2011), in an article stated that accident has the characteristics of:

- a) An accident is expected
- b) It results to some loss i.e. damage to property or equipment and injury or death. The third and the major important characteristics of an accident is that it arises out of work situation.

## **Classification of accidents**

Accident may be classified based on the magnitude of damage or harm done to the victim. Accidents may be considered to be fatal or minor. There are several factors that can be used to classify accidents generally and the classification by the International Labor Organization (ILO) will be considered. The classification includes:

- I. Classification according to length of recovery.
- II. Classification according to causes of events.
- III. Classification according to nature of events.
- IV. Classification according to damage caused.
- V. Classification according to nature of Injury
- VI. Classification according to accidents caused on construction work.

## **Prevention of Accidents on Construction Sites**

Jannadi (1996) conducted a sample survey of 86 safety officers and 173 workers from the top 200 construction companies in the UK to identify the key factors in accident prevention. Unlike many other studies the opinion of workers as well as safety officials was also considered; more conventionally, the focus remained on large construction companies.

The six most important factors were:

- I. Maintaining safe work conditions
- II. Establishing safety training
- III. Safety education to promote good safety habits amongst workers and supervisors
- IV. Effective control of the main contractors on site
- V. Maintaining close supervision of all work
- VI. Assigning safety responsibility to all levels of management and workers.

As falls are the largest causes of accidents, basic precautions should be undertaken before working at height. The work platform should be secure and adequate for the loads to be carried, the supporting ground firm, guard rails should be provided and appropriate harnesses and lines should be available. The main causes of death and injuries during excavation involved:

- I. Collapse of the sides.
- II. Material falling onto people in the excavation.
- III. People and vehicles falling into the excavation.
- IV. Undermining nearby excavation.
- V. Striking underground services.

Working in confined spaces is dangerous due to:

- I. Gas build-up in sewers and manholes and pits connected to them.
- II. Gas leaking into trenches and pits in contaminated lands.
- III. Oxygen consumption by rust inside tanks and vessels.
- IV. Liquid and slurries that can suddenly fill the space or release gases into it.

Chemical reactions between some soils and air causing oxygen depletion or production of carbon dioxide. Adequate ventilation should be ensured, and mechanical ventilation may be necessary. Entrance to the space should be large enough to allow trained workers wearing the necessary equipment to enter. There are two basic kinds of fall-protection systems in use in the construction industry, namely

- I. Passive System
- II. Active Systems.

### **Passive systems**

When installed, protect workers without the need for them to take positive action on their own behalf.

### **Active systems**

Are protection systems or devices that require each worker to take positive action to protect against a fall, such as putting on a safety belt, connecting the belt or lanyard to a safe suspension point or putting on a hard hat, etc. (Meltz Jesse M, 2009) Five major safety techniques which have highly contributed to excellent safety performance were identified in this study.

- I. Management commitment to contractor safety
- II. Safety planning: pre-project and pre-task
- III. Worker involvement
- IV. Safety education: orientation and specialized training

## V. Overall accident/incident investigations

An effective safety program should include all of these in order to attain the goal of zero accidents. By obtaining the goal of zero accidents; the direct and indirect costs associated with injuries are reduced, resulting in a higher profit margin and a more effective competitive position in the construction industry.

## RESEARCH METHOD

This study investigates the state of art of human health and safety practices on construction sites and the reliability of such practices. The research is underpinned by a review of extant literature to extract taxonomy of variables in the relevant domains; and empirical survey using quantitative techniques. The questionnaire survey aspect of this study was conducted using convenience sampling through a self-administered questionnaire to 87 respondents comprising construction workers, supervisors and professionals on 30 construction sites. In order to test the consistency of the Construct variables, reliability test was conducted for variables adopted in the questionnaire which resulted in a Cronbach's alpha values of 0.879 and 0.856 respectively indicating a good level of reliability and consistency of the construct validity (Doloi, Iyer and Sawhney, 2011). Data collected through the questionnaire survey were analyzed using basic descriptive statistical tools.

## 4.0 RESULTS, ANALYSIS AND DISCUSSION OF FINDINGS

### 4.1 Occurrence of Hazards on construction Sites

In determining the state of art of health and safety techniques on construction sites, it was needful to firstly examine the occurrence of Hazards on construction sites in Akure, Ondo State. The construct with nine variables as shown in Table 1 was scaled from No occurrence, Low occurrence, Average occurrence, Moderate occurrence to High occurrence to represent the top of the frequency scale. From the observations of the respondents, they claimed that hazards such as fall on site, accidents from failing or flying objects. Collision with stationary objects, handling accidents, overexerting or involvement in strenuous movements, contact with chemicals, fire explosion or blast occurs moderately on construction sites in Akure. Furthermore the table shows that, other hazards such as exposure to electricity occurs averagely on construction sites compared to the other hazards while heat/cold on construction sites has low occurrence. From the response, there was no hazard with no occurrence signifying that all of the hazards happens somehow on the construction projects participated in by the respondents. This implies that there is high rate of hazards on the construction projects the respondents participate in, this high rate of hazards occurring on construction sites in AKure is therefore a cause of concern to construction stakeholders, primarily the client and the professionals.

**Table 1. Occurrence of Hazards on construction Sites**

S/N	Construction Hazards	Mean
1	Fall on Site	4.08
2.	Accidents from falling or flying objects	4.01
3.	Collision with stationary objects	3.99
4.	Handling accidents	3.90
5.	Overexerting or involvement in strenuous movements	3.87
6.	Contact with chemicals	3.79
7.	Fire Explosion or blast	3.68
8.	Exposure to Electricity	2..56
9.	Heat/cold	2.05

**Note:** 1.00-1.49 for 1, No Occurrence; 1.50-2.49 for 2, Low occurrence; 2.50-3.49 for 3, Average Occurrence; 3.50-4.49 for 4, Moderate Occurrence and 4.50-5.00 for 5, High Occurrence

## 4.2 Usage of Human Safety Techniques

The state of art of human safety techniques on construction sites in Akure, Ondo state was examined by critically assessing the usage of human safety techniques on the projects carried out by the workers and professionals. The results revealed that some safety techniques have high use while others have low usage. Site cleaning and tidiness, checking of tools and equipment for defect before use, safety shoes to protect the feet from objects on the construction site are moderately used on construction sites though the use is not high enough, signifying that there are still considerable number of construction projects springing up with less regards or attention paid to the use of these safety techniques. Furthermore, proper shoring and earthwork support practices, provision of overall and use of safety harness are averagely used. This result is alarming as it shows safety is not priority where it matters most, the implications of this on the sustainability of construction projects and workers on site cannot be overemphasized. This is further proven by the extremely low usage of other safety techniques such as the use of face mask or safety goggle to protect the eyes from debris on the construction site, the use of safety gloves, effective site layout and the use of safety helmet. Others such as the aforementioned are; provision of first aid facilities, provision of perimeter fence, provision of worker training, provision of enlightenment schemes, the use of nose covers, earmuffs and frequent test for blood pressure.

**Table 2: Usage of Human Safety Techniques**

Safety Techniques	Mean
Site cleaning and tidiness	4.09
Checking of tools and equipment for defect before use	3.81
Safety shoes to protect the feet from objects on the construction site	3.56
Proper shoring and earthwork support practices	3.39
Provision of overall	3.37
The use of safety harness	3.13
Provision of safety signs	3.13
The use of face mask or safety goggles to protect your eyes from debris in the construction site	2.37
The use of safety gloves	2.36
Effective site layout	1.49
The use of safety helmet	1.47
Provision of first aid facilities	1.46
Provision of perimeter fence	1.41
Provision of worker training	1.24
Provision of enlightenment schemes	1.19
The use of nose covers	1.12
The use of earmuffs	1.12
Frequent test for blood pressure	1.01

**Note:** 1.00-1.49 for 1, No Usage; 1.50-2.49 for 2, Low Usage; 2.50-3.49 for 3, Average Usage; 3.50-4.49 for 4, Moderate Usage and 4.50-5.00 for 5, High Usage

### 4.3 Reliability of Health and Safety Techniques

Table 3 shows the observation of the respondents as regards the reliability of the safety techniques used on construction sites in AKure, Ondo State. safety shoes to protect the feet from objects on construction sites was observed to be highly reliable by the respondents, while site cleaning and tidiness, checking of tools and equipment for defect before use, effective site layout, use of safety helmet, provision of first aid facilities, provision of perimeter fence, proper shoring and earthwork support practices, the use of face mask or safety goggles to protect your eyes from debris in the construction site, provision of overall, the use of safety gloves and training of workers on safety practices were considered moderately reliable. However, the use of safety harness, provision of safety signs, use of nose covers, the use of earmuffs and test for blood pressure were considered averagely reliable by the respondents.

**Table 3:** Reliability of Safety Techniques

Safety techniques	Mean
The use of safety shoes to protect the feet from an object in the construction site	4.44
Site cleaning and tidiness	4.35
Checking of tools and equipment for defect before use	4.07
Effective site layout	4.01
The use of safety helmet	3.87
Provision of first aid facilities	3.77
Provision of perimeter fence	3.77
Proper shoring and earthwork support practices	3.77
The use of face mask or safety goggles to protect your eyes from debris in the construction site	3.72
Provision of overall	3.72
The use of safety gloves	3.62
Provision of worker training	3.55
Provision of enlightenment schemes	3.48
The use of safety harness	3.41
Provision of safety signs	3.25
The use of nose covers	3.13
The use of earmuffs	2.90
Frequent test for blood pressure	2.64

**Note:** 1.00-1.49 for 1, Not Reliable; 1.50-2.49 for 2, Low Reliability; 2.50-3.49 for 3, Average Reliability; 3.50-4.49 for 4, Moderate Reliability and 4.50-5.00 for 5, High Reliability

## CONCLUSION

The two main objectives of this study is to investigate the state of art of health and human safety techniques on construction sites in AKure and examine their reliability levels. Extant literature review and quantitative research design through survey method was used to achieve the objectives.

Results gotten from the respondents shows that the major hazards frequent on construction sites within the AKure metropolis includes but not limited to; fall on site, accidents from failing or flying objects. Collision with stationary objects, handling accidents, overexerting or involvement in strenuous movements, contact with chemicals and fire explosion or blast. The results also revealed that the use of safety shoes was considered very reliable as it prevents the workers from various ranges of injuries and harm. Other safety techniques considered moderately reliable are;



site cleaning and tidiness, checking of tools and equipment for defect before use, effective site layout, use of safety helmet, provision of first aid facilities, provision of perimeter fence, proper shoring and earthwork support practices, the use of face mask or safety goggles to protect your eyes from debris in the construction site, provision of overall, the use of safety gloves and training of workers on safety practices.

Though there is generally a low usage of these safety techniques in Akure, it was discovered that the respondents consider site cleaning and tidiness, checking of tools and equipment for defect before use, safety shoes to protect the feet from objects on the construction site as being moderately used on construction sites. Others being used mildly are; proper shoring and earthwork support practices, provision of overall and use of safety harness are averagely used.

## RECOMMENDATION

In Abraham Maslow's Pyramid, Safety needs come highly essential after physiological needs. This shows the imperativeness of having a secured and humanely conducive work environment for workers in the construction industry. It then becomes highly recommended that urgent effort be directed towards minimizing the high rate of hazards in the construction industry by improving the adoptability of human safety techniques. To make this work, essential importance must be given to creating a policy framework and enforcement units that can drive these processes.

Also, the Nigerian construction industry stakeholders comprising the clients/employer, the professionals and workers be taken through formal and informal education processes to instill the need for safety. Other motivational concepts such as tax cuts for the safest firms, safety awards and the likes can go a long way in driving the implementation of good safety practices.

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**Adetayo Onososen** is a research-driven, highly dependable, diligent and innovative graduate of Quantity surveying from the Federal University of Technology Akure, Ondo State, Nigeria. He also has a Master of Science in Quantity Surveying from the University of Lagos. He has a strong bias for excellence, execution and exemplary work ethic. He is highly analytical with industry-based experience in construction management/cost control and project management. He is skilled in conducting qualitative and quantitative field research in environmental sciences/technology in construction and sustainable/green buildings. He possesses effective communication and writing skills, strategic leadership, teamwork and dynamic people management skills. Over the years he has garnered keen interests in technology in construction, green buildings and research in the environmental science. He works as a practising quantity surveyor in a firm where a mix of entrepreneurial drive and extreme ownership mindset is encouraged where he is leveraging skills to contribute own quota to overall organization growth.

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